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BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION
NASHVILLE, TENNESSEE

IN RE: THE APPLICATION OF JACKSON SUSTAINABILITY COOPERATIVE FOR A DETERMINATION OF EXEMPTION AND IN THE ALTERNATIVE, FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY	**)**	**DOCKET NO. 21-00061**

PETITIONER'S RESPONSES TO TENNESSEE ELECTRIC COOPERATIVE ASSOCIATION'S INTERROGATORIES AND REQUEST FOR PRODUCTION OF DOCUMENTS

INSTRUCTIONS

These responses are made solely for the purpose of this action. These Responses are covered under the Protective Order issued in this matter. Petitioner Jackson Sustainability Cooperative has not completed preparation for the hearing and has not completed its investigation into some of the issues raised in by these interrogatories and request for documents. The following Responses are thus given without prejudice to Petitioner to produce subsequently discovered information and material.

By these responses Petitioner Jackson Sustainability Cooperative does not admit the relevance of any matter or document and reserves the right to object to the admission into evidence of any response or any document that is produced. Except for facts that may be explicitly admitted herein, no admission of any nature whatsoever is to be implied or inferred from these Responses.

Petitioner Jackson Sustainability Cooperative specifically reserves its right to assert privilege for any privileged matter or document that is inadvertently disclosed or produced in

response to these Interrogatories and Requests for Production. In the event such a matter or documents are inadvertently disclosed or produced, the inadvertent disclosure/production by Petitioner of any matter or of a document containing attorney-client communication, attorney work-product, or otherwise privileged information shall not constitute a waiver of privilege and such matter or document(s) shall be returned to the Petitioner immediately upon such request. Included in this reservation are not only matters and documents promulgated by Petitioner, but also any matter or document disclosed/produced by Petitioner that may have been promulgated by others.

GENERAL OBJECTIONS

Petitioner Jackson Sustainability Cooperative' undersigned counsel objects to each and every Interrogatory Request for Production to the extent it calls for the production of privileged information or documents, including information or documents protected by the attorney-client privilege, investigative privilege, consulting expert exemption, information or documents containing or pertaining to work product, and documents prepared in anticipation of the hearing in this matter. Petitioner Jackson Sustainability Cooperative' counsel further objects to each and every Interrogatory to the extent it seeks the disclosure of the identities of, or any work generated by, non-testifying consulting experts retained by or at the direction of Petitioner Jackson Sustainability Cooperative' attorneys in anticipation or preparation for the hearing in this matter, or in connection with the rendering of legal advice to the Petitioner Jackson Sustainability Cooperative. No restatement of, or failure to restate, any specific objection in the context of these answers shall be construed to imply a waiver of any unstated privilege objections addressed by this General Objection.

2. Petitioner Jackson Sustainability Cooperative' counsel objects to each and every Interrogatory and Request for Production to the extent it attempts to impose a duty on Petitioner Jackson Sustainability Cooperative to disclose information or to produce documents that is/are available from other entities not parties in this litigation and to the extent it seeks matter or materials that is/are available to the public.

3. Petitioner Jackson Sustainability Cooperative' counsel objects to each and every Interrogatory and Request for Production to the extent it is overly broad, burdensome, and/or oppressive, or seeks information or documents neither relevant to the subject matter of this action nor reasonably calculated to lead to the discovery of admissible evidence. Petitioner Jackson Sustainability Cooperative' counsel preserves its objection to each such Interrogatory and Request for Production to the extent it calls for the disclosure/production of such information/documents.

4. Petitioner Jackson Sustainability Cooperative' counsel objects to every Interrogatory and Request for Production that uses language such as "all" or "each and every" or similarly broad language. Such an Interrogatory or Request for Production is onerous, burdensome, harassing, prejudicial, and overly broad. Each Interrogatory asking "any" and "all" or "each and every" is objectionable in that such an inquiry, in essence, is a request for evidence, and not discoverable information. Moreover, Petitioner has no possible means of making the all encompassing identification such a broadly worded Interrogatory or Request for Production requires.

5. Petitioner Jackson Sustainability Cooperative is contacting those persons who have knowledge of the location and/or existence of information that may be responsive. To the

extent that the Interrogatories or Requests for Production or any portion thereof seek to require Petitioner Jackson Sustainability Cooperative to take any actions other than those enumerated above, such as identifying "all persons" having knowledge or identifying "all documents" concerning the subject of the Interrogatory or Request for Production, Petitioner Jackson Sustainability Cooperative's counsel objects to said Interrogatory or Request for Production on the grounds that it is unduly burdensome and oppressive.

6. Petitioner Jackson Sustainability Cooperative's counsel objects to each and every Interrogatory and Request for Production to the extent that it requires Petitioner Jackson Sustainability Cooperative to produce documents created for it by other parties in that such an Interrogatory or Request for Production is vague, ambiguous, and overly broad. Additionally, such an Interrogatory or Request for Production is broad enough to include information protected by the attorney-client privilege, the attorney work product doctrine, investigative privilege, and the consulting expert exemption.

7. Each Response herein below is subject to all objections as to competence, relevance, materiality, propriety, admissibility, and any and all other objections and grounds to which the same statement would be subject if delivered through live testimony. All such objections and grounds are expressly reserved by Petitioner Jackson Sustainability Cooperative and may be interposed at the time of hearing or in conjunction with other uses of the Responses.

REQUESTS FOR PRODUCTION

1. Produce all documents upon which You intend to rely in support of Your Petition or JSC's Response in this Docket.

RESPONSE:

Objection. This Request is overly broad and burdensome, and not likely to produce relevant evidence. Without waiving this objection, attached please find Bate Stamped JSC 000001 through JSC 000440 and Bate Stamped JSC CONFIDENTIAL 500001 through JSC CONFIDENTIAL 500087. Any other documents located will be supplemented as described in the instructions.

2. Produce all documents referenced or relied upon in Your answers to TECA's interrogatories to JSC in this Docket.

RESPONSE:

Objection. This Request is overly broad and burdensome, and not likely to produce relevant evidence. Without waiving this objection, attached please find Bate Stamped JSC 000001 through JSC 000440, and Bate Stamped JSC CONFIDENTIAL 500001 through JSC CONFIDENTIAL 500087. Any other documents located will be supplemented

3. Produce all documents that support Your position that JSC is a non-profit cooperative entity subject to the Rural Electric and Community Services Cooperative Act, as codified at T.C.A. § 65-25-101 et seq.

RESPONSE:

Please see attached the Charter (Bate Stamped JSC 000024 to JSC 000026), Charter Amendment (Bate Stamped JSC 000400 to JSC 000401), Bylaws (Bate Stamped JSC 000028 to JSC 000026), and Bylaw Amendment (Bate Stamped JSC 000403 to JSC 000407). See a detailed discussion on formation at the Direct Testimony of Dennis Emberling, Part II (Bate Stamped JSC 000426 to JSC 000429), which discusses other documents that may be responsive in showing the purpose of the Petitioner in operating for the mutual benefit of its members in

sharing supplemental energy from the shared equipment the Petitioner proposes to lease.

4. Produce all documents that support Your position that JSC is not a public utility.

RESPONSE:

Objection. This Request is overly broad and burdensome, and not likely to produce relevant evidence. Second, this Request calls for a legal conclusion. The correct legal conclusion is a non-profit membership cooperatives like the Petitioner exists to serve the mutual benefit of its members and not the general public. Caney Fork Electric Cooperative., Inc. v. Tennessee State Board of Equalization, Case No. M2016-00316-COA-R12-CV (Tenn. App. 2016) Municipal corporations like Jackson Energy Authority represent the public. See Allmand v. Pavletic, 292 S.W. 3d 618, 626 (Tenn. 2009) Without waiving these objections, please see the Petition filed in this matter as document 2100061, the Direct Testimony of Dennis Emberling (Part I) filed as document 2100061a, and the Response to TVA and JEA filed as document 2100061j. Additionally, please see the response to Request 3 above, and other documents produced that demonstrate the use of the property for the mutual benefit of members.

5. Produce all documents, including studies, analyses, policies, and plans, concerning JSC's operations; market; competition; competitors; potential and current members, patrons, or other customers; and projected customer demand.

RESPONSE:

Objection. This question as phrased is argumentative because it references customers, competitors, and projected customer demand. These concepts are not applicable to a membership cooperative that shares a solar facility for supplemental renewable energy. The members desire for all their energy to be from renewable sources. Jackson Sustainability

Cooperative will share its supplemental energy from renewable sources among its members. Second, this Request necessitates the preparation of a compilation of documents, abstracts, or summaries from documents which may be equally available to Tennessee Electric Cooperative Association. Because such preparation would be burdensome and/or expensive to the propounding party and responding party, Petitioner offers for review certain documents related to the projected future operation of the solar facility from which members share supplemental solar energy as described in the Petition. As the status of the final design nears completion, more documents may be responsive this request. Without waiving this objection, please see the feasibility study Bate Stamped document JSC CONFIDENTIAL500057 to JSC CONFIDENTIAL 500087.

6. Produce all documents, including studies, analyses, policies, and plans, concerning the benefits JSC may deliver to members, patrons, and the community, including documents relating to the document titled "Economic Impact of the Jackson Solar Facility," attached as Exhibit 13 to the Petition.

RESPONSE:

Exhibit 13 to the Petition, Economic Impact of the Jackson Solar Facility, is an analysis of how the construction and operation of the Solar Facility has a significant economic impact and benefit to Jackson and Madison County, Tennessee. Exhibit 13 states its modeling assumptions. See Bate Stamped JSC 000372 through JSC 000374.

7. Produce all documents concerning the impact of JSC's solar facility on JEA with respect to that entity's finances, facilities, future costs, and sales of electricity.

RESPONSE:

See Direct Testimony of Dennis Emberling Part II, Bate Stamped JSC 000426 to JSC 000440 together with the articles on demand charges cited in his testimony.

8. With respect to JSC's solar facility, produce all contracts, draft contracts, letters of intent, and memoranda of understanding to which JSC is, or is contemplated to be, a party, as well as communications concerning each of the foregoing.

RESPONSE:

Jackson Sustainability Cooperative is prepared to enter into an equipment lease for the solar facility with a purchase option substantially in the form of the document at Bate Stamped JSC CONFIDENTIAL 500034 to JSC CONFIDENTIAL 500052

9. Produce all documents concerning the relationship between JSC and CDE.

RESPONSE:

Jackson Sustainability Cooperative will lease its generation and deliver equipment from Community Development Enterprises - Jackson I (Petition, ¶¶23 and 31, Bate Stamped JSC 000013, and JSC 000016). Also, Community Development Enterprises - Jackson I may provide start up funds as a Patron of Jackson Sustainability Cooperative. (see Exhibit 2, Bylaws, Section 9.2, Bate Stamped JSC 000050) See response to Request 8 above.

10. Produce all documents, including requests for proposals and contracts, memoranda of understanding, or letters of intent to which JSC or CDE is a party, concerning the construction or operation of solar facilities, or the generation, transmission, or sale of electricity in the state of Tennessee by JSC, CDE, or any entity affiliated with JSC or CDE.

RESPONSE:

Objection. Request No. 10 as phrased is argumentative. It requires the adoption of an

assumption concerning the role of Community Development Enterprises - Jackson I and possible inferences which are improper and reserved for the hearing. Without waiving this objection, Community Development Enterprises - Jackson I is the solar developer who will coordinate the design, procurement and construction of the solar facility for the Petitioner. Northern Reliability, Inc. will oversee construction as discussed in the Petition (¶ 27, Bate Stamped 000015). The equipment is selected (but not ordered) and is described in Northern Reliability, Inc. contract, Bate Stamped document JSC CONFIDENTIAL 500001 through JSC 500033.

11. Produce all documents concerning the financing of JSC, CDE, or the solar facility, including all documents provided to potential funders, as referenced on page 14 of the Petition.

RESPONSE:

The Petitioner sent a nondisclosure agreement to several prospective funders at Bate Stamped JSC 000413 through JSC 000414. Once signed, the parties exchange information, including the project description found in the confidential feasibility study, Bate Stamped JSC CONFIDENTIAL 500057 through JSC CONFIDENTIAL 500087.

INTERROGATORIES

12. Identify each person that You reasonably believe may possess knowledge of facts or information relevant to this Docket.

RESPONSE:

All persons described in the Petition or who are associated with the vendors described in the Petition. Richard Donnell replaced Dr. Ann Keyl as a Director of the Petitioner. Other persons with knowledge include David Hunt, John C. Meyer Jr., Michael Miner, Michael Kahn,

Ken Sanders, and Greg Noble.

13. Identify each person who provided information or otherwise participated in creating the documents submitted by JSC in this Docket, including the Petition, the Direct Testimony of Dennis Emberling, filed on May 24, 2021, JSC's Bylaws and Amendment to the Bylaws, JSC's Charter and the Articles of Amendment to the Charter, JSC's Conditional Member Agreement, and JSC's Full Member Agreement.

RESPONSE:

Objection. Interrogatory 13 seeks information covered by the attorney-client privilege. Without waiving this objection, the Documents listed in Interrogatory 13 were created by counsel for the Petitioner to reflect the requests of the Petitioner. The Direct Testimony of Dennis Emberling was created by Mr. Emberling. The parties to contracts and agreements all provided information for those documents. The site plan identifies the civil engineer. The bylaw amendment was signed by all board members of Jackson Sustainability Cooperative. Jackson Sustainability Cooperative will further assist in identifying persons who contributed to specific documents identified by TECA.

14. Identify all facts that support Your position that JSC is a non-profit cooperative entity subject to the Rural Electric and Community Services Cooperative Act, as codified at T.C.A. § 65-25-101 et seq.

RESPONSE:

Objection. Interrogatory 14 is overly broad by asking for "all" facts. Without waiving this objection, see response to Request for Production No. 3 above with all controlling formation and essential operation documents. Additionally, in the case of Caney Fork Electric

Cooperative., Inc. v. Tennessee State Board of Equalization, Case No. M2016-00316-COA-R12-CV (Tenn. App. 2016)(challenge to constitutionality of property tax exemption), the Tennessee Court of Appeals described a membership electric cooperative as follows:

> In 1939, the Tennessee legislature first created the statutes allowing electric cooperatives. 1939 TENN. PUB. ACTS, ch. 176, § 2.
>
> ...
>
> Electric cooperatives were originally conceived as "cooperative, non-profit, membership corporations . . . organized . . . for the purpose of supplying electric energy and promoting and extending the use thereof." 1939 TENN. PUB. ACTS, ch. 176, § 2. Today's statutes identify them as "ideal business organizations in providing adequate and reliable electric services at reasonable rates throughout the rural communities of Tennessee." Tenn. Code Ann. § 65-25-101(b)(1).
>
> ...
>
> Electric cooperatives are membership based. See Tenn. Code Ann. § 65-25-102(4). Each member is entitled to vote for the directors and upon other matters. Tenn. Code Ann. §§ 65-25-102(6), 106(a). Members and nonmember patrons must agree to pay for the electric cooperative's services and abide by its terms and conditions of service. Tenn. Code Ann. § 65-25-111(a)(1). **Electric cooperatives are organized for the mutual benefit of their members, not the general public**. (emphasis added)
>
> ...
>
> There is no element of charity associated with electric cooperatives. Members and nonmember patrons pay for the services they receive. ... While no doubt exists that the conditions of the communities where these cooperatives were established improved because of access to electricity, there is no charitable purpose or activity involved.

Once the leased equipment is installed and operational, Jackson Sustainability Cooperative acts for the mutual benefit of its members. It promotes the use of renewable energy consistent with the sustainability goals of its commercial and industrial members.

15. Identify all facts that support Your position that JSC is not a "public utility" as defined by T.C.A. § 65-4-101 et seq.

RESPONSE:

Objection. Interrogatory 15 calls for a legal conclusion. Without waiving this objection, Petitioner Jackson Sustainability Cooperative has two alternative legal theories based on facts,

assumptions, and inferences as expressed in the Petition and in the Applicant's Response to TVA and JEA (Bate Stamped JSC 000384 through JSC 000412). First, Jackson Sustainability Cooperative requests that the Commission look at its proposed Solar Facility under T.C.A. §65-4-101(6)(A)(v) and T.C.A. §65-25-123 to determine that Jackson Sustainability Cooperative is not a public utility subject to regulation. T.C.A. §65-4-101(6)(A)(v) expressly provides that a nonprofit coop subject to the Rural Electric and Community Services Cooperative Act is not a public utility in Tennessee. Public utility is defined by statute as an entity that owns, operates, manages or controls power services that are "dedicated to the public use, under privileges, franchises, licenses, or agreements, granted by the state or by any political subdivision." T.C.A. 65-4-101(6)(A)

Jackson Sustainability Cooperative relies on the fact that it is organized with the intent to operate under the Rural Electric and Community Services Cooperative Act. Therefore, Jackson Sustainability Cooperative is "deemed to be not-for-profit cooperative[] and nonutilit[y], and, except as provided in § 65-25-122, exempt in all respects from the jurisdiction and control of the Tennessee Public Utility Commission. T.C.A. §65-25-123

Under the second theory, even if Jackson Sustainability Cooperative were not organized with the intent to operate under the Rural Electric and Community Services Cooperative Act (and it is under the Act), it is still not a public utility because it is not "dedicated to the public use, under privileges, franchises, licenses, or agreements, granted by the state or by any political subdivision." T.C.A. 65-4-101(6)(A) Jackson Sustainability Cooperative provides supplemental energy to its members from renewable sources. It intends to operate for the benefit of its members, and therefore, cannot operate for the general public. Moreover, it is not

franchised by the state.

16. Identify all facts that support Your position that JSC's proposed solar facility is not "affected by and dedicated to the public use," as stated on page 17 of the Petition and page 8 of JSC's Response.

RESPONSE:

Objection. Interrogatory 16 calls for a legal conclusion. Without waiving this objection, see the response to Interrogatory 15 above. In a closely analogous context, for personal property tax purposes, property is required to be classified based on its use. Specifically, tangible personal property is put into one of three possible classifications: (1) public utility property to be assessed at 55% of its value; (2) industrial and commercial property to be assessed at 30% of its value and (3) all other tangible personal property to be assessed at 5% of its value. See Article II, Section 28 of the Constitution of Tennessee. The definition of property in each class is determined by the legislature. T.C.A. §67-5-501(8) provides that "Public utility property" is hereby defined to include all property of every kind, whether owned or leased, and use or held for use, directly or indirectly in the operation of a public utility, which shall include but not necessarily be limited to the following business entities, whether corporate or otherwise: ... (E) Power companies, whether hydroelectric, steam, atomic, or other kinds for the transmission of power; ... [and] (I) Electric light companies. The focus is not on what property is owned, but how the property is used. In this case, Jackson Sustainability Cooperative works for the mutual benefit of its members to provide supplemental energy from renewable sources. It does not work “in the operation of a public utility” because the shared energy is only available to its members who have common goals to increase the use of energy from renewable sources. Jackson Sustainability

Cooperative does not make this supplemental energy available to the general public. Jackson Energy Authority remains the franchised municipal provider who is required to provide energy to the public.

17. Identify all facts that support Your position that JSC "does not hold itself out to the general public," as stated on page 10 of JSC's Response.

RESPONSE:

Objection. Interrogatory 17 calls for a legal conclusion. Without waiving this objection, please see the responses to Interrogatories 15 and 16 above. Jackson Sustainability Cooperative will provide is supplemental energy from its Solar Facility to a limited number of manufacturers and commercial users located along the West Tennessee Railroad. (See Petition ¶ 11, Bate Stamped JSC 000010) Jackson Sustainability Cooperative provides a supplemental service for the mutual benefit of its members. This is in stark contrast to a public service where the entity provides an essential service to the general public, which has a legal right to demand or receive this good or service. In this case, Jackson Sustainability Cooperative has ability to provide supplemental energy. Not all persons expressing an interest are suitable to share in the cost of supplemental energy. No person expressing an interest has a right to demand access to the solar service that is shared among neighboring manufacturers and commercial users.

18. Identify all facts that support Your position that JSC's proposed solar facility project does not violate the Geographic Territories of Electric Utility Systems act, as codified at T.C.A. § 65-34-101 et seq. (the "GTL").

RESPONSE:

Objection. Interrogatory 18 is overly broad by asking for “all” facts. Second, it calls for a

legal opinion. Without waiving these objections, the GTL provides the municipal utility service with a territory and limits the ability of other non-consumer owned entities to sell electric power within the boundaries of that territory. However, the GTL states that non-consumer owned entities expressly excludes electric and community service cooperatives. T.C.A. 65-34-102(4) Please see responses to Requests 3, 4, and 14 above that discuss why Jackson Sustainability Cooperative intends to operate as a cooperative. Each member can put solar panels on their roof. This is an consumer-owned activity that falls outside of the GTL. The members of Jackson Sustainability Cooperative are seeking to work collectively for their own benefit to accomplish a project that is difficult for any one member to do on its own. Ultimately, the members will have ownership of the Jackson Sustainability Cooperative. For a more complete discussion, please see the Applicant's Response to TVA and JEA, Bate Stamped JSC 000384 through JSC 000412.

19. Identify all language in the GTL that supports the statement "the legislature did not intend to prevent this kind of Solar Facility project," which appears on page 12 of JSC's Response.

RESPONSE:

Objection. Interrogatory 19 calls for a legal opinion. Without waiving this objection, please see response to Request 18 above.

20. Identify all facts that support Your position that JSC's proposed solar facility project does "not 'duplicate' the local distribution system except in a very minor way," as stated on page 11 of JSC's Response.

RESPONSE:

The local JEA distribution system consists of substations, transformers, other equipment,

poles, and wiring to tens of thousands of buildings. JSC's distribution system consists of one trunk line and approximately 2 to 4 drop-off wires to 2-4 buildings. That is why JSC's system is very minor by comparison to JEA's.

Further, underground, trenched wiring in conduit does not at all in any way duplicate existing overhead distribution wiring on poles. It is an entirely different form of distributing electricity - one that is proof against storms, fires, sabotage, and most other causes of grid failure.

Still further, the electricity carried on our underground wiring to our members does not duplicate the transmission of electricity carried on JEA's distribution system. It carries an entirely different type of electricity (solar), at entirely different voltages and current levels. It is not a duplication of the electricity sent across JEA's wires at all. It merely supplements it.

21. Explain whether and how JSC will adhere to the seven cooperative principles, as adopted by the International Co-operative Alliance, available at: https://www.ica.coop/en/cooperatives/cooperative-identity.

RESPONSE:

The ICA's Cooperative Principles are aspirational in nature. Jackson Sustainability Cooperative will train its board members on the 2016 Guidance Notes on the Cooperative Principles published by the ICA that are applicable to a membership coop serving the mutual benefit of its members in sharing a solar facility. This training will assist the Board in applying the Principles in governing the Petitioner as it transitions from design into operations, and from community representatives on the Board to member representatives.

22. Explain whether and how JSC will accept requests for its services.

RESPONSE:

Objection. Request 22 is argumentative and makes the false inference that once the membership is finally determined Jackson Sustainability Cooperative will be selling services to those who request it. Without waiving this objection, Jackson Sustainability Cooperative is a membership cooperative organization that facilities the sharing of supplementary energy among a few neighboring members. Jackson Sustainability Cooperative will invoice members for their share of the available supplemental energy produced by the leased equipment. Treatment of requests for membership would depend on the timing of the request. If Jackson Sustainability Cooperative has already admitted sufficient members to share energy from the solar facility, such requests will be rejected. If the request for membership is prior to this point, the requesting entity may, at JSC's discretion, be considered according to the minimum qualifications. If the requesting entity meets those qualifications and JSC decides to consider its request, it must submit its historical electrical profiles and other relevant usage information for analysis by engineers. If it is finally selected as one of entities to be offered membership, it will be given a membership agreement to sign. If it is not so selected, it will be rejected.

23. Identify the maximum number of users that may be served by JSC's solar facility as members, patrons, or in any other capacity.

RESPONSE:

Based on current knowledge and assumptions of the peak demand and usage of neighboring manufacturers, it is anticipated that Jackson Sustainability Cooperative will share energy from renewable sources between two to four members. Based on reasonable assumptions, it is highly unlikely Jackson Sustainability Cooperative could exceed ten members. To the extent the questions implies that a Patron is a user who is not a member, there will not be any sharing of

supplemental energy with entities that are not members.

24. Explain whether and how JSC will operate the solar facility on an area coverage basis.

RESPONSE:

Objection. Interrogatory 24 calls for a legal conclusion based on the inference that a few industrial neighbors working together to have supplemental energy from renewable sources forms a coverage area. Without waiving this objection, the Petitioner provides supplemental electricity from renewable sources to its members. The members continue to draw their primary electrical energy from the municipal provider who services them on an area coverage basis. The supplemental energy available is limited to the output of the solar facility.

25. Explain whether JSC members, patrons, and other customers will draw power from the solar facility only during outages on the JEA distribution system and, if not, explain when JSC members, patrons, and other customers will draw power from the solar facility, the person who decides when to draw power from the solar facility, and the standards that govern such decisions.

RESPONSE:

Jackson Sustainability Cooperative members will draw power from the solar facility whenever their instantaneous demand rises sufficiently for Jackson Sustainability Cooperative's supplementary power to them to be worthwhile to them and feasible for Jackson Sustainability Cooperative to supply. This is not limited to grid outages. No one makes such decisions. They are the responsibility of the computerized controller which electronically monitors production, storage, and demand and shares or optimizes power delivery among members.

26. Explain whether full members will be obligated to purchase "supplemental electric energy generated by JSC's solar facility" under Section 2 of the Full Member Agreement, attached as Exhibit 4 to the Petition, and whether there is any contractual cap on the amount of electricity that a member, patron, or other customer can purchase from the JSC solar facility.

RESPONSE:

Full members are not required to purchase any electricity at all from Jackson Sustainability Cooperative. They are only required to pay a monthly invoice to Jackson Sustainability Cooperative that, added to that month's invoice from JEA, is guaranteed to be less than 5% lower than what they would have paid JEA for that month's electricity, had they not been connected to Jackson Sustainability Cooperative's solar facility. The more electricity they use from Jackson Sustainability Cooperative's solar facility, the lower their JEA bill will be for that month, and the higher their Jackson Sustainability Cooperative bill will be for that month. There is neither a floor nor a cap on either the amount of electricity they draw from Jackson Sustainability Cooperative or that they pay Jackson Sustainability Cooperative for. If they use no Jackson Sustainability Cooperative electricity, their Jackson Sustainability Cooperative bill for that month is zero. The limitation on how much electricity they draw from Jackson Sustainability Cooperative's solar facility at any one instant is a function of the facility's ability to supply electricity and the demand from Jackson Sustainability Cooperative's other members. The smart microgrid controller optimizes these factors, as previously explained.

27. Explain whether and how JSC members will benefit from the "federal tax credits and accelerated depreciation benefits" referenced on page 14 of the Petition.

RESPONSE:

Jackson Sustainability Cooperative leases the equipment that forms the solar facility with an option to purchase. The solar facility is financed through the lessor using tax equity investments which pair the federal tax credits and other tax benefits generated by a qualifying physical investment with the capital financing associated with the solar facility. Typically, the buyer assigns the rights to claim the tax credits to a lender in exchange for an equity investment. The transfer of federal tax credits usually occurs within a contractual agreement that legally binds the two parties. There are two energy-related tax credits—the renewable electricity production tax credit (PTC) and energy investment tax credit (ITC). A third category of tax credit is the new markets tax credit (NMTC). In general, the federal government provides tax credits as an economic rationale for subsidizing the activities targeted by these tax credits.

In general, Jackson Sustainability Cooperative and its members benefit because use of tax equity markets is an efficient and effective means of delivering federal financial support for the increase of energy from renewable sources. The best tax equity investor, in addition to providing financing, will evaluate the quality of the project and provide continuing oversight and compliance monitoring.

Solar renewable energy certificates (SRECs) are a performance-based solar incentive that allows users to earn additional income from solar electricity generation. SRECs exist because of state regulations known as renewable portfolio standards (RPS). Tennessee does not have RPS. States with RPS encourage power generation utilities to produce a specific percentage of their electricity from renewable resources. SRECs are a type of renewable energy credit that are specific to electricity that comes from solar technologies. For example, the laws of some states may provide one megawatt-hour of solar produces one SREC. Members of Jackson

Sustainability Cooperative whose principal offices are out of state may be able to count the Tennessee SREC in the state of their principal residence, but not in Tennessee because Tennessee currently has no enabling legislation. States with this legislation have the public policy of carving out a set portion of a state's renewable portfolio standard for solar technologies, and mandate that a set amount of electricity generation needs to be met by just solar energy.

28. Explain whether and how JSC will be in competition with JEA or any other local power company once JSC's solar facility is operational.

RESPONSE:

Objection. The term "local power company" is argumentative. Jackson Sustainability Cooperative is not a "local power company." Jackson Sustainability Cooperative allows its industrial members to share in supplemental energy from renewable sources. Jackson Energy Authority will continue to provide electrical service to these members.

29. Explain whether and how JEA or TVA is a "competing enterprise that distributes electric energy" under Section 5.3.2. of the Bylaws of Jackson Sustainability Cooperative, attached as Exhibit 2 to the Petition.

RESPONSE:

Section 5.3 is the qualification of directors of the Jackson Sustainability Cooperative. The qualification standards are to identify conflicts of interest. For example, if a prospective director has a financial interest in another solar farm, like the one that exists at the airport in Jackson, Tennessee, the potential conflict of interest would require examination. If a TVA employee were nominated to serve on the board of directors, his employment at TVA would not be considered a conflict since Jackson Sustainability Cooperative provides only supplemental

energy.

30. Identify all facts that support Your statement that JEA and TVA "have frequent outages that result in sending employees home and lengthy restart protocols," as stated on page 10 of JSC's Response.

RESPONSE:

It is common knowledge in Jackson that power outages occur from time to time, often due to severe weather events. JEA has an entire section on its website dedicated to power outages. See

https://www.jaxenergy.com/learning-center-articles/outages-faq
https://www.jaxenergy.com/learning-center-articles/causes-of-outages
https://www.jaxenergy.com/learning-center-articles/restoration-process

As JEA states on its Causes of Outages webpage cited above, “animals are one of the top causes of electric outages? Despite the barriers and protective equipment in place, small animals can climb onto or inside certain pieces of equipment causing it to shut down, thus interrupting the flow of power to customers. During storms, high winds and lightning are common causes of outages. High winds may cause power lines to touch. Lightning may strike electrical equipment or nearby objects causing them to fall onto lines or poles. Freezing rain or sleet can create a buildup of ice on power lines and trees eventually causing lines to break. During storms, high winds and lightning are common causes of outages. High winds may cause power lines to touch. Lightning may strike electrical equipment or nearby objects causing them to fall onto lines or poles. Freezing rain or sleet can create a buildup of ice on power lines and trees eventually causing lines to break. Trees and tree limbs are a major cause of outages in all weather conditions. Whether it’s windy, stormy, icy or sunny outside, tree limbs can fall on power lines

and poles. Vehicle accidents involving utility poles may cause an outage. Poles may be damaged, causing power lines to break or touch. Also, accidental contact with underground or overhead power lines at construction sites can cause power outages."

It is also common knowledge among manufacturers that power outages of more than a few minutes require sending employees home and implementing lengthy restart protocols. See

"Power Outage", from madesafe.ca, attached as Bate Stamped JSC 000418)
www.plantengineering.com/articles/seven-steps-for-a-successful-shutdown

JEA does not restore power to manufacturers first. As its FAQ web page states, " We work to restore transmission lines, substations, and critical system loads such as hospitals, fire, police and other services vital to public welfare. Then we work our way across the system, first repairing problems serving larger groups of the customer than to smaller groups." See JEA's "Steps to Restoring Power Following a Major Outage" attached.

Power outages also can damage expensive heavy machinery. As JEA states in its FAQ webpage cited above, " If the electrical equipment that serves your home or business is damaged, a licensed electrician must complete certain repairs before power can be safely restored. Once the necessary repairs have been made and the work has passed inspection, the Jackson Energy Authority can safely restore power." Obviously, this is more costly to manufacturers, who lose production time, than to other types of businesses.

31. For the period January 1, 2019 through June 30, 2021, specify by date and duration each instance in which a member, prospective member, patron, prospective patron, or other customer or prospective customer of JSC: (a) lost electric power; and (b) was required to "send employees home as they begin lengthy restart protocols," as stated on page 7 of the

Petition.

RESPONSE:

At this time, Jackson Sustainability Cooperative has no specific information about grid power outages in East Jackson. Jackson Sustainability Cooperative does not have specific information about the dates or durations for which neighboring companies sent employees home and later conducted restart protocols. That manufacturing plants regularly engage in restart protocols is common knowledge. See, for example,

https://madesafe.ca/wp-content/uploads/2016/09/POWER-OUTAGE.pdf (JSC 000418)
https://www.plantengineering.com/articles/seven-steps-for-a-successful-shutdown/
https://www.epa.gov/sites/production/files/2019-11/documents/191126-incidentactionchecklist-po-form_508c.pdf

32. Specify the "peak demand profile" for each member or prospective member of JSC, as referenced on page 8 of the Petition.

RESPONSE:

For a more detailed explanation of peak-demand, please see the Direct Testimony of Dennis Emberling, Part II, at Bate Stamped JSC 000429 to JSC 000436). JEA customers pay "usages charges" for the energy they use at varying rates per kilo-Watt-hour (kWh) of energy. In addition, they pay "peak-demand charges" based on the highest amount of power in kilo-Watts (kW) they draw from JEA during a billing period.

Similarly, JEA pays TVA a monthly peak-demand charge based on JEA's maximum power demand from TVA for that month. This is theoretically justified by TVA as reimbursing it for its high costs of building, maintaining, and operating reserve power generation plants that usually sit idle, producing no energy and earning no revenues. These are required by law to be

able to supply 30% more power than the highest instantaneous power ever demanded of TVA.

This way of making stand-by reserve power available is highly inefficient and expensive. It is an artifact of our ancient and wasteful centralized energy system.

Modern energy systems use renewables to generate the electricity and various types of storage to build up these needed reserves. This is far more economical than the old-fashioned fossil-fuel systems. But TVA has steadfastly refused to modernize its systems and switch over to renewables. Therefore its retailers, like JEA, and their customers are stuck with all the drawbacks of this foolish configuration.

The Jackson Sustainability Cooperative's solar + storage facility solves this problem for its members by sharing renewable generation and battery storage. No additional generation reserves need be built, maintained, or operated. The battery storage with smart hardware and software controller meets demand surges at no additional cost.

If TVA's policies and Tennessee's laws permitted and encouraged commercial heavy users of electricity to acquire their own, individual, solar + storage systems, they could meet their demand themselves. But since TVA's policies and Tennessee's laws make this exceedingly uneconomical, they are forced to share solar + storage resources through a nonprofit cooperative.

33. Explain how JSC will provide "supplemental electric service" to its members through "advanced metering," "load control," and "equipment monitoring," as stated on page 5 of JSC's Response.

RESPONSE:

Jackson Sustainability Cooperative will install new smart meters and electric panels at each of its members' buildings, connected to its supplementary electricity service. These will

monitor and record all electrical usage of the building, broken down by individual circuit. This allows members to see the usage profiles of each major piece of machinery, enabling members to adjust their schedules and practices so as to conserve energy.

34. Identify all facts that support the statements made on pages 11-12 of JSC's Response about the benefits of JSC's proposed solar facility project, including that it: "positively supports … the local distribution system," "lowers costs of the local distribution system," will defer "capital costs associated with growth demand," will lengthen "service life of system components," and will reduce "costs associated with meeting peak system demands."

RESPONSE:

Obviously, to the degree Jackson Sustainability Cooperative's solar facility reduces peak demand by its customers to JEA, JEA has that much less need to spend capital to expand its facilities to meet increased peak demand. The reduced peak demand gives JEA exactly that much additional peak-demand reserve to draw on as it expands its customer base, without having to build additional peak-demand capability. The same is true of the reduced usage of JEA electricity by Jackson Sustainability Cooperative's customers.

Any reduction of usage, and especially high peak demand, on JEA's local power system and TVA's regional power system, obviously reduces wear and tear on these systems. High peak demand is especially damaging to these systems, as attested by many studies. See, for example, "Methods for Analyzing the Benefits and Costs of Distributed Photovoltaic Generation to the U.S. Electric Utility System," NREL Technical Report, September 2014.

35. Identify all facts that support the purported community benefits of JSC's proposed solar facility project, as listed on pages 14 and 15 of the Petition and in the document titled

"Economic Impact of the Jackson Solar Facility," attached as Exhibit 13 to the Petition.

RESPONSE:

Please attached the Supplemental Testimony of Dennis Emberling on how the proposed Project benefits Jackson, Tennessee, Bates Stamped JSC 000426 through JSC 000431.

36. Describe the "long working relationship" that JSC's officers/directors have with the Community Redevelopment Agency, as stated on page 15 of the Petition.

RESPONSE:

The officers of Jackson Sustainability Cooperative have a good working relationship with Michael D. Miner. Mr. Miner, a native of Jackson, Tennessee, is a West Point graduate and a retired Lieutenant Colonel in the U.S. Army, and he has worked closely with the Community Redevelopment Agency for years. In addition to his involvement with the Petitioner's solar facility, he is CEO of Mound City Redevelopment, LLC (a/k/a The Mound City Foundation. He has applied his training as a research statistician for the military into creating affordable housing and economic development in Jackson, Tennessee. The initial focus was on housing for seniors citizens and Vets to make the community stronger. A recent project for 48 housing units has a long waiting list.

37. Identify all venture participants in CDE and, for CDE and each venture participant, state whether the entity is a non-profit entity.

RESPONSE:

Community Development Enterprises - Jackson I is a joint venture with three venture partners: E A Solar, LLC, Hunt Solar, LLC, and SynEnergy, Inc.

38. According to a press release issued by iSun, Inc., available at https://isunenergy.com/news/isun-selected-by-northern-reliability-and-community-development-enterprises-for-pv-installation-of-one-of-americas-largest-solar-plus-storage-microgrid-projects, JSC's solar facility is "phase one of one of the nation's largest solar plus storage microgrid projects underway in Jackson, TN" and "Phase one of the multi-phase project …." Explain in detail all current and future "phases" of JSC's solar facility.

RESPONSE:

Jackson Sustainability Cooperative has no plans for further phases of our solar facility. iSun is merely referring to other business it may or may not have with on projects that are related to Mr. Shimon and Mr. Emberling's projects through related entities in other states or countries in the future.

39. Identify all facts that support CDE's public statements, available at https://communitydevelopmententerprises.com/, that: "JSC will get all its power from CDE's solar facility, so around half of Members' power will come from renewables"; "CDE will pay for the entire solar facility, underground wiring to Members' buildings, and smart meters in each building"; "Guaranteed to lower your total cost of electricity for 30 years"; "Higher quality, tightly regulated solar power improves reliability and extends the life of costly machinery"; and "This 17 MW solar facility will be the most productive per acre in the entire world."

RESPONSE:

Objection. Interrogatory 39 as phrased is argumentative. Jackson Sustainability Cooperative is leasing equipment for its solar project from Community Development Enterprises - Jackson I (see confidential lease at Bate Stamped JSC CONFIDENTIAL 500034 through JSC

CONFIDENTIAL 500052). The Petitioner will use the leased equipment for the benefit of its members who cooperatively share the supplemental electric energy from renewable sources. Community Development Enterprises - Jackson I is a solar developer charged with design of the solar facility, procurement of the equipment, and construction of the site. The current design and selected equipment includes the most efficient solar panels available in America. Though the number will be refined with the final design, 17 MW is a good faith estimate of the total output of the equipment leased by Jackson Sustainability Cooperative.

VERIFICATION

I, Dennis Emberling, as President of Jackson Sustainability Cooperative, swear and/or affirm that the foregoing Interrogatory Responses are true and accurate to the best of my knowledge, information, or belief.

Jackson Sustainability Cooperative

By: Dennis Emberling
Dennis Emberling, President

STATE OF TENNESSEE)
) SS
COUNTY OF DAVIDSON)

Before me, Dennis Emberling, of the state and county aforesaid, personally appeared Dennis Emberling, with whom I am personally acquainted, or proved to me on the basis of satisfactory evidence, and who, upon oath, acknowledged himself/herself to be the authorized representative of Jackson Sustainability Cooperative, and that he/she executed the foregoing instrument for the purpose therein contained, by signing the name of the corporation by himself/herself as the duly authorized representative.

WITNESS my hand at office, this 21 day of September, 2021.

Ambra Barnes
NOTARY PUBLIC

My commission expires: 3/23/2025

AMBRA BARNES
STATE OF TENNESSEE NOTARY PUBLIC
RUTHERFORD COUNTY

=

Respectfully submitted,

John A. Beam, III, BPR #11796
EQUITUS LAW ALLIANCE, PLLC
709 Taylor Street
P.O. Box 280240
Nashville, Tennessee 37228
Telephone: (615) 251-3131
Facsimile: (615) 252-6404
Attorneys for Petitioner

CERTIFICATE OF SERVICE

I hereby certify that on the 22nd day of September, 2021, I filed Responses To Discovery with the parties named below and filed a true and correct copy with the Tennessee Public Utility Commission within three days, and I emailed and sent by U.S. mail copies to the following parties:

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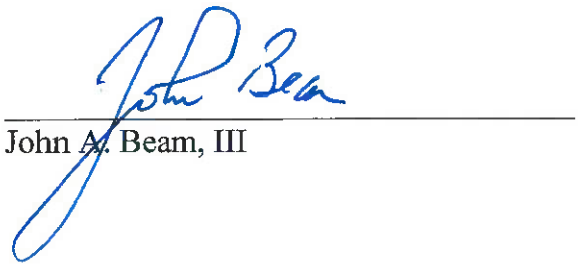

John A. Beam, III

EQUITUS
LAW ALLIANCE
PLLC
ATTORNEYS AT LAW

May 21, 2021

RECEIVED
MAY 24 2021
TN PUBLIC UTILITY COMMISSION
DOCKET OFFICE

21-00061

Hon. James M. Allison, Chairman
c/o Sharla Dillon
Tennessee Regulatory Authority
460 James Robertson Parkway
Nashville, TN 37243-0505

Re: Petition of Jackson Sustainability Cooperative for a Determination of Exemption or in the alternative for a Certificate of Convenience and Necessity

Dear Chairman Allison:

Jackson Sustainability Cooperative ("JSC") is a nonprofit cooperative established under the Electric G&T Cooperative Act. JSC files an original and 5 copies of the attached Petition, with supporting exhibits, for a Determination of Exemption or in the alternative for a Certificate of Convenience and Necessity to construct and operate a solar facility with battery storage for sharing among its members located on leased property in Madison County, Tennessee (collectively the "Application"). Second, enclosed please find a check in the amount of $25.00 to process this Application.

The Petition seeks to establish JSC as exempt from the control of the public utility commission under the Tennessee Electric G&T Cooperative Act. (T.C.A. §48-69-119) Specifically, JSC proposes to transact business as a nonprofit cooperative that is not characterized as a public utility. The Tennessee legislature provided this exemption based on the perceived need to develop electric power "through renewable, clean and passive sources of electrical energy." (T.C.A. §48-69-102(a)) The statutory scheme concludes with a statement that the Electric G&T Cooperative Act "shall be construed liberally." (T.C.A. §48-69-123(a))

Portions of the Application are being filed under seal. JSC respectfully requests that the Commission treat these portions confidentially because they contain projected capital costs and the names of competing tax equity financing opportunities for the project (Exs. 10 and 11). Public disclosure of this confidential information may harm the ability to negotiate favorable financing arrangements at the lowest reasonable cost. The contract with Northern Reliability, Inc. (Ex. 9) is also marked confidential because it contains information concerning capital costs and projected operating costs. Public disclosure of this information can harm Northern Reliability, Inc.'s ability to negotiate for installation services and equipment purchases in a small market of providers. If this commercially sensitive business and technical information were to be publicly disclosed, it would allow competitors, vendors and other market participants to gain an undue advantage, which may ultimately result in harm to JSC and its members. JSC will make the confidential information available to third parties upon the execution of an appropriate confidentiality and nondisclosure

JSC - 000001

709 Taylor Street ◆ P.O. Box 280240 ◆ Nashville, TN 37228 ◆ Phone: 615.251.3131 ◆ Fax: 615.252.6404 ◆ www.equituslaw.com

agreement.

Thank you for your attention to this matter. Please let me know if you have any questions, or need additional information in support of this application for a prospective ruling on exemption.

Sincerely,

John A. Beam, III

Enclosure
cc: Dennis Emberling, CEO

BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION
NASHVILLE, TENNESSEE

IN RE: THE APPLICATION OF JACKSON SUSTAINABILITY COOPERATIVE FOR A DETERMINATION OF EXEMPTION AND IN THE ALTERNATIVE, FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY	))))))	**DOCKET NO. 21-00061**

PETITION FOR A SOLAR FACILITY FOR SUPPLEMENTAL ENERGY

Jackson Sustainability Cooperative ("Jackson Sustainability Cooperative" or "Applicant"), a Tennessee non-profit corporation, through counsel, hereby applies to the Tennessee Utility Commission (the "Commission") to construct and operate a solar facility with battery-energy storage and shared interconnection (the "Facility" or "Solar Facility") located on Roosevelt Parkway in Jackson, Madison County, Tennessee. The Facility will provide supplemental electricity to select Members of Jackson Sustainability Cooperative. The Applicant seeks a determination that it is exempt from the Tennessee Public Utility Commission regulation because, as a non-profit cooperative, it is covered by an express exemption to the definition of "public utility" under T.C.A. 65-4-101(6)(E). If not exempt as an electric cooperative, then the Applicant, based on all the fact and circumstances, seeks a determination that it is not a "public utility" under T.C.A. 65-4-101(6)(A) because it distributes supplemental electrical energy in a manner that is not "affected by and dedicated to the public use.[1]" Alternatively, Jackson Sustainability Cooperative, pursuant to T.C.A. §65-4-201 et. seq., seeks a Certificate of Public Convenience and Necessity authorizing construction of the Facility and connection to its

[1] These factors are discussed in Attorney General Opinion No. 17-25, dated April 10, 2017.

Members.

In spite of the widespread existence of very strong corporate sustainability goals, the shift to renewable energy sources in Tennessee is moving slow. Most electric power generated in Tennessee comes from fossil-fuels, hydro, and nuclear generation. A shared solar facility is one of a very few ways that a small group of local users can acquire clean, renewable, stable, supplemental electricity. The Application is also supported by those Exhibits described as follows:

Exhibit 1	Charter of Jackson Sustainability Cooperative
Exhibit 2	Bylaws of Jackson Sustainability Cooperative
Exhibit 3	Possible Areas to Share Supplemental Energy
Exhibit 4	Member Agreements
Exhibit 5	TVA/JEA Contract and Schedule of Terms and Conditions
Exhibit 6	Integrated Resource Plan of Memphis Light, Gas and Water Authority
Exhibit 7	Integrated Resource Plan of Tennessee Valley Authority
Exhibit 8	Green Connect Program of Tennessee Valley Authority
Exhibit 9	Site Plan for the Facility
Confidential Exhibit 10	Contract with Northern Reliability, Inc.
Confidential Exhibit 11	Capital Cost Estimate
Confidential Exhibit 12	Financing Construction Cost
Exhibit 13	Study on Economic Impact of Facility to Jackson and Madison County, Tennessee
Exhibit 14	Pre-Filed Testimony of Dennis Emberling, President

WHEREFORE, Jackson Sustainability Cooperative respectfully requests that the Commission allow construction to proceed on the Facility as more specifically described herein.

General Information

1. The Applicant's full and correct name, business address, and business telephone number are:

Jackson Sustainability Cooperative

Dennis Emberling, President
1031 Greystone Square
Jackson, TN 38305

2. Jackson Sustainability Cooperative is a Tennessee non-profit corporation with its principal place of business at 1031 Greystone Square in Jackson, Tennessee. (see Exhibit 1, Charter) Historically, member owned electric cooperatives work for the sustainable development of the communities they serve. Manufacturing facilities in the Roosevelt Parkway neighborhood in Jackson are heavy users of electricity. Many of these manufacturers have corporate sustainability goals and policies that require use of renewable energy. They cannot economically justify building their own renewable-energy generation facilities in Jackson. Manufacturers can join together to take advantage of economies of scale by constructing and sharing the power a solar facility generates to supplement their demand for electricity and accomplish corporate goals of using renewable energy. Not only will the Facility reduce electricity costs incurred at peak demand, the Facility provides reliable, high-quality, stable power that can withstand major storms and lengthens the life of machinery. Newly installed "smart" meters will monitor precisely monitor electric energy consumption, making significant improvements in energy efficiency and conservation possible.

The municipal utility continue to provide primary usage requirements. The solar facility supplements by meeting the increased demands from time to time for higher amounts of power. In this way, energy from the Facility reduces the level and duration of high demand on the municipal utility, its distribution system, its substations, and TVA's entire system.

The Members of the cooperative also desire to be good corporate citizens of Jackson and contribute to its development, environment, and quality of life. The cooperative's purposes

therefore include doing research into various means of conserving energy, bringing Jackson into national prominence with its innovations in solar energy. The cooperative will also bring internships and training programs to Jackson's colleges and high schools, as well as other training to increase and improve the skilled-labor pool in Jackson, Tennessee.

The rights and obligations of the Members who consume supplemental electrical energy from the Facility are defined in the Bylaws of Jackson Sustainability Cooperative. (Exhibit 2, Bylaws). The proposed Solar Facility, at an approximate cost of $67,000,000, includes battery storage, energy-efficiency equipment, and hardware and software to help manage electricity demand.

The initial officers and directors of Jackson Sustainability Cooperative as established in the Charter (Ex. 1) are as follows:

Dennis Emberling, President and Director. Mr. Emberling enjoyed a forty-year career as an internationally-known management consultant. His work has included engagements ranging from small companies to Fortune 100 companies. His innovations in management science and organizational development are in use all over the world, including the United Nations Development Program. He is also an authority on distributed solar, having consulted for solar companies in California for seven years. He is a member of the California Intergovernmental Task Force on Consumer Protection and regularly advises the California Public Utility Commission. He was trained as a mathematician, and he has decades of experience in all aspects of business finance and management.

Dr. Ann Keyl, Director. Dr. Keyl is president of Sacred Heart of Jesus High School in Jackson, Tennessee. Previously, she served as Principle, Center for Research and Education Policy at the University of Memphis. She has an EdD from University of Memphis, an MS in School Counseling from the University of Memphis, and a BA in Education from Lambuth University.

Robert Starr, Secretary and Director. Robert Starr recently retired. Before retiring, he was administrator for the District Attorney General in the 26th Judicial District of Tennessee. He has an MSW from the University of Tennessee at Memphis and a BS from the University of Tennessee at Martin.

Jeff Frieling, Director. Since 1989, Jeff Frieling has served as Vice President and Chief

Information Officer for West Tennessee Healthcare. Mr. Frieling has held positions within the system including Administrative Director of West Tennessee Cancer Center, Administrator of Humboldt General Hospital and Director of Applications in Information Systems. He has degrees in Radiation Therapy, Operations Management, Business Management, a certificate in Healthcare Administration and is a Fellow in the American College of Healthcare Executives. He oversees Information Systems, IT Security, HIM, Bio-Med and the Laboratory Services.

David Shimon, Chief Financial Officer. Mr. Shimon was a founder and former owner of a commercial bank in Maryland, serving on its loan committee and board of directors. He also founded several companies that he guided to success. Currently, he owns and operates a Florida based solar company. Mr. Shimon has expertise in providing opportunities to under-developed empowerment zones in Florida.

Correspondence, documents, and filings regarding this application should be sent as follows:

John A. Beam, III
Equitus Law Alliance, PLLC,
P.O. Box 280240
Nashville, TN 37208
Phone: (615) 251 - 3131
Email: beam@equituslaw.com

Project Overview

3. The Applicant proposes to distribute supplemental electricity to its Members from its leased Facility. The Solar Facility is approximately 16.5 MW STC DC output power to be built on approximately 34.27 acres, including approximately 35,098 solar panels of 470 watts each on fixed mounts. Energy is stored using batteries of approximately 46 MWh storage capacity. Distribution of the energy uses controller hardware and software to share supplemental energy among Members. This controller sends the electric energy directly to meters installed at the sites of the Members. The Solar Facility has the ability to generate energy, store energy for distribution to loads, with management over all parts of the system through dynamic control. The system is capable of autonomous operation or operation in parallel with other sources such

as the municipal utility. Jackson Sustainability Cooperative seeks a determination of exemption from regulation as a public utility. Jackson Sustainability Cooperative will comply with the orders of the Commission and Tennessee courts.

4. The meters at the sites of the Members are "smart meters" because which gather more usage information and data (such as by individual circuit) than traditional utility meters which measure energy consumption. Smart meters communicate with the Facility controller to ensure optimum supplemental power distribution to the Member. While the smart meter is connected to both the Facility and the building's electric circuits, it is isolated from the utility's meter so no power from the Solar Facility backflows onto the municipal utility's grid. Members continue to purchase their primary electricity from the municipal power provider.

Benefits of the Applicant's Model

5. The Applicant's model provides cost effective, renewable, supplemental electrical energy to local manufacturers and commercial operators. The Facility supports their renewable energy goals and objectives, provides uninterruptible power during outages, as well as assists in controlling energy costs. The Applicant will install underground distribution lines for the power generated from the Facility to participating manufacturers. A map with a diagram of possible areas in which the Applicant can provide supplemental energy to Members is attached as Exhibit 3 (Possible Areas to Share Supplemental Energy).

6. This supplemental source of electrical energy also ensures that risk of interruptions or shortages of electric service currently experienced by local manufacturers is greatly reduced. The Facility designed to withstand extreme storms with storm-hardened components and underground wiring. Power outages currently occur in Jackson, Tennessee due

to animals, weather, trees, vehicles, and construction (Jackson Energy Authority website, Outage Center FAQ). Storms that create major system-wide damage leave customers without power for extended periods of time. Interruptions and outages in electrical power are very costly to manufacturers, who frequently must send employees home as they begin lengthy restart protocols. Currently, some manufacturers use fossil-fuel-based back-up generators to cover outages. Under the Applicant's model, in the event of an outage, the Members switch to using solar energy. The swith is seamless, ensuring no interruptions in service during times of temporary power outages.

7. The solar electric power supplied by the Solar Facility is tightly controlled. The energy output is steady. Voltages stay within a narrow prescribed range, with a steady A.C. frequency close to the rated value, and smooth a voltage-curve waveform. These optimal quality and stability features are expected to increase the life of expensive machinery.

8. The Applicant's model supplies renewable energy that supplements the municipal provider. The amounts charged for electricity by the Applicant will not exceed the rates charged by the municipal provider for monthly usage. (Exhibit 4, Member Agreements) Were the Applicant to charge more than the municipal provider, the Members are free to draw all the electricity they need from the municipal provider.

9. Members continue to draw power from Jackson Energy Authority ("JEA"), the local municipal utility. When their power demand rises above their average level, the Solar Facility will supply additional power seamlessly to the Member. When the grid suffers brownouts or blackouts, the Member continues to draw the power needed to sustain operations from the Applicant.

10. JEA benefits by lowering peak demands experienced by a few of its customers. JEA pays the Tennessee Valley Authority ("TVA") for capacity to supply JEA's peak demand on the system. Meeting peak demand is very expensive for regional suppliers like TVA because they must build and maintain sufficient power-generating capacity to supply the all-time maximum peak demand (with a substantial reserve) for all participating municipal authorities such as JEA. TVA passes these high peak demand costs on to JEA. (Exhibit 5, Schedule of Terms, p. 7) JEA recovers some of this cost from its customers through peak-demand charges. Because of this extra cost for peak demand capacity, the Applicant currently anticipates that lowering the high end of JEA's demand peaks with supplemental electrical power may improve JEA's profitability. Another possible future benefit to JEA is for the Applicant to use its battery storage components to offer storage services to JEA to help with its other peak-demand needs.

Distribution

11. The Applicant's model provides a source of renewable supplemental energy for use by 4 to 8 suitable, heavy users of electricity. Jackson Sustainability Cooperative will provide supplemental energy from its Solar Facility to a few manufacturers and commercial facilities located along the West Tennessee Railroad. Additionally, close to the Applicant's site along Dr. F. E. Wright Drive are another 10 commercial facilities. A short distance east are 4 more commercial facilities. There are approximately 38 public and private operators who are prospects for sharing supplemental energy from the Solar Facility. (see Exhibit 3)

12. The Applicant can best benefit Members who have significant peak demand profiles that can be met by the Facility. The initial discussions suggest a very high interest among prospective users who benefit from sharing supplemental renewable energy with

neighbors who are also Members of the Jackson Sustainability Cooperative.

Renewable Energy Standards and Goals

13. The state of Tennessee currently has no solar-incentive program. Tennessee is in the minority of states in the U.S. who have not established renewable energy targets.

14. Several states that border Tennessee have adopted target standards for their Renewable Energy Portfolios. For example, in 2007, Missouri established a Renewable Electricity Standard which requires that 15% of all consumption comes from renewable energy by 2021. (Mo. Rev. Stat. §393.1020 to 1050) In 2007, North Carolina similarly established a Renewable Energy and Energy Efficiency Portfolio Standard with a requirement that 12.5% of all energy consumption comes from renewable energy sources by 2021. (N.C. Gen Stat. §62-133/8) These statutory standards are generally measured by the percentage of renewable retail electric energy sales to all retail electric energy sales.

In 2020, Virginia established a Renewable Portfolio Standard of 100% renewable energy by 2045 (or by 2050 depending on the phase of public utilities). (VA Code Ann. §10.1-603.24.25; §10.1-1329; §10.1-1330; §56-576 and 585) Prior to 2020, Virginia had a voluntary renewable goal of 15% of all energy consumption by 2024. The new law increases in phases from 14% in 2025, 30% by 2030, and so on until 100% by 2050. In 2014, South Carolina established a Voluntary Renewable Portfolio Standard that targets a 2% requirement for renewable energy by 2021. (SC Code 58-39-110 et seq.) South Carolina and Virginia public policy demonstrate how small steps in the shift of consumption can lead to exponential environmental benefits.

15. The Applicant has reviewed the Integrated Resource Plan of Memphis Light, Gas

and Water Authority ("MLGW") filed May 29, 2020 because of its close proximity to Jackson, Tennessee. A copy of excerpted pages is attached as Exhibit 5. MLGW forecasts average loads changing over the next ten years by between -6.9% and +11.1%, for an average of 2.1%, with peak demand changing over the next 10 years by between -7.1% and +17.1%, for an average of 5% per year (Ex. 6, Appdx, p. 18).

16. Remarkably, MLGW forecasts increases in energy prices over the next 5.5 years of between 40% and 125% (Ex. 6, Appdx, p. 26). One of the cost drivers is the lost power and added costs as electricity goes from the generation site to the competitive transmission developers to the transmission owners to the power marketers/brokers to the utilities to the end-user customers (Ex. 6, Part I, p. 6).

17. MLGW presented the lowest cost scenario for consumers as using "up to 75% renewable energy and cut carbon pollution by 50% compared to TVA levels, resulting in better public health, cleaner air, and cleaner water." (Ex. 6, p. 10).

18. Jackson Energy Authority does not generate electricity. JEA buys power from the Tennessee Valley Authority under the terms of its present contract with TVA. (Exhibit 5) JEA is not required to prepare an Integrated Resource Plan. However, conclusions on general market conditions drawn by MLGW are very likely similar to the market conditions in Jackson, Tennessee.

19. In 2019, TVA prepared an Integrated Resource Plan. A copy is attached as Exhibit 7. TVA has the stated corporate goal to add between 1,500 and 8,000 MW of solar power generation by 2028, and up to 14,000 MW by 2038 conditioned on increasing load growth. (Ex. 7, p. ES-4). A second goal for TVA is to evaluate battery storage to gain

operational experience. (Ex. 7, p. ES-5). The Applicant's Facility is consistent with TVA's goals.

20. In its IRP, TVA identifies the advantages of local, distributed energy over energy transmitted over long distances and managed by multiple intermediaries (Ex. 7, pp. ES-7, 1-4, 2-2, 5-11). TVA recognizes the importance of moving toward implementation of programs that provide for flexible electricity generation for customers. (Ex. 7, p. ES-1) As TVA replaces expiring or retiring capacity, solar expansion plays a substantial role in all future models for the generation of electricity. (Ex. 7, p. ES-2)

21. TVA had a Green Connect Program that allows customers to sell power from qualified facilities to TVA. (Ex. 8, attached) The stated purpose of the former program was to help consumers support renewable energy generated within the Tennessee valley. The program ended on December 31, 2019.

22. Kellogg is a local manufacturer in Jackson, Tennessee. Kellogg has a corporate goal to achieve 100% renewable energy in its operations by 2050. Toyota is a local manufacturer. Toyota has the same corporate goal as Kellogg.

Establishment of the Facility

23. Construction is anticipated to begin in 2021. Operations are expected to begin as early as February or March of 2022. The Applicant will lease its generation and deliver equipment from Community Development Enterprises - Jackson I ("CDE"). CDE will be a Patron of the Applicant to supply needed capital. (see Exhibit 2, Bylaws, Section 9.2)

24. CDE was formed as a joint venture on September 3, 2020 to investigate the feasibility of developing a Solar Facility to help Members who have common goals share the

energy from the Facility as a cooperative. The venture participants include E A Solar, LLC, a Delaware limited liability company, Hunt Solar, LLC, a Delaware limited liability company, and SynEnergy, Inc., a Virginia corporation. As a collaborative effort, CDE's collective participants have the managerial, technical, and financial abilities to design, procure equipment, construct, and lease renewable, electrical-energy equipment to the Applicant to serve its few industrial and/or institutional Members. CDE engaged Northern Reliability, Inc, an expert in the design, construction, and operation of solar facilities as the prime contractor for the development of the Applicant's Solar Facility (see Paragraphs 27 and 29 below). Tax-equity financing and financial ability are discussed in Paragraph 32 below.

25. The Facility is located on 34.27 acres of land situated on Roosevelt Parkway, just west of Dr. F. E. Wright Drive, in Jackson, Tennessee. The GPS coordinates of the approximate center of the Facility are: 35.6357 N; 88.7921 W. The Applicant's Site has unshaded, south-facing exposure to the sun and easy service access from two points on Roosevelt Parkway. It is not in a flood zone and does not include wetlands. A map showing the layout of the Facility and a schematic of the equipment used in the systems is attached as Exhibit 9 (Site Plan).

26. All required environmental studies have been completed and approvals received. First was permission to clear the site from U. S. Fish and Wildlife, finding that there are no protected plants, habitats, or animals on the site and that it is not a wetland. Second was similar permission from the Tennessee Wildlife Resources Agency. Third was approval from the Tennessee Department of Environment and Conservation (TDEC) division of Natural History/Heritage, finding that there were no rare or endangered plant or animal species, ecologically significant sites, or conservation-managed areas within the site. Fourth was approval

to clear the site from the TDEC division of Cultural History, stating that there was no record of anything of archaeological significance on the site. Fifth was a general permit for bank armoring and vegetative stabilization (ARAP) from TDEC's Division of Water Resources. Sixth was a Construction Storm Water Permit (NPDES) from TDEC.

27. L. I. Smith and Associates, Inc. provided civil engineering and site design. L. I. Smith and Associates, Inc. submitted the Facility design to the Planning Commission for the City of Jackson for approval. These submissions included a hydrologic wetlands and stream determination study, which found that there are no wetlands on the site; a stormwater drainage plan; a Vegetation Impact Evaluation with tree inventory to determine requirements for preparing the site; an Erosion and Sedimentation Control Plan; a site grading plan; a boundary survey; and a site plan showing site barriers and buffer zones as well as the location of equipment on the site.

26. An emergency 911 street address has not been assigned to the Facility at this time. The Applicant will notify the Commission of the emergency 911 street address when it is received. Because Jackson, Tennessee experiences high winds, the solar panels selected will withstand high winds. The battery systems will be storm-hardened, and all wiring underground.

27. Northern Reliability, Inc., a Vermont corporation, will serve as the prime contractor and provide engineering and construction field services to design, engineer, procure equipment and construct the Facility. iSun Inc., a fifty-year old solar-development firm, as well as a local general contractor and electrical contractor hired by the Applicant, will assist Northern Relaibility (Confidential Exhibit 10, contract). Northern Reliability, Inc. was selected from among many qualified firms because of their experience in building over 1,000 similar solar projects all over the world.

28. The Applicant and/or CDE will secure all applicable federal, state, and local permits. A Special Use Permit from the City of Jackson is required for construction of the proposed Facility on the Site. Approval from the City of Jackson will be filed on request. Construction requires a building permit and an electrical permit.

29. After installation is completed on the Site and wired to the smart meters used by Members, Northern Reliability, Inc. will commission and test the Facility and entire Jackson system prior to operation.

Financing

30. The capital cost estimate for procurement and construction of the Solar Facility is approximately $67,000,000. (Confidential Exhibit 11) This estimate includes design and field engineering, procurement of equipment, installation of all major equipment, and construction of the Solar Facility and components for Members to share supplemental electrical energy.

31. Private financing will fund construction of the Solar Facility. The Applicant will lease the equipment and appendages from CDE. The small group of cooperative Members will not share in the risk of default.

32. Numerous funders have made oral commitments to finance the Facility. The funders under consideration are major tax-equity investors. They are listed on Confidential Exhibit 12, attached. Federal tax credits and accelerated depreciation benefits factor into funding the capital cost estimate for construction of the Solar Facility and related equipment.

Community Impact

33. Jackson, Tennessee is a small city of about 67,000 in southwest Tennessee. In 2009, the City of Jackson established a Community Redevelopment Agency (CRA) to work with

private entities to form public-private partnerships to build and restore Jackson. (Jackson Revitalization Strategy/Community Redevelopment Act Workable Program, February, 2009). Several of the officers and directors of the Applicant have a long working relationship with CRA.

34. The general contractors and electrical contractor selected will employ local citizens to promote economic development in Jackson, Tennessee. Components and services will be purchased from Tennessee providers who provide the required functionality and are cost competitive.

35. Construction and operation of the Solar Facility has a significant economic impact and benefit to Jackson and Madison County. Specifically, the economic impact is $212,000,000.00 over 10 years plus another $14,000,000.00 in new tax receipts (Exhibit 13, SynEnergy Economic Impact Study). It also provides the full-time-equivalent of 511 new jobs in 2021, and 23 permanent jobs thereafter, growing to 28 by 2030. (Id.)

36. The Applicant's model will make Jackson, Tennessee widely known as a renewable energy leader, and attract new business and economic development to the area. The Applicant will help local schools and colleges introduce new training, career programs, and internships in the solar and storage fields, leading to increased job opportunities for the entire community.

Conclusion and Summary

37. The Applicant's Solar Facility will bring supplemental clean energy to a small group of manufacturers and commercial operators to accomplish their renewable energy goals, improve the quality and stability of their electrical energy, and assist in controlling the peak demand cost of electrical energy. See Pre-Filed Testimony of Dennis Emberling, President.

(Exhibit 14)

38. Operation of the Solar Facility will have no emission or pollutants because the solar generation source is 100% renewable energy.

39. Jackson Sustainability Cooperative intends to work cooperatively with JEA and TVA to further their stated goals for renewable energy and local distribution of energy in the future. The Applicant and CDE hope that this Facility will lead to opportunities to partner with JEA and TVA in the future as they continue to move into solar energy and battery storage fields.

40. The Applicant's Facility is consistent with and promotes the public policies of setting and accomplishing Renewable Energy Standards for the future. The Facility will diversify power generation resources while providing greater energy stability and security through the use of the sun, an indigenous energy resource in Tennessee.

41. As previously discussed herein, the benefits to Members who share in supplemental electrical energy is based on the following:

a. Improving the resiliency and reliability of electric service to key manufacturing employers in Jackson, Tennessee. The Applicant's Facility for supplemental renewable energy is a modern solution that allows participants to continue using local energy from the municipal provider while having a local renewable generation and storage facility that reduces the risk of outages with real savings to the participants who have expensive restart-protocols.

b. Assisting major manufacturing facilities in Jackson in making substantial progress toward their stated corporate goals by switching some of their peak energy consumption from fossil-fuel based to fully clean, green, renewable energy from solar sources stored in lithium batteries.

c. Facilitating energy conservation through smart meter technology that allows customers to receive solar power and to prioritize and monitor their electrical usage down to the individual circuit level, giving them previously unavailable information and enabling them to increase

efficiency in their facilities.

d. Reducing manufacturers' maintenance and replacement expenses for their expensive machinery as a result of improved power quality and minimizing outagers such as brownouts and blackouts.

e. Enabling Members to acquire supplemental energy to operate with better efficiency in the hopes that they choose Jackson, Tennessee as the place to expand their business operations in the future.

42. If the Applicant's model is approved for construction and operation, the Applicant will abide by the rules, regulations, and orders applicable to its operation as a non-profit electric cooperative under Tennessee law.

WHEREFORE, Jackson Sustainability Cooperative respectfully requests a determination that it is exempt from regulation as a "public utility" by the Public Utility Commission because it is a "cooperative organization ... not organized or doing business for profit." T.C.A. 65-4-101(6)(E). If not exempt as an electric cooperative, then the Applicant, based on all the facts and circumstances, seeks a determination that it is not a "public utility" under T.C.A. 65-4-101(6)(A) because it distributes supplemental electrical energy in a manner that is not "affected by and dedicated to the public use." Alternatively, the Applicant, pursuant to T.C.A. §65-4-201 et. seq., seeks a Certificate of Public Convenience and Necessity authorizing construction of the Facility pursuant to T.C.A. §65-4-204 et. seq. as specifically described above.

Respectfully submitted this 21st day of May, 2021.

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Attorney for Jackson Sustainability Cooperative

CERTIFICATE OF SERVICE

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VERIFICATION OF PETITION

STATE OF TENNESSEE)
COUNTY OF MADISON)

Before me, the undersigned authority, a notary public in and for said State and County, personally appeared Dennis Emberling, who, being duly sworn according to law, deposes and states under penalties of perjury that he is the President of Jackson Sustainability Cooperative, that he is authorized to make this Affidavit on its behalf, that he is over the age of twenty-one (21) and under no disability and that the facts and averments set forth in the foregoing Petition are true upon his personal knowledge or, where indicated in the Petition, upon information and belief. The Applicant will abide by federal and state laws and regulations as well as this Commission's orders in constructing and operating a solar facility which provides supplemental electrical power to participating Members in Jackson, Tennessee.

Jackson Sustainability Cooperative

By: Dennis Emberling
Dennis Emberling, President

Sworn to and subscribed before me, this 7th day of May, 2021.

Notary Public

EARNEST ANDERSON
STATE OF TENNESSEE NOTARY PUBLIC
WILLIAMSON COUNTY
My Commission Expires July 5, 2022

My Commission Expires: July 5 2022

EXHIBIT 1

Tre Hargett
Secretary of State

Division of Business Services
Department of State
State of Tennessee
312 Rosa L. Parks AVE, 6th FL
Nashville, TN 37243-1102

ACKSON SUSTAINABILITY COOPERATIVE
031 GREYSTONE SQ
ACKSON, TN 38305-3581

May 14, 2021

Filing Acknowledgment

lease review the filing information below and notify our office immediately of any discrepancies.

OS Control # :	**001200202**	Formation Locale:	TENNESSEE
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iling Date:	05/14/2021 8:34 AM	Fiscal Year Close:	12
tatus:	Active	Annual Report Due:	04/01/2022
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usiness County:	MADISON COUNTY		

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egistered Agent Address:
OHN A BEAM III
09 TAYLOR ST
ASHVILLE, TN 37208-2637

Principal Address:
1031 GREYSTONE SQ
JACKSON, TN 38305-3581

ongratulations on the successful filing of your **Charter** for **JACKSON SUSTAINABILITY COOPERATIVE** in the tate of Tennessee which is effective on the date shown above. You must also file this document in the office of the egister of Deeds in the county where the entity has its principal office if such principal office is in Tennessee. Please sit the Tennessee Department of Revenue website (www.tn.gov/revenue) to determine your online tax registration iquirements. If you need to obtain a Certificate of Existence for this entity, you can request, pay for, and receive it om our website.

ou must file an Annual Report with this office on or before the Annual Report Due Date noted above and maintain a egistered Office and Registered Agent. Failure to do so will subject the business to Administrative issolution/Revocation.

Tre Hargett
Secretary of State

rocessed By: Alex Maxfield

FILED

CHARTER
OF
JACKSON SUSTAINABILITY COOPERATIVE

The undersigned person, under the Tennessee Nonprofit Corporation Act, adopts the following Charter for JACKSON SUSTAINABILITY COOPERATIVE.

1. The name of the Corporation is JACKSON SUSTAINABILITY COOPERATIVE.

2. The purpose or purposes for which this Corporation is formed are:

(a) To assist its members in sharing supplemental electrical energy from renewable sources while contributing to the redevelopment of the Roosevelt Parkway neighborhood in Jackson, Tennessee;

(b) To promote corporate goals for renewable energy where the Members cannot economically justify building, maintaining and operating their own renewable solar energy facilities;

(c) To assist its members in the efficient and economical use of energy;

(d) To use smart meter technology to allow members who share a solar facility to directly connect to the solar facility and share supplemental energy with other members;

(e) To engage in research and to promote and develop energy conservation and sources and methods of conserving, producing, converting, and delivering energy;

(f) To accomplish improved energy efficiency by acquiring the ability to monitor electricity usage by individual circuits;

(g) To promote energy conservation through research into methods of conserving, producing, converting, and delivering energy;

(h) To provide programs and training in solar energy for members by enhancing labor skills, and providing educational enrichment and curricula for schools and colleges.

(i) To purchase, lease as lessee, and in any manner acquire the use of solar equipment, machines, supplies, and systems necessary or useful for furnishing supplemental electrical energy to its members in carrying out the purposes of the Corporation;

(j) To acquire the use of, to the extent permitted by law, the franchises, rights, privileges, licenses, rights-of-way and easements necessary or useful for furnishing supplemental electrical energy to its members in carrying out the purposes of the Corporation;

(k) To purchase, lease as lessee, or in any other manner acquire or dispose of any and all real and personal property or any interest therein necessary or useful for furnishing

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supplemental electrical energy to its members in carrying out the purposes of the Corporation;

(l) To borrow money, to make and issue bonds, notes and other evidences of indebtedness, secured or unsecured, and used in payment for property acquired, or for any of the other purposes of the Corporation, to secure the payment by deeds of trust upon, or by the pledge of any other lien upon, any or all of the property, rights, privileges or permits of the Corporation, wheresoever situated, acquired or to be acquired;

(m) To do and perform, either for itself or its members, any and all acts and things, and to have and exercise any and all of the foregoing purposes or as may be permitted by the Acts under which the Corporation is formed, for any lawful act or activity necessary or convenient to effect the foregoing purposes, including, but not limited to, the exercise of all powers granted to electric membership corporations as set forth in the Tennessee Electric G&T Cooperative Act of 2009, T.C.A. § 48-69-101 *et seq.*, as amended from time to time.

3. (a) The Corporation is a not for profit corporation organized for the benefit of its members pursuant to the provisions of the Tennessee Electric G&T Cooperative Act of 2009, T.C.A. § 48-69-101 *et seq.*

(b) The Corporation is a mutual benefit corporation.

(c) Membership and membership rights, privileges and obligations shall be as prescribed in the Bylaws of the Corporation.

(d) The private property of the Members of the Corporation shall be exempt from execution for the debts of the Corporation.

4. The period of duration of this Corporation is perpetual.

5. The name and complete address of the Corporation's registered agent is John A. Beam, III, P.O. Box 280240, 709 Taylor Street, Nashville, Davidson County, Tennessee 37208.

6. The name and address of the incorporator is: John A. Beam, III, P.O. Box 280240, Nashville, Davidson County, Tennessee 37228-0240.

7. The address of the Corporation's principal office is 1031 Greystone Square, Jackson, Madison County, Tennessee 38305.

8. The affairs of the Corporation shall be managed by a Board of Directors. The number of the Directors of the Corporation and the method of their election shall be established in the Bylaws. The number of initial, organizational Directors of this Corporation shall be five persons. The five organizational Directors shall serve until the solar facility is tested, commissioned, and certified, and then at the next annual meeting of the members the Directors will be elected under the process established in the Bylaws. The names and addresses of the organizational Directors who shall

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manage the affairs and business of the Corporation until the election of the Directors after the solar facility is operational are listed as follows:

(a) Dr. Ann Keyl, 445 Walnut Street, Jackson, TN 38305
(b) Mr. Robert Starr, 140 Sunnyvalley Drive, Jackson, TN 38305
(c) Mr. Jeff Frieling, 161 Shadow Ridge Drive, Jackson, TN 38305
(d) Dennis Emberling, 5548 Trousdale Drive, Brentwood, TN 37027
(e) David Shimon, 19840 W. Dixie Hwy, Unit #3311, Miami, FL 33180

9. The Corporation may be dissolved under provision established in the Bylaws.

10. Directors shall not have personal liability to the Corporation for monetary damages for a breach of fiduciary duty as a Director. This limitation shall not eliminate or limit the liability of the director for any breach of a director's duty of loyalty to the corporation or for any acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law.

11. Except as specifically limited in Section 48-58-502 of the Tennessee Nonprofit Corporation Act, this corporation shall indemnify against liability incurred in a proceeding by any individual made a party to the proceeding because he or she was or is a director or officer of this Corporation if the person conducted himself or herself in good faith and reasonably believed that:

(a) In the case of conduct in his or her official capacity with the Corporation, the conduct was in the Corporation's best interest;

(b) In all other cases, the conduct was at least not opposed to the best interest of the Corporation;

(c) In the case of any criminal proceeding the individual had no reasonable cause to believe the conduct was unlawful; and

(d) Conduct with respect to an employee benefit plan for a purpose reasonably believed to be in the interest of the participants and beneficiaries of the plan and the conduct was at least not opposed to their best interest.

12. The document is to be effective upon filing by the Secretary of State.

Dated this 14th day of May, 2021.

John A. Beam, III, Incorporator

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EXHIBIT 2

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JACKSON SUSTAINABILITY COOPERATIVE

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Preamble

Jackson Sustainability Cooperative seeks to enable a small group of manufacturers with facilities in the Roosevelt Parkway neighborhood of Jackson, Tennessee to share supplemental electrical energy from renewable sources that helps them mitigate the cost of peak demand energy and period power outages. Members who share this supplemental energy share the common goal of moving to renewable energy, while contributing to the redevelopment of this area of Jackson. A shared solar facility allows Members to make progress toward corporate goals for renewable energy where they cannot economically justify building, maintaining and operating their own renewable energy generation facilities. New smart meter technology allows members to directly connect to the solar facility and share supplemental energy with other like-minded manufacturers and commercial operators. On the plant side of the smart meter, the Members gain improved energy efficiency by acquiring the ability to monitor electricity usage by individual circuits. Jackson Sustainability Cooperative (the "Cooperative") also promotes and develops energy conservation through research into methods of conserving, producing, converting, and delivering energy. Jackson Sustainability Cooperative will give the local labor force training in solar energy. Training programs will be expanded to the schools and colleges in the future.

ARTICLE I
GENERAL PROVISIONS

Section 1.1. Purposes and Aims of Corporation. This Corporation was formed and exists to do and perform, either for itself or its Members, any and all acts and things, and to have and exercise any and all of the powers granted to electric membership corporations as may be permitted by the Tennessee Electric G&T Cooperative Act of 2009 and by T.C.A. § 48-69-101 *et seq.*, as amended from time to time, for any lawful act or activity, including, but not limited to, the following:

1. To assist its members in sharing supplemental electrical energy from renewable sources while contributing to the redevelopment of the Roosevelt Parkway neighborhood in Jackson, Tennessee;

2. To help achieve corporate goals for sustainability where the Members cannot economically justify building, maintaining and operating their own renewable energy solar facilities;

3. To conserve energy by acquiring the ability to monitor electricity usage by individual circuits;

4. To assist its Members in the efficient and economical use of energy;

5. To use smart meter technology to allow Members who share a solar facility to directly connect to the solar facility and share supplemental energy with other Members;

6. To avoid costs caused by grid outages by gaining access to solar power, without

having to resort to dangerous and toxic fossil-fuel backup generators;

7. To increase the reliability and lengthen the life span of machinery by acquiring higher quality power in terms of voltage and frequency regulation, particularly during periods of high demand;

8. To improve environmental quality in and around Jackson, Tennessee;

9. To engage in research and to promote and develop energy conservation and sources and methods of conserving, producing, converting, and delivering energy;

10. To provide programs, training, and internships in solar energy for Members by enhancing labor skills, and providing educational enrichment and curricula for schools and colleges.

11. To expand and improve Jackson's pool of skilled-labor, increasing the skilled workforce that will enable members' businesses to expand in Jackson, providing more jobs to the Jackson community;

12. To increase the resiliency and redundancy of Jackson's electrical supply by providing supplementary sources of energy;

13. To reduce stresses on the Tennessee Valley Authority's grid and the Jackson Energy Authority distribution system by relieving peak demand, without capital cost to Jackson;

14. To purchase, lease as lessee, and in any manner acquire the use of solar equipment, machines, supplies, and systems necessary or useful for furnishing supplemental electrical energy to its members in carrying out the purposes of the Corporation;

15. To acquire the use of, to the extent permitted by law, the franchises, rights, privileges, licenses, rights-of-way and easements necessary or useful for furnishing supplemental electrical energy to its members in carrying out the purposes of the Corporation;

16. To purchase, lease as lessee, or in any other manner acquire or dispose of any and all real and personal property or any interest therein necessary or useful for furnishing supplemental electrical energy to its members in carrying out the purposes of the Corporation; and,

17. To borrow money, to make and issue bonds, notes and other evidences of indebtedness, secured or unsecured, and used in payment for property acquired, or for any of the other purposes of the Corporation, to secure the payment by deeds of trust upon, or by the pledge of any other lien upon, any or all of the property, rights, privileges or permits of the Corporation, wheresoever situated, acquired or to be acquired.

Section 1.2. Defined Terms. These Bylaws define certain words, phrases, and terms ("Defined Terms"). In general, Defined Terms are: (1) defined in a full sentence or part of a sentence; (2) capitalized, underlined, and enclosed within quotation marks when defined; (3) enclosed within parenthesis when defined in part of a sentence; and (4) capitalized when otherwise used in these Bylaws. Except as otherwise provided in these Bylaws and subject to the context requiring otherwise, Defined Terms have the meaning specified in the appropriate Bylaw.

Section 1.3. Law and Charter. These Bylaws are subject to Law (defined below) and the Charter filed with the Tennessee Secretary of State ("Charter"). If, and to the extent that, a Bylaw conflicts with Law or the Charter, then the Law or Charter control. "Law" includes applicable (1) local, state, and federal statutes and regulations, and (2) legally binding contracts enforceable by or against the Cooperative, including the Member Agreement.

Section 1.4. Validity of Electronic Signatures. To the extent that Member Agreement or any other document between the Cooperative and the Members or Directors, is completed or transmitted by electronic means, the Member or Director agrees to be bound by federal and state laws and regulations governing the validity of such electronic signatures, and agrees that any such electronic transmission to or from the Member or Director satisfies any requirements imposed by the law that a document, notice, minutes or other communication be in writing. The Member or Director agrees that any document sent electronically to the Member or Director or former Member at the Member's last known electronic address is considered received on the date sent by the Cooperative.

ARTICLE II
MEMBERSHIP

Section 2.1. Eligibility Requirements. The "Cooperative Service" is supplemental electric energy provided by the Cooperative. An "Entity" includes a domestic or foreign business or nonprofit corporation, limited liability company, or any agency or division of government. An Entity becomes a conditional member of the Cooperative if it signs a Conditional Member Agreement. The Cooperative will analyze the energy profile and energy demands of the conditional Member to see if the conditional Member's electricity needs are a suitable fit for the Cooperative Service. Qualifying conditional Members are invited to become full Members who receive the Cooperative Service after they sign a Full Member Agreement (such person being a "Member" and the Member being in a "Membership"). An applicant is eligible for conditional Membership if its plant and facility

1. annually requires or is expected to annually require at least 100,000 kilowatt-hours (kWh) of electric energy; and,

2. uses electric energy on a demand curve consistent with the Cooperative's requirements.

Section 2.2. Cooperative Membership. These Bylaws are a contract between the Cooperative and a Member. If a Member fails to comply with the Bylaws, the Conditional Member Agreement, or the Full Member Agreement, the Cooperative may suspend or terminate the Member or the Cooperative Service provided to the Member.

1. Each Member agrees to:

   a. Comply with the Bylaws;

   b. Comply with the Member Agreement it signs;

   c. Comply with any rules established and approved to manage the sharing of supplemental energy;

   d. Pay dues of $10.00 per year;

   e. Pay for the Cooperative Service used at prices, rates, or amounts established in the Member Agreement;

   f. Pay for Cooperative Service during municipal outages within the priority guidelines agreed to between the Cooperative and Member from time to time;

   g. provide and maintain a current mailing address and telephone number with the Cooperative.

2. The Member Agreements will be on forms provided by the Cooperative. The Conditional Member Agreement will require a review of the applicant's electric energy demand curve. There is no connection fee or deposit. The Full Member Agreement will provide for sharing supplemental energy with other Members.

3. Unless the Member Agreement provides otherwise, if the Cooperative Service is not paid for within 30 days, the outstanding amount owed to the Cooperative bears a late fee at the monthly periodic rate of 1.5% (18% per annum) until paid in full.

4. Member Premises Equipment ("MPE") consists of any equipment, device or apparatus that is physically located on a Member's property that was installed by the Member and maintained by the Member. Cooperative Equipment consists of any equipment, device or apparatus that was installed by the Cooperative, including the smart meter and other equipment used to transfer, monitor and share electric energy provided by the Cooperative to allow the Member to access the supplemental energy provided by the Cooperative ("Cooperative Equipment"). In no event shall the responsibility of the Cooperative extend to the MPE. The Cooperative shall repair malfunctioning of Cooperative Equipment or any error occurring in the Cooperative's billing procedures. The Member shall repair malfunctioning MPE.

Section 2.3. Acceptance into Full Membership. Upon complying with the requirements set forth in Section 2.2, an applicant will be offered a Full Membership Agreement, and upon signing is eligible to receive Cooperative Service provided by the Cooperative. If the Member is unable to abide by the Full Member Agreement and these Bylaws, then the person's Membership may be

suspended or terminated by the Cooperative.

Section 2.4 Provision of Cooperative Service. The Cooperative shall use reasonable efforts to furnish its Members with adequate and dependable Cooperative Service. However, the Cooperative does not exist to replace the existing municipal electric service except temporarily in the event of municipal electric service outages. In case of emergency, or as requested by government or emergency officials or representatives, the Cooperative may interrupt the provision of Cooperative Service to Members.

Each Member shall pay for such purchases when they become due and payable in accordance with the Full Member Agreement and rate classifications and rate schedules established by the Cooperative. A Member may have more than one service connection from the Cooperative. The Cooperative's accounting procedures will reflect both connections.

Section 2.5. Wiring of Premises; Responsibility for Wiring, Meter Tampering or Bypassing and for Damage to Cooperative Equipment. Each Member shall cause all premises receiving electric service pursuant to its Membership Agreement to become and to remain wired in accordance with the specifications of the Tennessee Fire Insurance Underwriters Association, the National Electrical Code, any applicable state code or local government ordinances, requirements of the local municipal power authority, and requirements of the Cooperative. The Cooperative will provide the Cooperative Service at a location agreed to with the Member using Cooperative Equipment. A Member shall: (1) protect Cooperative Equipment; and (2) maintain any protective device or procedure to protect the connection. A Member shall not tamper with, alter, interfere with, damage, or impair Cooperative Equipment.

Section 2.6. Member Arbitration, Indemnification, and Liability. Whenever requested by the Cooperative, a Member shall:

1. Submit a claim or dispute between the Member and the Cooperative regarding the Member Agreement or the Cooperative's provision of Cooperative Service, or the Member's use of a Cooperative Service to mediation and arbitration and shall comply with an arbitration award according to the rules and procedures prescribed by the operative rules of the American Arbitration Association. A demand for arbitration shall be made within a reasonable time after the claim, dispute or other matter in question has arisen.

2. Indemnify the Cooperative for, and hold the Cooperative harmless from, liabilities, damages, costs, or expenses, including reasonable attorney fees and legal expenses, incurred by the Cooperative, or its directors, officers, employees, agents, or representatives (collectively, "Cooperative Officials"), and caused by the Member's negligence, gross negligence, or willful misconduct, or by the unsafe or defective condition of a location occupied by the Member that is not the fault of the Cooperative.

In general, a Member is not liable to third parties for the Cooperative's acts, debts, liabilities, or obligations solely because of Membership in the Cooperative. A Member may become liable to the Cooperative as provided in the Full Member Agreement or Bylaws or as otherwise agreed to by

the Cooperative and the Member.

Section 2.7. Access. Each Member shall make available to the Cooperative a suitable site, as determined by the Cooperative, whereon to place the Cooperative's physical equipment for the furnishing and metering of Cooperative Service and shall permit the Cooperative's authorized employees, agents and independent contractors to have access thereto safely and without interference from any hostile source for inspection, maintenance, replacement, relocation, repair or disconnection of such facilities at all reasonable times, and at any time during an emergency. As part of the consideration for such service, each Member shall be the Cooperative's bailee of such facilities and shall accordingly desist from interfering with, impairing the operation of or causing damage to such facilities, and shall use its best efforts to prevent others from so doing. The Cooperative will generally provide email notice of its need to enter the Member property for an inspection and/or repair of the Cooperative Equipment.

Section 2.8. Member to Grant Property Rights to Cooperative. The Member shall grant the Cooperative in the Full Member Agreement or other agreement a right-of-way, license or other grant or interest in Member property, under such lands owned, leased, mortgaged, by the Member to connect the Cooperative Service or for a Cooperative Purpose (defined below). In the event Member has a mortgage or lien on a property, the Member shall not use the mortgage or lien as a reason to object to the grant of property rights pursuant to this section. A "Cooperative Purpose" is: (1) installing, constructing, inspecting, monitoring, operating, repairing, maintaining, removing, relocating, upgrading, or replacing Cooperative Equipment; (2) clearing, trimming, removing, or managing any trees, bushes, brush, or other vegetation to run wire underground to the Member facility; (3) providing a Cooperative Service to the Member or another Member; (4) monitoring, measuring, or maintaining a Cooperative Service provided to a Member; (5) authorizing, permitting, satisfying, or facilitating an obligation incurred, or right granted, by the Cooperative regarding use of Cooperative Equipment; or (6) safely, reliably, and efficiently providing a Cooperative Service to the Member.

Section 2.9. Energy Conservation. Member and Cooperative shall work together to enhance energy conservation, to more efficiently utilize electric energy, and to conduct energy usage research.

Section 2.10 Statement of Nondiscrimination. The Cooperative does not discriminate on the basis of race, color, national origin, sex, religion, age, disability, or other protected class. The Cooperative encourages persons who believe they have been improperly discriminated against to contact the President. Written discrimination complaints must be filed not later than 180 days from the date of the alleged discrimination.

ARTICLE III
MEMBERSHIP SUSPENSION AND TERMINATION

Section 3.1. Suspension of Cooperative Service.

1. Suspension Reasons. The Cooperative may suspend a Member for the following reasons ("Suspension Reasons"):

a. Failing to pay for Cooperative Service or not complying with the Full Member Agreement or these Bylaws;

b. For good cause if the Member legally dissolves, or legally ceases to exist; tampers with, alters, interferes with, damages, or impairs any Cooperative Equipment; or,

c. voluntarily requests suspension.

2. Notice and Comment. Unless otherwise provided in these Bylaws, and following the occurrence of a suspension reason other than a Member's voluntary request for suspension, the Cooperative:

a. Provides the Member at least fifteen (15) days prior written notice of the Member's possible suspension and the underlying suspension reason; and

b. Notifies the Member that the Member has, and allows the Member, at least five (5) days after the effective date of the notice to comment upon the suspension reason, either orally or in writing.

Any written suspension notice provided by mail must be mailed to the Member's most current address shown on the membership list.

3. Effect of Member suspension upon Cooperative. Upon a Member's suspension, then:

a. The Cooperative's duties, obligations, and liabilities imposed by these Bylaws for the Member cease; and

b. The Cooperative may cease providing any Cooperative Service to the Member.

4. Effect of Member suspension upon Member. A suspended Member forfeits and relinquishes all rights provided in the Full Member Agreement and these Bylaws. In particular, a suspended Member forfeits and relinquishes any voting rights provided by these Bylaws. A suspended Member, however, remains subject to all obligations imposed by the Full Member Agreement and these Bylaws.

5. Lifting of Suspension. A Member's suspension is automatically lifted upon the Member rectifying, to the Cooperative's reasonable satisfaction, the underlying suspension reason within ten (10) days of the suspension. The Cooperative may lift any Member suspension for good cause as determined by the President.

Section 3.2. Payment Termination. Membership of the Member shall be terminated without further action by the Cooperative for a failure to make payment that began as a suspension and was not cured by the Member within thirty (30) days of the effective date of the suspension.

Termination for failure to pay does not release the Member from any debts, liabilities, or obligations owed to the Cooperative.

Section 3.3. Termination for Reasons Other Than Failure to Pay. The Membership of the Member shall be terminated without further action by the Cooperative after a suspension has been in place for forty-five (45) days without a resolution, unless the Member shall request in writing within thirty (30) days of the effective date of the suspension a hearing before the Board of Directors. The termination, but not the suspension, shall be held in abeyance until the Board votes on the termination. Termination of a Member does not release the Member from any debts, liabilities, or obligations owed the Cooperative. Upon a Member's termination from the Cooperative, and after deducting any amounts owed the Cooperative, the Cooperative shall return to the Member any amounts due to the terminated Member, if any, unless deemed otherwise for good cause by the Board.

Section 3.4. Withdrawal. Once a Member has satisfied its minimum term established in the Member Agreement, the Member may withdraw from the Cooperative on thirty (30) days written notice. Upon the Member becoming ineligible under the provisions of Section 2.1 for Membership in the Cooperative, the Member may withdraw on terms agreed to between the Member and the Cooperative. In all other cases, a Member may be permitted to withdraw from Membership in the Cooperative at such times and on such conditions as the President prescribes which are accepted by the Member.

Section 3.5. Effect of Withdrawal or Termination. Upon the withdrawal or termination in any manner of a Membership, the former Member shall be entitled to a refund of any over payment, less any amounts due the Cooperative. Should an action be commenced or an attorney employed to enforce payments of any amount owing on an account, the Member agrees to pay all costs of enforcement, including reasonable attorneys' fees and a late fee at the monthly periodic rate of 1.5% per month (18% per annum) until paid in full.

ARTICLE IV
MEETINGS OF MEMBERS

Section 4.1. Organizational Board and Annual Meeting. The affairs of the Corporation are managed by a Board of Directors. The names of the initial, organizational Directors are in the Charter of the Corporation. The organizational Directors shall serve until the solar facility is tested, commissioned, and certified, and then at the first annual meeting of the Members, the Members shall elect Directors consistent with the voting agreements, Charter, and these bylaws.

For the purpose of electing Directors, hearing and passing upon reports covering the previous fiscal year, and transacting such other business as may properly come before the meeting of the Members, the annual meeting of the Members shall be held on such date and beginning at such time as the Board from year to year shall provide. It shall be the responsibility of the Board to make adequate plans and preparations for and to encourage Member attendance at the annual meeting. Failure to hold the annual meeting at the designated time shall not constitute a forfeiture or dissolution of the Cooperative. These meetings may be conducted over zoom or any other electronic media.

Section 4.2. Special Member Meetings. A special meeting of the Members may be called by resolution of the Board or upon written request of at least the greater of three Members or twenty-five percent (25%) of all the Members, signed and dated within thirty (30) days following the first signature. The Cooperative will give notice of the special meeting to all Members. The special meeting shall be held in Madison County, Tennessee on such date, and beginning at such hour as designated by the Members calling the special meeting.

Section 4.3. Notice of Member Meetings. Written notice of the place, date and hour of the meeting, and, in the case of a special meeting or of an annual meeting at which business requiring special notice is to be transacted, the purpose or purposes of the meeting, shall be delivered to each Member not less than fourteen (14) nor more than forty-five (45) days before the date of the meeting. Such notice may be made personally; by United States Postal Service either with or without other documents, or electronically at a verified Member e-mail address. No matter that requires the affirmative votes of a clear majority of the Cooperative's Members attending a Member meeting shall be acted upon unless notice of such matter shall have been contained in the notice of the meeting. If mailed, such notice shall be deemed to be delivered when deposited in the United States mail, addressed to the Member at its address as it appears on the Cooperative's records, with postage thereon prepaid and postmarked at least fourteen (14) days before the meeting date. If transmitted via e-mail, such notice shall be deemed delivered when transmitted to a previously verified e-mail address for Member. The inadvertent failure of any Member to receive such notice shall not invalidate any action which may be taken by the Members at any such meeting. In making time calculations required by this section, the day of the meeting shall not be counted.

Section 4.4. Quorum for Member Meetings. Whenever ballots are cast by Members for the election of a director, attendance in person, by proxy, or by the submission of mailed ballots of at least twenty-five percent (25%) of the total Members of the Cooperative at any meeting of the Members shall constitute a quorum for the purpose of electing Directors and conducting other Cooperative business. Once a quorum is established for election of Directors, the results of the vote for Directors may be announced. Once a quorum is established for conducting Cooperative business, all business may be transacted despite the loss of a quorum. If a quorum is not established, the chair may recess the meeting to another time and date to any place within Madison County. The Secretary of the Cooperative, or his or her designee, shall notify all Members of the time, place and date of the recessed meeting by delivering notice thereof as provided in Section 4.3 of these Bylaws. At all meetings of the Members, the Secretary shall annex to the meeting minutes or incorporate therein by reference, a list of those who were present in person, by mailed-in ballot and by proxy.

Section 4.5. Credentials and Elections Committee. The Board appoints a Credentials and Elections Committee consisting of an uneven number of persons, not less than three (3) nor more than seven (7). Members of the Credentials and Elections Committee may not be close relatives or members of the same household of existing Directors or known candidates for Directors to be elected at such meeting. The Credentials and Elections Committee decides Member meeting issues. A Credentials and Elections Committee decision or action requires a vote of at least a majority of the Credentials and Elections Committee members present. Except as otherwise provided in these Bylaws, Credentials and Elections Committee decisions or actions during, or

within a reasonable time before or after a Member meeting are final. In the event a member of the Credentials and Elections Committee resigns or becomes unable to participate due to illness or death, the Board may appoint, in its sole discretion an alternate member. The Committee may elect its own chairperson. In the exercise of its responsibility, the Credentials and Elections Committee shall have available to it the advice of counsel provided by the Cooperative. The Credentials and Elections Committee shall certify the results of all elections and other balloting. It shall be the responsibility of the Credentials and Elections Committee to establish or approve the manner of conducting Member registration at a Member meeting, to pass upon all questions that may arise with respect to the registration of Members in person and the authenticity and validity of mailed-in ballots and proxies, to oversee the counting of all ballots cast in any election, to rule upon all other questions that may arise relating to Member voting and the election of candidates for Director. The Credentials and Elections Committee's responsibilities include, but are not limited to, reviewing the process for the nomination and election of Directors and ruling on the validity of qualifications of candidates and nominees.

Section 4.6. Voting. Each Member who is not in a status of suspension as provided for in Section 3.1 shall be entitled to one vote and no more upon each matter submitted to a vote at a meeting of the Members. An Entity may vote through a duly designated representative, qualified as such upon registering for the meeting. Voting by Members shall be allowed upon the presentation to the Cooperative prior to, or upon registration at, each Member meeting of satisfactory evidence entitling the person to vote on behalf of the Entity. Such evidence shall not be required in any voting by mailed ballots for election of Directors. No one may vote on behalf of more than one Member. At all meetings of the Members at which a quorum is present all questions shall be decided by a majority of the Members voting thereon, except as otherwise provided by law or by the Cooperative's Charter or these Bylaws. Members may not accumulate their votes.

Members shall vote for the election of Directors by ballots mailed in or delivered to the address indicated in the notice of meeting on or before the date and hour indicated in such notice. Members shall not be permitted to vote in person for the election of Directors, but may attend and register and participate in all other proceedings of the meeting of Members to the fullest extent, and including the voting in person on all other questions that come before the meeting of Members. All elections of Directors shall be conducted so that the ballots will be return-mailed or delivered so as to assure that the way the vote is cast may not be determined and to assure that Members vote only once. The counting of mail ballots shall be conducted by or under the direction of the Credentials and Elections Committee prior to the meeting of the Members. The results will not be made official until certified by the Credentials and Elections Committee and announced by the chair of the Committee during the meeting. The provisions of the Section shall not apply to the election of a Director to fill a vacancy caused by the removal of a Director by the Members, in which case the provisions of Section 5.12 (Removal of Directors by Members) shall be followed.

The Board may authorize balloting by electronic means as an alternative to mail ballots or as replacement to mail ballots. Such authorization shall be in the form of a Board resolution that sets forth the process and security safeguards for the collection of electronic ballots. In the event the Board adopts electronic ballots, then these Bylaws shall be read to replace or add, as the case may be, "mail" ballots with "electronic" ballots as set forth in the Board resolution. The electronic ballots must meet at least the standards for mail ballots set forth in this Section.

Section 4.7. Member Suggested Resolutions and New Business. Any Member or Members wishing to have a resolution or an item of business placed on the agenda of any meeting of Members to be discussed or acted upon at the meeting shall submit the resolution or other items in writing to the Secretary not less than sixty (60) days before the scheduled meeting date. Notice of such resolution or other item of business so presented shall be given to the Membership with the notice of meeting.

ARTICLE V
DIRECTORS

Section 5.1. General Powers and Responsibilities. The business and affairs of the Cooperative shall be managed by a board of five (5) Directors, which shall exercise all of the powers of the Cooperative except such powers that are, by Law or the Charter or Bylaws reserved to the Members.

Section 5.2. Director Conduct. A Director shall discharge the Director's duties, in good faith; in a manner the Director reasonably believes to be in the Cooperative's best interests; when becoming informed in connection with the Director's decision-making function or devoting attention to the Director's oversight function, with the care that an individual in a like position would reasonably believe appropriate under similar circumstances; and in a manner in which the Director discloses or causes to be disclosed to other Directors information not known by them, but known by the Director to be material to discharging their decision-making or oversight functions, except that disclosure is not required to the extent that the Director reasonably believes that disclosure would violate a duty imposed under law, a legally enforceable obligation of confidentiality, or a professional ethics rule.

Unless a Director has knowledge making reliance unwarranted, then in discharging the Director's duties, the Director may rely on the performance, information or statements, including financial statements, presented by any of the following individuals:

1. one or more Cooperative Officers or employees whom the Director reasonably believes to be reliable and competent in the functions performed or the information, opinions, reports, or statements provided;

2. legal counsel, public accountants, or other individuals retained by the Cooperative regarding matters involving skills or expertise the Director reasonably believes are matters within the individual's professional or expert competence and as to which the individual merits confidence; and

3. a Board Committee of which the Director is not a member if the Director reasonably believes the Board Committee merits confidence.

Section 5.3. Qualifications. To become and remain a Director of the Cooperative, a person must meet and maintain continuously each of the following qualification requirements (collectively, the "Director Qualifications"):

1. Not be a close relative of an incumbent Director or an employee of the Cooperative.

2. Not be in any way financially interested in a competing enterprise that distributes electric energy.

3. Not have been convicted of a felony or any misdemeanor involving moral turpitude.

4. Be a citizen of the United States of America.

5. Be legally competent and physically able to enter contracts and exercise a Director's legal duties at the time of election and continuously during the Director's term of office.

Section 5.4. Disqualification of Nominees, Candidates and Directors.

1. The Credentials and Elections Committee shall determine whether nominees and candidates for Director are qualified through education or experience to assist the Board in governing the Cooperative.

2. If any Member alleges in a written statement signed by the Member and containing specific facts that a sitting Director does not meet any one or more of the Director Qualifications at a time after the Director's election, it shall be the duty of the Board to determine the validity of the such allegations according to the following procedures:

    a. Upon a majority vote of the Board that a Director is likely to have become disqualified, the Chairman of the Board shall notify the Director in writing of the basis for disqualification and provide the person an opportunity for a hearing before the Board. The Director must demand a hearing no later than the close of business on the tenth (10th) business day after the Director receives the notice or the notice is confirmed delivered to the Director's e-mail or physical address on file with the Cooperative, whichever is sooner. Failure to demand a hearing pursuant to this section shall mean that the Director has waived his or her right to a hearing.

    b. All disqualification hearings procedures shall adhere to Chapter XX, Disciplinary Proceedings, as set forth in Roberts Rules of Order, Newly Revised, except as otherwise stated herein. d. After the hearing, if held, or at a regular or special meeting if a hearing is not demanded, the members of the Board shall vote on whether the subject Director is disqualified. A two-thirds majority favoring disqualification shall affect the immediate removal of the person as Director. After removal, the Director's seat shall be treated as if it were vacant. If the Director is not removed, his Director Qualifications can be challenged again only through a new allegation of facts substantially different from the facts contained in the prior allegation.

    c. The decision of the Board is final.

3. If a majority of Directors authorized by these Bylaws complies with the Director Qualifications and approves a Board action, then the failure of a Director to comply with the Director Qualifications does not affect the Board action.

Section 5.5. Elections.

1. At each annual meeting of the Members, Directors shall be elected by secret mailed-in ballot by the Members.

2. Directors shall be elected by a plurality vote of the Members.

3. Cumulative voting shall not be allowed.

Section 5.6. Tenure. Directors shall be elected for terms of three (3) years or until their successors are elected and take office. The Board shall ensure staggered Director terms by dividing the total number of authorized Directors into groups of approximately equal number. Members must annually elect an approximately equal number of Directors. Directors shall take office at the first regular meeting of the Board following the annual meeting of the membership.

Section 5.7. Nominations. The Credentials and Elections Committee shall approve nominations, and shall:

1. (60) days before the meeting a list of nominations for Directors to be elected;

2. The list may include a brief biography or statement provided by the nominee or candidate.

3. If any nominee or candidate withdraws his name from nomination or dies between the time he or she is nominated as provided herein and sixty (60) days before the deadline for returning ballots to the Cooperative, and if as a result of such withdrawal or death there is less than one (1) candidate for election for any seat, the Credentials and Elections Committee shall nominate someone else to take the place of such withdrawn or deceased nominee.

Section 5.8. Voting for Directors. For purposes of electing Directors, each Member who is a Member of the Cooperative on the day thirty (30) days before the annual Membership meeting or any special meeting of the Members called for the purpose of electing Directors shall be entitled to cast one vote. Ballots marked in violation of this restriction shall be invalid and shall not be counted. An invalid ballot shall not affect in any manner whatsoever the validity of any action taken by the Board after the election of Directors.

Section 5.9. Attendance at Board Meetings. By operation of these Bylaws and without any need for action by the Board, any Director who misses more than three (3) regular meetings in any twelve-month period shall automatically be removed from office and his or her seat on the Board shall be declared vacant.

Section 5.10. Director Resignation. A Director may resign at any time by delivering written notice of resignation to the Chairman. A resigning Director may request that the resignation be effective at a future date, which the Board may grant or deny in its sole discretion.

Section 5.11. Removal of Directors by Members. Any Member may bring one or more charge(s) for grossly negligent, fraudulent or criminal act, or omission significantly and adversely affecting the Cooperative against any one or more Director(s) and may request the removal of such Director(s) by reason thereof by filing with the Chairman such charge(s) in writing, together with a petition signed by not less than twenty-five percent (25%) of the then-total Members of the Cooperative which petition shall call for a special meeting, the stated purpose of which shall be to hear and act upon such charge(s) and, if one or more Directors are recalled, to elect their successor(s), and which specifies the place, time and date thereof not sooner than forty (40) days nor more than eighty (80) days after filing of such petition, or which requests that the matter be acted upon at the subsequent annual Member meeting if such meeting will be held no sooner than forty (40) days nor more than eighty (80) days after the filing of such petition. Each page of the petition shall, in the forepart thereof, state the name(s) and address(es) of the Member(s) filing such charge(s), a verbatim statement of such charge(s) and the name(s) of the Director(s) against whom such charge(s) is (are) being made. The petition shall be signed by each Member in the same name as he is billed by the Cooperative and shall state the signatory's address as the same appears on such billings. Notice of such charge(s), verbatim, of the Director(s) against whom the charge(s) have been made and of the Member(s) filing the charge(s) and the purpose of the meeting shall be contained in the notice of the meeting, or separately noticed to the Members not less than fourteen (14) days prior to the Member meeting at which the matter will be acted upon.

Such Director(s) shall be informed in writing of the charges after they have been validly filed and at least twenty (20) days prior to the meeting of the Members at which the charges are to be considered, and shall have an opportunity at the meeting to be heard in person, by witnesses, by counsel, or any combination of such, and to present evidence in respect of the charge(s); and the Member(s) bringing the charges shall have the same opportunity, but must be heard first. The question of the removal of such Director(s) shall, separately for each if more than one has been charged, be considered and voted upon at such meeting, and any vacancy created by such removal shall be filled by vote of the Members at such meeting without compliance with the foregoing provisions with respect to nominations, except that nominations shall be made from the floor. The question of the removal of a Director shall not be voted upon at all unless some evidence in support of the charge(s) against him or her are presented during the meeting through oral statements, documents or otherwise. Any Director elected by the Members as a replacement for a removed Director shall meet all eligibility requirements for being a Director and shall serve the unexpired portion of the removed Director's term. No Director may be removed for lawfully opposing or resisting any transfer of Cooperative assets.

Section 5.12. Vacancies. Subject to the provisions of these Bylaws with respect to the filling of vacancies caused by the removal of a Director by the Members, a vacancy occurring in the Board shall be filled by the affirmative vote of a majority of the remaining Directors. A Director thus elected shall fill the unexpired term of the Director whose office was originally vacated.

Section 5.13. Compensation; Expenses. A Director is not an employee of the Cooperative. A

Directors serves as an uncompensated volunteer without benefits. However, as determined or approved by the Board, the Cooperative may reimburse Directors for their expenses for attending a: (1) Board meeting; (2) function, meeting, or event involving or relating to the Cooperative; or (3) function, meeting, or event involving, relating to, or reasonably enhancing the Director's ability to serve in, the role of Director. The Board must determine or approve the manner, method, and amount of any Director expense reimbursement.

Section 5.14. Rules, Regulations, and Contracts. The Board shall have power to make, adopt, amend, abolish and promulgate such rules, regulations, and contracts, not inconsistent with Law or the Cooperative's Charter or Bylaws, as it may deem advisable for the management, administration and regulation of the business and affairs of the Cooperative.

Section 5.15. Accounting System and Report. The Board shall cause to be established a complete accounting system of the Cooperative's financial operations and condition, and may, after the close of each fiscal year, cause to be made a full, complete and independent audit of the Cooperative's accounts, books and records reflecting operations during and financial condition as of the end of such year.

Section 5.16. Reserves. The Cooperative is a non-profit operated for the benefit of its Members. The Member Agreement may establish a maximum billing amount or rate for the Member. Therefore, the Cooperative will not hold more than twelve months in budgeted expenses as a surplus. Any excess will be distributed annually to the Members based on usage or credited against their Cooperative Service.

ARTICLE VI
MEETINGS OF DIRECTORS

Section 6.1. Regular Board Meetings. The Board shall regularly meet at the date, time, and location determined by the Board ("Regular Board Meeting") through a resolution. Once the resolution establishing the Regular Board Meeting schedule is adopted, the Board may hold Regular Board Meetings without further notice. For good cause, the Chairman may change the date, time, or location of a Regular Board Meeting.

Section 6.2. Special Board Meetings. The Board, the Chairman, the President, or at least two Directors may call a special meeting of the Board ("Special Board Meeting") by instructing the Cooperative to provide each Director at least five days prior written or Electronic notice indicating the date, time, location, and purpose of the Special Board Meeting. Special Board Meetings may also be held via telephone conference call or via zoom or similar service.

Section 6.3. Waiver of Board Meeting Notice. At any time before, during, or after a Board Meeting or Special Board Meeting, a Director may waive notice of such meeting by delivering to the Cooperative a written or Electronic waiver of notice signed by the Director and later filed with the Board Meeting minutes or the Cooperative's records. In addition, a Director's attendance at, or participation in, a Board Meeting waives notice of the Board Meeting and any matter considered at the Board Meeting, unless the Director:

1. at the beginning of the Board Meeting objects to holding or transacting business at the Board Meeting or lack of, or defective, notice of the Board Meeting or Special Board Meeting; and

2. does not vote for, or assent to, an objected matter.

Section 6.4. Quorum. The presence of a majority of the Directors in office shall be required for the transaction of business and the affirmative votes of a majority of the Directors in office shall be required for any action to be taken. A Director who by Law or by these Bylaws is disqualified from voting on a particular matter shall not, with respect to consideration of and action upon that matter, be counted in determining the number in office. A Director may not vote by proxy. An agreement signed by Directors providing the manner in which a Director must vote is not valid and is unenforceable. If less than a quorum is present at a meeting, a majority of the Directors present may recess the meeting until a later date, but shall cause any absent Directors to be duly notified of the time and place of such recessed meeting.

Section 6.5. Procedures for Board Meetings. Except as otherwise provided in these Bylaws, a Regular Board Meeting or Special Board Meeting (collectively, a "Board Meeting") may implement those meeting procedures the Board deems most appropriate. A Board Meeting or a Board Committee meeting may be conducted with physically absent Directors participating, and deemed present in person, through any means of communication by which all Directors participating in the Board Meeting may simultaneously hear each other during the Board Meeting.

Without a Board Meeting, the Board may take an action required or permitted to be taken at a Board Meeting by "Director Written Consent" if the action is: (1) taken by all Directors; and (2) evidenced by one or more written consents ("Director Written Consent") (A) describing the action taken; (B) signed by each Director; (C) delivered to the Cooperative; and (D) included with the Cooperative's Board Meeting minutes. Except as a different effective date is provided in the Director Written Consent, action taken by Director Written Consent is effective when the last Director signs the Director Written Consent. A Director Written Consent has the effect of, and may be described as, a Board Meeting vote. Prior to his or her assent to a Director Written Consent, a Director may object for any reason and thereby refuse to allow the Director Written Consent to become effective. If the Chairman is not present at a Board Meeting, then the Directors attending the Board Meeting must elect a Director to preside over the Board Meeting.

The Board may promulgate or approve rules, policies, and procedures regarding:

1. The conduct of Board Meetings.

2. The attendance at, participation in, or presentation during Board Meetings by persons other than Directors; or

3. The right to access, inspect, or copy any minutes, record, or other document relating to any Board Meeting by persons other than Directors; or

Section 6.6. Committees. The Board may create a committee of the Board ("Board Committee")

and appoint Directors and others to serve on the Board Committee. A Board Committee must consist of at least one Director. The Board may create a committee of the Members ("Member Committee") and appoint Members, including Directors, to serve on the Member Committee. The Board may appoint one or more Directors or Members, respectively, as alternate members of any Board or Member Committee to replace any absent or disqualified Committee member during the Committee member's absence or disqualification. A Member Committee may act as specified by the Board, but may not exercise Board authority. Except as otherwise provided in this Bylaw, the Board may authorize a Board Committee to exercise Board authority. Although a Board Committee may recommend, a Board Committee may not act, to: (1) retire and pay debts and leases; (2) approve the Cooperative's dissolution or merger, or the sale, pledge, or Transfer of all, or substantially all, assets; (3) elect, appoint, disqualify, or remove a Director, or fill a Board or Board Committee vacancy; or (4) adopt, amend, or repeal Bylaws.

ARTICLE VII
OFFICERS

Section 7.1 Officer Standard of Conduct. An Officer shall discharge the Officer's duties: (1) in good faith; (2) with the care an ordinarily prudent person in a like position would exercise under similar circumstances; and (3) in a manner the Officer reasonably believes to be in the Cooperative's best interests. An Officer shall: (1) inform the Board, or the superior Officer or Board Committee to whom or which the Officer reports, of information regarding the Cooperative's affairs known to the Officer, within the scope of the Officer's duties and functions, and known to the Officer to be material to the superior Officer or Board; and (2) inform the Board, the superior Officer to whom the Officer reports, or another appropriate person within Cooperative of any actual or probable material violation of Law involving the Cooperative, or material breach of duty to the Cooperative by a Cooperative Officer, employee, or agent, that the Officer believes has occurred or is likely to occur.

Section 7.2. Required Officers; Other Officers; Election; Terms. The Cooperative must have at least a President, Secretary, and a Treasurer ("Required Officers"). The Board may create other executive officers that it deems appropriate. The Board shall elect Required Officers: (1) at the first Regular Board Meeting following each annual Member meeting, or as soon after each annual Member meeting as reasonably possible and convenient and (2) by affirmative vote of a majority of Directors in office. The Board may create or appoint Other Officers at any time. The Board may authorize a Required Officer to delegate duties and responsibilities to a third party with expertise in that area.

Section 7.3. Removal. Any officer, agent or employee elected or appointed by the Board may be removed by the Board whenever in its judgment the best interests of the Cooperative will thereby be served.

Section 7.4. Vacancies. A vacancy in any office elected by the Board may be filled by the Board for the unexpired portion of the term.

Section 7.5. President. The President may also be referred to as the Manager or General Manager. The President:

1. May sign Member Agreements, any deeds, mortgages, deeds of trust, notes, bonds, contracts or other instruments authorized by the Board to be executed, except in cases in which the signing and execution thereof shall be expressly delegated by the Board or by these Bylaws to some other officer or agent of the Cooperative, or shall be required by law to be otherwise signed or executed; and

2. In general, shall perform all duties incidental to the office of President and such other duties as may be prescribed by the Board from time to time.

Section 7.6. Secretary. Except as otherwise provided by the Board or these Bylaws, the Secretary:

1. shall be responsible for preparing, or supervising the preparation of, minutes of Board and Member meetings;
2. shall be responsible for maintaining and authenticating the Cooperative's records;
3. may affix the Cooperative's seal to a document authorized or approved by the Board or Members; and
4. shall perform all other duties, shall have all other responsibilities, and may exercise all other authority prescribed by the Board.

Section 7.7 Treasurer. Except as otherwise provided by the Board or these Bylaws, the Treasurer shall perform all duties, shall have all responsibility, and may exercise all authority that may be prescribed by the Board.

Section 7.8. Delegation of Secretary's and Treasurer's Responsibilities. Notwithstanding the duties, responsibilities and authorities of the Secretary and of the Treasurer hereinbefore provided in this Article, the Board by resolution may, except as otherwise limited by Law or these Bylaws, delegate, wholly or in part, the responsibility and authority for, and the regular or routine administration of, one or more of such officers, such duties to one or more Cooperative employees or subcontractors. To the extent that the Board does so delegate with respect to either such officer, that officer as such shall be released from such duties, responsibilities and authorities.

Section 7.9. Compensation. The compensation, if any, of any officer, agent or employee shall be fixed or set according to a plan approved by the Board.

Section 7.10. Reports. The officers of the Cooperative shall annually submit to the Members reports covering the business of the Cooperative for the previous fiscal year and showing the financial condition of the Cooperative at the close of such fiscal year.

Section 7.11. Indemnification. The Cooperative shall indemnify present and former Directors, officers, agents and employees against liability to the extent that their acts or omissions constituting the grounds for alleged liability were performed in their official capacity and, if actionable at all, were based upon good faith business judgments in the belief the acts or omissions were in the best interests of the Cooperative or were not against the best interest of the Cooperative. The Cooperative may purchase insurance to cover such indemnification.

ARTICLE VIII

CONTRACTS, CHECKS AND DEPOSITS

Section 8.1. Contracts. Except as otherwise provided in these Bylaws, the Board may authorize any officer or officers, agent or agents to enter into any Member Agreement or other contract or execute and deliver any instrument in the name and on behalf of the Cooperative, and such authority may be general or confined to specific instances.

Section 8.2. Checks, Drafts, etc. All checks, drafts or other orders for the payment of money, and all notes, bonds or other evidences of indebtedness issued in the name of the Cooperative shall be signed by such officer, officers, agent or agents, employee or employees of the Cooperative and in such manner as shall from time to time be determined by resolution of the Board.

Section 8.3. Deposits. All funds of the Cooperative shall be deposited from time to time to the credit of the Cooperative in such bank, banks, or other financial institutions as the Board may select. The Board may delegate to an officer of the Cooperative the authority to effectuate such deposits and to manage Cooperative funds and deposits in the best interest of the Cooperative, such delegation being consistent with the Board's fiduciary duties and standard of conduct set forth in Section 5.2.

ARTICLE IX
NON-PROFIT OPERATION

Section 9.1. Interest or Dividends on Capital Prohibited. The Cooperative shall at all times be operated on a cooperative non-profit basis for the mutual benefit of its Members and patrons. The term "Patron" means: a Member or any person to whom the Cooperative is obligated to allocate Capital Credits. No interest or dividends shall be paid or payable by the Cooperative on any capital furnished by its Patrons. The term "Capital Credits" means the amounts allocated to a Patron and contributed by the Patron to the Cooperative as capital.

Section 9.2. Patronage Capital in Connection with Generation, Storage and Distribution Equipment and Installation. The Cooperative's operations in generating, storing, and distributing supplemental electric energy shall be conducted so that all Patrons who furnish capital or who provide for the lease of capital assets to the Cooperative receive a Capital Credit. At its inception, the Cooperative will lease equipment and receive electrical energy from a lease agreement with Community Development Enterprises - Jackson I. Community Development Enterprises - Jackson I will obtain tax equity financing for the equipment, construct a solar facility and related distribution to Members. Community Development Enterprises - Jackson I is an initial Patron. The Cooperative will receive initial capitalization and anticipates future capital needs being satisfied from it Patron(s). This capitalization will cover obligations which are incurred prior to the date on which the Cooperative begins receiving payment from Members for the Cooperative Service. In order to induce patronage and to assure that the Cooperative will operate on a non-profit basis, the Cooperative is obligated to account on a patronage basis to its Patrons for all amounts received. The books and records of the Cooperative shall be set up and kept in such a manner that at the end of each fiscal year the amount of capital, if any, so furnished by each Patron is clearly reflected and credited in an appropriate record to the capital account of each Patron. The Cooperative shall within a reasonable time after the close of the fiscal year notify each Patron of the amount of capital so credited to its capital account. All such amounts credited to the capital

account of any Patron shall have the same status as though they had been paid to the Cooperative in cash in pursuance of a legal obligation to do so, and the Patron had then furnished the Cooperative corresponding amounts for capital. The Cooperative will retire these Capital Credits over time. The Cooperative authorizes the Patron to perfect its security interest in its Capital Credits by filing a financing statement. Additionally, the Patron(s) and the Cooperative may agree to secure loans from third parties through a security agreement signed or authenticated by a Patron, in which the Patron grants the third party a security interest in Capital Credits allocated to the Patron to secure a loan to the Cooperative.

Section 9.3. Patronage Capital in Connection with Furnishing Electric Energy. The Cooperative's operations in furnishing supplemental electric energy shall be conducted so that all Patrons who furnish capital receive a Capital Credit. In order to induce patronage and to assure that the Cooperative will operate on a non-profit basis, the Cooperative is obligated to account on a patronage basis to its Members for all amounts received from the furnishing of electric energy in excess of operating costs and expenses properly chargeable against the furnishing of electric energy. The Cooperative will maintain a surplus that is no greater than twelve (12) months of budgeted expenses. All such amounts in excess of operating costs and expenses which is represented by this surplus is considered capital furnished by a Patron based on usage of electrical energy. The Cooperative is obligated to pay by credits to a capital account for each patron all such amounts in excess of operating costs and expenses. The books and records of the Cooperative shall be set up and kept in such a manner that at the end of each fiscal year the amount of capital, if any, so furnished by each Patron is clearly reflected and credited in an appropriate record to the capital account of each Patron. The Cooperative shall within a reasonable time after the close of the fiscal year notify each Patron of the amount of capital so credited to its capital account. All such amounts credited to the capital account of any Patron shall have the same status as though they had been paid by the Patron to the Cooperative in cash in pursuance of a legal obligation to do so, and the Patron had then furnished the Cooperative corresponding amounts for capital. Other than operating margins, funds and amounts received by the Cooperative that exceed the Cooperative's costs and expenses (also known as non-operating margins-interest) may be allocated as Capital Credits to Patrons in the same manner as the Cooperative allocates operating margins to Members who become Patrons, retained or used by the Cooperative and used to pay or offset any Cooperative cost or expense. Any excess surplus held by the Cooperative will be used to retire Capital Credits at the end of each year.

Section 9.4. Allocation of Capital Credits to Patrons. Consistent with these Bylaws and the Membership Agreement, the Board will determine the manner, method, and timing of allocating Capital Credits. The Cooperative may retire Capital Credits or use or invest unretired Capital Credits for its capital needs. The Board shall have the power to adopt rules providing for the separate treatment of that portion (that is, power supply or other service or supply portion) of capital credited to the accounts of patrons which corresponds to capital credited to the account of the Cooperative by an organization furnishing electric service or any other service or supply to the Cooperative. Such rules shall;

1. Establish a method for determining the portions of such capital credited to each patron for each applicable fiscal year;

2. Provide for separate identification on the Cooperative's books of such portions of capital credited to the Cooperative's Patrons;

3. Provide for appropriate notifications to Patrons with respect to such portions of capital credited to their accounts; and,

4. Preclude a general retirement of such portions of capital credited to Patrons for any fiscal year prior to the general retirement of other capital credited to Patrons for the same year or of any capital credited to Patrons for any prior fiscal year.

In the event of dissolution or liquidation of the Cooperative, after all outstanding indebtedness of the Cooperative shall have been paid, outstanding Capital Credits shall be retired without priority on a pro rata basis before any payments are made on account of property rights of Members. If, at any time prior to dissolution or liquidation, the Board shall determine that the financial condition of the Cooperative will not be impaired thereby, the capital then credited to patrons' accounts may be retired in full or in part.

Section 9.5. Retirement of Capital Credits. After operations begin, the Board shall determine the method, basis, priority and order of retirement, if any, for all amounts furnished as capital. Subject to amounts due, capital credited to the account of each Patron shall be assigned only on the books of the Cooperative pursuant to written instructions from the assignor and only to successors in interest or successors in occupancy in all or a part of such former Member-Patron's premises served by the Cooperative. The Cooperative, before retiring any capital credited to any patron's account, shall deduct therefrom any amount owing by such patron to the Cooperative, together with interest thereon in effect when such amount became overdue, compounded annually.

Patrons may elect to contribute all or a part of the capital credits to the Cooperative or, if formed in the future, to the Community Services Cooperative Foundation of Jackson. Such election will be made in writing. The patrons of the Cooperative, by dealing with the Cooperative, acknowledge that the terms and provisions of the Charter and Bylaws shall constitute and be a contract between the Cooperative and each Patron, and both the Cooperative and the Patrons are bound by such contract, as fully as though each Patron had individually signed a separate instrument containing such terms and provisions.

ARTICLE X
PAYMENT OF EXPENSES IN SELLOUT DELIBERATIONS

In the event that an officer, Director, Member, Patron, or group of Members shall incur any reasonable expenses, costs, and/or attorney's fees in connection with opposing the selling of all or substantially all of the assets of the Cooperative, and provided such expenses, costs and/or fees have not been or are not to be reimbursed or paid by any other person, firm, association or corporation, such costs, expenses and fees shall be paid by the Cooperative provided they were incurred in opposition to such proposal.

ARTICLE XI
WAIVER OF NOTICE

Any Member or Director may waive, in writing, any notice of meetings required to be given by these Bylaws. Personal attendance at any meeting of the Members or Directors shall constitute a waiver of notice of such meeting unless such personal attendance shall be for the express purpose of objecting to the transaction of any business on the ground that the meeting shall not have been lawfully called or convened. Any Member or Director attending any meeting for the purpose of making such objection shall notify the Secretary prior to or at the beginning of the meeting of his objections. Waiver of Director meetings is also subject to Section 6.3.

ARTICLE XII
DISPOSITION & PLEDGING OF PROPERTY; DISTRIBUTION OF SURPLUS ASSETS ON DISSOLUTION

Section 12.1. Transfer of Cooperative Assets. The Board may pledge assets of the Cooperative to secure indebtedness. The Board may transfer, mortgage, pledge, dedicate to repayment, or encumber any Cooperative asset in the regular course of business for the furnishing of Cooperative Services. Except for the initial lease of equipment or the purchase or lease of real property at the inception of the Cooperative, the Members must approve by a two-thirds vote the sale of substantially all of the assets of the Cooperative to a third party. The Board shall approve any other sale, lease, exchange, or other disposition of any Cooperative property or Cooperative asset, including the following:

1. To secure indebtedness;

2. Pursuant to condemnation or threat of condemnation;

3. Pursuant to an existing legal obligation;

4. Associated with a consolidation or merger with another cooperative entity;

5. To another entity operating on a cooperative basis and providing electric energy; or,

6. To a Cooperative subsidiary, the Cooperative shall not transfer, during any twelve (12) month period, more than ten per centum (10%) of the Cooperative's assets unless:

    a. At the expense of the person seeking to purchase, lease or acquire the Cooperative's assets, the Board appoints three (3) independent appraisers, each of whom, within a reasonable time of appointment, evaluates and renders an appraisal valuing the Cooperative's assets specified in the proposed transfer;

    b. Within a reasonable time of receiving the appraisals, the Cooperative invites any other entities operating on a cooperative basis, providing electric energy, and primarily located within the same state as, or within a state adjacent to, the state in which the Cooperative is primarily located to submit proposals to purchase, lease, or acquire the Cooperative's assets specified in the proposed

transfer, or to merge or consolidate with the Cooperative;

c. The Board approves the proposed transfer;

d. By mail ballot, at least two-thirds (2/3) of the total Membership approves the proposed transfer; and

e. Notice of any Member meeting at which Members will consider the proposed transfer states that one of the purposes of the Member meeting is to consider the transfer, and includes a copy or summary of the proposed transfer.

In proportion to the value or quantity of Cooperative services used by Members during the period in which the Cooperative owned a Cooperative asset, the Cooperative allocates and credits to Members as Capital Credits any consideration received for the Cooperative's assets that exceed the amount paid for the Cooperative assets.

Section 12.2. Distribution of Surplus Assets on Dissolution. Upon the Cooperative's dissolution, any assets remaining after all liabilities or obligations of the Cooperative have been satisfied and discharged shall be distributed among all persons who shall have been Members of the Cooperative at any time during the fiscal year in which such dissolution is authorized by vote of the Members or any of the five (5) next preceding years, prorated to them on the basis that their respective patronage during all such years bears to the total receipts of the Cooperative for all such years. Provided, however, that if in the judgment of the Board the amount of such surplus is too small to justify the expense of making such distribution, the Board may, in lieu thereof, donate, or provide for the donation of, such surplus to one or more nonprofit charitable or educational organizations that are exempt from federal income taxation.

ARTICLE XIII
FISCAL YEAR

The Cooperative's fiscal year shall begin on the first day of the month of January of each year and end on the last day of the month of December following.

ARTICLE XIV
RULES OF ORDER

Parliamentary procedure at all meetings of the Members, of the Board, of any committee provided for in these Bylaws and of any other committee of the Members or Board which may from time to time be duly established shall be governed by the most recent edition of Robert's Rules of Order, except to the extent such procedure is otherwise determined by these Bylaws, by Law, by the Cooperative's Charter, or by action of the Board.

ARTICLE XV
LEGAL FORMALITIES

These Bylaws are governed by, and are to be interpreted under the laws of the State of Tennessee and any proceedings or actions arising therefrom shall be brought in a forum of competent jurisdiction located therein. The Board reserves the right to amend the Bylaws of the Cooperative at any time and for any reason consistent with the purpose of the Cooperative. Such amendment may be adopted without prior notice to Members, and such amendment shall become binding on the Members automatically on the effective date of the amendment. The titles and headings of the Charter and Sections of these Bylaws are for convenience and reference only, and do not affect the interpretation of any Bylaw, Article, Section, or sub-section thereof. The failure of the Cooperative to assert any right or remedy provided by these Bylaws does not waive the right or remedy provided by these Bylaws. These Bylaws and the Member Agreement constitute the entire agreement between the Cooperative and the Members and supersede any prior or contemporaneous oral or written communication or representation. The invalidity of any Bylaw provision does not invalidate the remaining Bylaw provisions. In the event a provision of these Bylaws is found to be invalid, the remaining provisions are to be read in such a manner as to give the fullest effect to the entire document as if, to the extent legally possible, the invalid provision were valid.

ARTICLE XVI
AMENDMENTS

Except as otherwise provided in these Bylaws, these Bylaws may be adopted, amended, or repealed only by two-thirds of Directors present and entitled to vote at a regular or special meeting of the Board. Except as otherwise provided in a Bylaw Amendment, the Amendment is effective the day after the vote approving the Amendment. The Cooperative must notify Members of amended Bylaws at the annual meeting following the amendment.

Notice of a Board meeting at which Directors will consider a proposed Bylaw amendment must: (1) state that the purpose or one of the purposes, of the Board meeting is to consider the proposed Bylaw amendment; and (2) contain, or be accompanied by, a copy or summary of the proposed Bylaw amendment. After notice of a proposed Bylaw amendment, the proposed Bylaw amendment may not be materially changed before the meeting at which the amendment will be considered.

Robert Starr, Secretary

EXHIBIT 3

Solar Facility
HEAVY INDUSTRIAL
SCHOOLS
LIGHT INDUSTRIAL
Jones Creek
Dyer Creek
Sandy Creek
N Parkway E
Flex Dr
Decatur Fe Wright Dr
N Royal St
Betty Hawkins Rd
Atraco Pkwy
Henderson Rd
412
40

EXHIBIT 4

JACKSON SUSTAINABILITY COOPERATIVE
CONDITIONAL MEMBER AGREEMENT

AGREEMENT by and between:

JACKSON SUSTAINABILITY COOPERATIVE, ("JSC")
a Tennessee nonprofit corporation

and

_____ ("MEMBER")
Print Name

_____
Street

_____
City/State/Zip

_____
Member Number

_____
Email

_____
Taxpayer Identification Number

RECITALS:

WHEREAS, a small group of manufacturers and commercial operators with facilities in the Roosevelt Parkway area of Jackson, Tennessee desire to move to renewable energy and contribute to Jackson's redevelopment through participation in the Jackson Sustainability Cooperative, a Tennessee non-profit corporation;

WHEREAS, certain manufacturers and commercial operators in the neighborhood have corporate goals and aspirations of improving environmental quality through promoting and developing energy conservation through research while at the same time lowering energy costs, improving energy efficiency and energy quality to protect equipment, and avoiding the costs of power outages;

WHEREAS, certain manufacturers and commercial operators currently experience high peak-demand charges for electricity, as well as periodic power outages from construction, accidents and storms;

WHEREAS, these manufacturers and commercial operators may benefit from participating as a Member in the Jackson Sustainability Cooperative to share a solar facility in their neighborhood;

WHEREAS, the proposed solar facility connects directly to the Member to provide supplemental electrical energy through smart meters that precisely monitor electrical loads without backfeeding the existing municipal electricity provider's grid;

WHEREAS, the applicant desires to become a conditional Member for the purpose of allowing the Jackson Sustainability Cooperative to evaluate its energy profile to determine if it is eligible for the supplemental energy from sustainable sources provided by the Jackson Sustainability Cooperative, leading to full Membership and participation in the solar facility.

WITNESSETH

NOW THEREFORE, in consideration for a detailed analysis of electrial profile and potentially receiving an offer to participate in supplemental electrical energy from the shared solar facility, and the covenants and obligations contained herein, the parties agree as follows:

1. JACKSON SUSTAINABILITY COOPERATIVE ("JSC") is an electric cooperative incorporated and operating under the Tennessee Electric G&T Cooperative Act of 2009, T.C.A. §48-69-101. JSC is initially controlled by its founding board as set forth in the Charter. After supplemental electric energy is provided to the Members, then JSC will be controlled by its members and operate on a nonprofit basis to provide supplemental electric service ("Service") to those Members who meet its requirements, and not to the general public.

2. This Agreement makes the undersigned Applicant a temporary, conditional Member ("Member"). After the Member provides JSC with all requested information to analyze, within 60 days JSC will review the Member's current electrical energy profile experienced at Member's service location ("Premises"). JSC will determine if the Member's electrical profile is a suitable fit with the capabilities of JSC to determine if the conditional Member would benefit from participating as a full Member who receives supplemental electrical energy from JSC. This Agreement making the Applicant a conditional Member is not a contract for electrical energy provided by JSC. If JSC determines that the electrical needs of the conditional Member fit well with the capabilities of the solar facility, then JSC will offer a second agreement to become a full member with pricing and terms to approve interconnecting with JSC's solar facility for supplemental electrical energy.

3. The Member has no obligation to become a full Member of JSC. The conditional Member agrees to provide JSC with the following (collectively the "Information"):

a. A general description of the Member's business;
b. A description of what is manufactured and the processes;
c. A description of the labor-shift hours;
d. A short list of major equipment used in the process;
e. An electrical single-line drawing for the plant;
f. Excel file showing electrical usage per meter by 15, 30, or 60 minute intervals, for the prior 3 years if possible, otherwise at least 1 year;
g. Copy of agreement with municipal utility;
h. Monthly utility bills for prior 3 years if possible, otherwise at least 1 year; and
i. Permission to pull the Member's Dun & Bradstreet credit report.

4. JSC shall receive and use the Information solely for the purpose stated above and shall not use it for any other purpose. JSC and its agents and employees will hold in strict trust and confidence all Information that the Member furnishes and discloses or otherwise makes available to JSC. JSC shall not photograph the inside of the Premises at any place other than at the existing master breaker box where the Member receives power from the municipal provider. JSC will not reveal or otherwise disclose or make available any Information it receives to any person or parties other than JSC's contract technicians who reasonably have a need to possess knowledge of such Information for the purpose stated above and who have signed a confidentiality agreement with JSC on terms at least as strict as those in terms in this Agreement.

5. Upon the conclusion of the evaluation process described above, JSC shall return to the Member all Information it received. JSC shall not be subject to the restrictions imposed herein with respect to any Information obtained by it from the Member pursuant to this Agreement if:

   a. JSC can show by written documentation that the Information was known to it at the time of the receipt from the Member;

   b. The Information was at the time of disclosure by the Member to JSC was or thereafter becomes a matter of public knowledge through no violation of this Agreement by JSC; or

   c. the Information was or hereafter is obtained properly by JSC from another source without any restrictions of confidentiality or use.

6. This Agreement shall be governed by the laws of the State of Tennessee.

7. The obligations contained in this Agreement with respect to any Information shall remain in effect for five (5) years from date of disclosure of such Information.

8. This Agreement constitutes the entire agreement between the parties with respect to the subject matter hereof, and it supersedes all prior or contemporaneous agreements, negotiations or understandings with respect to said subject matter. This Agreement may be amended or waived only by a written instrument duly signed by both parties.

IN WITNESS WHEREOF, the parties hereto have affixed their hands and seal the date first shown above.

ATTEST:

JACKSON SUSTAINABILITY COOPERATIVE: MEMBER/APPLICANT:

By:_____
Dennis Emberling, President

By:_____

Its: _____

Date:_____

Date:_____

JACKSON SUSTAINABILITY COOPERATIVE
FULL MEMBER AGREEMENT

AGREEMENT by and between:

JACKSON SUSTAINABILITY COOPERATIVE ("JSC")
a Tennessee nonprofit corporation

and

ABC MANUFACTURING, INC. ("MEMBER")

_____
Member Number

RECITALS:

WHEREAS, Jackson Sustainability Cooperative has determined that the conditional Member's energy profile indicates that it can benefit from participating as a Member in the Jackson Sustainability Cooperative to share a solar facility with other similarly situated manufacturers and commercial operators who share the same vision of improving environmental quality, promoting conservation, improving energy quality and efficiency, avoiding the costs of power outages, and lowering energy costs without capital expenditures;

WHEREAS, the conditional Member desires to become a full Member who enjoys the benefits of a shared solar facility under the terms and conditions provided in this Member Agreement.

WITNESSETH[1]

NOW THEREFORE, in consideration for providing supplemental electrical energy, covenants and obligations contained herein, the parties agree as follows:

1. Cooperative and Membership. JACKSON SUSTAINABILITY COOPERATIVE ("JSC") is an electric cooperative incorporated and operating under the Tennessee Electric G&T Cooperative Act of 2009, T.C.A. § 48-69-101. This Agreement accepts Member as a full Member of JSC. Member agrees to abide by the terms of this Agreement at Member's service location(s). The undersigned Member agrees to be bound by the governing Documents, including JSC's: (a) Charter; (b) Bylaws; (c) service rules; (d) rate or price schedules; and (e) rules adopted by JSC's board of directors for the safe delivery of services,

[1] This agreement is adapted, in significant part, from a power purchase agreement provided by the National Renewable Energy Laboratory, a division of the U.S. Department of Energy.

and (f) amendments to the Governing Documents adopted from time to time. Member agrees that JSC selects the type of equipment and/or technology used to deliver or measure electric service.

2. Delivery of Electricity to Member. Member agrees to purchase from JSC, and JSC shall sell to Member, supplemental electric energy generated by JSC's solar facility ("the System") during the Initial Term and any Additional Term(s) (defined in paragraph 5 below). Electric energy generated by the System will be delivered to Member at the delivery point identified on Exhibit 1 (the "Delivery Point"). Member receives the electric energy generated by the System at the Delivery Point, and risk of loss will pass from JSC to Member at the Delivery Point. Member has the risk of loss from the Delivery Point into the facility and plant occupied by the Member (the "Member's Plant"). Member's primary source of electric energy will continue to come from the municipal utility. Any purchase, sale and/or delivery of electric energy generated by the System prior to the Commercial Operation Date shall be treated as purchase, sale and/or delivery of limited amounts of test energy only and shall not indicate that the System has been put in commercial operation by the purchase, sale and/or delivery of such test energy.

3. Measurement. JSC shall install one or more meter(s), at or immediately before the Delivery Point to measure the energy received by the Member. Such meter shall meet the general commercial standards of the solar photovoltaic industry or the required standard of JSC. JSC shall maintain the meter(s) in accordance with industry standards. As soon as Service becomes available to Member's Premises, Member shall purchase supplemental electricity for use on the Premises from JSC.

4. Billing and Payment.

   a. Monthly Charges. Member shall pay JSC monthly for supplemental renewable energy generated by the System delivered to the Delivery Point. Member agrees to pay the amounts invoiced by JSC for supplemental clean electric energy by the tenth (10th) day of the next month. The amount charged will never exceed an amount that is ninety-five percent (95%) of the difference between what the municipal utility would have charged without JSC's supplemental green energy and what the municipal utility actually did charge for that month. This cap on the amount charged by JSC to its Member applies even where municipal utility rates decrease. On the other hand, if municipal utility rates increase, the increase, if any, on JSC's charge is capped at no more than a five percent (5%) increase above the Member's total electricity charge for the same month in the prior year, after adjusting for this month's actual usage and adjusting for any annual change in the Consumer Price Index. Thus, even if municipal utility rates increase dramatically, the charge to the Member is capped so that year-over-year increases in real dollars (adjusted for changes in the Consumer Price Index) cannot exceed five percent (5%).

   b. Monthly Invoices. JSC shall invoice Member monthly by email or other method agreed to between the parties. Such monthly invoices shall state (i) the amount of

electric energy produced by the System and delivered to the Delivery Point, (ii) the rates and charges incurred by Member under this Agreement and (iii) the total amount due from Member.

c. Payment Terms. All amounts due under this Agreement shall be due and payable net twenty (20) days from receipt of invoice. Any undisputed portion of the invoice amount not paid within the twenty (20) day period shall accrue interest at the annual rate of two and one-half percent (2.5%) over the prime rate, as published in the Wall Street Journal (but not to exceed the maximum rate permitted by law).

5. Term and Termination.

a. Initial Term. The initial term ("Initial Term") of this Agreement shall commence on the Commercial Operation Date (as defined below) and continue for thirty (30) years, unless earlier terminated as provided for in this Agreement. The "Commercial Operation Date" is the date JSC gives Member written notice that the System is mechanically complete and capable of providing electric energy to the Delivery Point. Such notice shall be deemed effective unless Member reasonably objects within five (5) days of the date of such notice. Upon Member's request, JSC will give Member copies of certificates of completion or similar documentation from JSC's contractor and any similar agreements required under applicable law. This Agreement is effective as of the Effective Date and Member's failure to allow JSC to provide the electric energy by preventing it from installing the System up to the Delivery Point or otherwise not performing results in termination of this Agreement and damages to JSC. Member agrees that if it signs this Agreement then does not allow the installation of the wiring, smart meter, and related components on its site, then a $10,000.00 design cancellation fee and equipment restocking fee is due from Member to JSC as liquidated damages. Member acknowledges that this pre-installation cancellation fee is reasonably related to actual damages caused by JSC reasonably relying on the executed Agreement.

Member agrees that if it signs this Agreement and allows the installation of the wiring, smart meter, and related components on its site then terminates and/or cancels this Agreement, the Member agrees to pay an early cancellation fee. The Member agrees to give one hundred eighty (180) days notice of its intent to terminate. The early cancellation fee is equal to the installation labor costs of the equipment installed on the Member site, plus the value of the equipment at cost as installed by JSC on Member's site and configured for Member's use; provided, however, the value of the equipment at cost will be depreciated equally over a period of twenty (20) years for the purpose of determining this early cancellation fee. The early cancellation fee is in addition to any damages sustained by JSC as described in Section 15 below. Legal title to the equipment remains with JSC or its lien holders. There are no cancellation fees or early termination damages if Member terminates because JSC fails to provide the supplemental electric energy for ninety (90) consecutive days.

b. Additional Terms. Prior to the end of the Initial Term or of any applicable Additional Term, as defined below, either Party may give the other Party written notice of its desire to extend this Agreement on the terms and conditions set forth herein for an additional five (5) year period. Such notice shall be given, if at all, not more than one hundred twenty (120) and not less than sixty (60) days before the last day of the Initial Term or the then current Additional Term, as applicable. The Party receiving the notice requesting an Additional Term shall respond positively or negatively to that request in writing within thirty (30) days after receipt of the request. Failure to respond within such thirty (30) day period shall be deemed an acceptance of the offer for an Additional Term. If both Parties agree to an Additional Term, the Additional Term shall begin immediately upon the conclusion of the Initial Term or the then current term on the same terms and conditions as set forth in this Agreement. The Parties may agree to more than one Additional Term of five (5) years. If the Party receiving the request for an Additional Term rejects or is deemed to reject the first Party's offer, this Agreement shall terminate at the end of the Initial Term (if the same has not been extended) or the then current Additional Term.

6. Goodwill and Publicity. Neither Party shall use any name, trade name, service mark or trademark of the other Party in any promotional or advertising material without the prior written consent of such other Party. Provided, however, after Member signs this Agreement and within the following twelve (12) months, JSC may make one press release or similar announcement listing the names of all members of JSC. The Parties shall coordinate and cooperate with each other when making public announcements related to the execution and existence of this Agreement, and each Party shall have the right to promptly review, comment upon and approve any publicity materials, press releases or other public statements by the other Party that refer to, or that describe any aspect of, this Agreement. Neither Party shall make any press release or public announcement of the specific terms of this Agreement (except for filings or other statements or releases as may be required by applicable law) without the specific prior written consent of the other Party. Without limiting the generality of the foregoing, all public statements must accurately reflect the rights and obligations of the Parties under this Agreement.

7. Member's Rights and Obligations.

a. Access Rights. Member grants to JSC and to JSC's agents, employees, contractors and assignees an irrevocable non-exclusive license running with the Premises (the "License") for access to, on, over, under and across the Premises for the purposes of (i) installing, constructing, operating, owning, maintaining, accessing, removing and replacing the System; (ii) performing all of JSC's obligations and enforcing all of JSC's rights set forth in this Agreement; and (iii) installing, using and maintaining electric lines and equipment, including inverters and meters necessary to interconnect the System to Member's electric system at the Member's Plant, or for any other purpose that may from time to time be useful or necessary in connection with the construction, installation, operation, maintenance or repair of the System. JSC shall notify Member prior to entering the Member's Plant except in situations where there

is imminent risk of damage to persons or property. The term of the License shall continue until the date that is one hundred and twenty (120) days following the date of expiration or termination of this Agreement (the "License Term"). During the License Term, Member shall ensure that JSC's rights under the License and JSC's access to the Member's Plant are preserved and protected. Member shall not interfere with nor shall permit any third parties to interfere with such rights or access. The grant of the License shall survive termination of this Agreement by either Party. At request of JSC, Member shall execute a memorandum of License, and which shall be in a form agreed to by the parties. JSC may, at its sole cost and expense, record such memorandum of License with the register's office.

b. OSHA Compliance. Both Parties shall ensure that all Occupational Safety and Health Act (OSHA) requirements and other similar applicable safety laws or codes are adhered to in their performance under this Agreement.

c. No Alteration to System. Member shall not make any alterations or repairs to the System which could adversely affect the operation and maintenance of the System without JSC's prior written consent. If Member wishes to make such alterations or repairs, Member shall give prior written notice to JSC, setting forth the work to be undertaken (except for emergency repairs, for which notice may be given by telephone), and give JSC the opportunity to advise Member in making such alterations or repairs in a manner that avoids damage to the System, but, notwithstanding any such advice, Member shall be responsible for all damage to the System caused by Member or its contractors. To the extent that temporary disconnection or removal of the System is necessary to perform such alterations or repairs, such work and any replacement of the System after completion of Member's alterations and repairs, shall be done by JSC or its contractors at Member's cost. In addition, if the System is disconnected for more than five (5) days, JSC may ask Member to pay an amount not to exceed the sum of payments that Member would have made to JSC hereunder for electric energy during the time of disconnection that would have been produced by the System during such disconnection or removal based on a daily charge derived from a rolling average of the prior twelve months. All of Member's alterations and repairs will be done in a good and workmanlike manner and in compliance with all applicable laws, codes and permits.

d. Unscheduled Outages. The municipal utility is the primary electric distribution service to Member at the Member's Plant. When the municipal provider experiences an unscheduled service outage, JSC will provide additional electric energy to assist the Member. This additional supplement electrical energy will be prioritized based on the municipal provider's estimates length of the unscheduled outage. The Member and JSC will cooperate in determining the priority of additional supplemental power and the circuits that receive that power in preparation of anticipated unscheduled municipal outages.

e. Liens. Member shall not directly or indirectly cause, create, incur, assume or allow

to exist any mortgage, pledge, lien, charge, security interest, encumbrance or other claim of any nature on or with respect to the System or any interest therein. Member shall immediately notify JSC in writing of the existence of any such mortgage, pledge, lien, charge, security interest, encumbrance or other claim, shall promptly cause the same to be discharged and released of record without cost to JSC, and shall indemnify JSC against all costs and expenses (including reasonable attorneys' fees) incurred in discharging and releasing any such mortgage, pledge, lien, charge, security interest, encumbrance or other claim. Notwithstanding anything else herein to the contrary, JSC may grant a lien on the System and may assign, mortgage, pledge or otherwise collaterally assign its interests in this Agreement and the System to any Financing Party.

f. Security. Member shall be responsible for using commercially reasonable efforts to maintain the physical security of the smart meter and other equipment of JSC located at the Member's Plant against known risks and risks that should have been known by Member. Member will not conduct activities on, in or about the Member's Plant that have a reasonable likelihood of causing damage, impairment or otherwise adversely affecting the System.

g. Data Line. Member shall provide JSC a high speed internet data line during the Term to enable JSC to record the electric energy generated by the System. If Member fails to provide such high speed internet data line, or if such line ceases to function and is not repaired, JSC may reasonably estimate the amount of electric energy that was generated and invoice Member for such amount in accordance with Section 4.

h. Breakdown Notice. Member shall notify JSC within twenty-four (24) hours following the discovery by it of (i) any material malfunction in the operation of the System; or (ii) any occurrences that could reasonably be expected to adversely affect the System. Member shall notify JSC immediately upon (i) an interruption in the supply of electrical energy from the System; or (ii) the discovery of an emergency condition respecting the System. Member and JSC shall each designate personnel and establish procedures such that each Party may provide notice of such conditions requiring JSC's repair or alteration at all times, twenty-four (24) hours per day, including weekends and holidays.

8. JSC's Rights and Obligations.

a. Permits and Approvals. JSC, with Member's reasonable cooperation, shall use commercially reasonable efforts to obtain, at its sole cost and expense:
   i. any zoning, land use and building permits required to construct, install and operate the System up to the Delivery Point; and
   ii. any agreements and approvals necessary in order to connect the System to the Member's electrical system in parallel with the municipal provider's electric distribution system so that no electrical energy back flows into the municipal

provider's distribution system.

b. System Repair and Maintenance. JSC shall connect the System to the Member's Plant. JSC will operate and perform all routine and emergency repairs to, and maintenance of, the System at its sole cost and expense, except for any repairs or maintenance resulting from Member's negligence, willful misconduct or breach of this Agreement. JSC shall not be responsible for any work done by others on any part of the System unless JSC authorizes that work in advance in writing. JSC shall not be responsible for any loss, damage, cost or expense arising out of or resulting from improper environmental controls or improper operation or maintenance of the System by anyone other than JSC or JSC's contractors. JSC shall provide Member with reasonable notice prior to accessing the Member's Plant to make standard repairs.

c. Non-Standard System Repair and Maintenance. If JSC incurs incremental costs to maintain the System due to conditions at the Member's Plant or due to the inaccuracy of any information provided by Member and relied upon by JSC, the pricing, schedule and other terms of this Agreement will be equitably adjusted to compensate for any work in excess of normally expected work required to be performed by JSC. In such event, the Parties will negotiate such equitable adjustment in good faith.

d. Breakdown Notice. JSC shall notify Member within twenty-four (24) hours following JSC's discovery of (i) any material malfunction in the operation of the System or (ii) an interruption in the supply of electrical energy from the System. Member and JSC shall each designate personnel and establish procedures such that each Party may provide notice of such conditions requiring JSC's repair or alteration at all times, twenty-four (24) hours per day, including weekends and holidays. Member shall notify JSC immediately upon the discovery of an emergency condition affecting the System.

e. Suspension. Notwithstanding anything to the contrary herein, JSC shall be entitled to suspend delivery of electricity from the System to the Delivery Point for the purpose of maintaining and repairing the System and such suspension of service shall not constitute a breach of this Agreement; provided, that JSC shall use commercially reasonable efforts to minimize any interruption in service to the Member.

f. Use of Contractors and Subcontractors. JSC shall be permitted to use contractors and subcontractors to perform its obligations under this Agreement, provided however, that such contractors and subcontractors shall be duly licensed and shall provide any work in accordance with applicable industry standards. Notwithstanding the foregoing, JSC shall continue to be responsible for the quality of the work performed by its contractors and subcontractors.

g. Liens and Payment of Contractors and Suppliers. JSC shall pay when due all valid charges from all contractors, subcontractors and suppliers supplying goods or

services to JSC under this Agreement and shall keep the Member's Plant free and clear of any liens related to such charges, except for those liens which JSC is permitted by law to place on the Member's Plant following non-payment by Member of amounts due under this Agreement. JSC shall indemnify Member for all claims, losses, damages, liabilities and expenses resulting from any liens filed against the Member's Plant in connection with such charges; provided, however, that JSC shall have the right to contest any such lien, so long as it provides a statutory bond or other reasonable assurances of payment that either remove such lien from title to the Member's Plant or that assure that any adverse judgment with respect to such lien will be paid without affecting title to the Member's Plant.

h. No Warranty. NO WARRANTY OR REMEDY, WHETHER STATUTORY, WRITTEN, ORAL, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE SHALL APPLY. The remedies set forth in this Agreement shall be Member's sole and exclusive remedies for any claim or liability arising out of or in connection with this Agreement, whether arising in contract, tort (including negligence), strict liability or otherwise.

9. Conditions to Obligations.

a. Conditions to JSC's Obligations. JSC's obligations under this Agreement are conditioned on the completion of the following conditions to JSC's reasonable satisfaction on or before 360 days from signing this Agreement (the "Condition Satisfaction Date"):

i. Completion of a physical inspection of the Member's Plant and the property upon which the Member's Plant is located (the "Premises") including, due diligence to confirm the suitability of the Member's Plant and the Premises for the System;

ii. Approval of (A) this Agreement and (B) the Construction Agreement (if any) for the System by JSC's Financing Parties. "Construction Agreement" as used in this subsection means an agreement between JSC and any contractor or subcontractor to install the System or any of its component parts;

iii. Receipt of all necessary zoning, land use and building permits; and

iv. Execution of all other necessary agreements for interconnection of the System to the Member's Plant electrical system and/or the Utility's electric distribution system.

b. Failure of Conditions. If any of the conditions listed in subsection (a) are not satisfied by the Condition Satisfaction Date, the Parties will attempt in good faith to

negotiate new dates for the satisfaction of the failed conditions. If the Parties are unable to negotiate new dates then JSC may terminate this Agreement upon ten (10) days written notice to Buyer without liability for costs or damages or triggering a default under this Agreement.

c. Commencement of Construction. JSC's obligation to commence construction of the System is conditioned on JSC's receipt of (A) proof of insurance for all insurance required to be maintained by Member under this Agreement, (B) written confirmation from any person holding a mortgage, lien or other encumbrance over the Premises or the Member's Plant, as applicable, that such person will recognize JSC's rights under this Agreement for as long JSC is not in default hereunder and (C), a signed and notarized original copy of the easement agreement suitable for recording, substantially in the form attached hereto as Exhibit 6 (the "Easement Agreement").

d. Conditions to Member's Obligations. Member's obligations under Section 4(a) are conditioned on the occurrence of the Commercial Operation Date for the System by the Commercial Operation Date.

10. Meter Tampering. If JSC reasonably determines that its meter or other equipment has been tampered with or bypassed, JSC may disconnect service, estimate electric energy consumed as a result and Member agrees to pay for the estimated unmetered energy consumed and the cost of investigating, repairing, replacing or relocating any JSC equipment.

11. System and Member's Plant Damage and Insurance.

a. System and Member's Plant Damage. If the System is damaged or destroyed other than by Member's gross negligence or willful misconduct, JSC shall promptly repair and restore the System to its pre-existing condition; provided, however, that if more than fifty percent (50%) of the System is destroyed during the last five (5) years of the Initial Term or during any Additional Term, JSC shall not be required to restore the System, but may instead terminate this Agreement, unless Member agrees (A) to pay for the cost of such restoration of the System or (B) to purchase the System "AS-IS" at the Fair Market Value of the System.

b. Insurance Coverage. At all times during the Term, JSC and Member shall maintain the following insurance:

i. JSC's Insurance. JSC shall maintain (A) property insurance on the System for the replacement cost thereof, (B) commercial general liability insurance with coverage of at least $1,000,000 per occurrence and $2,000,000 annual aggregate, (C) employer's liability insurance with coverage of at least $1,000,000 and (iv) workers' compensation insurance as required by law.

ii. Member's Insurance. Member shall maintain commercial general liability insurance with coverage of at least $1,000,000 per occurrence and $2,000,000

annual aggregate.

c. Policy Provisions. All insurance policies provided hereunder shall (i) contain a provision whereby the insurer agrees to give the party not providing the insurance (A) not less than ten (10) days written notice before the insurance is cancelled, or terminated as a result of non-payment of premiums, or (B) not less than thirty (30) days written notice before the insurance is otherwise cancelled or terminated, and (ii) be written on an occurrence basis.

d. Certificates. Upon the other Party's request each Party shall deliver the other Party certificates of insurance evidencing the above required coverage. A Party's receipt, review or acceptance of such certificate shall in no way limit or relieve the other Party of the duties and responsibilities to maintain insurance as set forth in this Agreement.

e. Deductibles. Unless and to the extent that a claim is covered by an indemnity set forth in this Agreement, each Party shall be responsible for the payment of its own deductibles.

12. Representations, Warranties and Covenants.

a. General Representations and Warranties. Each Party represents and warrants to the other the following as of the Effective Date:

i. Such Party is duly organized, validly existing and in good standing under the laws of the jurisdiction of its formation; the execution, delivery and performance by such Party of this Agreement have been duly authorized by all necessary corporate, partnership or limited liability company action, as applicable, and do not and shall not violate any law; and this Agreement is valid obligation of such Party, enforceable against such Party in accordance with its terms (except as may be limited by applicable bankruptcy, insolvency, reorganization, moratorium and other similar laws now or hereafter in effect relating to creditors' rights generally).

ii. Such Party has obtained all licenses, authorizations, consents and approvals required by any Governmental Authority or other third party and necessary for such Party to own its assets, carry on its business and to execute and deliver this Agreement; and such Party is in compliance with all laws that relate to this Agreement in all material respects.

b. Member's Representations, Warranties and Covenants. Member represents and warrants to JSC the following as of the Effective Date and covenants that throughout the Term:

i. License. Member has title to or a leasehold or other property interest in the

Premises. Member has the full right, power and authority to grant the License contained in Section 8(a). Such grant of the License does not violate any law, ordinance, rule or other governmental restriction applicable to Member or the Member's Plant and is not inconsistent with and will not result in a breach or default under any agreement by which Member is bound or that affects the Member's Plant. If Member does not own the Premises or Member's Plant, Member has obtained all required consents from the owner of the Premises and/or Member's Plant to grant the License and enter into and perform its obligations under this Agreement.

ii. Other Agreements. Neither the execution and delivery of this Agreement by Member nor the performance by Member of any of its obligations under this Agreement conflicts with or will result in a breach or default under any agreement or obligation to which Member is a party or by which Member or the Member's Plant is bound.

iii. Accuracy of Information. All information provided by Member to JSC, as it pertains to the Member's Plant's physical configuration, Member's planned use of the Member's Plant, and Member's estimated electricity requirements, is accurate in all material respects.

13. Indemnification and Limitations of Liability.

a. General. Each Party (the "Indemnifying Party") shall defend, indemnify and hold harmless the other Party and the directors, officers, shareholders, partners, members, agents and employees of such other Party, and the respective affiliates of each thereof (collectively, the "Indemnified Parties"), from and against all loss, damage, expense, liability and other claims, including court costs and reasonable attorneys' fees (collectively, "Liabilities") resulting from any third party actions relating to the breach of any representation or warranty set forth in Section 14 and from injury to or death of persons, and damage to or loss of property to the extent caused by or arising out of the negligent acts or omissions of, or the willful misconduct of, the Indemnifying Party (or its contractors, agents or employees) in connection with this Agreement; provided, however, that nothing herein shall require the Indemnifying Party to indemnify the Indemnified Party for any Liabilities to the extent caused by or arising out of the negligent acts or omissions of, or the willful misconduct of, the Indemnified Party. This Section 13(a) however, shall not apply to liability arising from any form of hazardous substances or other environmental contamination, such matters being addressed exclusively by Section 13(c).

b. Notice and Participation in Third Party Claims. The Indemnified Party shall give the Indemnifying Party written notice with respect to any Liability asserted by a third party (a "Claim"), as soon as possible upon the receipt of information of any possible Claim or of the commencement of such Claim. The Indemnifying Party may assume the defense of any Claim, at its sole cost and expense, with counsel designated by the

Indemnifying Party and reasonably satisfactory to the Indemnified Party. The Indemnified Party may, however, select separate counsel if both Parties are defendants in the Claim and such defense or other form of participation is not reasonably available to the Indemnifying Party. The Indemnifying Party shall pay the reasonable attorneys' fees incurred by such separate counsel until such time as the need for separate counsel expires. The Indemnified Party may also, at the sole cost and expense of the Indemnifying Party, assume the defense of any Claim if the Indemnifying Party fails to assume the defense of the Claim within a reasonable time. Neither Party shall settle any Claim covered by this Section 17(b) unless it has obtained the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed. The Indemnifying Party shall have no liability under this Section 13(b) for any Claim for which such notice is not provided if that the failure to give notice prejudices the Indemnifying Party.

c. Environmental Indemnification. JSC shall indemnify, defend and hold harmless all of Member's Indemnified Parties from and against all Liabilities arising out of or relating to the existence at, on, above, below or near the Premises of any Hazardous Substance (as defined in Section 13(c)(i)) to the extent deposited, spilled or otherwise caused by JSC or any of its contractors or agents. Member shall indemnify, defend and hold harmless all of JSC's Indemnified Parties from and against all Liabilities arising out of or relating to the existence at, on, above, below or near the Premises of any Hazardous Substance, except to the extent deposited, spilled or otherwise caused by JSC or any of its contractors or agents. Each Party shall promptly notify the other Party if it becomes aware of any Hazardous Substance on or about the Premises or the Premises generally or any deposit, spill or release of any Hazardous Substance.

i. "Hazardous Substance" means any chemical, waste or other substance (A) which now or hereafter becomes defined as or included in the definition of "hazardous substances," "hazardous wastes," "hazardous materials," "extremely hazardous wastes," "restricted hazardous wastes," "toxic substances," "toxic pollutants," "pollution," "pollutants," "regulated substances," or words of similar import under any laws pertaining to the environment, health, safety or welfare, (B) which is declared to be hazardous, toxic, or polluting by any Governmental Authority, (C) exposure to which is now or hereafter prohibited, limited or regulated by any Governmental Authority, (D) the storage, use, handling, disposal or release of which is restricted or regulated by any Governmental Authority, or (E) for which remediation or cleanup is required by any Governmental Authority.

d. Limitations on Liability.

i. No Consequential Damages. Except with respect to indemnification for third party claims pursuant to this Section 13 and damages that result from the willful misconduct of a Party, neither Party nor its directors, officers,

shareholders, partners, members, agents and employees subcontractors or suppliers shall be liable for any indirect, special, incidental, exemplary, or consequential loss or damage of any nature arising out of their performance or non-performance hereunder even if advised of such. The Parties agree that (1) in the event that JSC is required to recapture any Tax Credits or other tax benefits as a result of a breach of this Agreement by Member, such recaptured amount shall be deemed to be direct and not indirect or consequential damages, and (ii) in the event that JSC is retaining the Environmental Attributes produced by the System, and a breach of this Agreement by Member causes JSC to lose the benefit of sales of such Environmental Attributes to third parties, the amount of such lost sales shall be direct and not indirect or consequential damages.

ii. Actual Damages. Except with respect to indemnification for third party claims pursuant to Section 26 and damages that result from the willful misconduct of JSC, JSC's aggregate liability under this Agreement arising out of or in connection with the performance or non-performance of this Agreement shall not exceed the total payments made (or, as applicable, projected to be made) by Member under this Agreement. The provisions of this Section (13)(d)(ii) shall apply whether such liability arises in contract, tort (including negligence), strict liability or otherwise. Any action against JSC must be brought within one (1) year after the cause of action accrues.

14. Confidentiality and Publicity.

a. Confidentiality. If either Party provides confidential information, including business plans, strategies, financial information, proprietary, patented, licensed, copyrighted or trademarked information, and/or technical information regarding the design, operation and maintenance of the System or of Member's business ("Confidential Information") to the other or, if in the course of performing under this Agreement or negotiating this Agreement a Party learns Confidential Information regarding the facilities or plans of the other, the receiving Party shall (a) protect the Confidential Information from disclosure to third parties with the same degree of care accorded its own confidential and proprietary information, and (b) refrain from using such Confidential Information, except in the negotiation and performance of this Agreement, including but not limited to obtaining financing for the System. Notwithstanding the above, a Party may provide such Confidential Information to its, officers, directors, members, managers, employees, agents, contractors and consultants (collectively, "Representatives"), and affiliates, lenders, and potential assignees of this Agreement (provided and on condition that such potential assignees be bound by a written agreement or legal obligation restricting use and disclosure of Confidential Information). Each such recipient of Confidential Information shall be informed by the Party disclosing Confidential Information of its confidential nature and shall be directed to treat such information confidentially and shall agree to abide by these provisions. In any event, each Party shall be liable (with respect to the other

Party) for any breach of this provision by any entity to whom that Party improperly discloses Confidential Information. The terms of this Agreement (but not its execution or existence) shall be considered Confidential Information for purposes of this Section 14(a), except as set forth in Section 14(b). All Confidential Information shall remain the property of the disclosing Party and shall be returned to the disclosing Party or destroyed after the receiving Party's need for it has expired or upon the request of the disclosing Party. Each Party agrees that the disclosing Party would be irreparably injured by a breach of this Section 14(a) by the receiving Party or its Representatives or other person to whom the receiving Party discloses Confidential Information of the disclosing Party and that the disclosing Party may be entitled to equitable relief, including injunctive relief and specific performance, in the event of a breach of the provision of this Section 14(a). To the fullest extent permitted by applicable law, such remedies shall not be deemed to be the exclusive remedies for a breach of this Section 14(a), but shall be in addition to all other remedies available at law or in equity.

b. Permitted Disclosures. Notwithstanding any other provision in this Agreement, neither Party shall be required to hold confidential any information that (i) becomes publicly available other than through the receiving Party, (ii) is required to be disclosed to a Governmental Authority under applicable law or pursuant to a validly issued subpoena (but a receiving Party subject to any such requirement shall promptly notify the disclosing Party of such requirement to the extent permitted by applicable law), (iii) is independently developed by the receiving Party or (iv) becomes available to the receiving Party without restriction from a third party under no obligation of confidentiality. If disclosure of information is required by a Governmental Authority, the disclosing Party shall, to the extent permitted by applicable law, notify the other Party of such required disclosure promptly upon becoming aware of such required disclosure and shall cooperate with the other Party in efforts to limit the disclosure to the maximum extent permitted by law.

15. Default, Remedies and Damages.

a. Default. Any Party that fails to perform its responsibilities as listed below or experiences any of the circumstances listed below shall be deemed to be the "Defaulting Party", the other Party shall be deemed to be the "Non-Defaulting Party", and each event of default shall be a "Default Event":

b. Member agrees to pay any damages, costs, and expenses, including attorney fees and legal expenses, caused by or associated with Member's failure to: (a) pay any amount charged or assessed by JSC for electric Service; (b) comply with the Governing Documents; or (c) provide JSC with truthful, accurate, and complete information.

i. failure of a Party to pay any amount due and payable under this Agreement, other than an amount that is subject to a good faith dispute, within ten (10) days following receipt of written notice from the Non-Defaulting Party of

such failure to pay ("Payment Default");

ii. failure of a Party to substantially perform any other material obligation under this Agreement within thirty (30) days following receipt of written notice from the Non-Defaulting Party demanding such cure; provided, that such thirty (30) day cure period shall be extended (but not beyond ninety (90) days) if and to the extent reasonably necessary to cure the Default Event, if (A) the Defaulting Party initiates such cure within the thirty (30) day period and continues such cure to completion and (B) there is no material adverse effect on the Non-Defaulting Party resulting from the failure to cure the Default Event;

iii. if any representation or warranty of a Party proves at any time to have been incorrect in any material respect when made and is material to the transactions contemplated hereby, if the effect of such incorrectness is not cured within thirty (30) days following receipt of written notice from the Non-Defaulting Party demanding such cure;

iv. Member loses its rights to occupy and enjoy the Premises;

v. a Party becomes insolvent or is a party to a bankruptcy, reorganization, insolvency, liquidation, receivership, dissolution, winding-up or relief of debtors, or any general assignment for the benefit of creditors or other similar arrangement or any event occurs or proceedings are taken in any jurisdiction with respect to the Party which has a similar effect, and, if any such bankruptcy or other proceedings were initiated by a third party, if such proceedings have not been dismissed within sixty (60) days following receipt of a written notice from the Non-Defaulting Party demanding such cure; or

vi. Member prevents JSC from installing the System or otherwise failing to perform in a way that prevents the delivery of electric energy from the System. Such Default Event shall not excuse Member's obligations to make payments that otherwise would have been due under this Agreement.

c. Remedies.

i. Remedies for Payment Default. If a Payment Default occurs, the Non-Defaulting Party may suspend performance of its obligations under this Agreement. Further, the Non-Defaulting Party may (A) at any time during the continuation of the Default Event, terminate this Agreement upon five (5) days prior written notice to the Defaulting Party, and (B) pursue any remedy under this Agreement, at law or in equity, including an action for damages.

ii. Remedies for Other Defaults. On the occurrence of a Default Event other than a Payment Default, the Non-Defaulting Party may (A) at any time during the

continuation of the Default Event, terminate this Agreement or suspend its performance of its obligations under this Agreement, upon five (5) days prior written notice to the Defaulting Party, and (B) pursue any remedy under this Agreement, at law or in equity, including an action for damages. Nothing herein shall limit either Party's right to collect damages upon the occurrence of a breach or a default by the other Party that does not become a Default Event. If Member terminates this contract without cause prior to commencement of System installation on the Member's premises, a $10,000.00 design cancellation fee and equipment restocking fee applies as decribed in Section 5(a) above in addition to any other remedy available to JSC.

iii. Damages Upon Termination by Default. Upon a termination of this Agreement by the Non-Defaulting Party as a result of a Default Event by the Defaulting Party, the Defaulting Party shall pay a Termination Payment to the Non-Defaulting Party determined as follows (the "Termination Payment"):

d. Obligations Following Termination. If a Non-Defaulting Party terminates this Agreement pursuant to this Section 13(b), then following such termination, JSC shall, at the sole cost and expense of the Defaulting Party, remove the equipment (except for mounting pads and support structures) constituting the System. The Non-Defaulting Party shall take all commercially reasonable efforts to mitigate its damages as the result of a Default Event.

16. Removal of System at Expiration. Upon the expiration or earlier termination of this Agreement (provided Member does not exercise its purchase option), JSC shall, at its expense, remove all of its tangible property comprising the System from the Member's Plant on a mutually convenient date, but in no event later than one hundred twenty (120) days after the expiration of the Term. Excluding ordinary wear and tear, the Member's Plant shall be returned to its original condition including the removal of System mounting pads or other support structures. In no case shall JSC's removal of the System affect the integrity of Member's roof, which shall be as leak proof as it was prior to removal of the System and shall be flashed and/or patched to existing roof specifications. JSC shall leave the Member's Plant in neat and clean order. If JSC fails to remove or commence substantial efforts to remove the System by such agreed upon date, Member shall have the right, at its option, to remove the System to a public warehouse and restore the Member's Plant to its original condition (other than ordinary wear and tear) at JSC's cost. Member shall provide sufficient space for the temporary storage and staging of tools, materials and equipment and for the parking of construction crew vehicles and temporary construction trailers and facilities reasonably necessary during System removal.

17. Miscellaneous

a. Member agrees to comply with all governmental rules and regulations and all electric

industry standards and requirements applicable to Service to Member, including, the National Electric Safety Code, applicable state or local statutes, codes or ordinances and all similar regulations or requirements necessary to for JSC to safely, efficiently, and reliably provide Service to Member and/or to other persons. Member specifically agrees that the ownership, operation, maintenance, repair, use, and removal of any electric generating equipment by Member that is connected to any transformer, line, or other JSC equipment or property, shall be subject to applicable safety rules.

b. Change in Law. "Change in Law" means (i) the enactment, adoption, promulgation, modification or repeal after the Effective Date of any applicable law or regulation; (ii) the imposition of any material conditions on the issuance or renewal of any applicable permit after the Effective Date of this Agreement (notwithstanding the general requirements contained in any applicable Permit at the time of application or issue to comply with future laws, ordinances, codes, rules, regulations or similar legislation), or (iii) a change in any utility rate schedule or tariff approved by any Governmental Authority which in the case of any of (i), (ii) or (iii), establishes requirements affecting owning, supplying, constructing, installing, operating or maintaining the System, or other performance of the JSC's obligations hereunder and which has a material adverse effect on the cost to JSC of performing such obligations; provided, that a change in federal, state, county or any other tax law after the Effective Date of this Agreement shall not be a Change in Law pursuant to this Agreement.

If any Change in Law occurs that has a material adverse effect on the cost to JSC of performing its obligations under this Agreement, then the Parties shall, within thirty (30) days following receipt by Member from JSC of notice of such Change in Law, meet and attempt in good faith to negotiate amendments to this Agreement as are reasonably necessary to preserve the economic value of this Agreement to both Parties. If the Parties are unable to agree upon such amendments within such thirty (30) day period, then JSC shall have the right to terminate this Agreement without further liability to either Party except with respect to payment of amounts accrued prior to termination.

c. Environmental Attributes. Member acknowledges that on todays market JSC can sell the Renewable Energy Credits on the open market. Unless otherwise agreed, Member is the owner of all Environmental Attributes and Environmental Incentives and is entitled to the benefit of the Renewable Energy Credits (excluding the Investment Tax Credit), and Member's purchase of electricity under this Agreement includes all Environmental Attributes. Member shall cooperate with JSC in obtaining, securing and transferring all Environmental Attributes and Environmental Incentives and the benefit of all Renewable Energy Credits, including by using the electric energy generated by the System in a manner necessary to qualify for such available Environmental Attributes, Environmental Incentives and Renewable Energy Credits. JSC shall not be obligated to incur any out-of-pocket costs or expenses in connection with such actions unless reimbursed by Member. If any Environmental Incentives are paid directly to JSC, JSC shall immediately pay such amounts over to Member. To

avoid any conflicts with fair trade rules regarding claims of solar or renewable energy use, Member, if engaged in commerce and/or trade, shall submit to JSC for approval any press releases regarding Member's use of solar or renewable energy. Approval shall not be unreasonably withheld, and JSC's review and approval shall be made in a timely manner to permit Member's timely publication.

"Environmental Attributes" means any and all credits, benefits, emissions reductions, offsets, and allowances, howsoever entitled, attributable to the System, the production of electrical energy from the System and its displacement of conventional energy generation, including (a) any avoided emissions of pollutants to the air, soil or water such as sulfur oxides (SOx), nitrogen oxides (NOx), carbon monoxide (CO) and other pollutants; (b) any avoided emissions of carbon dioxide (CO2), methane (CH4), nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride and other greenhouse gases (GHGs) that have been determined by the United Nations Intergovernmental Panel on Climate Change, or otherwise by law, to contribute to the actual or potential threat of altering the Earth's climate by trapping heat in the atmosphere; and (c) the reporting rights related to these avoided emissions, such as Green Tag Reporting Rights and Renewable Energy Credits. Green Tag Reporting Rights are the right of a party to report the ownership of accumulated Green Tags in compliance with federal or state law, if applicable, and to a federal or state agency or any other party, and include Green Tag Reporting Rights accruing under Section 1605(b) of The Energy Policy Act of 1992 and any present or future federal, state, or local law, regulation or bill, and international or foreign emissions trading program. Environmental Attributes do not include Environmental Incentives and Renewable Energy Credits. Member and JSC shall file all tax returns in a manner consistent with this Section 5. Without limiting the generality of the foregoing, Environmental Attributes include carbon trading credits, renewable energy credits or certificates, emissions reduction credits, emissions allowances, green tags tradable renewable credits and Green-e® products.

d. Force Majeure.

i. "Force Majeure" means any event or circumstances beyond the reasonable control of and without the fault or negligence of the Party claiming Force Majeure. It shall include, without limitation, failure or interruption of the production, delivery or acceptance of electricity due to: an act of god; war (declared or undeclared); sabotage; riot; insurrection; civil unrest or disturbance; military or guerilla action; terrorism; economic sanction or embargo; civil strike, work stoppage, slow-down, or lock-out; explosion; fire; earthquake; abnormal weather condition or actions of the elements; hurricane; flood; lightning; wind; drought; the binding order of any Governmental Authority (provided that such order has been resisted in good faith by all reasonable legal means); the failure to act on the part of any Governmental Authority (provided that such action has been timely requested and diligently pursued); unavailability of electricity from the utility grid, equipment, supplies or products (but not to the extent that any such availability of any of the

foregoing results from the failure of the Party claiming Force Majeure to have exercised reasonable diligence); and failure of equipment not utilized by or under the control of the Party claiming Force Majeure.

ii. Except as otherwise expressly provided to the contrary in this Agreement, if either Party is rendered wholly or partly unable to timely perform its obligations under this Agreement because of a Force Majeure event, that Party shall be excused from the performance affected by the Force Majeure event (but only to the extent so affected) and the time for performing such excused obligations shall be extended as reasonably necessary; provided, that: (i) the Party affected by such Force Majeure event, as soon as reasonably practicable after obtaining knowledge of the occurrence of the claimed Force Majeure event, gives the other Party prompt oral notice, followed by a written notice reasonably describing the event; (ii) the suspension of or extension of time for performance is of no greater scope and of no longer duration than is required by the Force Majeure event; and (iii) the Party affected by such Force Majeure event uses all reasonable efforts to mitigate or remedy its inability to perform as soon as reasonably possible. The Term shall be extended day for day for each day performance is suspended due to a Force Majeure event.

iii. Notwithstanding anything herein to the contrary, the obligation to make any payment due under this Agreement shall not be excused by a Force Majeure event that solely impacts Member's ability to make payment.

iv. If a Force Majeure event continues for a period of thirty (30) days or more within a twelve (12) month period and prevents a material part of the performance by a Party hereunder, then at any time during the continuation of the Force Majeure event, the Party not claiming the Force Majeure shall have the right to terminate this Agreement without fault or further liability to either Party (except for amounts accrued but unpaid).

e. This Agreement shall be governed by and interpreted under the laws of the State of Tennessee. In the event a suit is commenced to enforce this Agreement, venue may be laid, at the option of JSC in Madison County, Tennessee.

f. Waiver. The failure of either party to enforce, or the delay by either party in enforcing, any of its rights hereunder shall not constitute a continuing waiver or a modification of this Agreement and either party may, within the time provided by application of law, commence appropriate legal proceedings to enforce any or all of such rights.

g. Assignment and Financing.

i. Assignment. This Agreement may not be assigned in whole or in part by either Party without the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed. Notwithstanding the foregoing,

JSC may, without the prior written consent of Member, (i) assign, mortgage, pledge or otherwise collaterally assign its interests in this Agreement and the System to any Financing Party, (ii) directly or indirectly assign this Agreement and the System to an affiliate or subsidiary of JSC, (iii) assign this Agreement and the System to any entity through which JSC is obtaining financing or capital for the System and (iv) assign this Agreement and the System to any person succeeding to all or substantially all of the assets of JSC (provided that JSC shall be released from liability hereunder as a result of any of the foregoing permitted assignments only upon assumption of JSC's obligations hereunder by the assignee). In the event of any such assignment, the JSC shall be released from all its liabilities and other obligations under this Agreement. However, any assignment of JSC's right and/or obligations under this Agreement, shall not result in any change to Member's rights and obligations under this Agreement. Member's consent to any other assignment shall not be unreasonably withheld if Member has been provided with reasonable proof that the proposed assignee (x) has comparable experience in operating and maintaining photovoltaic solar systems comparable to the System and providing services comparable to those contemplated by this Agreement and (y) has the financial capability to maintain the System and provide the services contemplated by this Agreement in the manner required by this Agreement. This Agreement shall be binding on and inure to the benefit of the successors and permitted assignees.

ii. Financing. The Parties acknowledge that JSC may obtain construction and long-term financing or other credit support from one or more Financing Parties. "Financing Parties" means person or persons providing construction or permanent financing to JSC in connection with construction, ownership, operation and maintenance of the System, or if applicable, means, if applicable, any person to whom JSC has transferred the ownership interest in the System, subject to a leaseback of the System from such person. Both Parties agree in good faith to consider and to negotiate changes or additions to this Agreement that may be reasonably requested by the Financing Parties; provided, that such changes do not alter the fundamental economic terms of this Agreement.

iii. Successor Servicing. The Parties further acknowledge that in connection with any construction or long term financing or other credit support provided to JSC or its affiliates by Financing Parties, that such Financing Parties may require that JSC or its affiliates appoint a third party to act as backup or successor provider of operation and maintenance services with respect to the System and/or administrative services with respect to this Agreement (the "Successor Provider"). Member agrees to accept performance from any Successor Provider so appointed so long as such Successor Provider performs in accordance with the terms of this Agreement.

h. Arbitration and Attorneys' Fees. Any dispute arising from or relating to this Agreement shall be arbitrated in Jackson, Tennessee. The arbitration shall be administered by JAMS in accordance with its Comprehensive Arbitration Rules and Procedures, and judgment on any award may be entered in any court of competent jurisdiction. If the Parties agree, a mediator may be consulted prior to arbitration. The prevailing party in any dispute arising out of this Agreement shall be entitled to reasonable attorneys' fees and costs.

i. Notices. All notices under this Agreement shall be in writing and shall be by personal delivery, facsimile transmission, electronic mail, overnight courier, or regular, certified, or registered mail, return receipt requested, and deemed received upon personal delivery, acknowledgment of receipt of electronic transmission, the promised delivery date after deposit with overnight courier, or five (5) days after deposit in the mail. Notices shall be sent to the person identified in this Agreement at the addresses set forth in this Agreement or such other address as either party may specify in writing. Each party shall deem a document faxed, emailed or electronically sent in PDF form to it as an original document.

j. Survival. Provisions of this Agreement that should reasonably be considered to survive termination of this Agreement shall survive. For the avoidance of doubt, surviving provisions shall include, without limitation, Section 6 (Goodwill and Publicity), Section 7 (Member's Rights and Obligations), Section 8 (JSC's Rights and Obligations), Section 11 (System Damage and Insurance), Section 12 (Representations, Warranties and Covenants), Section 13 (Indemnification), Section 14 (Confidentiality and Publicity), and Section 15 (Default, Remedies and Damages).

k. Further Assurances. Each of the Parties hereto agree to provide such information, execute and deliver any instruments and documents and to take such other actions as may be necessary or reasonably requested by the other Party which are not inconsistent with the provisions of this Agreement and which do not involve the assumptions of obligations other than those provided for in this Agreement, to give full effect to this Agreement and to carry out the intent of this Agreement.

l. Non-Dedication of Facilities. Nothing herein shall be construed as the dedication by either Party of its facilities or equipment to the public or any part thereof. Neither Party shall knowingly take any action that would subject the other Party, or other Party's facilities or equipment, to the jurisdiction of any Governmental Authority as a public utility or similar entity.

m. Estoppel. Either Party hereto, without charge, at any time and from time to time, within five (5) business days after receipt of a written request by the other party hereto, shall deliver a written instrument, duly executed, certifying to such requesting party, or any other person specified by such requesting Party: (i) that this Agreement is unmodified and in full force and effect, or if there has been any modification, that the same is in full force and effect as so modified, and identifying any such

modification; (ii) whether or not to the knowledge of any such party there are then existing any offsets or defenses in favor of such party against enforcement of any of the terms, covenants and conditions of this Agreement and, if so, specifying the same and also whether or not to the knowledge of such party the other party has observed and performed all of the terms, covenants and conditions on its part to be observed and performed, and if not, specifying the same; and (iii) such other information as may be reasonably requested by the requesting Party. Any written instrument given hereunder may be relied upon by the recipient of such instrument, except to the extent the recipient has actual knowledge of facts contained in the certificate.

n. Service Contract. The Parties intend this Agreement to be a "service contract" within the meaning of Section 7701(e)(3) of the Internal Revenue Code of 1986. Member will not take the position on any tax return or in any other filings suggesting that it is anything other than a purchase of electricity from the System.

o. Full Agreement, Modification, Invalidity, Counterparts, Captions. This Agreement, together with any Exhibits, completely and exclusively states the agreement of the Parties regarding its subject matter and supersedes all prior proposals, agreements, or other communications between the Parties, oral or written, regarding its subject matter. This Agreement may be modified only by a writing signed by both Parties. If any provision of this Agreement is found unenforceable or invalid, such unenforceability or invalidity shall not render this Agreement unenforceable or invalid as a whole. In such event, such provision shall be changed and interpreted so as to best accomplish the objectives of such unenforceable or invalid provision within the limits of applicable law. This Agreement may be executed in any number of separate counterparts and each counterpart shall be considered an original and together shall comprise the same Agreement. The captions or headings in this Agreement are strictly for convenience and shall not be considered in interpreting this Agreement.

p. Forward Contract. The transaction contemplated under this Agreement constitutes a "forward contract" within the meaning of the United States Bankruptcy Code, and the Parties further acknowledge and agree that each Party is a "forward contract merchant" within the meaning of the United States Bankruptcy Code.

q. Bonding.

i. Performance bond liability. Any performance bond issued for a site or system will cease one (1) year from the completion of construction. If a warranty or guarantee is provided under the terms of this Agreement, the balance of any warranty or guarantee beyond one year term of the applicable performance bond shall continue to be guaranteed solely by JSC under the terms of this Agreement. The performance bond does not guarantee any property restorative requirements.

ii. Payment bond liability. Any payment bond issued will cease at the termination

of any time required by law.

iii. Performance Guarantee. Neither payment bonds, whether for labor or materials, nor performance bonds are applicable to any specified performance guarantee.

IN WITNESS WHEREOF, the parties hereto have affixed their hands and seal the date first shown above.

JACKSON SUSTAINABILITY COOPERATIVE: MEMBER:

By:_____
Denny Emberling, President

By:_____

Its: _____

Date:_____

Date:_____

EXHIBIT 5

Power Contract

See Supp 21, 10/1/89

TV-47356A

See TV-47356A Supp. No. 28 6/21/91

See TV-47356A, S. 29, 3-1-92

See Supp 41, 3/1/96. See Supp. No. 48, 10/2/96

POWER CONTRACT
Between
TENNESSEE VALLEY AUTHORITY
And
CITY OF JACKSON, TENNESSEE

THIS CONTRACT, made and entered into as of the 12th day of August, 1977, by and between TENNESSEE VALLEY AUTHORITY (hereinafter called "TVA"), a corporation created and existing under and by virtue of the Tennessee Valley Authority Act of 1933, as amended (hereinafter called "TVA Act"), and CITY OF JACKSON (hereinafter called "Municipality"), a municipal corporation duly created, organized, and existing under and by virtue of the laws of the State of Tennessee;

W I T N E S S E T H:

WHEREAS, the TVA Act authorizes TVA to sell the power generated by it and not used in its operations to States, counties, municipalities, corporations, partnerships, or individuals according to the policies therein set forth; and

WHEREAS, the TVA Act provides that the sale of such power shall be primarily for the benefit of the people of the section as a whole and particularly the domestic and rural consumers, to whom it is desired to make power available at the lowest possible rates; and

WHEREAS, Municipality owns an electric system which is managed and operated by a board of utility commissioners (hereinafter called "Board") and in the operation thereof is presently purchasing and desires to continue to purchase its entire power requirements from TVA; and

WHEREAS, the parties wish to enter into a new contract to replace their present power contract;

NOW, THEREFORE, in consideration of the mutual promises herein contained and subject to the provisions of the TVA Act, the parties agree as follows:

1. Purpose of Contract. It is hereby recognized and declared that, pursuant to the obligations imposed by the TVA Act, Municipality's operation of a municipal electric system and TVA's wholesale service thereto are primarily for the benefit of the consumers of electricity. Toward that end, Municipality agrees that the electric system shall be operated on a nonprofit basis, and that electric system funds and accounts shall not be mingled with other funds or accounts of Municipality. Municipality may, as hereinafter provided, receive from the operation thereof for the benefit of its general funds only an amount in lieu of taxes representing a fair share of the cost of government properly to be borne by such system. In accordance with these principles, which are mutually recognized as of the essence of this contract, Municipality agrees that the electric system shall be operated and the system's financial accounts and affairs shall be maintained in full and strict accordance with the provisions of this contract.

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2. Power Supply.

(a) Subject to the other provisions of this contract, TVA shall produce and deliver to Municipality at the delivery point or points specified in or hereafter established under section 3 hereof and Municipality shall take and distribute the electric power required for service to Municipality's customers. Municipality shall keep TVA currently informed of any important developments affecting its probable future loads or service arrangements. TVA shall take account of all available information in making its forecasts of the loads of Municipality and of TVA's other customers. TVA shall make every reasonable effort to increase the generating capacity of its system and to provide the transmission facilities required to deliver the output thereof so as to be in a position to supply additional power therefrom when and to the extent needed to meet increases in their loads.

(b) Municipality shall be entitled to use the power made available hereunder to serve all consumers to whom the resale rate schedules specified in section 5(b) hereof are applicable except those TVA is entitled to serve directly, as provided below. TVA shall be entitled to serve directly any consumer to whom said resale rate schedules are not applicable, any federal installations excepting those with loads less than 5,000 kilowatts served from a general delivery point, and any consumer whose energy requirements in any month are more than 10 million kilowatthours plus the amount of energy, if any, delivered by Municipality to residential consumers under billings for the preceding June and received from TVA at the delivery point through which Municipality would receive the energy for such consumer if it were served by Municipality. The supply of power by TVA to Municipality for resale to any consumer which has a supply of 5,000 kilowatts or more of power other than that furnished by Municipality under said resale rate schedules, and the contract for such resale between Municipality and such consumer, shall be subject to such special arrangements as TVA may reasonably require. Nothing herein shall be construed as preventing Municipality and TVA from agreeing upon special arrangements for service to any consumer.

(c) It is recognized that from time to time there may be a consumer served by one party hereto which, because of changed conditions, may become a consumer which the other party is entitled to serve under the provisions of subsection (b) of this section. In any such case the parties hereto, unless otherwise agreed, shall make such arrangements (including making appropriate allowance for any otherwise unrecoverable investment made to serve such consumer) as may be necessary to transfer as soon as practicable such consumer to the party entitled to serve the consumer hereunder and the party originally serving said consumer shall cooperate in every way with the party entitled to serve the consumer in making arrangements for the latter to undertake such service including, without limitation, releasing the consumer from any then existing power contract from and after the effective date for initiating service under any contract between such consumer and the party entitled to serve it.

(d) Municipality shall keep TVA informed of any prospective developments affecting any individual load which uses or will use 5,000 kilowatts or more. As soon as practicable after receipt of information from Municipality regarding the prospective addition of, or increase in, any load of 5,000 kilowatts or larger which Municipality would be entitled to serve hereunder, TVA

shall notify Municipality of the time schedule upon which the additional power required for such service could be made available to Municipality at the wholesale rates then in effect hereunder and, upon request, of any terms under which it could supply any power in advance of said schedule. Municipality shall not take and deliver such additional power for said load in advance of or in amounts larger than specified in said schedule except to the extent that it has made special arrangements with TVA to do so. TVA, by notice in writing to Municipality, may change the designated amount of 5,000 kilowatts appearing in this subsection (d) to such other amount as TVA deems necessary.

(e) The area limitations in the first three paragraphs of subsection (a) of section 15d of the TVA Act are incorporated herein by reference as fully as though set out herein, and this contract shall not be construed as permitting any arrangement by Municipality which would be inconsistent with those limitations.

(f) Notwithstanding any other provision of this section, TVA may, as a condition precedent to TVA's obligation to make power available, require Municipality to provide such assurances of revenue to TVA as in TVA's judgment may be necessary to justify the reservation, alteration, or installation by TVA of additional generation, transmission, or transformation facilities for the purpose of supplying power to Municipality.

3. Delivery and Receipt of Power. The power to be supplied hereunder shall be delivered at the delivery points designated below and, under normal operating conditions, shall be within commercial limits of 60 hertz and within 3 percent above or below the normal wholesale delivery voltage specified below for each delivery point; provided, however, that any normal wholesale delivery voltage of 46 kV or higher specified below may be changed by TVA from time to time upon notice to Municipality to a voltage level not more than 5 percent higher or lower than the voltage so specified. Substation transformers with a high-side voltage rating of 46 kV or above will be equipped with taps or other suitable means for adjusting for the changes in normal voltage set forth herein. The operating representatives of the parties may by mutual agreement provide for variations in wholesale delivery voltage other than those provided for herein when in their judgment such variations are necessary or desirable.
161-KV SIDE of the CARRIAGE HOUSE 161-KV SUBSTATION 161,000 (SUPP. 47, 6/21/96)

Delivery Point	Normal Wholesale Delivery Voltage
161-KV bus connection at TVA's Madison West 161-KV Switching Station 161,000, dated (5/6/98, Supp. 55	
46-kV side of TVA's South Jackson 161-kV Substation	46,000

*

It is recognized that load growth and development and the maintenance of high quality service in Municipality's area may require new delivery points from time to time. Such new delivery points will be established by mutual agreement. In reaching such agreement Municipality and TVA shall be guided by the policy of providing the most economical of the practical combinations of transmission and distribution facilities, considering all pertinent factors, including any unusual factors applicable to the area involved.

*Point of connection of Municipality's Oakfield [illegible] Substation to TVA [illegible] facilities

(See S#18, dated 4-8-88)
DJH

Neither party shall be responsible for installing at any delivery point equipment for the protection of the other's facilities, or for damages to the other's system resulting from the failure of its own protective devices, but each party agrees so to design, construct, and operate its system as not to cause undue hazards to the other's system.

4. Wholesale Rate. Attached hereto and made a part hereof is a "Schedule of Rates and Charges" wherein Municipality is referred to as "Distributor." Subject to the other provisions of this contract, Municipality shall pay for the power and energy supplied by TVA in accordance with the provisions of Wholesale Power Rate--Schedule WS.

The payments to be made hereunder shall be made solely and exclusively from the revenues of the electric system and shall not be a charge upon Municipality's general funds.

5. Resale Rates. In distributing electric energy in the area served by Municipality, the parties agree as follows:

(a) Municipality agrees that the power purchased hereunder shall be sold and distributed to the ultimate consumer without discrimination among consumers of the same class, and that no discriminatory rate, rebate, or other special concession will be made or given to any consumer, directly or indirectly.

(b) Municipality agrees to serve consumers, including all municipal and governmental customers and departments, at and in accordance with the rates, charges, and provisions set forth for the several classes thereof in Schedules RS-10, GS-10, and LS of said Schedule of Rates and Charges, and not to depart therefrom except as the parties hereto may agree upon surcharges, special minimum bills, or additional resale schedules for special classes of consumers or special uses of electric energy, and except as provided in subsection (c) next following.

For the purpose of uniform application, within the classes of consumers, of the provisions of the paragraph entitled "Payment" of said resale schedules, Municipality shall designate in its standard policy a period of not less than 10 days nor more than 20 days after date of the bill during which period the bill is payable as computed by application of the charges for service under the appropriate resale schedule, and shall further designate in said policy the percentage or percentages, if any, not to exceed 10 percent of the bill, computed as above provided, which will be added to the bill as additional charges for payment after the period so designated.

(c) If the rates and charges provided for in said resale schedules do not produce revenues sufficient to provide for the operation and maintenance of the electric system on a self-supporting and financially sound basis, including requirements for interest and principal payments on indebtedness incurred or assumed by Municipality for the acquisition, extension, or improvement of the electric system (hereinafter called "System Indebtedness"), Board and TVA shall agree upon, and Municipality shall put into effect promptly, such

changes in rates and charges as will provide the increased revenues necessary to place the system upon a self-supporting and financially sound basis. If the rates and charges in effect at any time provide revenues that are more than sufficient for such purposes, as more particularly described in section 6 hereof, Board and TVA shall agree upon a reduction in said rates and charges, and Municipality shall promptly put such reduced rates and charges into effect.

6. Use of Revenues.

(a) Municipality agrees to use the gross revenues from electric operations for the following purposes:

(1) Current electric system operating expenses, including salaries, wages, cost of materials and supplies, power at wholesale, and insurance;

(2) Current payments of interest on System Indebtedness, and the payment of principal amounts, including sinking fund payments, when due;

(3) From any remaining revenues, reasonable reserves for renewals, replacements, and contingencies; and cash working capital adequate to cover operating expenses for a reasonable number of weeks; and

(4) From any revenues then remaining, tax equivalent payments into Municipality's general funds, as more particularly provided in section 2 of the Schedule of Terms and Conditions hereinafter referred to.

(b) All revenues remaining over and above the requirements described in subsection (a) of this section shall be considered surplus revenues and may be used for new electric system construction or the retirement of System Indebtedness prior to maturity; provided, however, that resale rates and charges shall be reduced from time to time to the lowest practicable levels considering such factors as future circumstances affecting the probable level of earnings, the need or desirability of financing a reasonable share of new construction from such surplus revenues, and fluctuations in debt service requirements.

7. Equal Opportunity. It is the policy of the federal government to provide equal employment opportunity, and in furtherance of that policy, it is the policy of TVA, as an agency of the federal government, to encourage equal employment opportunity in the various aspects of its programs, including the sale and distribution of TVA power. Accordingly, during the term of this power contract:

(a) Municipality will not discriminate against any employee or applicant for employment with its electric system because of race, color, religion, sex, or national origin. Municipality will take such affirmative action as is necessary to insure that all applicants are considered for employment and that all employees are treated in all aspects of employment without regard to their race, color, religion, sex, or national origin.

(b) Municipality will, in all solicitations or advertisements for employees placed by or on behalf of the electric system, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(c) Municipality will cooperate and participate with TVA in the development of training and apprenticeship programs which will provide opportunities for applicants and prospective applicants for employment with the electric system to become qualified for such employment, and such cooperation will include access by authorized TVA representatives to its electric system's books, records, and accounts pertaining to training, apprenticeship, recruitment, and employment practices and procedures.

8. Terms and Conditions. Certain additional provisions of this contract are set forth in a "Schedule of Terms and Conditions," which is attached hereto and made a part hereof.

9. Rules and Regulations. Municipality hereby adopts the "Schedule of Rules and Regulations" attached hereto, in which Municipality is referred to as "Distributor." Such Rules and Regulations may be amended, supplemented, or repealed by Municipality at any time upon 30 days' written notice to TVA setting forth the nature of and reason for the proposed change. No change shall be made in said schedule, however, which is in violation of or inconsistent with any of the provisions of this contract.

10. Use of Lines for Transmission Purposes. TVA is hereby granted the privilege of using any electric lines of Municipality, to the extent of their capacity in excess of the requirements of Municipality, for the purpose of transmitting electric energy between adjoining portions of TVA's facilities or to other customers of TVA. TVA shall be obligated to pay Municipality the additional cost, including any additional fixed charges and operating and maintenance costs, imposed on Municipality by permitting use of its facilities to serve other customers of TVA, and to indemnify and save harmless Municipality from any damage or injury caused by TVA's exercise of such use.

11. Waiver of Defaults. Any waiver at any time by either party hereto of its rights with respect to any default of the other party or with respect to any other matter arising in connection with this contract shall not be considered a waiver with respect to any subsequent default or matter.

12. Transfer of Contract. Neither this contract nor any interest herein shall be transferable or assignable by Municipality without the consent of TVA.

13. Restriction of Benefits. No member of or delegate to Congress or resident commissioner or any agent or employee of TVA shall be admitted to any share or part of this contract or to any benefit to arise therefrom. However, nothing contained in this section shall be construed to extend to any citizen of Municipality under arrangements for the general benefit of Municipality.

14. Termination of Existing Contracts. It is hereby agreed that the power contract dated April 1, 1957, and numbered TV-19330A, as supplemented and amended, between the parties is terminated as of the effective date of this contract; provided, however, that nothing herein contained shall be construed as

effecting the termination of (1) Lease-Purchase Agreement TV-19330A, Supplement No. 12, dated November 30, 1976, between the parties hereto relative to the lease and eventual purchase by Municipality of sections of TVA's South Jackson-Humboldt and South Jackson-Morris 46-kV Transmission Lines and (2) section 3 of Agreement TV-19330A, Supplement No. 10, dated December 28, 1976, between the parties hereto relative to application of a monthly facilities rental credit to billings under Wholesale Power Rate--Schedule WS, it being the intention of the parties that each of said agreements, or portions thereof, shall remain in full force and effect for the term of this contract unless sooner terminated in accordance with the provisions of each agreement. All references in said agreements or portions thereof, to the power contract dated April 1, 1957, shall be deemed to refer to this contract.

15. Term of Contract. This contract shall become effective as of September 1, 1977, and shall continue in effect for 20 years from said date, subject to termination by either party, effective not earlier than 10 years from said date, on not less than four years' prior written notice. If Municipality should give notice of termination hereunder, TVA shall be under no obligation from the date of receipt of such notice to make or complete any additions to or changes in any transformation or transmission facilities for service to Municipality unless Municipality agrees to reimburse TVA for its nonrecoverable costs in connection with the making or completion of such additions or changes.

IN WITNESS WHEREOF, the parties hereto have caused this contract to be executed by their duly authorized officers, as of the day and year first above written.

Approved by TVA
Board of Directors
AUG 25 1977
s/ M.E.
Assistant Secretary

Attest: (SEAL)

TENNESSEE VALLEY AUTHORITY

s/ Madge Evans
Assistant Secretary

By s/ Lynn Seeber
General Manager

s/ JMc
Law

Attest:

CITY OF JACKSON, TENNESSEE
By Board of Utility Commissioners

s/ Joe H. Exum
(Title) General Manager

By s/ James W. Hoppers
Chairman

Attest:

Approved:
CITY OF JACKSON, TENNESSEE

s/ James A. Wolfe, Jr.
(Title) City Recorder

By s/ Robert D. Conger
Mayor

Outdoor Lighting

OUTDOOR LIGHTING RATE--SCHEDULE LS
(October 1976)

Availability

Available for service to street and park lighting systems, traffic signal systems, athletic field lighting installations (during prescribed use-period), and outdoor lighting for individual customers.

Service under this schedule is for a term of not less than one year.

PART A—CHARGES FOR STREET AND PARK LIGHTING SYSTEMS, TRAFFIC SIGNAL SYSTEMS, AND ATHLETIC FIELD LIGHTING INSTALLATIONS

I. Energy Charge: 1.984 cents per kilowatthour as increased or decreased in accordance with Appendix I to the Schedule of Rates and Charges

Adjustment

The customer's bill for each month shall be increased or decreased in accordance with the current Adjustment Addendum published by TVA.

II. Investment Charge

The annual investment charge shall be 10 percent of the installed cost to Distributor's electric system of the facilities devoted to street and park lighting service specified in this Part A. Such installed cost shall be recomputed on July 1 of each year, or more often if substantial changes in the facilities are made. Each month, one-twelfth of the then total annual investment charge shall be billed to the customer. If any part of the facilities has not been provided at the electric system's expense or if the installed cost of any portion thereof is reflected on the books of another municipality or agency or department, the annual investment charge shall be adjusted to reflect properly the remaining cost to be borne by the electric system.

Traffic signal systems and athletic field lighting installations shall be provided, owned, and maintained by and at the expense of the customer, except as Distributor may agree otherwise in accordance with the provisions of the paragraph next following in this Section II. The facilities necessary to provide service to such systems and installations shall be provided by and at the expense of Distributor's electric system, and the annual investment charge provided for first above in this Section II shall apply to the installed cost of such facilities.

When so authorized by policy duly adopted by Distributor's governing board, traffic signal systems and athletic field lighting installations may be provided, owned, and maintained by Distributor's electric system for the customer's benefit. In such cases Distributor may require reimbursement from the customer for a portion of the initial installed cost of any such system or installation and shall require payment by the customer of an investment charge sufficient to cover all of Distributor's costs (except reimbursed costs), including appropriate overheads, of providing, owning, and maintaining such system or installation; provided that, for athletic field lighting installations, such investment charge shall in no case be less than 12 percent per year of such costs. Said investment charge shall be in addition to the annual investment charge on the facilities necessary to provide service to such system or installation as provided for in the preceding paragraph. Replacement of lamps and related glassware for traffic signal systems and athletic field lighting installations provided under this paragraph shall be paid for under the provisions of paragraph A in Section III.

III. Replacement of Lamps and Related Glassware - Street and park lighting.

Customer shall be billed and shall pay for replacements as provided in paragraph A below, which shall be applied to all service for street and park lighting.

A. Distributor shall bill the customer monthly for such replacements during each month at Distributor's cost of materials, including appropriate storeroom expense.

B. Distributor shall bill the customer monthly for one-twelfth of the amount by which Distributor's cost of materials, including appropriate storeroom expense, exceeds the product of 3 mills multiplied by the number of kilowatthours used for street and park lighting during the fiscal year immediately preceding the fiscal year in which such month occurs.

Metering

For any billing month or part of such month in which the energy is not metered or for which a meter reading is found to be in error or a meter is found to have failed, the energy for billing purposes for that billing month or part of such month shall be computed from the rated capacity of the lamps (including ballast) plus 5 percent of such capacity to reflect secondary circuit losses, multiplied by the number of hours of use.

Use-Period For Athletic Field Lighting

Service to athletic field lighting installations under this rate schedule shall not commence earlier than 7 p.m., except that the customer may be permitted to use up to 10 percent (not to exceed 10 kilowatts) of the total installed lighting capacity prior to commencement of such period. In the event the customer fails to restrict service in accordance with these requirements, it shall be billed under the General Power Rate.

Revenue and Cost Review

Distributor's costs of providing service under Part A of this rate schedule are subject to review at any time and from time to time to determine if Distributor's revenues from the charges being applied are sufficient to cover said costs. If any such review discloses that revenues are either less or more than sufficient to cover said costs, Distributor shall revise the above investment charges so that revenues will be sufficient to cover said costs. Any such revision of the annual investment charge provided for first above in Section II of Part A of this rate schedule shall be by agreement between Distributor and TVA.

PART B--CHARGES FOR OUTDOOR LIGHTING FOR INDIVIDUAL CUSTOMERS

Charge Per Fixture

Type of Fixture	Lamp Size (Watts)	Base Monthly Charge
Mercury Vapor or Incandescent*	175	$ 3.00
	250	3.50
	400	4.75
	700	7.75
	1,000	10.00
High Pressure Sodium	100	3.50
	150	3.75
	250	5.00
	400	6.50
	1,000	14.00

*Incandescent fixtures not offered for new service.

The above charges in this Part B are limited to service from a photoelectrically controlled standard street lighting fixture installed on a pole already in place. If the customer wishes to have the fixture installed at a location other than on a pole already in place, Distributor may apply a monthly charge not to exceed $2.00 per pole for additional poles required to serve the fixture from Distributor's nearest available source. Distributor may uniformly adjust the above base monthly charges up or down by an amount not to exceed $1.00.

When so authorized by policy duly adopted by Distributor's governing board, special outdoor lighting installations may be provided, owned, and maintained by Distributor's electric system. In such cases Distributor may require reimbursement from the customer for a portion of the initial installed cost of any such installation and shall require payment by the customer of monthly charges sufficient to cover all of Distributor's costs (except reimbursed costs), including appropriate overheads, of providing, owning, and maintaining such installations.

Lamp Replacements

Replacements of lamps and related glassware will be made in accordance with replacement policies of Distributor without additional charge to the customer.

Payment

Bills under this rate schedule will be rendered monthly. Any amount of bill unpaid after due date specified on bill may be subject to additional charges under Distributor's standard policy.

Service is subject to Rules and Regulations of Distributor.

GENERAL POWER RATE--SCHEDULE GS-10
(October 1976)

Availability

This rate shall apply to the firm power requirements for electric service to commercial, industrial, and governmental customers; institutional customers including, without limitation, churches, clubs, fraternities, orphanages, nursing homes, rooming or boarding houses, and like customers; and other customers except those to whom service is available under other resale rate schedules.

Character of Service

Alternating current, single or three-phase, 60 hertz. Under A below power shall be delivered at a voltage available in the vicinity or agreed to by Distributor. Under B below power shall be delivered at a transmission voltage of 161 kV or, if such transmission voltage is not available, at the highest voltage available in the vicinity, unless at the customer's request a lower standard voltage is agreed upon.

Base Charges

A. If the customer's demand for the month and its contract demand, if any, are each 5,000 kilowatts or less:

Customer Charge: $3.10 per delivery point per month

Demand Charge:

First 50 kilowatts of demand per month, no demand charge
Next 50 kilowatts of demand per month, at $1.90 per kilowatt
Excess over 100 kilowatts of demand per month, at $2.20 per kilowatt

Energy Charge:

First 500 kilowatthours	per	month	at	2.523	cents	per	kWh*
Next 14,500	"	"	"	2.103	"	"	kWh*
Next 25,000	"	"	"	1.237	"	"	kWh*
Next 60,000	"	"	"	1.147	"	"	kWh*
Next 400,000	"	"	"	1.047	"	"	kWh*
Additional	"	"	"	1.007	"	"	kWh*

*as increased or decreased in accordance with Appendix I to the Schedule of Rates and Charges

B. If either the customer's demand for the month or its contract demand is greater than 5,000 kilowatts:

Customer Charge: $1,000 per delivery point per month

Demand Charge: $1.91 per kilowatt of demand per month

Additional charge for any demand in excess of customer's contract demand: $1.91 per kilowatt per month

Energy Charge: 0.993 cent per kilowatthour per month as increased or decreased in accordance with Appendix I to the Schedule of Rates and Charges

Facilities Rental Charge Applicable Under B Above

There shall be no facilities rental charge under this rate schedule for delivery at bulk transmission voltage levels of 161 kV or higher. For delivery at less than 161 kV, there shall be added to the customer's bill a facilities rental charge. This charge shall be 20 cents per kW per month except for delivery at voltages below 46 kV, in which case the charge shall be 55 cents per kW per month for the first 10,000 kW and 30 cents per kW per month for the excess over 10,000 kW. Such charge shall be applied to the customer's currently effective contract demand and shall be in addition to all other charges under this rate schedule including minimum bill charges.

Adjustment

The customer's bill for each month shall be increased or decreased in accordance with the current Adjustment Addendum published by TVA.

Determination of Demand

Distributor shall measure the demands in kilowatts of all customers having loads in excess of 50 kilowatts. The demand for any month shall be the higher of the highest average during any 30-consecutive-minute period of the month of (a) the load measured in kilowatts or (b) 85 percent of the load in kVA plus an additional 10 percent for that part of the load over 5,000 kVA, and such amount shall be used as the billing demand except that, under B above, the billing demand for any month shall in no case be less than the sum of (1) 40 percent of the first 5,000 kilowatts, (2) 70 percent of the next 45,000 kilowatts, and (3) 90 percent of all kilowatts in excess of 50,000 kilowatts of the higher of the currently effective contract demand or the highest billing demand established during the preceding 12 months.

Minimum Bill

The monthly bill under A above shall [illegible]

RESIDENTIAL RATE—SCHEDULE RS-10
(October 1976)

Availability

This rate shall apply only to electric service to a single family dwelling and its appurtenances, where the major use of electricity is for domestic purposes such as lighting, household appliances, and the personal comfort and convenience of those residing therein. Any such dwelling in which space is occasionally used for the conduct of business by a person residing therein may be served under this rate. Where a portion of a dwelling is used regularly for the conduct of business, the electricity consumed in that portion so used shall be separately metered and billed under the General Power Rate; if separate circuits are not provided by the customer, service to the entire premises shall be billed under the General Power Rate.

Character of Service

Alternating current, single-phase, 60 hertz. Voltage supplied shall be at the discretion of Distributor and shall be determined by the voltage available from distribution lines in the vicinity and/or other conditions. Multi-phase service shall be supplied in accordance with Distributor's standard policy.

Base Charges

Customer Charge: $2.10 per delivery point per month

Energy Charge:
First 500 kilowatthours per month at 1.847 cents per kilowatthour*
Additional " " " " 1.717 " " kilowatthour*

*as increased or decreased in accordance with Appendix I to the Schedule of Rates and Charges

Adjustment

The customer's bill for each month shall be increased or decreased in accordance with the current Adjustment Addendum published by TVA.

Minimum Monthly Bill

The customer charge constitutes the minimum monthly bill for all customers served under this rate schedule except those customers for which a higher minimum monthly bill is required under Distributor's standard policy because of special circumstances affecting Distributor's cost of rendering service.

Payment

Bills under this rate schedule will be rendered monthly. Any amount of bill unpaid after due date specified on bill may be subject to additional charges under Distributor's standard policy.

Single-Point Delivery

The charges under this rate schedule are based upon the supply of service through a single delivery and metering point, and at a single voltage. If service is supplied to the same customer through more than one point of delivery or at different voltages, the supply of service at each delivery and metering point and at each different voltage shall be separately metered and billed under this rate schedule.

Service is subject to Rules and Regulations of Distributor.

TENNESSEE VALLEY AUTHORITY
SCHEDULE OF RATES AND CHARGES

WHOLESALE POWER RATE--SCHEDULE WS
(October 1976)

Availability

Firm power available under long-term contracts with, and for distribution and resale by, States, counties, municipalities, and cooperative organizations of citizens or farmers, all referred to herein as "Distributor."

Base Charges

Delivery Point Charge:	$1,500 per delivery point per month
Demand Charge:	$1.81 per kilowatt of demand per month
Energy Charge:	0.950 cent per kilowatthour per month as increased or decreased in accordance with Appendix I to the Schedule of Rates and Charges

Adjustments

1. Distributor's bill for each month shall be increased or decreased in accordance with the current Adjustment Addendum published by TVA.

2. Distributor's bill for each month shall be adjusted by adding to the bill 10 cents per kW and 0.02 cent per kWh for power and energy resold by Distributor in the preceding month to any consumer which has a billing demand of more than 10,000 kW or which uses more than 5 million kWh (herein referred to as a large load), except that such adjustment shall not apply to any portion of a large load up to the following respective amounts: 10,000 kW plus an amount (not to exceed 20,000 kW) equal to that portion of Distributor's demand at the TVA delivery point from which such large load is served by Distributor which is in excess of the sum of the billing demands of all large loads served by Distributor from that delivery point; 5 million kWh plus an amount (not to exceed 15 million kWh) equal to that portion of Distributor's purchases of energy at the TVA delivery point from which such large load is served by Distributor which is in excess of the energy resold to all large loads served by Distributor from that delivery point.

Determination of Demand

The demand for any month shall be the highest average during any 60-consecutive-minute period of the month of (a) the load measured in kilowatts or (b) 85 percent of the load in kVA plus 10 percent of the excess over 5,000 kVA of the maximum kVA demand for the month for each individual consumer, whichever is the higher.

Facilities Rental

There shall be no facilities rental charge under this rate schedule for delivery at bulk transmission voltage levels of 161 kV or higher. For delivery at less than 161 kV, there shall be added to Distributor's bill a facilities rental charge. This charge shall be 20 cents per kW per month, except for delivery at voltages below 46 kV, in which case the charge shall be 55 cents per kW per month for the first 10,000 kW and 30 cents per kW per month for the excess over 10,000 kW. Such charge shall be applied to the highest billing demand established at each delivery point during the latest 12-consecutive-month period and shall be in addition to all other charges under this rate schedule including minimum bill charges.

Minimum Bill

The monthly bill, exclusive of Adjustment 2, shall not be less than the higher of (1) the base delivery point charge or (2) 70 percent of the highest billing demand established during the previous 36 months multiplied by the base demand charge (adjusted for the portion of the current Adjustment Addendum applicable to the Distributor's billing demand as provided in Adjustment 1 above). At Distributor's request, in lieu of such minimum bill being applied individually in the case of two or more delivery points through each of which less than half of the energy taken by Distributor is resold to lighting and power consumers with demands of 50 kW or more, the minimum bill, exclusive of Adjustment 2, for any month for such delivery points, considered together, shall instead be an amount equal to the sum of the minimum bills which would otherwise have been applicable to such delivery points for such month; provided, however, that a special minimum bill shall be applied for any delivery point through which more than 75 percent of the energy taken by Distributor is resold to lighting and power consumers with demands of 50 kW or more.

Single-Point Delivery

The charges under this rate schedule are based upon the supply of service through a single delivery and metering point, and at a single voltage. If service is supplied to Distributor through more than one point of delivery or at different voltages, the supply of service at each delivery and metering point and at each different voltage shall be separately metered and billed under this rate schedule.

Schedule of Terms

SCHEDULE OF TERMS AND CONDITIONS

1. Financial and Accounting Policy. Municipality agrees to be bound by the following statement of financial and accounting policy:

(a) Except as hereinafter provided, Municipality shall administer, operate, and maintain the electric system as a separate department in all respects, shall establish and maintain a separate fund for the revenues from electric operations, and shall not directly or indirectly mingle electric system funds or accounts, or otherwise consolidate or combine the financing of the electric system, with those of any other of its operations. The restrictions of this subsection include, but are not limited to, prohibitions against furnishing, advancing, lending, pledging, or otherwise diverting electric system funds, revenues, credit or property to other operations of Municipality, the purchase or payment of, or providing security for, indebtedness or other obligations applicable to such other operations, and payment of greater than standardized or market prices for property or services from other departments of Municipality. In the interest of efficiency and economy, Municipality may use property and personnel jointly for the electric system and other operations, subject to agreement between Municipality and TVA as to appropriate allocations, based on direction of effort, relative use, or similar standards, of any and all joint investments, salaries and other expenses, funds, or use of property or facilities.

(b) Municipality shall keep the general books of accounts of the electric system according to the Federal Power Commission Uniform System of Accounts. Municipality shall allow the duly authorized agents of TVA to have free access at all reasonable times to all books and records relating to electric system operations. TVA may provide advisory accounting service, in reasonable amount, to help assure the proper setting up and administering of such accounts.

(c) Municipality shall supply TVA not later than August 15 of each year with an annual financial report in such form as may be requested, of electric system transactions for the preceding year ending June 30 and of electric system assets and liabilities as of June 30. Municipality shall furnish promptly to TVA such monthly operating, statistical, and financial statements relating to electric system operations as may reasonably be requested by TVA. In the event of failure to furnish promptly such statements TVA, following written notification to Municipality of intention so to do, may with its own staff perform at Municipality's expense all work necessary to collect such data.

(d) Municipality shall have the electric system financial statements examined annually by independent certified public accountants in accordance with generally accepted auditing standards and shall publish the financial statements, along with the auditor's certificate, in a newspaper of general circulation in the area.

2. Payments in Lieu of Taxes. Municipality may pay or cause to be paid from its electric system revenues for each year beginning July 1 (hereinafter called "fiscal year," the first such fiscal year for purposes hereof being the year beginning July 1, 1969), an amount for payments in lieu of taxes (hereinafter called "tax equivalents") on its electric system and electric operations which, in the judgment of Municipality's governing body after consultation with the supervisory body, shall represent the fair share of the cost of government properly to be borne thereby, subject, however, to the following conditions and limitations:

(a) The total amount so paid as tax equivalents for each fiscal year shall not exceed a maximum equal to the sum of the following:

(1) One and one-half times the weighted average effective tax rates of the respective taxing jurisdictions as of the beginning of each fiscal year, determined as hereinafter provided in this section, multiplied by the net plant values of the electric plant in service and the book values of materials and supplies within the respective taxing jurisdictions in which Municipality's electric system is located as of the beginning of such fiscal year; and

(2) Two and one-half percent of the adjusted net distribution plant value of electric plant in service within the corporate limits of Municipality and of any other city taxing jurisdiction as of the beginning of each fiscal year; and

(3) One and one-half percent of the adjusted net distribution plant value of electric plant in service outside the corporate limits of Municipality and of any other city taxing jurisdictions as of the beginning of each fiscal year.

(b) Notwithstanding the foregoing, until the first fiscal year in which the aforesaid maximum amount for payments in lieu of taxes calculated as provided in subparagraph (a) of this section exceeds the total of (1) and (2) of this subparagraph (b), the maximum total tax equivalent that may be paid for any fiscal year shall not be less than the sum of the following:

(1) The highest total annual amount in lieu of taxes taken or paid from Municipality's electric system funds prior to April 1, 1969, for any one of the three consecutive calendar years ending with calendar year 1968, increased by the same percentage as that by which the net plant value has increased from December 31, 1968, through June 30, 1969; and

(2) The amount by which the result of the calculation of item (1) in subparagraph (a) of this section for such fiscal year exceeds the result of such a calculation for the year ending with June 30, 1969.

Thereafter, such maximum for any fiscal year shall not exceed the aforesaid maximum calculated as provided in subparagraph (a) of this section. All such maximum amounts shall be subject to the conditions and limitations of subparagraphs (c), (d), and (e) of this section.

(c) Such tax equivalent payments shall be made only from current electric system revenues remaining after payment of or making reasonable provision for payment of (i) current operating expenses of the electric system, including without limitation salaries, wages, cost of materials and supplies, cost of power, and insurance; (ii) current payments of interest on electric system indebtedness, and payment of principal thereof, including amortization, reserve and sinking fund payments, when due; and (iii) reasonable reserves for renewals, replacements, and contengencies and for cash working capital.

(d) The total tax equivalent to be paid for each fiscal year shall be in lieu of all State, county, city, and other local taxes or charges on Municipality's electric system and electric operations except as provided in subparagraph (f) of this section. Accordingly, after initial determination of such total tax equivalent to be paid in the absence of any such taxes or charges, such total tax equivalent shall be reduced by the aggregate amount of any taxes or other charges imposed for such fiscal year on Municipality's electric system or electric operations for the benefit of the respective taxing jurisdictions (including Municipality) in which Municipality's electric system is located and in which such electric operations are conducted, whether or not such taxes or other charges were imposed by the respective taxing jurisdictions receiving the benefit thereof. It shall be the responsibility of Municipality to provide for allocation of such total tax equivalent among the taxing jurisdictions in which Municipality's electric system is located in accordance with applicable law or contracts, but any amount so allocated to any such taxing jurisdiction shall be reduced by the aggregate amount of any such tax or other charges imposed for that fiscal year for the benefit of that taxing jurisdiction. Only the respective amounts remaining after the aforesaid allocated amounts have been so reduced shall be actually paid to Municipality and to such other taxing jurisdictions.

(e) The amounts to be paid for each fiscal year to Municipality and to each other taxing jurisdiction, determined in accordance with and subject to the provisions of this section 2, shall be set forth in a resolution adopted by Municipality's governing

body after consultation with the supervisory body, and Municipality's electric system shall pay such amounts to Municipality and the other taxing jurisdictions as provided in said resolution. Such determination shall be made as early in such fiscal year as possible and shall become final at the end of such year; provided, however, that any reductions in such amounts required by subsection (d) above, to the extent not made during such year, shall be made in the succeeding years until the full adjustments are completed.

(f) Notwithstanding anything in the foregoing which might be construed to the contrary, properly authorized retail sales or use taxes on electric power or energy at the same rates applicable generally to sales or use of personal property or services, including natural or artificial gas, coal, and fuel oil as well as electric power or energy, imposed upon the vendees or users thereof by the State, a county, or a city (including Municipality) on a statewide, countywide, or citywide basis, respectively, shall not be considered a tax or charge on Municipality's electric system or its electric operations or properties for purposes of this section 2.

For purposes of this section 2, the following terms shall have the following meanings:

(a) "Electric system" shall mean all tangible and intangible property and resources of every kind and description used or held for use in the purchase, transmission, distribution, and sale, but not the generation, of electric energy.

(b) "Electric operations" shall mean all activities associated with the establishment, development, and administration of an electric system and the business of supplying electricity and associated services to the public, including without limitation the generation, purchase, and sale of electric energy and the purchase, use, and consumption thereof by ultimate consumers.

(c) "Supervisory body" shall mean any board or other agency of Municipality established to supervise the management and operation of its electric system and electric operations, or, in the absence thereof, the governing body of Municipality.

(d) The term "weighted average effective tax rate" of any taxing jurisdiction shall mean the actual ad valorem real property tax rate in effect multiplied by the weighted average ratio of the assessed value to market value of all classes or real property within such taxing jurisdiction. Said weighted average ratio of assessed to market value for any taxing jurisdiction shall be determined by dividing (1) the total actual assessed valuation of all classes of taxable real

property within such jurisdiction, by (2) the total market value of the same classes of taxable real property within the jurisdiction included in (1), calculated from the assessment ratios determined and published by any authorized agency of the State of Tennessee or, in the absence thereof, by the Tennessee Taxpayers Association, or, if such information is unavailable from either of these sources, from the best information available. For purposes of this section 2, the weighted average effective tax rate in effect at the beginning of any fiscal year for any taxing jurisdiction shall be deemed to be the weighted average effective tax rate of such taxing jurisdiction determined as provided in this paragraph for the tax year (calendar year) immediately preceding such fiscal year using the actual property tax rate and assessment ratios of such taxing jurisdiction in effect for such tax year.

(e) "Net plant value" shall mean the depreciated original cost of electric plant in service used and held for use in the transmission and distribution, but not the generation, of electricity as shown on the books of the electric system from time to time.

(f) "Adjusted net distribution plant value" shall mean net plant value less the depreciated original cost of (1) underground plant in service and (2) electric lines and equipment in service designed for operation at voltages in excess of 26,000 volts.

(g) "Electric plant in service" or "plant in service" shall have the meanings defined or ascribed to them in the Federal Power Commission's Uniform System of Accounts.

3. Municipality's Lines and Equipment. All lines and substations from the point or points of delivery (as defined in section 3 of the contract of which these Terms and Conditions are a part), and all electrical equipment, except metering equipment of TVA, located on Municipality's side of such point or points of delivery shall be furnished and maintained by Municipality. Municipality's electrical facilities shall conform to accepted modern standards. Failure to inspect for or to object to defects in such facilities shall not render TVA liable or responsible for any loss or damage resulting therefrom or from violation of the contract of which these Terms and Conditions are a part, or from accidents which may occur upon Municipality's premises.

4. Responsibility for Property of the Other Party. All equipment furnished by each party shall be and remain its property. Each party shall exercise proper care to protect any property of the other on its premises, and shall bear the cost of any necessary repairs or replacements arising from its neglect to exercise such proper care. The authorized employees of each party shall have access at all reasonable times to any of its facilities on the other's premises, for such purposes as reading its meters, and testing, repairing, or replacing its equipment.

5. Measurement of Demand, Energy, and Power Factor. TVA will, at its own expense, install and maintain or cause to be installed and maintained the necessary metering equipment for measuring the maximum demand and the amount of energy furnished Municipality at each point of delivery. If, for economy or convenience, such equipment is located elsewhere than at the point of delivery, the readings shall be adjusted to reflect the quantities delivered at the point of delivery and such adjusted amounts shall be deemed to be the measured amounts for purposes of billing under Wholesale Rate Schedule WS. TVA may also, at its option, provide equipment to determine power factor. Municipality shall permit the use of its housing facilities, ducts and supports for TVA's metering equipment.

Municipality shall have the right at its own expense to install, equip, and maintain check meters in a mutually satisfactory location.

TVA will make periodical tests and inspections of its metering equipment in order to maintain a high standard of accuracy, and will make additional tests or inspections of its metering equipment at the request of Municipality. Municipality shall have the right to have representatives present at tests and meter readings. If any test shows that the metering equipment is accurate within two percent no adjustment of past readings will be made and, if the test was requested by Municipality, the testing charge will be paid by Municipality; all other tests shall be at TVA's expense. In case any test shows the meter reading to be in error more than two percent, a corresponding adjustment shall be made in Municipality's bills for any agreed period of error; in the absence of such agreement, the adjustment shall be limited to the current billing period. Should the metering equipment fail, the deliveries will be estimated by TVA from the best information available.

6. Billing. Payment for power and energy used in any monthly period shall become due fifteen days after TVA's meter reading date or seven days after the date of bill from TVA, whichever is later. To any amount remaining unpaid fifteen days after the due date, there shall be added a charge of one percent and an additional one percent shall be added for each succeeding thirty-day period until the amount is paid in full. Upon failure of Municipality to pay for the power and energy used in any monthly period within sixty days after due date, TVA shall have the right, upon reasonable notice, to discontinue the supply of power and energy and refuse to resume delivery so long as any part thereof remains unpaid. Discontinuance of supply under this section will not relieve Municipality of its liability for the agreed minimum monthly payment during the time the supply of energy is so discontinued. All payments shall be made to TVA at its offices at Chattanooga, Tennessee, or at such other place as TVA may from time to time designate. For purposes of billing, the term "month" in Wholesale Power Rate--Schedule WS and the term "monthly period" in this section are defined as the period from the meter reading time in one month to the meter reading time in the next month; provided, however, that with respect to the determination of demand said period shall begin and end at midnight prior to said meter reading times. Subject to such changes in TVA's meter reading scheduling as it deems necessary, meters shall be read on the same day of each month.

7. Adjustment and Change of Wholesale Rate and Resale Rates. The wholesale rate and resale rates provided in sections 4 and 5 of the contract shall

be subject to adjustment and change from time to time in accordance with this section in order to assure TVA's ability to continue to supply the power requirements of Municipality and TVA's other customers on a financially sound basis with due regard for the primary objectives of the TVA Act, including the objective that power shall be sold at rates as low as feasible, and to assure Municipality's ability to continue to operate on a financially sound basis.

Wholesale power rates and charges shall be sufficient to produce revenue from TVA's wholesale power customers which, together with revenue from its other power customers, will assure TVA's ability each fiscal year to:

(a) meet the requirements of the TVA Act including particularly section 15d(f) thereof which provides in part that:

> The Corporation shall charge rates for power which will produce gross revenues sufficient to provide funds for operation, maintenance, and administration of its power system; payments to States and counties in lieu of taxes; debt service on outstanding bonds, including provision and maintenance of reserve funds and other funds established in connection therewith; payments to the Treasury as a return on the appropriation investment pursuant to subsection (e) hereof; payment to the Treasury of the repayment sums specified in subsection (e) hereof; and such additional margin as the Board may consider desirable for investment in power system assets, retirement of outstanding bonds in advance of maturity, additional reduction of appropriation investment, and other purposes connected with the Corporation's power business, having due regard for the primary objectives of the Act, including the objective that power shall be sold at rates as low as are feasible.

and (b) meet all tests and comply with the provisions of TVA's bond resolutions as from time to time adopted and amended in such a manner as to assure its ability to continue to finance and operate its power program at the lowest feasible cost.

Adjustment. TVA will review with Municipality or its representative, at least 30 days prior to the first day of each of the months of October, January, April, and July pertinent data concerning the current and anticipated conditions and costs affecting TVA's operations and the adequacy of its revenues from both wholesale and other power customers to meet the requirements of the TVA Act and the tests and provisions of its bond resolutions as provided in the second paragraph of this section. At least fifteen days prior to the first day of each of the aforesaid months, TVA will determine what adjustments, if any, are required in the demand and energy charges provided for in the then effective Schedule of Rates and Charges to assure (a) revenues to TVA adequate to meet the requirements of the TVA Act and the tests and provisions of its bond resolutions as provided in the second paragraph of this section and (b) revenues to Municipality adequate to compensate for changes, if any, in the cost of power to Municipality resulting from adjustments to Wholesale Power Rate--Schedule WS made under the provisions of this section. Such adjustments as TVA determines are required shall be incorporated by TVA in Adjustment Addendums to Wholesale Power Rate--Schedule WS and to the resale schedules of the Schedule of

Rates and Charges, which Adjustment Addendums shall be promptly published by TVA by mailing the same to Municipality by registered mail and shall be applicable to bills rendered from meter readings taken for TVA and Municipality billing cycles scheduled to begin on or after the effective date of said Adjustment Addendum; provided that any adjustment determined by TVA to be necessary as hereinbefore provided shall not be conditioned upon or be postponed pending the review provided for in the first sentence of this paragraph or the completion of such review. Municipality shall pay for power and energy in accordance with Wholesale Power Rate--Schedule WS of the Schedule of Rates and Charges as so adjusted from time to time by any such Adjustment Addendums published by TVA as above provided, and shall adjust the charges in the resale schedules of the Schedule of Rates and Charges applicable to its customers in accordance with such Adjustment Addendums and the provisions of such resale schedules.

Change. Whenever any adjustment or adjustments made under the preceding paragraph, or the costs of TVA's service to Municipality and TVA's other customers, or the costs of Municipality's service to customers, or any other factors are believed by either party to warrant general or major changes in the Schedule of Rates and Charges, either party or its representative may request that the parties or their representatives meet and endeavor to reach agreement upon such changes. If within 180 days after any request for such changes the representatives of the parties for any reason have not agreed upon such changes, TVA may thereafter, upon not less than 30 days' notice by registered mail in which the basis for each change is set forth, place into effect such changes in the Schedule of Rates and Charges as it determines will enable TVA to carry out the objectives of the TVA Act and meet the requirements and tests and comply with the provisions of its bond resolutions as outlined in the second paragraph of this section and enable Municipality to continue on a financially sound basis as provided in section 5(c) of the contract and Municipality shall thereafter pay and charge for power and energy in accordance with the Schedule of Rates and Charges as so changed; provided, however, that unless the parties agree otherwise, any adjustment determined by TVA to be required under the provisions of the preceding paragraph of this section shall become effective without reference to, and shall not be delayed or postponed pending completion of, any actions under this paragraph.

8. Compensation for Additional Tax or in Lieu of Tax Payments. It is recognized that among the costs which the rates specified in Wholesale Power Rate--Schedule WS were designed to cover are annual payments in lieu of taxes by TVA in an aggregate sum equivalent to 5 percent of its gross proceeds from sales of power exclusive of sales to agencies of the Government of the United States. If at any time TVA is compelled by law to pay during any fiscal year ending June 30 taxes and payments in lieu of taxes in an aggregate amount which shall exceed 5 percent of such proceeds, TVA may, if it so elects, increase the billing amounts during the succeeding fiscal year by the number of percentage points (to the nearest 0.1 point) by which said aggregate amount exceeded 5 percent of said proceeds.

9. Interference with Availability or Use of Power. Neither TVA nor Municipality shall be liable for damages or breach of contract when and to the extent that the availability or use of power, respectively, is interrupted, curtailed or interfered with or the performance of any other obligation hereunder is prevented by circumstances reasonably beyond the control of the party affected,

15. Conflict. In case of conflict between any express provision of the body of this contract or any provision of the Schedule of Rates and Charges and these Terms and Conditions, the former shall govern.

16. Section Headings. The section headings in this contract are only for convenience of reference and are not a part of the contract between the parties.

Schedule of Rules and Regulations

SCHEDULE OF RULES AND REGULATIONS

1. Application for Service. Each prospective Customer desiring electric service may be required to sign Distributor's standard form of application for service or contract before service is supplied by the Distributor.

2. Deposit. A deposit or suitable guarantee approximately equal to twice the average monthly bill may be required of any Customer before electric service is supplied. Distributor may at its option return deposit to Customer after one year. Upon termination of service, deposit may be applied by Distributor against unpaid bills of Customer, and if any balance remains after such application is made, said balance shall be refunded to Customer.

3. Point of Delivery. The point of delivery is the point, as designated by Distributor, on Customer's premises where current is to be delivered to building or premises. All wiring and equipment beyond this point of delivery shall be provided and maintained by Customer at no expense to Distributor.

4. Customer's Wiring--Standards. All wiring of Customer must conform to Distributor's requirements and accepted modern standards, as exemplified by the requirements of the National Electrical Safety Code and the National Electrical Code.

5. Inspections. Distributor shall have the right, but shall not be obligated, to inspect any installation before electricity is introduced or at any later time, and reserves the right to reject any wiring or appliances not in accordance with Distributor's standards; but such inspection or failure to inspect or reject shall not render Distributor liable or responsible for any loss or damage resulting from defects in the installation, wiring, or appliances, or from violation of Distributor's rules, or from accidents which may occur upon Customer's premises.

6. Underground Service Lines. Customers desiring underground service lines from Distributor's overhead system must bear the excess cost incident thereto. Specifications and terms for such construction will be furnished by Distributor on request

7. Customer's Responsibility for Distributor's Property. All meters, service connections, and other equipment furnished by Distributor shall be, and remain, the property of Distributor. Customer shall provide a space for and exercise proper care to protect the property of Distributor on its premises, and, in the event of loss or damage to Distributor's property arising from neglect of Customer to care for same, the cost of the necessary repairs or replacements shall be paid by Customer.

8. Right of Access. Distributor's identified employees shall have access to Customer's premises at all reasonable times for the purpose of

reading meters, testing, repairing, removing, or exchanging any or all equipment belonging to Distributor.

9. Billing. Bills will be rendered monthly and shall be paid at the office of Distributor or at other locations designated by Distributor. Failure to receive bill will not release Customer from payment obligation. Should bills not be paid as above, Distributor may at any time thereafter, upon five (5) days' written notice to Customer, discontinue service. Bills paid after due date specified on bill may be subject to additional charges. Should the due date of bill fall on a Sunday or holiday, the business day next following the due date will be held as a day of grace for delivery of payment. Remittances received by mail after the due date will not be subject to such additional charges if the incoming envelope bears United States Postal Service date stamp of the due date or any late prior thereto.

10. Discontinuance of Service by Distributor. Distributor may refuse to connect or may discontinue service for the violation of any of its Rules and Regulations, or for violation of any of the provisions of the Schedule of Rates and Charges, or of the application of Customer or contract with Customer. Distributor may discontinue service to Customer for the theft of current or the appearance of current theft devices on the premises of Customer. The discontinuance of service by Distributor for any causes as stated in this rule does not release Customer from his obligation to Distributor for the payment of minimum bills as specified in application of Customer or contract with Customer.

11. Connection, Reconnection, and Disconnection Charges. Distributor may establish and collect standard charges to cover the reasonable average cost, including administration, of connecting or reconnecting service, or disconnecting service as provided above. Higher charges may be established and collected when connections and reconnections are performed after normal office hours, or when special circumstances warrant.

12. Termination of Contract by Customer. Customers who have fulfilled their contract terms and wish to discontinue service must give at least three (3) days' written notice to that effect, unless contract specifies otherwise. Notice to discontinue service prior to expiration of contract term will not relieve Customer from any minimum or guaranteed payment under any contract or rate.

13. Service Charges for Temporary Service. Customers requiring electric service on a temporary basis may be required by Distributor to pay all costs for connection and disconnection incidental to the supplying and removing of service. This rule applies to circuses, carnivals, fairs, temporary construction, and the like.

14. Interruption of Service. Distributor will use reasonable diligence in supplying current, but shall not be liable for breach of contract in the event of, or for loss, injury, or damage to persons or property resulting from, interruptions in service, excessive or inadequate voltage, single-phasing, or otherwise unsatisfactory service, whether or not caused by negligence.

15. Shortage of Electricity. In the event of an emergency or other condition causing a shortage in the amount of electricity for Distributor to meet the demand on its system, Distributor may, by an allocation method deemed equitable by Distributor, fix the amount of electricity to be made available for use by Customer and/or may otherwise restrict the time during which Customer may make use of electricity and the uses which Customer may make of electricity. If such actions become necessary, Customer may request a variance because of unusual circumstances including matters adversely affecting the public health, safety and welfare. If Customer fails to comply with such allocation or restriction, Distributor may take such remedial actions as it deems appropriate under the circumstances including temporarily disconnecting electric service and charging additional amounts because of the excess use of electricity. The provisions of the Section entitled Interruption of Service of this Schedule of Rules and Regulations are applicable to any such allocation or restriction.

16. Voltage Fluctuations Caused by Customer. Electric service must not be used in such a manner as to cause unusual fluctuations or disturbances to Distributor's system. Distributor may require Customer, at his own expense, to install suitable apparatus which will reasonably limit such fluctuations.

17. Additional Load. The service connection, transformers, meters, and equipment supplied by Distributor for each Customer have definite capacity, and no addition to the equipment or load connected thereto will be allowed except by consent of Distributor. Failure to give notice of additions or changes in load, and to obtain Distributor's consent for same, shall render Customer liable for any damage to any of Distributor's lines or equipment caused by the additional or changed installation.

18. Standby and Resale Service. All purchased electric service (other than emergency or standby service) used on the premises of Customer shall be supplied exclusively by Distributor, and Customer shall not, directly or indirectly, sell, sublet, assign, or otherwise dispose of the electric service or any part thereof.

19. Notice of Trouble. Customer shall notify Distributor immediately should the service be unsatisfactory for any reason, or should there be any defects, trouble, or accidents affecting the supply of electricity. Such notices, if verbal, should be confirmed in writing.

20. Non-Standard Service. Customer shall pay the cost of any special installation necessary to meet his peculiar requirements for service at other than standard voltages, or for the supply of closer voltage regulation than required by standard practice.

21. Meter Tests. Distributor will, at its own expense, make periodical tests and inspections of its meters in order to maintain a high standard of accuracy. Distributor will make additional tests or inspections of its meters at the request of Customer. If tests made at Customer's request show that the meter is accurate within two percent (2%), slow or fast, no adjustment will be made in Customer's bill, and Distributor's standard testing

charge will be paid by Customer. In case the test shows meter to be in excess of two percent (2%) fast or slow, an adjustment shall be made in Customer's bill over a period of not over thirty (30) days prior to date of such test, and cost of making test shall be borne by Distributor.

22. Relocation of Outdoor Lighting Facilities. Distributor shall, at the request of Customer, relocate or change existing Distributor-owned equipment. Customer shall reimburse Distributor for such changes at actual cost including appropriate overheads.

23. Billing Adjusted to Standard Periods. The demand charges and the blocks in the energy charges set forth in the rate schedules are based on billing periods of approximately one month. In the case of the first billing of new accounts (temporary service, cotton gins, and other seasonal customers excepted) and final billings of all accounts (temporary service excepted) where the period covered by the billing involves fractions of a month, the demand charges and the blocks of the energy charge will be adjusted to a basis proportionate with the period of time during which service is extended.

24. Scope. This Schedule of Rules and Regulations is a part of all contracts for receiving electric service from Distributor, and applies to all service received from Distributor, whether the service is based upon contract, agreement, signed application, or otherwise. A copy of this schedule, together with a copy of Distributor's Schedule of Rates and Charges, shall be kept open to inspection at the offices of Distributor.

25. Revisions. These Rules and Regulations may be revised, amended, supplemented, or otherwise changed from time to time, without notice. Such changes, when effective, shall have the same force as the present Rules and Regulations.

26. Conflict. In case of conflict between any provision of any rate schedule and the Schedule of Rules and Regulations, the rate schedule shall apply.

Assignment Agreement

ASSIGNMENT AGREEMENT
Among
CITY OF JACKSON, TENNESSEE,
JACKSON ENERGY AUTHORITY,
And
TENNESSEE VALLEY AUTHORITY

Date: November 1, 2001

TV-47356A, Supp. No. 68

THIS AGREEMENT, made and entered into by and among CITY OF JACKSON, TENNESSEE (Municipality), a municipal corporation created and existing under and by virtue of the laws of the State of Tennessee; JACKSON ENERGY AUTHORITY (Assignee), a public corporation created and existing under and by virtue of the laws of the State of Tennessee; and TENNESSEE VALLEY AUTHORITY (TVA), a corporation created and existing under and by virtue of the Tennessee Valley Authority Act of 1933, as amended;

WITNESSETH:

WHEREAS, TVA and Municipality have heretofore entered into Power Contract TV-47356A, dated August 12, 1977, as amended (1977 Contract), and related agreements under which Municipality purchases its entire requirements for electric power and energy from TVA for resale; and

WHEREAS, Assignee is in the process of acquiring and plans to operate the electric utility system of Municipality as provided for by Chapter 55 of the Tennessee Private Acts of 2001 (2001 Act); and

WHEREAS, Municipality has requested TVA's consent to the assignment of the 1977 Contract and related agreements from Municipality to Assignee; and

WHEREAS, TVA is willing to consent to this assignment subject to the terms and conditions set forth below;

NOW, THEREFORE, for and in consideration of the premises and of the mutual agreements set forth below, and subject to the provisions of the Tennessee Valley Authority Act of 1933, as amended, the parties agree as follows:

1. Effective as of the date first above written (Effective Date), Municipality hereby assigns to Assignee the 1977 Contract, including all rights and obligations included therein, and TVA hereby consents to such assignment in accordance with the provisions of section 12 of the 1977 Contract.

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2. Municipality hereby also assigns to Assignee (and TVA consents to such assignment) the following agreements, including all rights and obligations included therein:

(a) Industrial Development Contract TV-58454A, dated December 21, 1981.

(b) Letter Agreement TV-71888A, dated July 14, 1987.

(c) Letter Agreement TV- 74673A, dated February 4, 1988.

(d) Letter Agreement TV-75737A, dated August 10, 1988.

(e) Mobile Spare Transformer Program Agreement TV-80220U, dated November 27, 1989.

(f) Power Supply Contract TV-85861U, dated March 1, 1992.

(g) Power Supply Contract TV-98618U, dated May 1, 1995.

(h) Comprehensive Services Program Agreement TV-99211U, dated July 1, 1995.

(i) Purchase Agreement TV-98678U, dated January 1, 1996.

(j) Energy Right Residential Program Agreement 98PCG-227153, dated October 1, 1997.

(k) Direct Load Control Agreement 98PCG-231567, dated October 1, 1997.

(l) Power Supply Contract 01PCG-267209, dated September 1, 2000.

(m) Power Supply Contract 00PCG-266825, dated September 25, 2000.

(n) Power Supply Contract 00PCG-264479, dated April 1, 2000.

(o) Power Supply Contract 01PCG-268921, dated November 1, 2000.

3. Assignee, by virtue of said assignment, becomes bound for the full performance of the 1977 Contract.

4. In the event that Assignee shall cease to exist as addressed by section 25 of the 2001 Act or otherwise, all rights and obligations of Assignee under the 1977 Contract shall become the rights and obligations of Municipality without further action by TVA, Municipality, or Assignee.

5. The 1977 Contract is amended in all respects necessary to make all references to Municipality refer to Assignee except for the references with respect to payments in lieu of taxes in the third sentence of section 1, section 6(a)(4), and section 2 of the Schedule of Terms and Conditions, which shall continue to refer to the City of Jackson.

IN WITNESS WHEREOF, the parties to this agreement have caused it to be executed by their duly authorized representatives, as of the day and year first above written.

CITY OF JACKSON, TENNESSEE

By _____
Title:

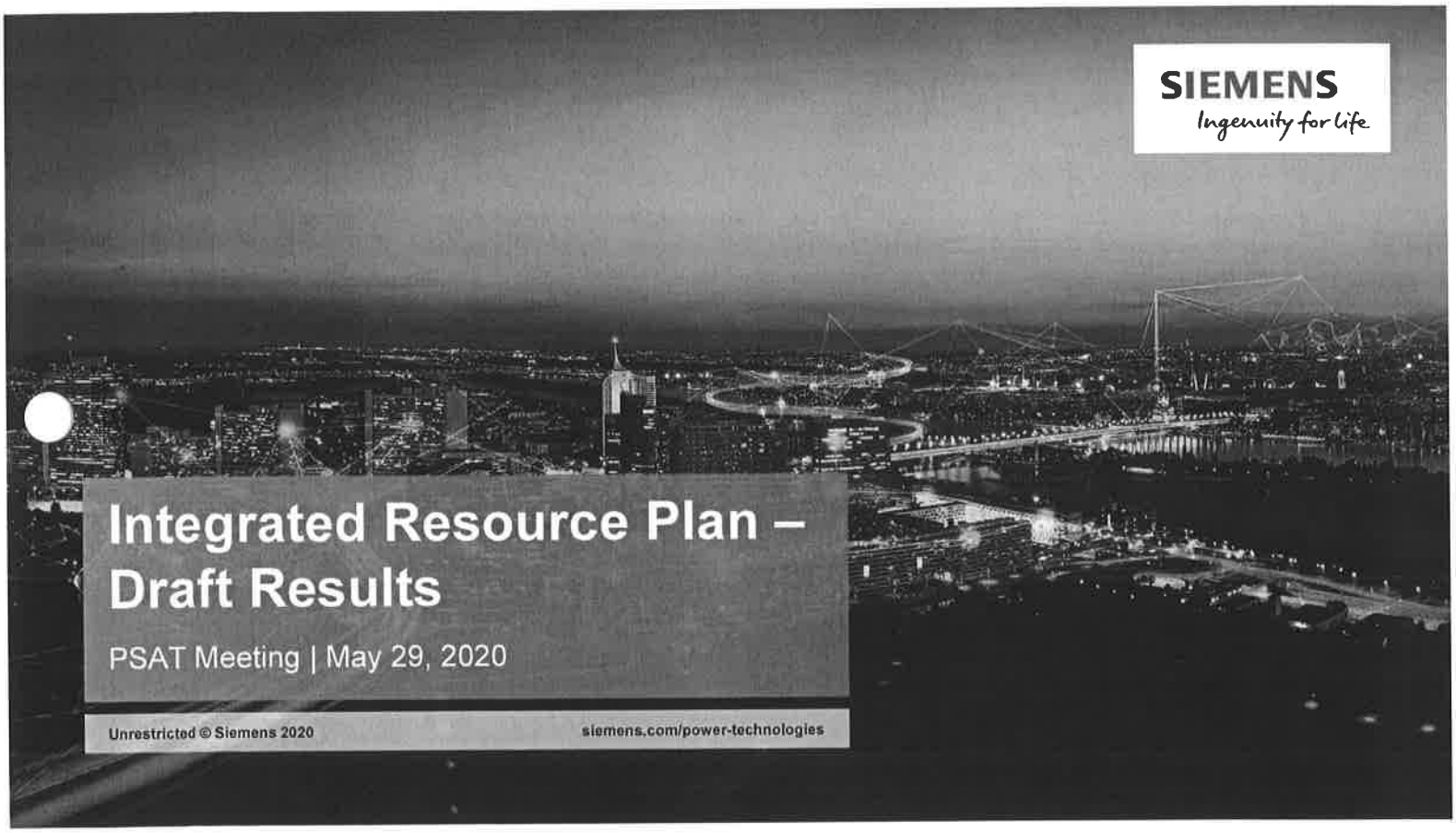
JACKSON ENERGY AUTHORITY

By _____
Title: President

TENNESSEE VALLEY AUTHORITY

By _____
Executive Vice President
Customer Service and Marketing

EXHIBIT 6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Integrated Resource Plan – Draft Results
PSAT Meeting | May 29, 2020
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Agenda

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• Overview / Meeting Objectives – J.T. Young	10:00 am
• Agenda and Executive Summary - Siemens	10:10 am
• MISO Overview and Membership Assessment - MISO	10:40 am
• Questions of PSAT to MISO	11:30 am
• Break	11:40 am
• IRP Overview - Siemens	11:50 am
◦ Introduction	
◦ Strategies / Scenarios / Portfolio Analyzed	
◦ Metrics	
◦ Load Forecast / Fuel Forecast / Technology Assessment	
◦ Transmission / Resource Adequacy Issues	
◦ Other Costs for Direct Comparison	
◦ Portfolio Analyses (deterministic, stochastic and Waterfall)	
◦ Summary of Conclusions and Recommendations	
◦ Next Steps	
• Break	1:20 pm
• Questions and Comments from PSAT	1:30 pm

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Introduction

IRP Process Recap

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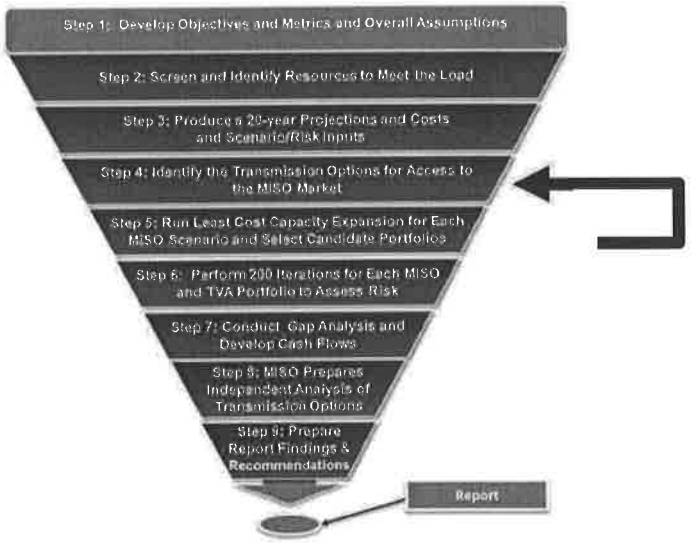
- The IRP process is designed to evaluate options for MLGW to supply of its current and forecasted load while meeting key objectives including:
  - *Affordability / Least Cost / Rate Impact*
  - *Reliability / Resource Adequacy*
  - *Sustainability / CO2 / Water Use / RPS*
  - *Stability / Price Risk Mitigation / Reliance on Market*
  - *Economic Impact / Local Capital Investment*
- Today we will present the results of the final set of Portfolios and our findings and recommendations.



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Integrated Resource Planning... a Recap

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Why do an IRP?

The Integrated Resource Plan is:

- Independent and unbiased
- Comprehensive regarding strategies and options
- Addresses the risk associated with market, regulatory and technology uncertainty
- Compares the TVA Full Requirements Contract to alternatives on an equivalent basis (generation, plus transmission, PILOT, Gap analysis, MISO charges, TVA Benefits, becoming LBA)
- Determines No Regret Strategies

What is an IRP?

The purpose of an IRP is to provide a plan for energy resource (primarily generation, transmission and demand side programs) development to meet future load and compare the status quo (TVA FRC) to MISO market and self generation options):

This is not a traditional IRP which focuses primarily on generation. Exiting TVA requires a combination of generation and transmission investments to replace TVA supply.

Least cost plans are developed for a given transmission infrastructure – hence alignment between Siemens and MISO's assumptions regarding transmission are critical inputs to the analysis.

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Integrated Resource Planning... a Recap

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What we will do today

- Siemens will present analyses and results that MLGW can use to determine the best path forward for Memphis
- Siemens will present its findings regarding the tradeoffs among cost, risk, reliability, sustainability, resilience, and economic development
- Siemens will
  - review previous materials,
  - fill in gaps in information that not covered in previous presentations (PILOT, benefits, gap analyses, TVA cost),
  - present the results of the Risk Analysis,
  - Present the balanced Scorecard,
  - Explain No Regret Positions for each Strategy,
  - Describe the Waterfall showing the components of Savings among Strategies
  - Recommend next steps (RFP to confirm savings)

What we will not do today

- Siemens will not make a final recommendation regarding whether MLGW should exit the TVA agreement – that is an MLGW decision
- Siemens has no view regarding which of the metrics is the most important to MLGW
- Siemens believes that MLGW should conduct an RFP to verify savings before making a final decision regarding both TVA and the best Portfolio options. However its timing is an MLGW decision.

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Summary of Findings

11 Resource Portfolios under Self-Supply plus MISO (Strategy 3) and All MISO (Strategy 4) were Evaluated

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Portfolio ID	Final Portfolio	Total Thermal 2039	Local Renew 2039	Battery 2039	Total Local Nameplate 2039	MISO Renew 2039	MISO Cap 2039	950 MW CC	450 MW CC	237 MW CT
S3S1_P	Portfolio 1	1137	1000	0	2137	2200	1761	0	2	1
S3S1_F	Portfolio 2	1587	1000	0	2587	1550	1487	0	3	1
S3S2_BB	Portfolio 3	1824	1000	0	2824	1350	1308	0	3	2
_BB	Portfolio 4	1350	1000	0	2350	1550	1697	0	3	0
S3S5	Portfolio 5	1398	1000	100	2498	3450	1183	0	1	4
S3S7_BB	Portfolio 6	1137	1000	0	2137	2200	1761	0	2	1
S3S1_2CT	Portfolio 7	1374	1000	0	2374	2200	1550	0	2	2
S3S7_2CT	Portfolio 8	1374	1000	0	2374	2200	1550	0	2	2
S3S5_YD	Portfolio 9	1398	1000	100	2498	3450	1186	0	1	4
S3S10	Portfolio 10	950	1000	0	1950	2250	1901	1	0	0
S4S1	Portfolio All MISO	950	0	0	0	3200	1909	1	0	0

- Portfolio 1, 2 and 7: derived from the Reference case.
- Portfolio 3: derived from High Load / Base Gas case.
- Portfolio 4: derived from Low Load / Base Gas case.
- Portfolio 5 and 9: derived from High Transmission case, with battery storage (9 moved CTs to 2025).
- Portfolio 6 and 8: derived from Low Load / High Gas case (different numbers of CTs and timing).
- Portfolio All MISO: derived without local supply options.
- Portfolio 10: Shifted the CCGT and 1000 MW MISO renewables to local.

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Summary of Findings

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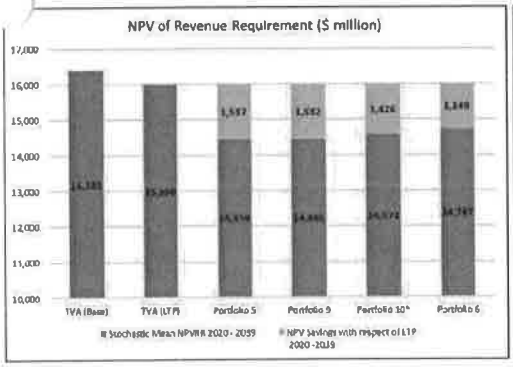
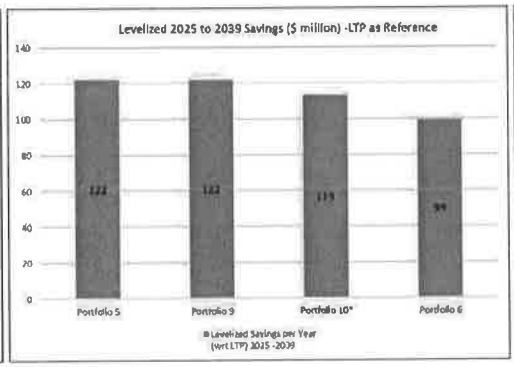
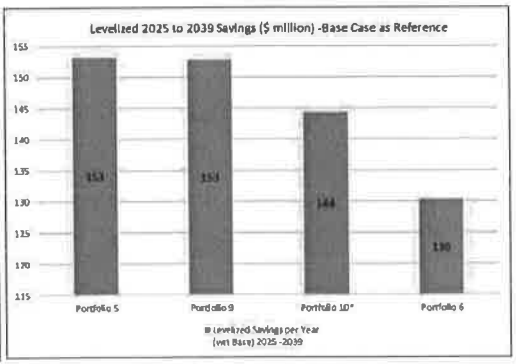
- Future supply Portfolios 5 and 9 were identified that could provide savings of over $1.9 billion in 2018 dollars for the 2020 to 2039 period with respect of the TVA's Existing Contract and $1.5 billion (shown lower left) with respect of the Long Term Partnership contract. The sum of the $1.9 billion savings becomes about $3 billion in nominal dollars (including inflation).
- These two portfolios could achieve in annual savings of about $150 million per year (2025-2039) with TVA's Existing Contract (lower middle) and about $120 million per year (2025-2039) with TVA's LTP (in 2018$). In nominal dollars the $150 million averages about $200 million/year (assuming 2% inflation).







Summary of Findings

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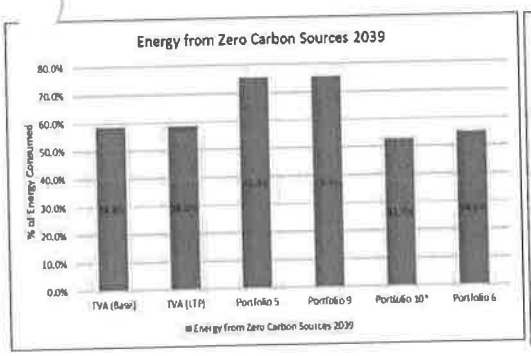
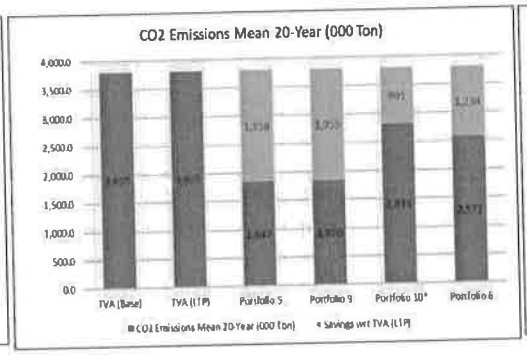
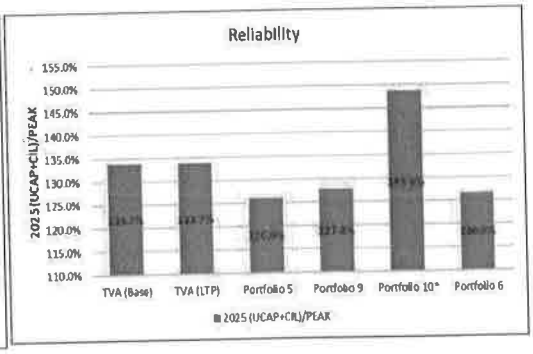
- All of the best performing Self Supply plus MISO Portfolios have high levels of generation from zero carbon sources reaching levels from 52% to 75% when fully developed.
- CO_2 emissions are reduced by almost 50% of TVA levels with Portfolios 5 and 9.
- There will be an increase of local water consumption for generation of about 27% relative to TVA
- All Portfolios meet or surpass NERC reliability requirements, but Portfolio 5 has potential risk of load shed during double 500 kV line outages. This was addressed in Portfolio 9.







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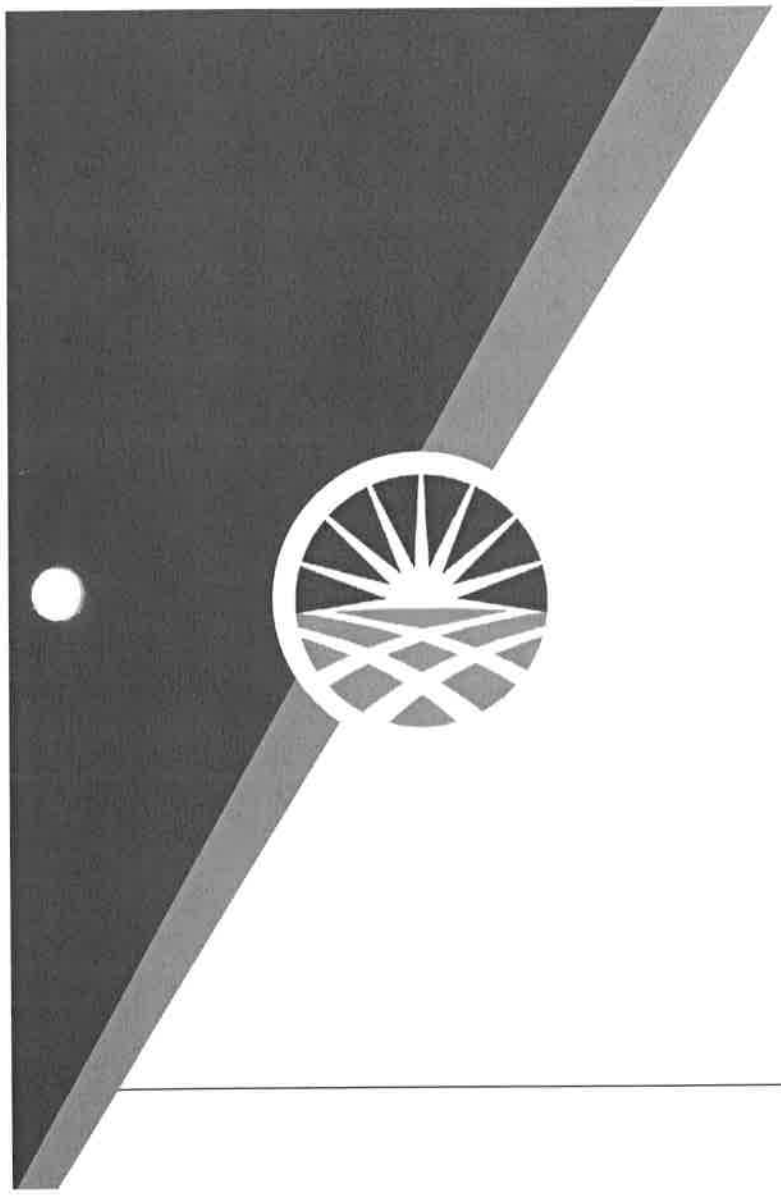
MISO Overview and Membership Assessment

JSC - 000132

Memphis Light, Gas and Water (MLGW)
Power Supply Advisory Team Meeting

May 29, 2020

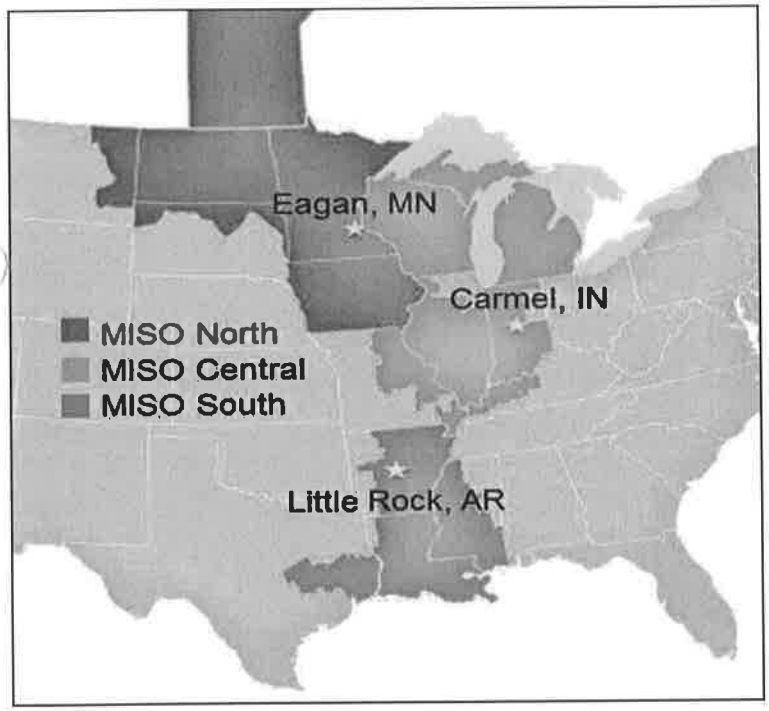
MISO



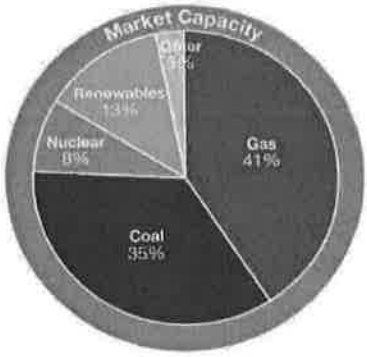
Part I: MISO Overview

MISO drives value creation through efficient and reliable markets, operations, planning, and innovation

Our Vision: To be the most reliable, value-creating RTO

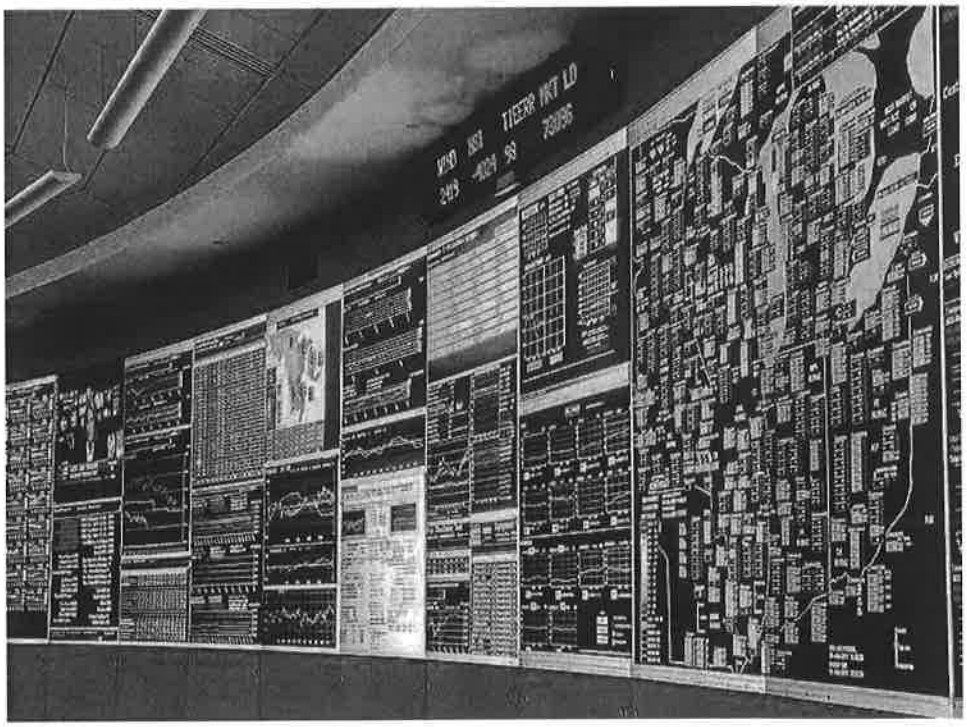


MISO by-the-numbers	
High Voltage Transmission	65,800 miles
Generation Capacity	174,000 MW
Peak Summer System Demand (07-20-11)	127,125 MW
Customers Served	42 million



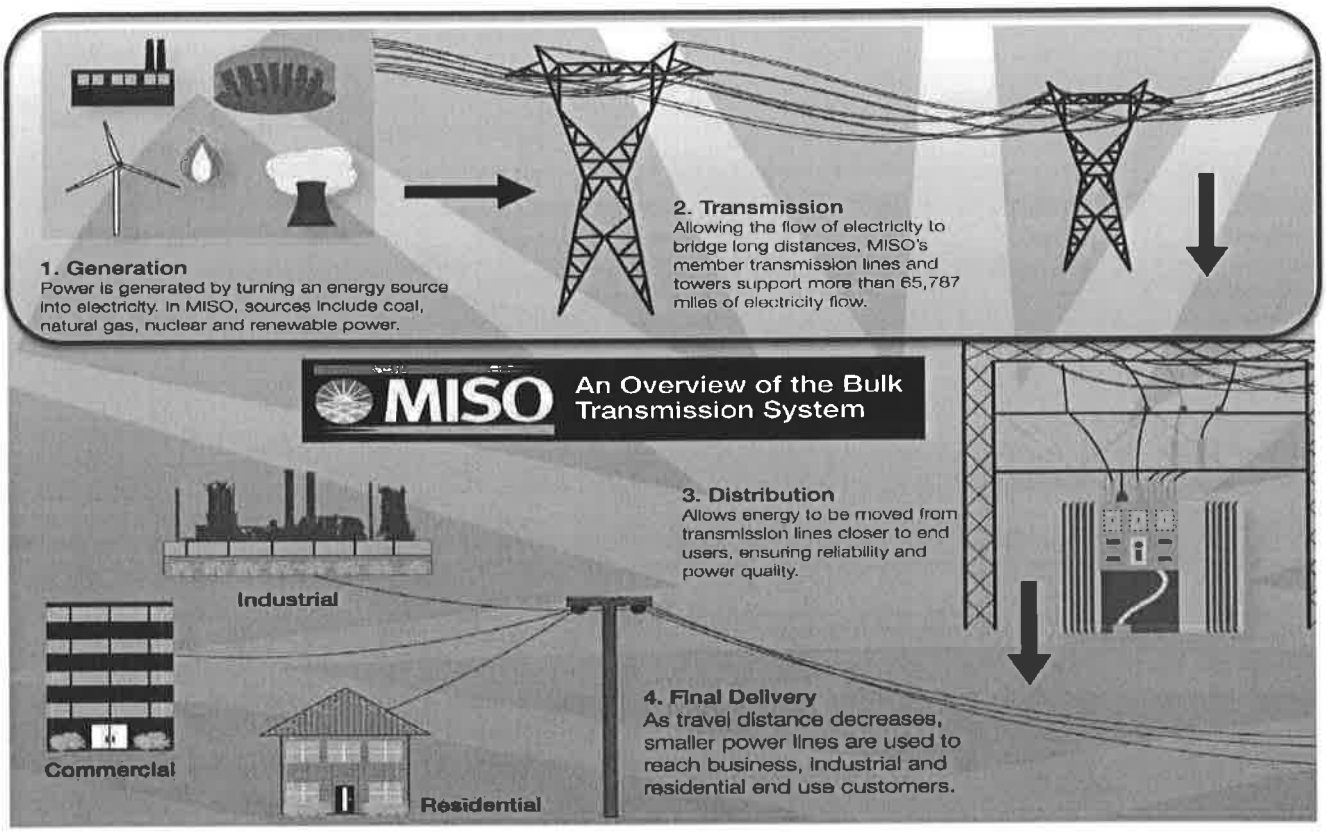
MISO's Key Functions

1. **Keeping the Lights On:** Safe and reliable operation of the electric grid
2. **Operating Open Energy Markets:** Scheduling and economic dispatch of generation to support reliability and efficiencies across the system
3. **Performing Transmission Planning:** Comprehensive expansion planning that meets reliability needs, policy needs, and economic needs



MISO

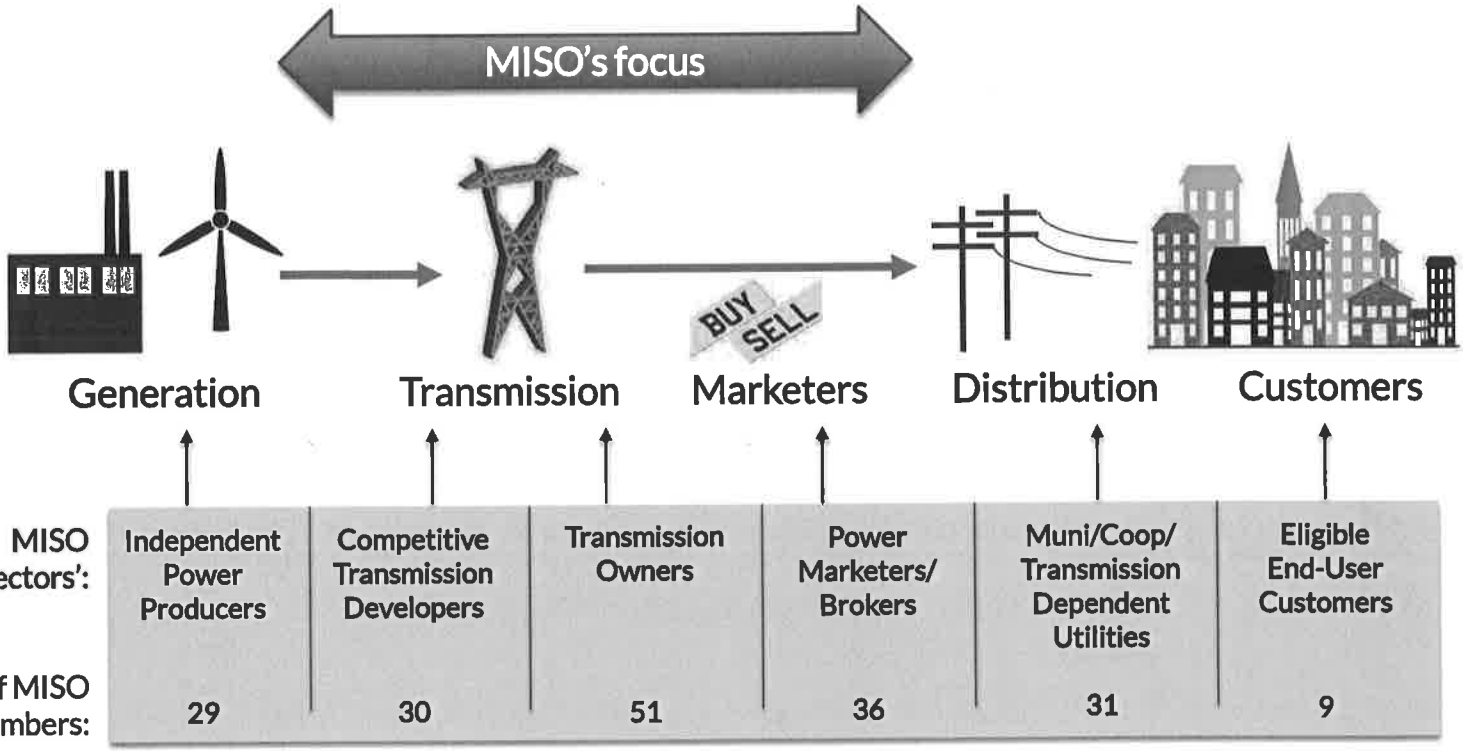
MISO doesn't own any physical assets, we manage flows on the transmission system by directing generator usage



MISO

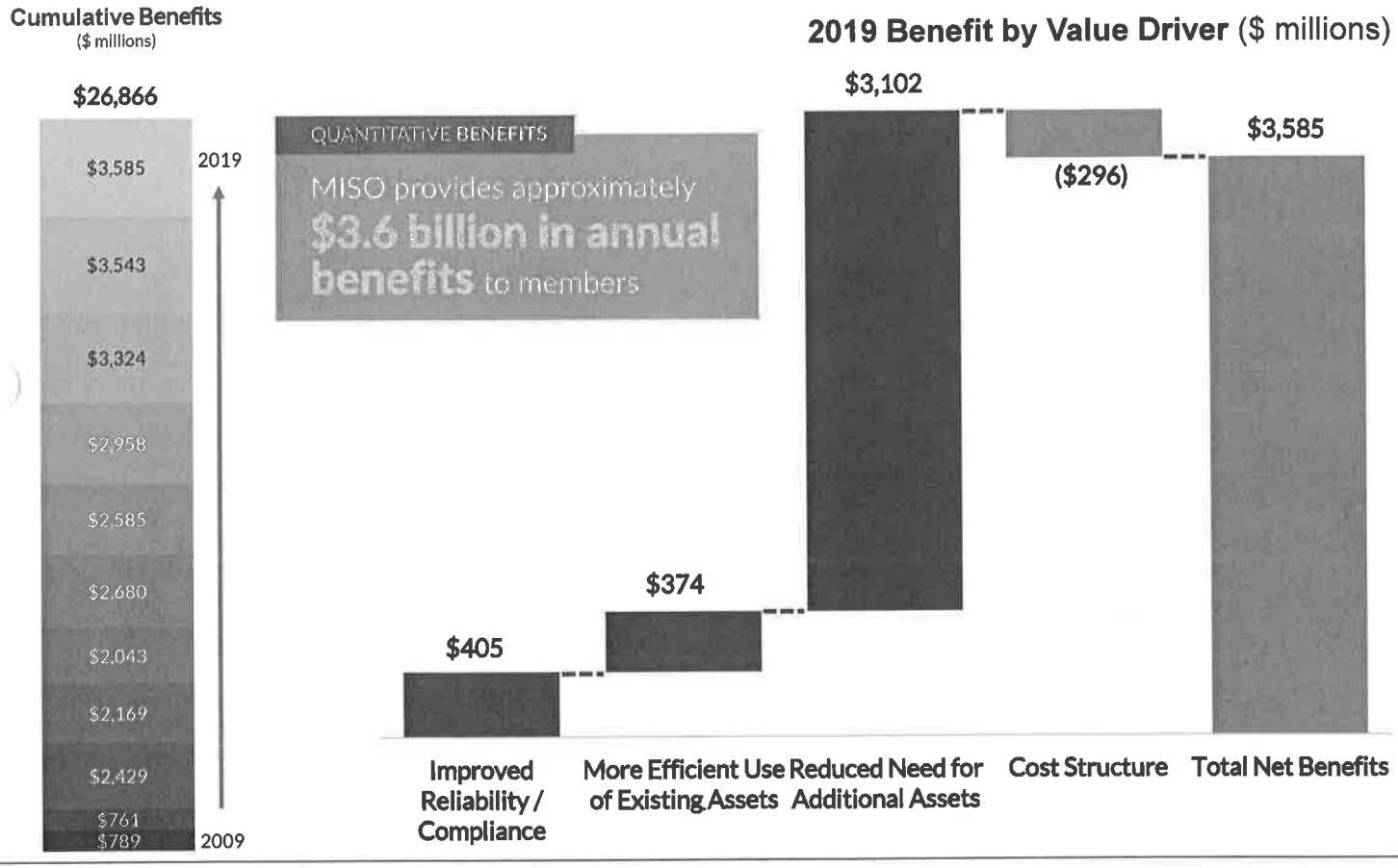
JSC - 000137

MISO members participate across the electricity value chain



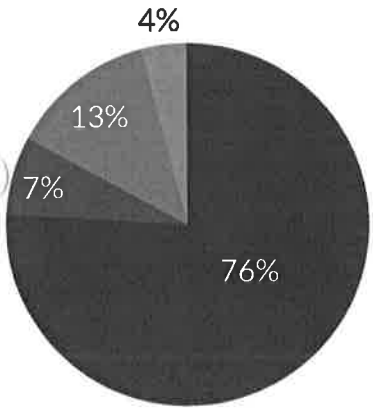
MISO

Since 2009, MISO has estimated over $26 billion in membership benefits

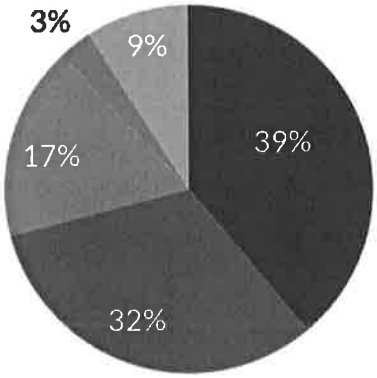


MISO will continue to support the evolution of resources on the bulk electric grid

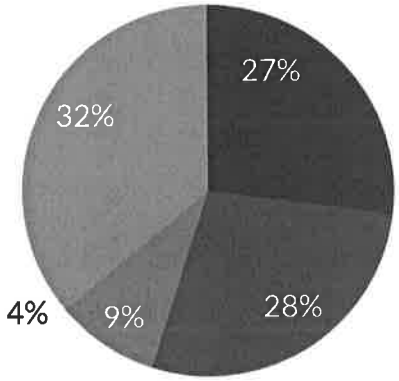
2005 Generation Mix (% MWH)



2019 Generation Mix (% MWH)



2030 Generation Mix (% MWH)[1]



Renewables | Other | Nuclear | Gas | Coal

[1]The 2030 projection compiled from Integrated Resource Plans , investor reports and other sources. Figures represent energy generated by fuel type, distinguished from capacity.

MISO

Part II: MLGW Membership Assessment

MISO

Siemens provided a list of study objectives and requested MISO's independent review

- Resource Adequacy:
  - Is the capacity expansion plan sufficient to join MISO Local Resource Zone (LRZ) 8 or to be a standalone Local Resource Zone?
  - What is the impact to the MISO Planning Reserve Margin (PRM)?
  - Is there adequate capacity for MLGW to purchase starting in 2025?
- Transmission Interconnection:
  - Is the transmission expansion proposal a reliable solution?
  - What is the MLGW import capability?
  - What is MISO's estimate of the costs for transmission expansion, reliability upgrades, and generator interconnections?
- Market Impact:
  - How will membership affect its Adjusted Production Costs (APC)?
  - What are the impacts to MISO's regional congestion patterns?
- MISO Cost:
  - What are the annual costs to MLGW of MISO membership?

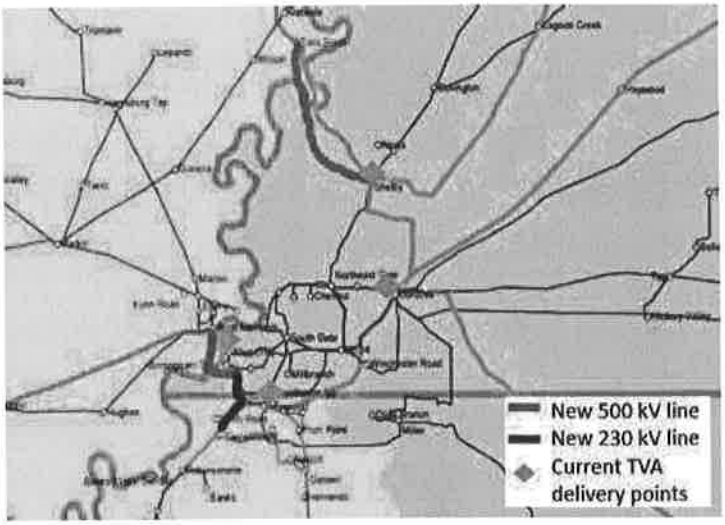
MISO performed its assessment for MLGW based on the following capacity and transmission expansion plan

Base Capacity Expansion Plan

MW	Gas CT	Gas CC	MLGW Solar	Arkansas Solar	Arkansas Wind
2025	237	1,350	600	500	200
2026	0	0	400	0	0
2027	0	0	0	0	0
2028	0	0	0	0	50
2029	0	0	0	0	50
2030	0	0	0	150	0
2031	0	0	0	50	0
2032	0	0	0	0	50
2033	0	0	0	50	0
2034	0	0	0	300	0
2035	0	0	0	0	0
2036	0	0	0	50	0

Transmission Expansion Plan

- 500 kV line from San Souci – Shelby
- 500 kV line from West Memphis – New Allen
- 230 kV line from Twinkletown – New Allen



MISO

The MLGW membership analysis resulted in the following takeaways

RESOURCE ADEQUACY ASSESSMENT

- Siemens' proposal provides MLGW with adequate resources to join MISO Local Resource Zone (LRZ) 8 or to be its own standalone zone
- If MLGW were to join MISO it would lower the Installed Capacity (ICAP) Planning Reserve Margin (PRM) from 18.2% to 17.9%
- MISO is unable to provide direction on how much excess capacity would be available for purchase

TRANSMISSION INTERCONNECTION ASSESSMENT / COST

- MISO validated the physical transmission import capability up to 2,400 MW during 2024 summer peak conditions
- MISO's estimated the transmission expansion, reliability upgrades, and interconnection costs to be $736.2M vs. $728.2M by Siemens[2]

MARKET IMPACT ASSESSMENT

- MLGW could realize annual production cost savings of $92.6 million in 2024 to as much as $268.6 million in 2034 (note: these totals do not account for fixed costs)
- Projections show MLGW self supplying 50% of its energy needs in 2024 and increasing over time
- No significant changes to congestion patterns were observed

MISO ADMINISTRATIVE COST RECOVERY FEES

- Based on a projection of MISO's annual operating expenses MLGW's share of MISO's costs would be approximately $6 million annually
- As a MISO member MLGW would be charged a portion of FERC's annual budget. This cost is estimated at an additional $730,000 per year.

[2]The Siemens cost estimate is adjusted to match MISO's assumptions regarding contingencies and inflation.

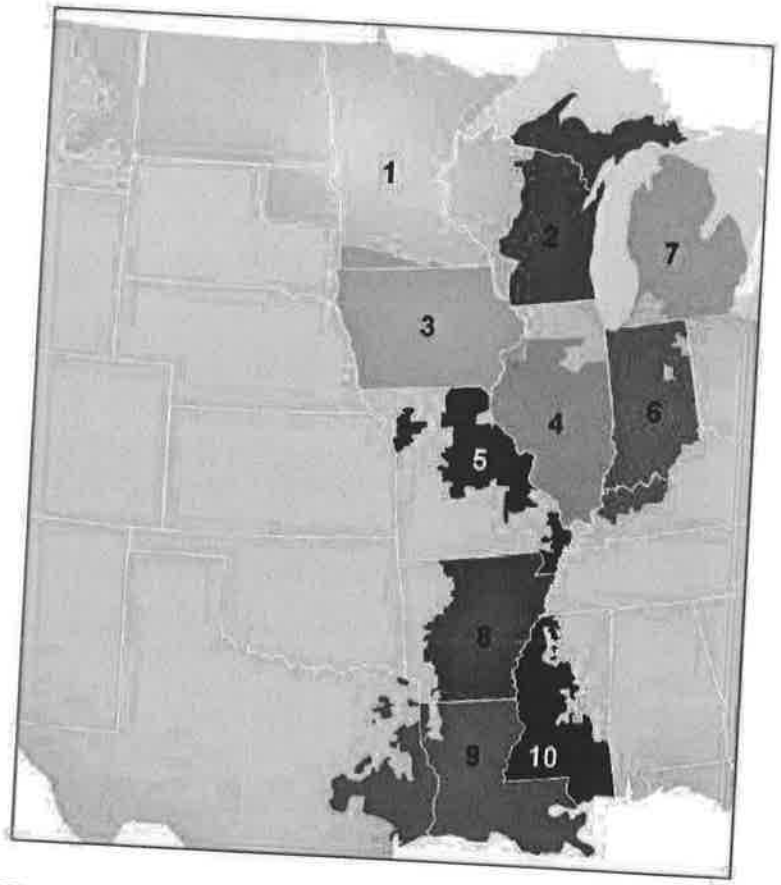
MLGW has requested that MISO evaluate an additional option which includes no local generating resources

- MISO will be analyzing the same variables that were reviewed under the previous capacity/transmission expansion plan
  - Resource Adequacy
  - Transmission Interconnection Reliability
  - Transmission Interconnection Cost
  - Market Impacts
- MISO has committed to delivering the results of its analysis prior to MLGW's Integrated Resource Plan (IRP) being finalized in early July

Appendix

MISO Local Resource Zone (LRZ) Map

- MISO's footprint is divided into ten Local Resource Zones (LRZs)
- MISO developed LRZs to reflect the need for an adequate amount of planning resources to be located in the right physical locations within the MISO Region
- The geographic boundaries of the LRZs are based on multiple criteria



MISO

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Strategies / Scenarios / Portfolio Analyzed

Key Issue: Portfolio Expansion Strategies

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- The **Strategies**, representing the available options to MLGW to supply its load, are combined with **Scenarios** (i.e. future states of the world) and using a structured approach to identify Portfolios.
- Multiple Strategies were assessed:
  - Strategy 1: Full Requirements Contract with TVA
  - Strategy 2: Self-Supply (found to be impractical)
  - Strategy 3: MLGW-MISO combination with restricted transmission access ("No Deal" Case)
  - Strategy 4: All MISO
- Multiple Scenarios were developed for Strategy 3
- A least cost generation and transmission plan was developed for each Strategy/Scenario combination

Scenarios / Portfolios		Strategy		
		Strategy 1 (TVA)	Strategy 3 Self + MISO	Strategy 4 All MISO
State of the World	Scenario 1 Reference	S1S1	S3S1	S4S1
	Scenario 2 (High Load)		S3S2	
	Scenario 3 (Low Load)		S3S3	
	Scenario 4 (High Load/Low Gas)		S3S4	
	Scenario 5 (High Transmission)		S3S5	
	Scenario 6 (Promote BESS)		S3S6	
	Scenario 7 (Low Load/High Gas)		S3S7	

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Summary of the Selection of 11 Portfolios

Portfolio ID	Final Portfolio	Load	Gas Price	Total Thermal 2039	Local Renew 2039	Battery 2039	Total Local Nameplate 2039	MISO Renew 2039	MISO Cap 2039	950 MW CC	450 MW CC	237 MW CT	343 MW CT
S3S1	No	Base	Base	1137	1000	0	2137	2200	1761	0	2	1	0
S3S1_P	Portfolio 1	Base	Base	1137	1000	0	2137	2200	1761	0	2	1	0
S3S7_BB	Portfolio 6	Base	Base	1137	1000	0	2137	2200	1761	0	2	1	0
S3S1_2CT	Portfolio 7	Base	Base	1374	1000	0	2374	2200	1550	0	2	2	0
S3S7_2CT	Portfolio 8	Base	Base	1374	1000	0	2374	2200	1550	0	2	2	0
S3S1_M	No	Base	Base	1930	650	0	2580	1050	1342	0	3	1	1
S3S1_MP	No	Base	Base	1587	750	0	2337	1800	1487	0	3	1	0
S3S1_F	Portfolio 2	Base	Base	1587	1000	0	2587	1550	1487	0	3	1	0
1_A	No	Base	Base	1587	1000	0	2587	1150	1554	0	3	1	0
/S2	No	High	Base	1824	1000	0	2824	1350	1746	0	3	2	0
S3S2_BB	Portfolio 3	Base	Base	1824	1000	0	2824	1350	1308	0	3	2	0
S3S3	No	Low	Base	1350	1000	0	2350	1550	1655	0	3	0	0
S3S3_BB	Portfolio 4	Base	Base	1350	1000	0	2350	1550	1697	0	3	0	0
S3S4	No	High	Low	1824	1000	25	2849	700	1849	0	3	2	0
S3S5	Portfolio 5	Base	Base	1398	1000	100	2498	3450	1183	0	1	4	0
S3S5_YD	Portfolio 9	Base	Base	1398	1000	100	2498	3450	1186	0	1	4	0
S3S6_N	No	Base	Base	900	1000	475	2375	2200	1505	0	2	0	0
S3S6	No	Base	Base	900	1000	475	2375	2200	1505	0	2	0	0
S3S7	No	Low	High	1137	1000	0	2137	2200	1718	0	2	1	0
S3S8	No	Base	Base	0	1000	0	1000	4850	2248	0	0	0	0
S3S10	Portfolio 10	Base	Base	950	1000	0	1950	2250	1909	1	0	0	0
S4S1	Portfolio All MISO	Base	Base	950	0	0	0	3200	1909	1	0	0	0

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Recognizing that cost was not the sole basis for selecting Portfolios. The determination of the final Portfolios is a two-step process:

- First: a base capacity expansion is produced using the Long Term Capacity Expansion (LTCE) module of the optimization software (AURORA).
- Next: Expert judgement is used to adjust the initial expansion plan and the AURORA LTCE was re-run with these adjustments in place, resulting in a unique Portfolio that is better suited to manage risks, such as reduced dependence on remote resources.

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Metrics

Objectives and Metrics Used in The Evaluation Of Alternative Portfolios

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OBJECTIVES	METRICS
Reliability	Meets or exceeds NERC reliability requirements and manages intermittency. All Portfolios meet the minimum levels of NERC thus the metric is designed to measure the ratio of Capacity Import Limit (CIL) + Generation Unforced Capacity (UCAP) to Peak Load. ***Higher the better.***
Least cost (Affordability)	NPV of revenue requirements: this includes all costs in addition to the generation capital and operating costs, i.e. transmission, MISO Membership, TVA benefits, PILOT, etc. ***Lower the better.***
Price Risk (Minimization/Stability)	Measured as: a) 95% (worst) outcome and b) Regret: i.e. the level by which MLGW would regret having chosen a Portfolio in case of an adverse future. ***Lower worst outcome and Minimum or No Regret is the goal.***
Sustainability	Measured as a) Carbon (proxy for total emissions), b) water consumption and c) percentage of the energy coming from renewable resources (nuclear and large hydro excluded). ***On a & b lower the better , c higher the better.***
Market Risk	Energy Market Purchases or Sales as a percentage of load; Amount of Capacity Purchases. ***Lower the better.***
Economic Growth	Capital Expenditures in Shelby County and number of plants as a proxy. ***Higher the better.***
Resiliency	Amount of load shed during extreme events. ***Lower the better.***

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Input Assumptions

Memphis Stochastic Load

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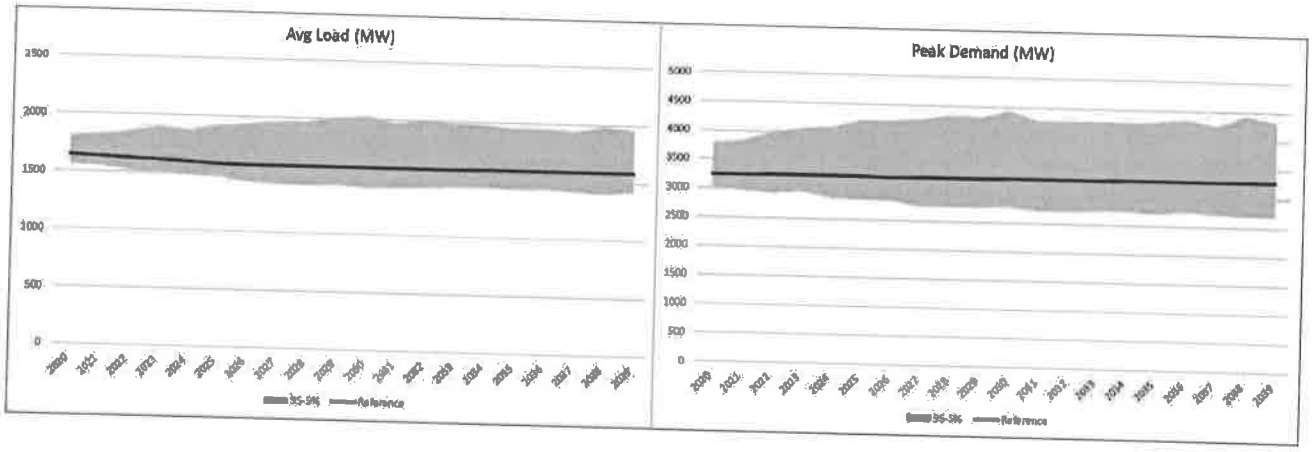

The overall distribution shows considerable uncertainty for future average load growth exceeding the reference case, and less uncertainty for future average load growth trending below the reference case.

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Natural Gas Price Outlook Cost Components: Henry Hub + Market Gas Hub Index + Transport Tariff

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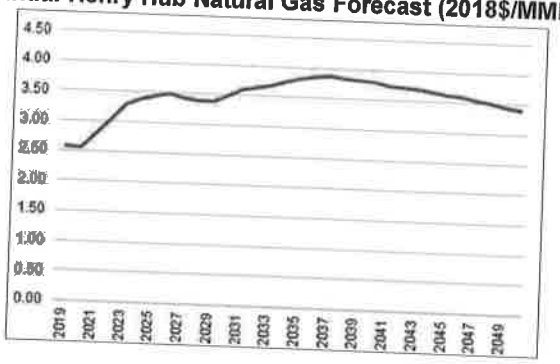
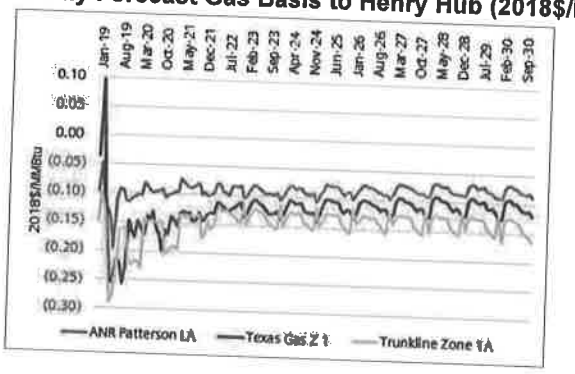
Annual Henry Hub Natural Gas Forecast (2018$/MMBtu)



Monthly Forecast Gas Basis to Henry Hub (2018$/MMBtu)



- The average of Trunkline Zone 1A and Texas Gas Z1 was used as the gas basis for gas plants built in MLGW territory.
- Trunkline firm transportation rate of $0.3811/MMBtu was used for combined cycles and interruptible transportation rate of $0.3212/MMBtu was used for gas peaker.

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Stochastic Inputs – Gas Prices

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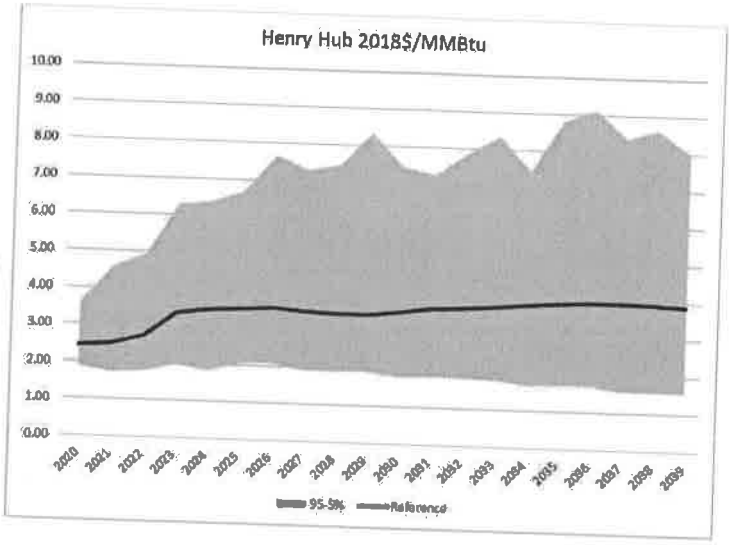

- Siemens has developed stochastics around the price at the Henry Hub based on historical volatility, current market forwards, and a long-term term fundamental view that considers the expected supply-demand balance.
- The 95th percentile probability bands are driven by increased gas demand (most likely due to coal retirements) and fracking regulations that raise the cost of producing gas.
- Prices in the 5th percentile are driven by significant renewable development that keeps gas plant utilization down as well as little to no environmental legislation around power plant emissions.

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Stochastic Inputs – Coal Prices

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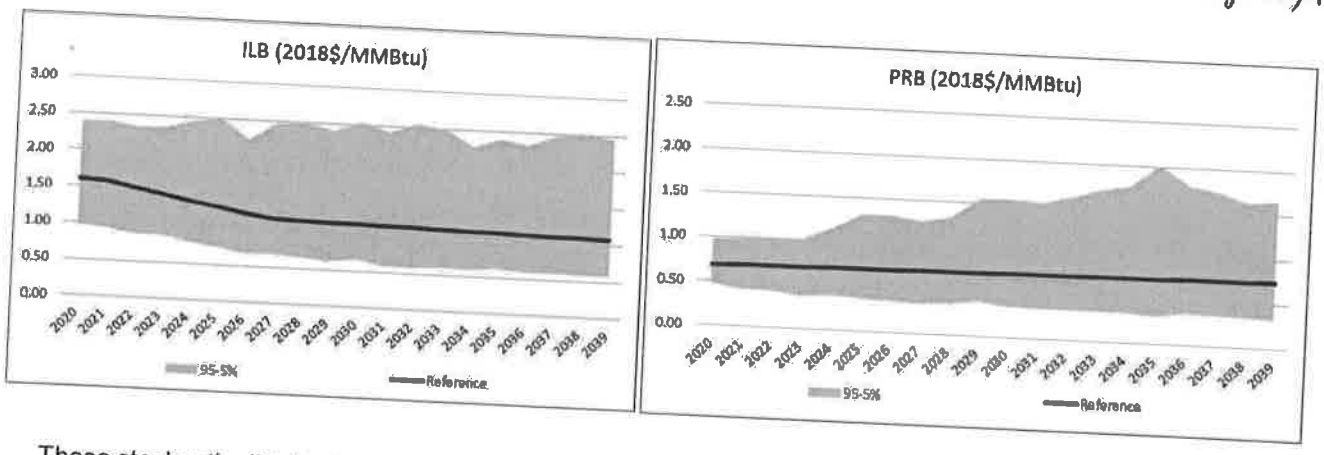

These stochastic distributions are based on a reference case view of coal prices with probability bands developed based on a combination of historical volatility and mean reversion parameters.

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Technology Options – Capital Costs

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Technology	Advanced 2x1 CCGT	Conventional 1x1 CCGT, Duct Fired	Simple Cycle Advanced Frame CT	Simple Cycle Conventional Frame 7FA CT	Simple Cycle Aero CT	Coal With 30% CCS	Utility Solar PV - Tracking	Onshore Wind	Lithium Ion Batteries (4 hrs.)	Nuclear SMR
Fuel	Nat. Gas.	Nat. Gas.	Nat. Gas.	Nat. Gas.	Nat. Gas.	Coal	Sun	Wind	Elec. Grid	Uranium
Construction Time (Yrs.)	3	3	2	2	2	5	1	2	<1	7
Size (MW)	950	361 (Base) 89 (DF)	343	237	50	600	50	100	5 MW / 20 MWh	50-1,200
Average Heat Rate (Btu/kWh), HHV	6,536	7,011 (Base) 8,380 (Incr. DF)	8,704	9,928	9,013	9,750	N/A	N/A	N/A	N/A
VOM (2018$/MWh)	1.81	2.49	7.13	5.05	6.50	7.14	0.00	0.92	1.39	14.79
FOM (2018$/kW-yr)	15.90	17.41	9.53	4.39	15.70	73.45	20.70	36.56	32.21	165.42
Range of Capital Cost (2018$/kW)	947-874	1084-1003	711-652	626-578	1136-1041	6135-5027	1245-702	1636-1399	1534-693	9539-5365
Range of LCOE (2018$/MWh)	35-51	42-58	95-112	88-110	140-155	98-101	38-29	37-28	151-84	124-86

- The technologies in red boxes were selected for Self-Supply + MISO Portfolios.
- Local solar has important advantages as it is closer to the load, behind the transmission constraints, and has lower transmission costs. Due to land availability, only 1000 MW was allowed to be built in Shelby County.
- Advanced 2x1 CCGT was removed from being built locally as an option due to reliability considerations; but remains a candidate for All-MISO Strategy.

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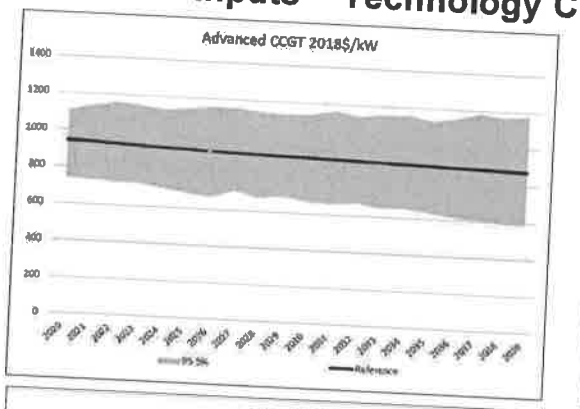
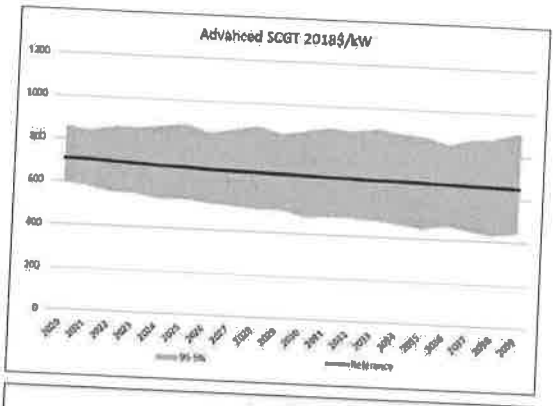
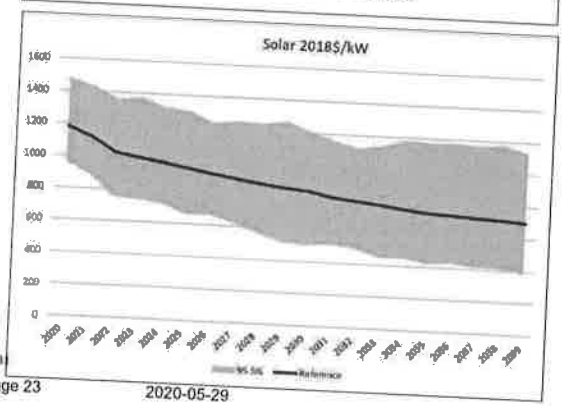
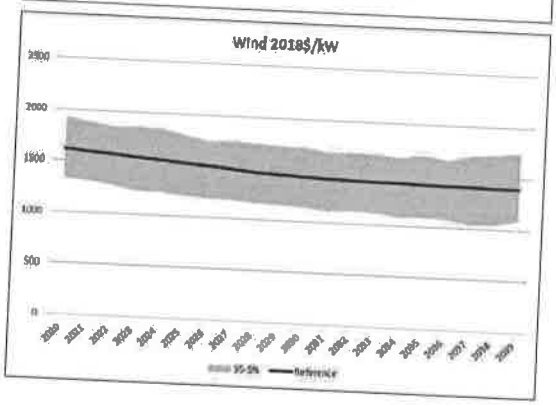
Stochastic Inputs – Technology Costs









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Sustainability / Environmental Considerations

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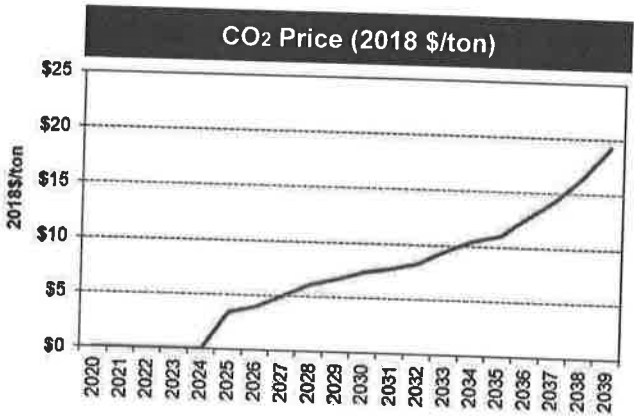
- Renewable standard was imposed at a minimal level. However, because renewable technologies were found to be an economic option, most portfolios included 50% or more renewable generation.
- A moderate federal price on carbon emissions was included in the Reference Case starting in 2025.
- Emission allowance price costs were included for existing market for SO_2 and NO_x.
- Permitting for new generation facilities was not conducted as a part of the IRP.
- High level assessment suggests that water access and air permits would be feasible for any large new gas generation facility in Shelby County.



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Stochastic Inputs – CO_2 Prices

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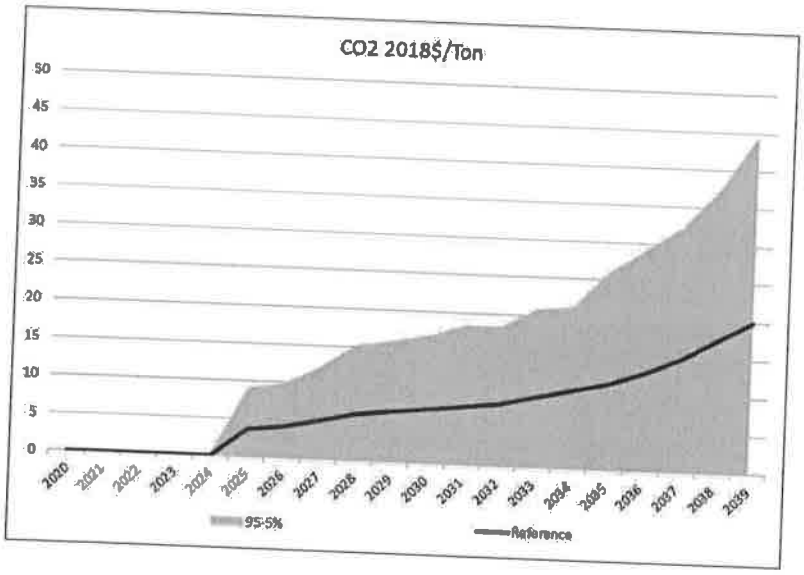

- Siemens developed uncertainty distributions around carbon compliance costs based on "expert-opinion" based projections, when the historical data is not available. The top end reflects estimates of the social cost of carbon.
- The distribution of carbon prices were used in the power dispatch modeling to capture the inherent risk associated with regulatory compliance requirements.

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Stochastic Inputs – Market Forecast

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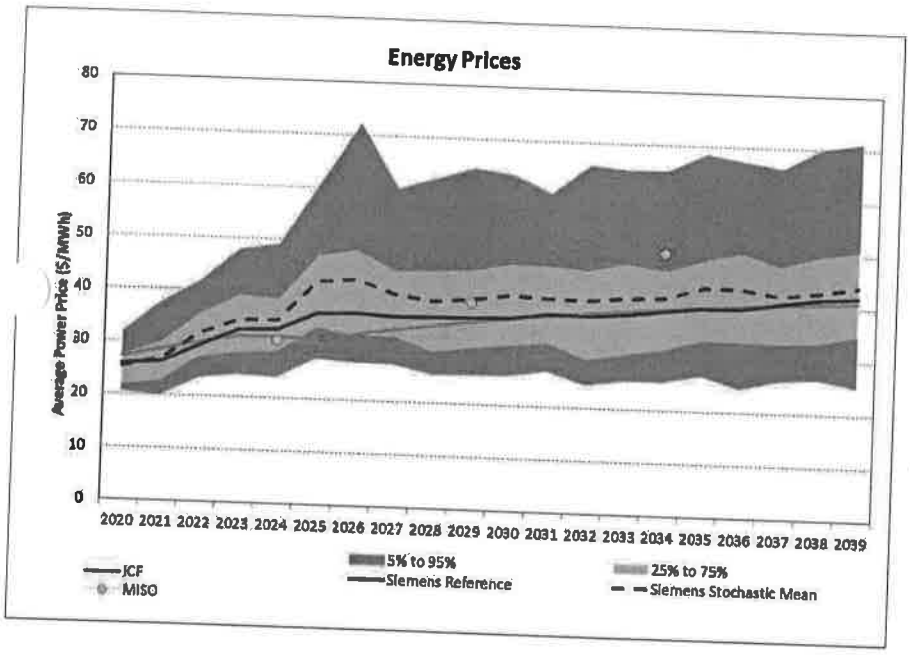

- Siemens also produces a range of views on how energy prices will change over the planning horizon.
- These are based on our forecast of future expansions.
- AURORA is used with all the input distributions to calculate energy prices.
- ICF and MISO forecasts are well within the bands of uncertainty evaluated. MISO is lower in the near term and higher in the long term.

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Resource Adequacy
All Portfolios Must Meet MISO Resource Adequacy

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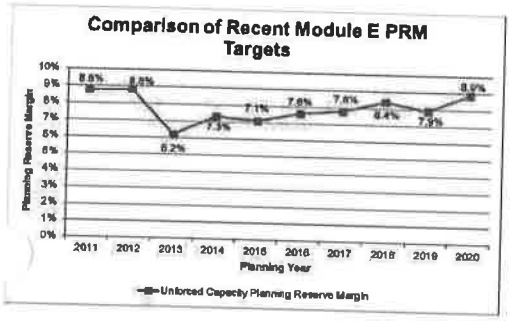

- MISO is planned so that there are enough reserves to ensure that the loss of load expectation (LOLE) is less than one day in 10 years
- Current requirement is 8.9% of Unforced Capacity (UCAP) or 18.2% considering the Installed Capacity (ICAP)
- To plan for this MISO is divided into 10 Local Resource Zones (LRZ)
- Each LRZ must have enough Local Resources so that with the ability to import resources from the rest of MISO (Capacity Import Limit – CIL) it meets the zone's criteria of 1 in 10. This is called the Local Reliability Requirement (LRR)
  - If MLGW were a new LRZ it would have a **LRR** of about 126%
  - If MLGW is part of LRZ-8 Arkansas this drops to about 120.6%
- Each LRZ must have internal resources so that it meets the larger of:
  a. MISO Planning Reserve Margin (PRM) of 8.9% (108.9% of peak load)
  b. The Local Clearing Requirement; which is the amount of internal generation (UCAP) that when added to the ability to import from MISO to meet the **LRR**
- All Portfolios that have internal generation were designed to meet:

UCAP + CIL >= 126% of Peak Load

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Transmission – The Proposed Plan and Analysis Performed

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- Transmission was planned under the assumption that TVA will not provide wheeling to MLGW for use of its transmission system, aka "No Deal"
- Strong interconnections must be established between MLGW and MISO if MLGW were to join MISO. This applies to Strategies 3 & 4.
- Baseline transmission interconnections consist of:
  1. New San Souci-MISO to Shelby-MLGW 500 kV line, 26 miles
  2. West Memphis-MISO to New Allen-MLGW 500 kV line, 8.5 miles
  3. Twinkletown-MISO to New Allen-MLGW 230 kV line, 8 miles
- Based on the LTCE plans and proposed transmission configurations, Siemens performed:
  - Steady state contingency analysis, using NERC TPL reliability standards confirming all system reliable, and identified local upgrades
  - Transfer analysis, determined import capabilities from 2579 MW to 3690 MW depending on the requirement by the Portfolio
  - Stability analysis, demonstrated system stable against critical faults
  - Economic nodal production cost analysis, showed no expected system congestion
- Maximum transmission option adds 4th interconnection line: Dell-MISO to Shelby-MLGW 500 kV, 44 miles, required for All MISO Strategy.

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Transmission – The Numbers

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- Total capital costs for baseline configurations ~$700 M (with contingency) in 2018 $ or $2.1/MWh NPV 2025-2039:
  - Transmission expansions, $376 M
  - Local 161 kV reinforcements, $184 M
  - Generator Interconnections, $88 M
  - Reimbursements to TVA for Allen CCGT reconnection and reliability upgrades, $47 M
- Maximum transmission option (for All MISO Strategy), adds ~$407 M for a total of $1,014 M, or $3.1/MWh NPV 2025-2039.
- Cost of transmission O&M for new facilities, 2.5% of capital cost, ~$9.4M/year, or $0.7/MWh for base plan and increased to $0.9/MWh for max transmission plan.
- Capital cost varies based on the import requirement of each Portfolio

The transmission configurations, reliability performance, transfer capability, and cost estimation were all independently reviewed by MISO

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Other Costs – Integral part of the total revenue requirement

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- Payment in Lieu of Taxes (PILOT)
  - MLGW assumes full responsibility of state and local PILOT
    - State PILOT assumes 5% of the wholesale power cost, ranging $2.3/MWh to $2.6/MWh, or avg. $33 M /year, depending on the NPVRR of the Portfolio
    - Local PILOT ranges $1.4/MWh to $2.3/MWh depending on the total transmission investments
- TVA Service and Benefits Replacements
  - TVA has been providing social and economic benefits to Memphis area
  - MLGW is expected to continue those benefits and spend $13 to $15 million per year, or $1/MWh on the NPV basis.
- MISO Membership Cost
  - MLGW would be responsible for MISO membership fee and annual cost shares at about $6.7 million per year or $0.45/MWh on the NPV basis.
- Energy Efficiency Programs
  - MLGW is assumed to implement system wide energy efficiency programs to achieve 0.5% penetration at a cost of ~$ 7 million per year or $0.64/MWh on the NPV basis.

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Gap Analysis

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Local Balancing Area Costs	
Fixed Capital Cost (2020 $M)-LBA	
AGC to MLGW controlled units	$0.8
Data communications to generators and LBA service provider	$1.2
Control center facility upgrade	$1.0
Real-time contingency and reliability analysis	$0.8
CIP compliance upgrade	$0.8
TOTAL	$4.6
Annual O&M Cost (2020 $M, with annual escalator)-LBA	
Annual LBA service vendor	$0.8
LBA service technical support at MLGW	$0.4
Expanded CIP Scope	$0.2
Staff (+3) and training	$0.8
Additional communications maintenance and fees	$0.4
Additional control center systems maintenance	$0.4
TOTAL	$3.0

- Siemens reviewed MLGW's existing capabilities and assessed the gaps for enabling MLGW to perform required planning and operating functions as a MISO LBA.
- The Gap Analysis referenced NERC reliability standards assigned to Balancing Authorities (BAs), and examined NERC's operations readiness (BA Certification) document. Additionally, the review included an analysis of the MISO Operating Agreement, last amended in January 2019.
- The total cost is about $0.5/MWh on NPV 2025-2039.

Gap Cost - Other	YR 1	YR 2	YR 3	YR 4	YR 5	YR 6	YR 7	YR 8	YR 9	YR 10	Steady State-->
Resource and Transmission Planning, Studies and Procurement	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Resource Planning Staff	1	2	2	2	2	2	2	2	2	2	2
Transmission Planning and Interconnection Study Staff	1	2	2	2	2	2	2	2	2	2	2
Procurement Staff	1	2	2	2	2	2	2	2	1	1	1
Total Staff	3	6	6	6	6	6	6	6	5	5	5
Staffing Costs $266,000/FTE including salary, benefits, rent, facilities	$0.8	$1.6	$1.6	$1.6	$1.6	$1.6	$1.6	$1.6	$1.3	$1.3	$1.3
Contractor & Consulting Costs, G&T MLGW	$0.5	$0.8	$1.0	$1.0	$1.0	$1.0	$1.0	$0.5	$0.5	$0.3	$0.3
Total Cost	$1.3	$2.4	$2.6	$2.6	$2.6	$2.6	$2.6	$2.1	$1.8	$1.6	$1.6

*All staff are in addition to existing staff
*costs start 2021

*All Costs in Million

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Analyses of Portfolios

Balanced Scorecard: Portfolios 9 and 10 of Strategy 3 Perform Best Across All Metrics

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Objective	Measure	Unit	TVA (Base)	TVA (LTP)	Portfolio 5	Portfolio 9	Portfolio 10	Portfolio 6	Portfolio 8	All MISO	Portfolio 1	Portfolio 7	Portfolio 4	Portfolio 2	Portfolio 3
					1 CC + 4 CT	1 CC + 4 CT	1 CC + 0 CT	2 CC + 1 CT	2 CC + 2 CT	1 CC + 0 CT	2 CC + 1 CT	2 CC + 2 CT	3 CC + 1 CT	3 CC + 2 CT	3 CC + 0 CT
Least Cost	NPVRR 2020 - 2039	$ Millions	16,411	16,020	14,504	14,453	14,304	14,614	14,627	14,522	14,490	14,503	14,511	14,668	14,709
	Stochastic Mean NPVRR 2020 - 2039	$ millions	16,388	15,996	14,459	14,465	14,571	14,747	14,766	14,789	14,790	14,808	15,052	15,076	15,203
	Levelized Cost of Energy	$ / MWh	67.47	65.86	59.32	59.34	59.48	60.51	60.59	60.68	60.69	60.76	61.77	61.87	62.39
	NPV Savings with respect of LTP (wrt LTP) 2020 -2039	$ Millions			**1,537.4**	**1,531.7**	1,425.9	**1,249.3**	**1,230.5**	**1,207.8**	**1,206.8**	**1,188.0**	**944.7**	**920.2**	**793.0**
	Levelized Savings per Year (wrt LTP) 2025 -2039	$ Millions			**122.1**	**121.7**	113.3	**99.2**	**97.8**	**96.0**	**95.9**	**94.4**	**75.0**	**73.1**	**63.0**
	Levelized Savings per Year (wrt Base) 2025 -2039	$ Millions			**153.2**	**152.8**	144.4	**130.3**	**128.8**	**127.0**	**127.0**	**125.5**	**106.1**	**104.2**	**94.1**
Min Risk	95th Percentile Value of NPVRR	$ millions	17,221	16,830	16,576	16,517	16,993	16,946	16,944	17,211	17,051	17,074	17,648	17,535	17,844
Min Env. Risk	CO_2 Emissions Mean 20-Year	Million Tons CO_2	3.8	3.8	1.85	1.85	2.81	2.57	2.57	2.81	2.57	2.57	3.29	3.29	3.30
	Energy from Renewable Sources 2039 (RPS)	% of Energy Consumed	6.5%	6.5%	75.3%	75.3%	52.7%	54.9%	54.9%	52.7%	56.8%	56.8%	47.3%	46.1%	40.7%
	Energy from Zero Carbon Sources 2039	% of Energy Consumed	58.6%	58.6%	75.3%	75.3%	52.7%	54.9%	54.9%	52.7%	56.8%	56.8%	47.3%	46.1%	40.7%
	2025 Local Water Consumption	Million Gallon	3,103	3,103	3,961	3,782	4,899	4,782	4,789	3,103	4,788	4,795	5,645	5,551	5,607
Reliability	2025 (UCAP+CIL)/PEAK	%	133.7%	133.7%	126.0%	127.8%	148.6%	126.6%	127.2%	115.4%	126.6%	127.2%	126.7%	130.8%	137.3%
Resiliency	Max Load Shed in 2025 under Extreme Event	MW	0	0	622.4	0.0	0.0	8.4	0.0	0.0	8.4	0.0	0.0	0.0	0.0
Min Market Exp.	% Energy Purchased in Market	%	10.9%	10.9%	31.2%	31.2%	23.0%	17.4%	16.2%	16.7%	16.7%	15.6%	7.4%	7.0%	7.7%
	% Energy Sold in Market	%	8.7%	8.7%	22.6%	22.6%	17.9%	9.7%	9.7%	10.5%	10.5%	10.6%	7.6%	6.7%	5.6%
Econ. Growth	Local T&G CapEx	$ Millions			2,989	2,864	2,984	2,845	2,965	1,014	2,811	2,932	3,138	3,299	3,404

*All $ is in 2018$ unless otherwise noted.

Evaluation of Strategies 3 and 4: Portfolios 5, 6, 9 and 10 are Lowest Cost

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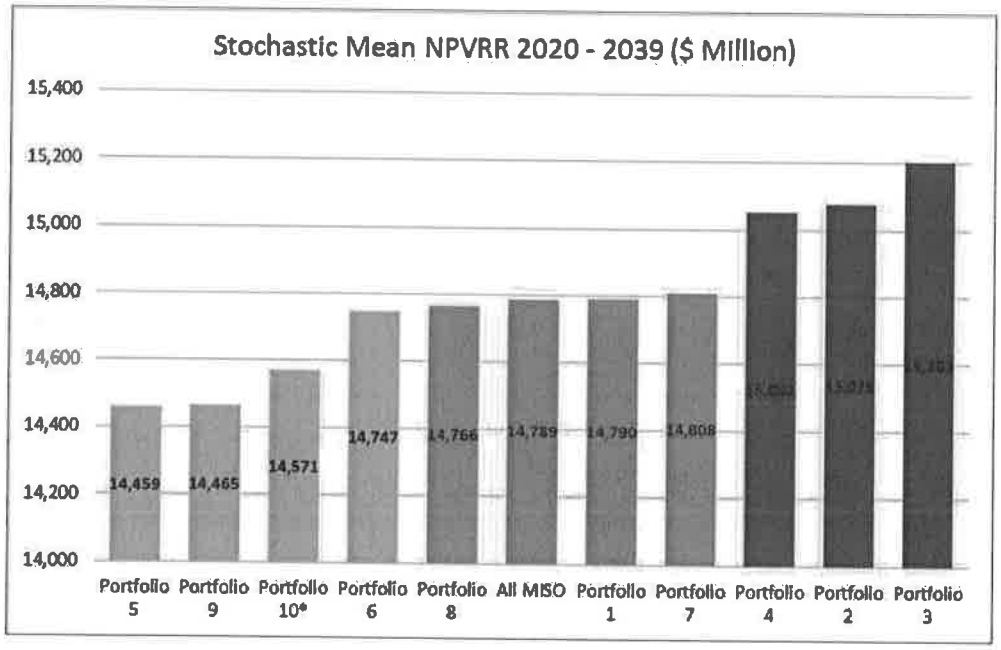

- Portfolios 5 and 9 have one 450 MW CCGT and Portfolio 10 has one 950 MW CCGT.
- Portfolio 6 has two 450 MW CCGTs.
- Other Portfolios with two CCGTs are close and Portfolio 6 is representative.
- Portfolios in blue are preferred.

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Evaluation of Strategies 3 and 4: Portfolios 5, 6, 9 and 10 are among the Lowest Risk

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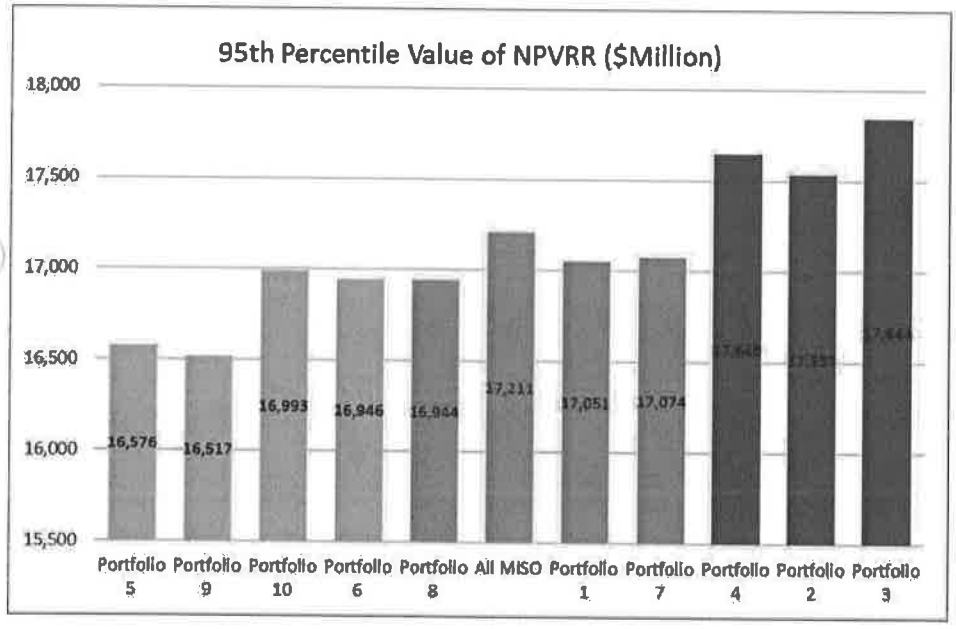

- Portfolios 10 and 6 show the higher risk among the preferred portfolios in blue.
- Risk is measured as the value that only 5% of the outcomes in the stochastic assessment was worse.

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Four Portfolios Selected for Comparison with TVA Portfolios 5, 6, 9 and 10.

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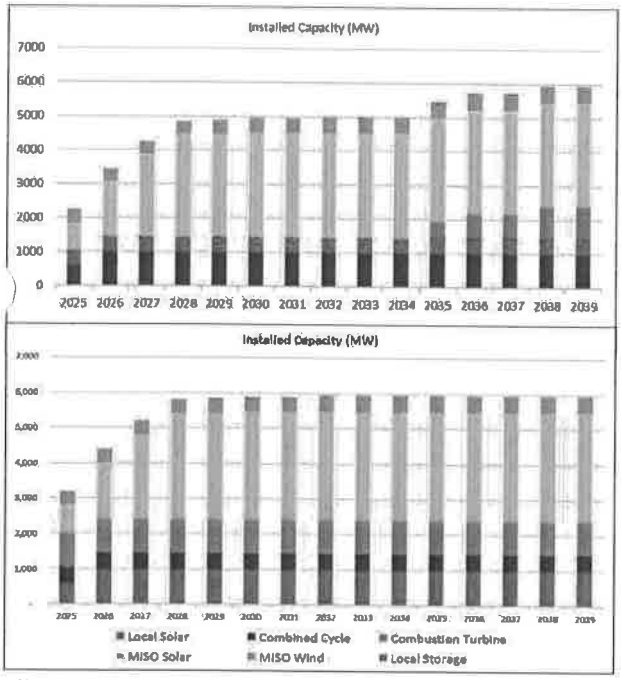

Portfolio 5

- Has the largest amount of renewable generation with 4,450 MW, most of which (4,400 MW) by 2028.
- Has one 450 MW CCGT in 2025.
- Four CTs (4x237 MW) are selected optimally as the price in MISO capacity increases.
- Requires heavy investments in transmission.

Portfolio 9

- Has the same level of renewable generation as Portfolio 5 and the CCGT.
- The four CTs are advanced to 2025 to address reliability concerns with Portfolio 5.
- Requires less investments in transmission.

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Four Portfolios Selected for Comparison with TVA Portfolios 5, 6, 9 and 10.

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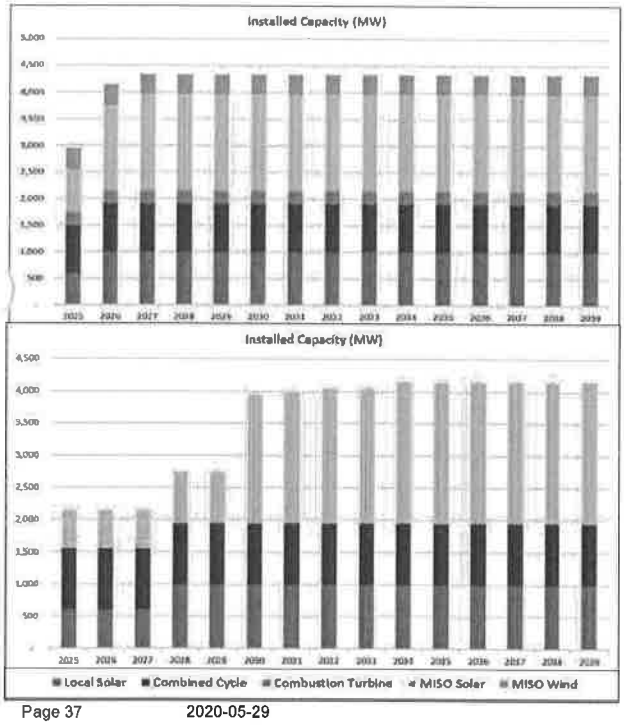

Portfolio 6

- Has 3,200 MW of renewable generation, all of which by 2027.
- Has two 450 MW CCGTs in service by 2025
- Has one CT (237 MW) by 2025
- Moderate investments in transmission

Portfolio 10

- Has 3,200 MW of renewable generation, most of which (3,000 MW) by 2030.
- Has one large 950 MW CCGT in 2025
- No CT
- Max investments in transmission to address reliability concerns due to one large CCGT

Exiting TVA Could Save MLGW $1.5 Billion over 20 Years Considering the LTP and $ 1.9 Billion with Current Contract

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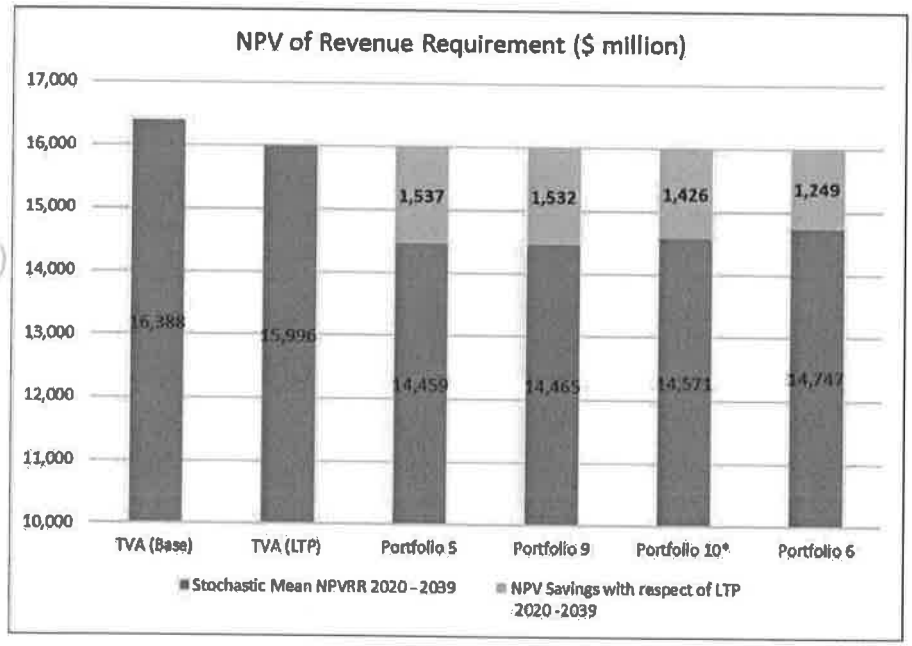

The savings are in real 2018$

- If expressed in 2020$ this would increase to $1.6 billion with respect of the LTP and $ 2.0 with respect of current contract.
- These savings are after all other costs are included.
- In nominal terms the savings add to over $ 3 billion with respect to the current contract.

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Exiting TVA could result in annual savings of about $120 million per year (2025-2039) with LTP to about $150 million per year (2025-2039) with current contract

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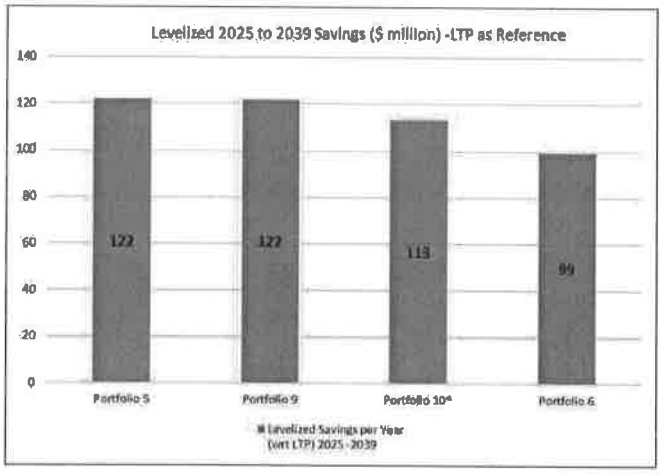

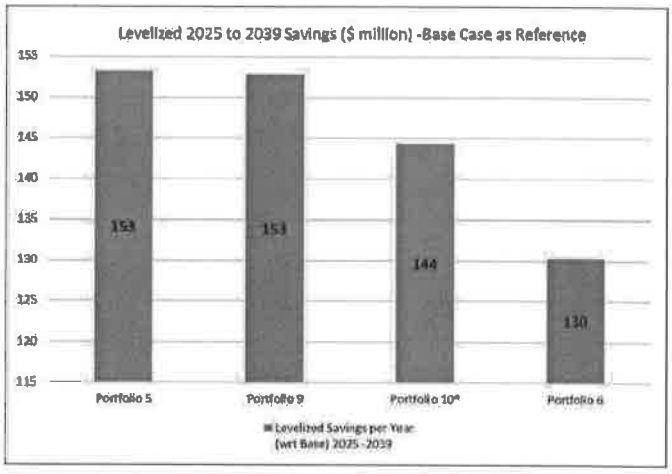

- There are potential savings of over $ 3.0 billion for the 2025 to 2039 period in nominal terms and with respect of the current contract. This averages to $ 200 million per year.

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95th % NPVRR Risk Higher with TVA than Self Supply + MISO Options

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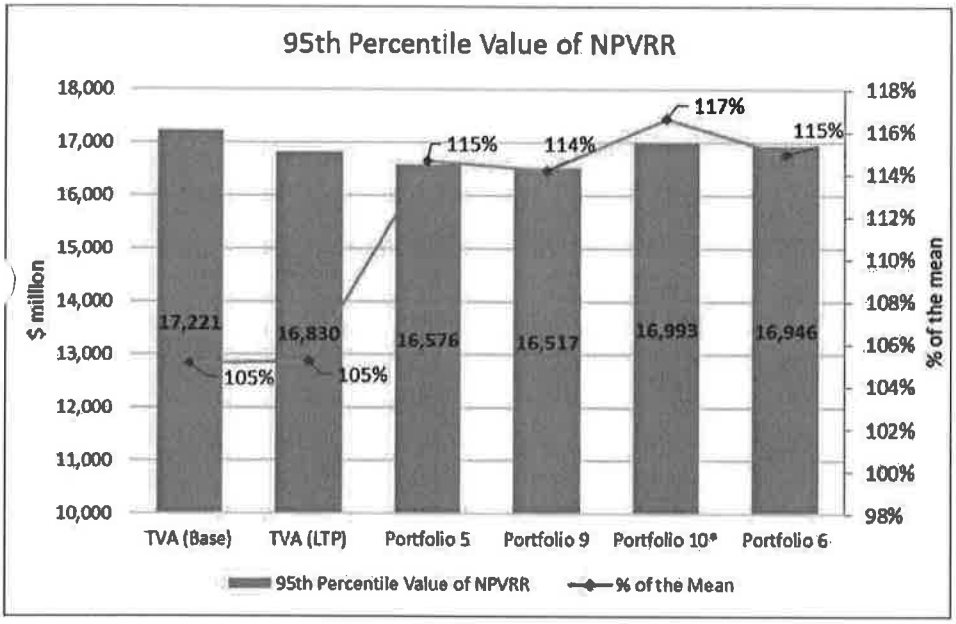

- The TVA option, given the size of the company and strong presence of nuclear and hydro that experience little or no volatility in costs, has more stable cost
- The 95th percentile of TVA portfolios is only 105% times the mean, while in other portfolios this reaches 114% to 117% times.
- Portfolios 5 & 9 are still least cost.
- It is important for MLGW to manage this volatility in costs by entering into, for example, long term fuel supply contracts.

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CO_2 Emissions from Self-Supply + MISO options are well below TVA options

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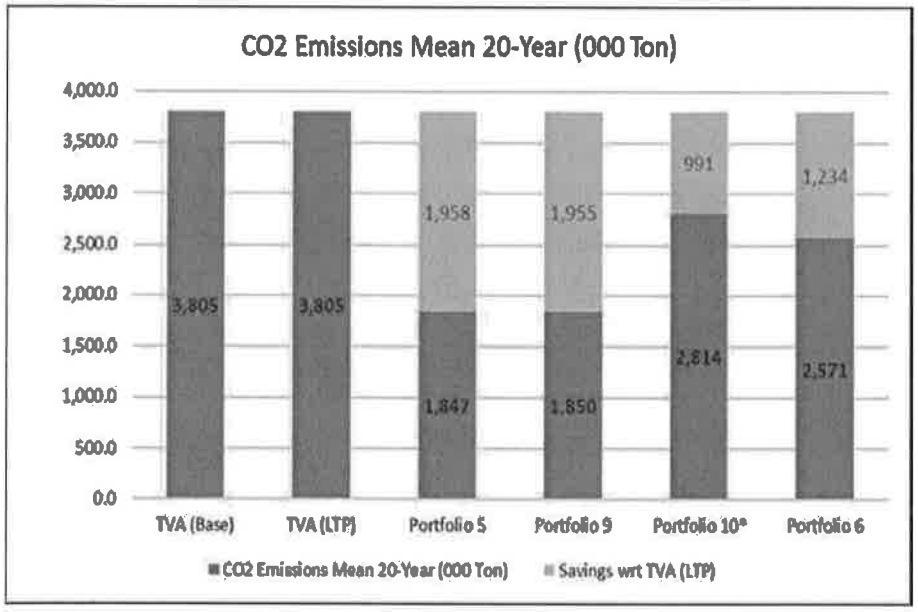

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Self-Supply + MISO Options Can Produce more Energy (Portfolios 5 and 9) from Zero Carbon Sources than TVA

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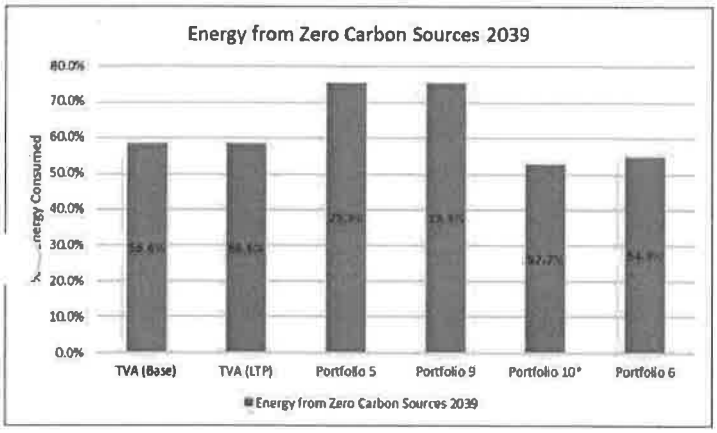

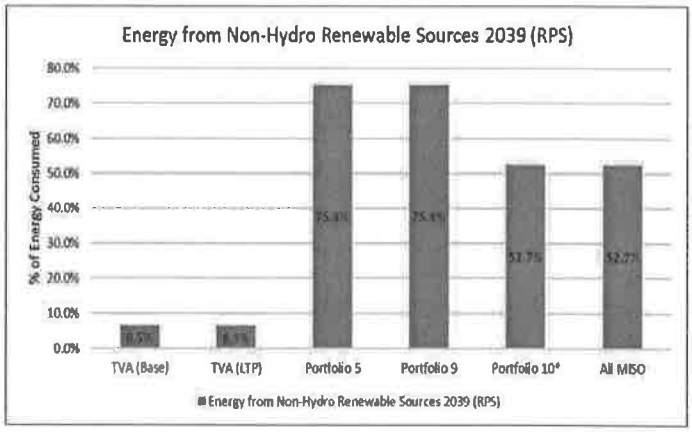

- TVA portfolio has lower renewable generation due to large hydro and nuclear being excluded.

Shelby County Water Consumption is Lowest with TVA Options

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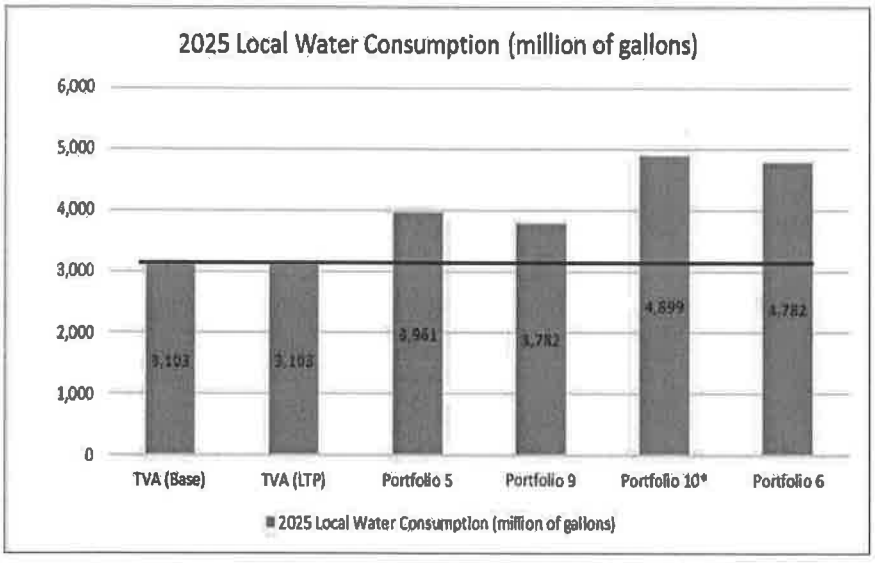

- These are the water usage for cooling thermal generation
- In case of TVA, the consumption is only by the Allen Combined Cycle
- Any other thermal generation adds to it.

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All the Portfolios Meet Minimum Reliability Requirements Portfolio 5 is Less Desirable Because of Potential Load Shedding

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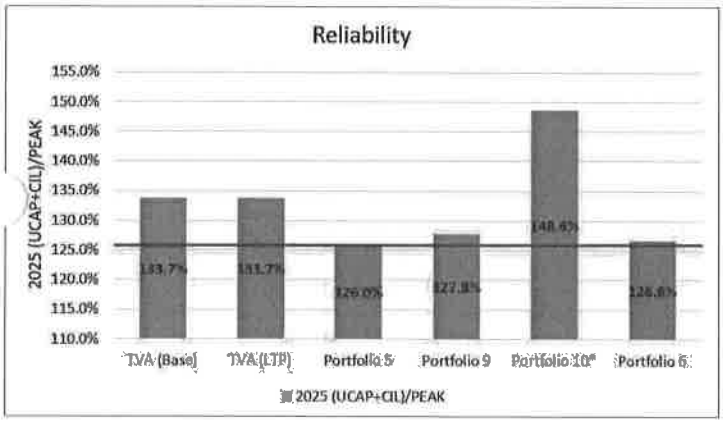

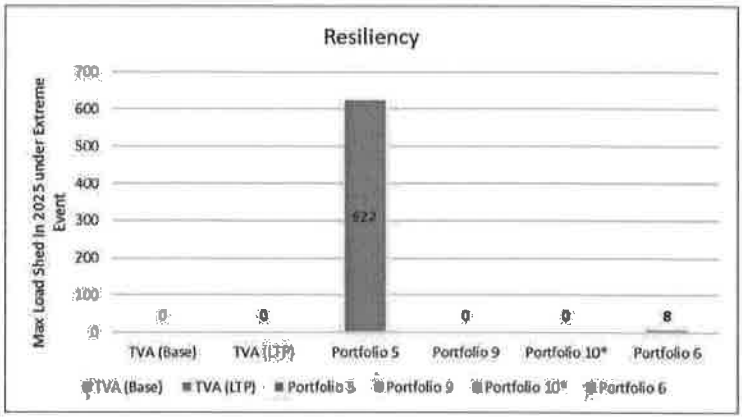

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TVA Has Less Exposure to Energy Market Risk
Portfolios 5 and 9 Have the Greatest Exposure

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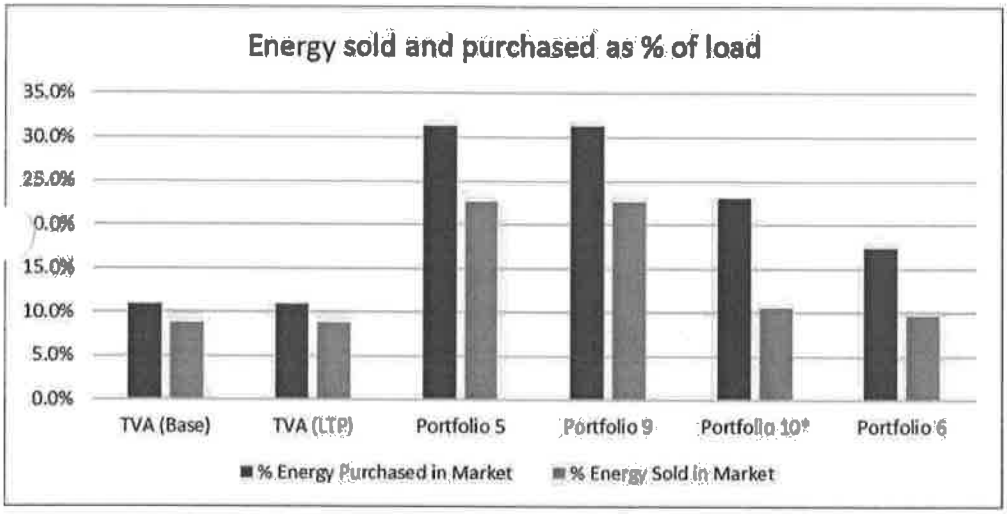

- Portfolios 5 and 9 with high levels of renewable have the greatest amounts of energy exchanged with MISO.
- Sales during the day and purchases at night.

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Economic Development (as expressed by local investment) Impacts are Similar Among Portfolios

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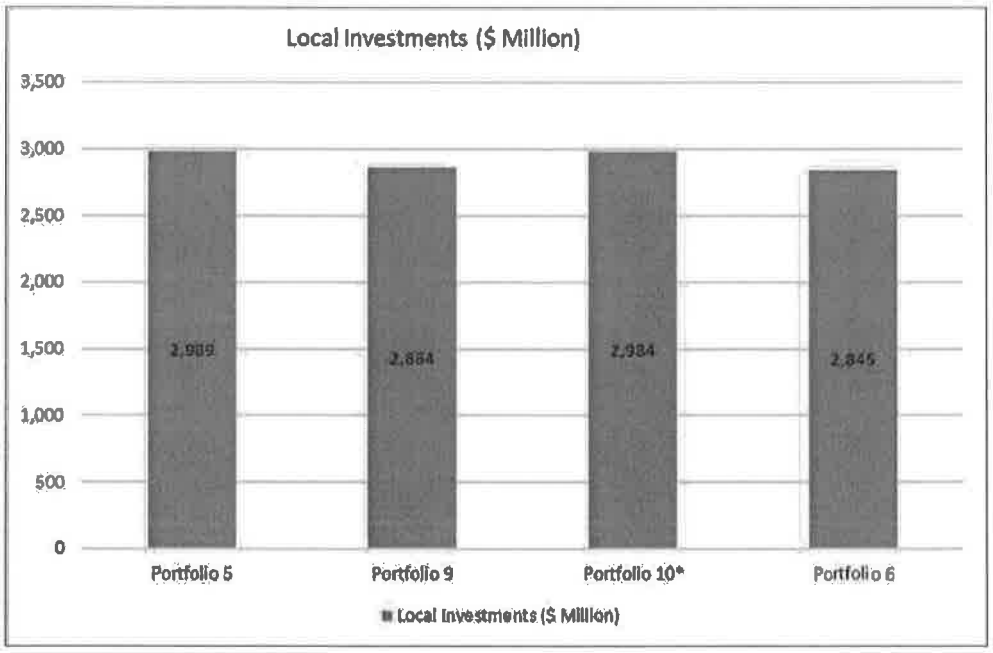

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Summary of Comparisons with TVA

Focusing on the period after notice is given, the waterfall shows savings (2025-2039) with respect of the TVA LTP contract compared with Portfolio 9

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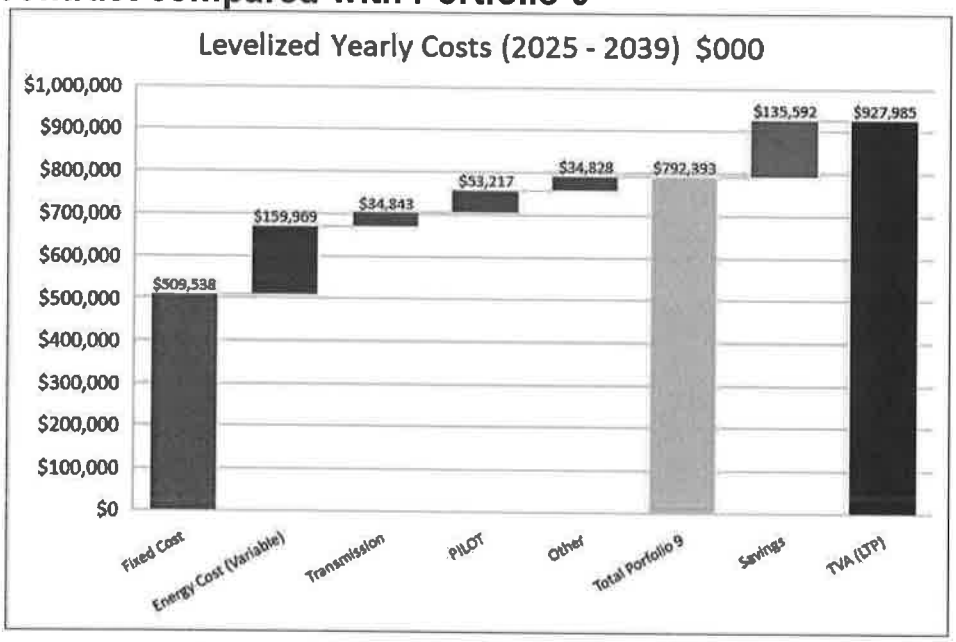

- The waterfall (buildout) shows the importance of the relative components of cost for Portfolio 9.
- The transmission and other costs are important. They contribute over $122 million/year to the comparable cost for TVA.
- This highlights the importance of assumptions.
- The savings are determined looking only at the difference in NPVs for the 2025 to 2039 period

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Focusing on the period after notice is given, annual savings for exiting TVA's current (5 year exit) contract (2025-2039) compared with Portfolio 9

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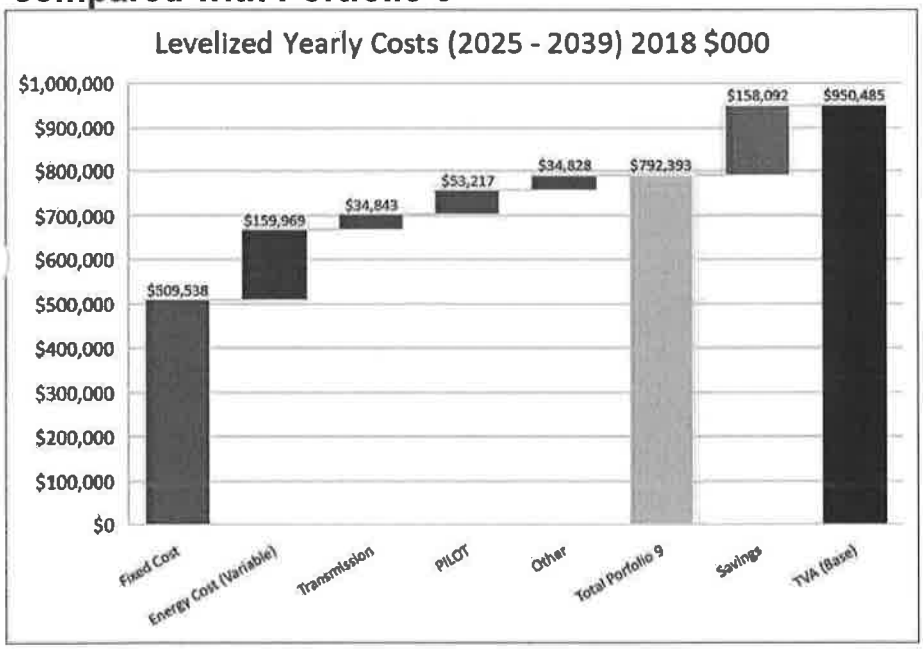

- Siemens forecast assumptions drives a future rate for TVA of about $71/MWh. If TVA rate were to be maintained at the current $75/MWh, the savings would increase by about $66 million in 2018 $.
- All savings are reported in real 2018 $. If future inflation is 2%/year, the actual average savings is about $200 million/year.

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Focusing on the period after notice is given, levelized costs (2025-2039) with TVA current contract compared with Portfolio 9

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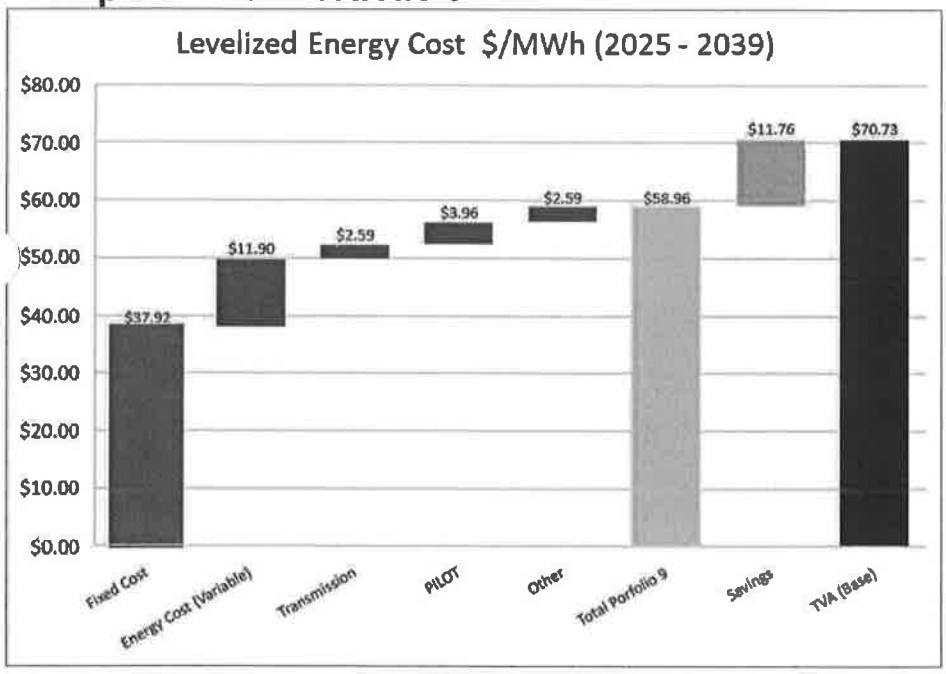

- This shows savings on a levelized cost of energy basis ($/MWh)

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Recommendations

No Regret Actions if MLGW Joins MISO

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If MLGW chooses to exit the TVA contract and join MISO, MLGW should:

- Maximize the amount of local renewable generation, which provides local support and it is not affected by transmission. This is a no regret decision, i.e. it is present in all Portfolios and should be pursued.
- One combined cycle (450 MW) is present in all preferred solutions, thus this is a no regret decision. However, its size could be subject to further optimization.
- Installing at least two combustion turbines (237 MW) in 2025, also appears to be a no regret solution. Also, if two CCGTs are selected (as in Portfolio 6) and then two CTs would be required to reduce the risk of load shedding under N-1-1 to zero.
- MLGW should seek to become part of MISO Local Resource Zone 8 rather than becoming an independent zone. Both MLGW and the current members in LRZ8 stand to gain from this given the load diversity and the larger size of the new zone.

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Recommended Next Steps to Confirm Savings Before Making a Final Determination

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An RFP should be undertaken by MLGW to confirm the savings before making a final decision.

The IRP can be utilized to determine the general mix of assets and locations of interest in the RFP and the orders of magnitude of transmission required.

Differences between Portfolios 5, 9, 6 and 10 can be reassessed with bids provided by potential suppliers.

Options to manage fuel price risk should be an element to be included in the RFP

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No Regret Actions if MLGW Stays with TVA

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In case MLGW decides to stay with TVA:

- MLGW should explore options to increase the amount of local renewable generation (which is limited to 5% offered by TVA under the 20-year LTP).
- In addition, MLGW should assess further the LTP option. On one hand there will be a reduction on the costs and the 20-year NPVRR with the LTP is approximately $400 million lower than without it. On the other hand, MLGW will be locked for 20 years or more and unable to control or take advantage of development in the power industry as, for example, deeper drops in the cost of renewable generation and storage that could increase the economic savings for reconsidering exiting TVA and joining MISO at a later date. The value of the optionality provided by a shorter term exit can be evaluated.
- This analysis only needs to be performed if MLGW chooses to stay with TVA.

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Questions

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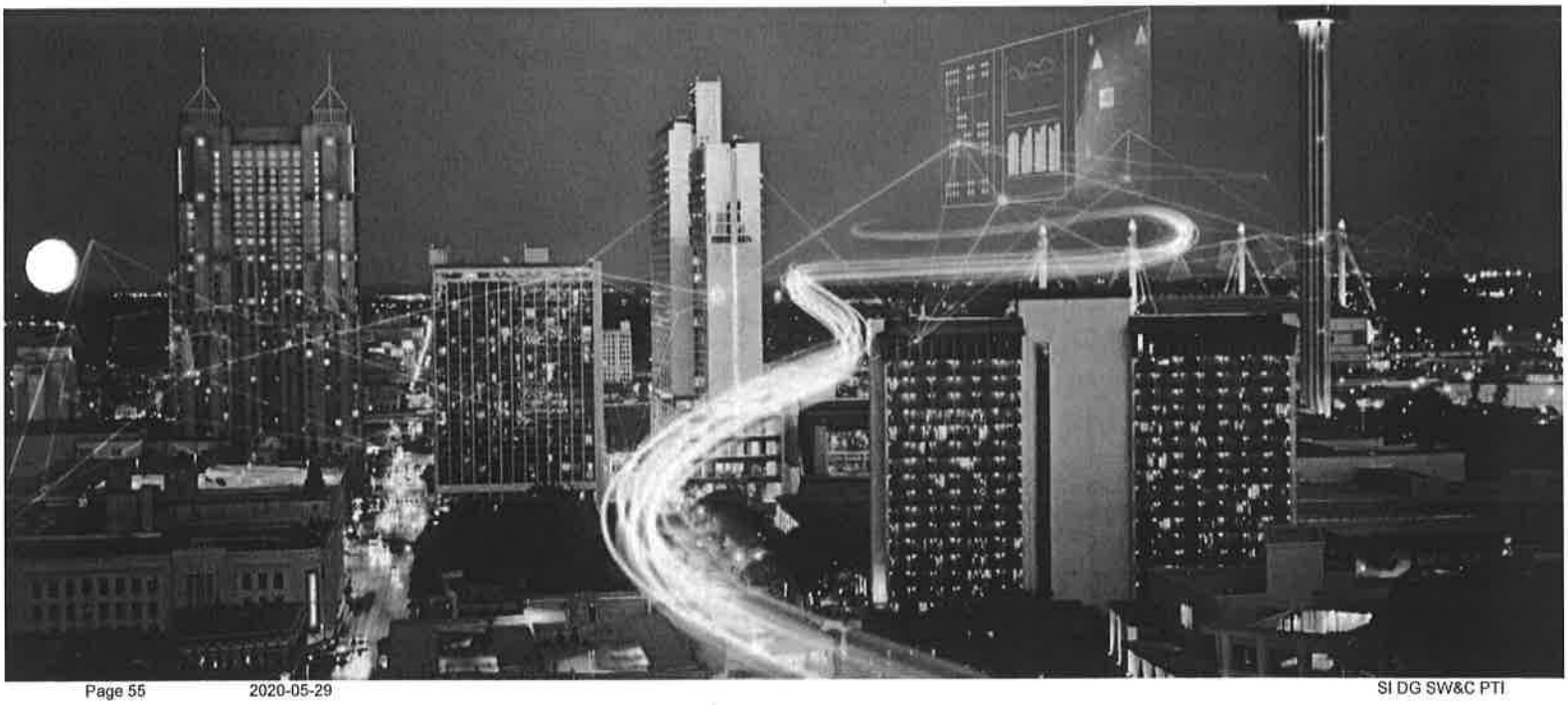

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Glossary

Glossary

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- All-in Capital Cost = The capital costs for building a facility within the plant boundary, which includes equipment, installation labor, owners costs, allowance for funds used during construction, and interest during construction.
- Appalachia Basin = Marcellus Shale Play and Utica Shale Play.
- Average Demand = Average of the monthly demand in megawatts.
- Average Heat Rate = The amount of energy used by an electrical generator to generate one kilowatt hour (kWh) of electricity.
- Baseload Heat Rate = The amount of energy used by an electrical generator to generate one kilowatt hour (kWh) of electricity at baseload production. Baseload production is the production of a plant at an agreed level of standard environmental conditions.
- Breakeven Cost = Average price of gas required to cover capital spending (ideally adjusted to regional prices).
- BAU = Business As Usual
- BTU = British Thermal Unit = unit of energy used typically for fuels.
- CF = Capacity Factor. The output of a power generating asset divided by the maximum capacity of that asset over a period of time.
- CCGT (or CC) = Combined Cycle plant, gas turbine combined with an steam turbine
- CCS = Carbon Capture and Sequestration
- CT = Combustion Turbine
- DER = Distributed Energy Resources, distributed generation, small scale decentralized power generation or storage technologies
- DS = Distributed Solar
- Dth = Dekatherm (equal to one million British Thermal Units or 1 MMBtu)
- EE = Energy Efficiency
- ELCC = Effective Load Carrying Capability
- EFT = Enhanced Firm Transportation (varies by pipeline but can include short- or no-notice changes to day-ahead nominations of fuel delivery
- FID = Final Investment Decision
- FOM = Fixed operations and maintenance costs
- FT = Firm Transportation. FT capacity on a natural gas pipeline is available 24/7 and is more expensive than interruptible transportation (IT) capacity but unused FT capacity can be sold on secondary market.
- Futures = Highly standardized contract. Natural gas futures here are traded on the New York Mercantile Exchange (NYMEX) or Chicago Mercantile Exchange (CME).

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Glossary

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- GT = Gas Turbine
- IPP = Independent Power Producer
- IRP = Integrated Resource Plan
- LNG = Liquified natural gas
- LCOE = Levelized cost of energy
- LOLE = Loss of load expectation
- LOLH = Loss of load hours
- LTCE = Long Term Capacity Expansion Plan; optimization process to select generation
- MMBtu = million British Thermal Units, unit of energy usually used for fuels
- MWh = unit of energy usually electric power = 1 million watts x hour
  MW = unit of power = 1 million watts
- Peak Demand = The maximum demand in megawatts (MW) in a year
- PPA = Power Purchase Agreement; contract to purchase the power from a generating asset
- PV = Photovoltaic
- Reserve Margin = The amount of electric generating capacity divided by the peak demand.
- RPS = Renewable Portfolio Standard: a regulation that requires the increased production of energy from renewable energy sources
- RFP = Request for Proposal
- SMR = Small Modular Reactor
- "Sweet Spot" Core Acreage = Areas within a natural gas play that offer the highest production at least cost.
- Utility Scale = large grid-connected power generation, could be solar, gas, diesel, etc.
- VOM = Variable operations and maintenance costs
- Wheeling = a transaction by which a generator injects power onto a third party transmission system for delivery to a client (load).

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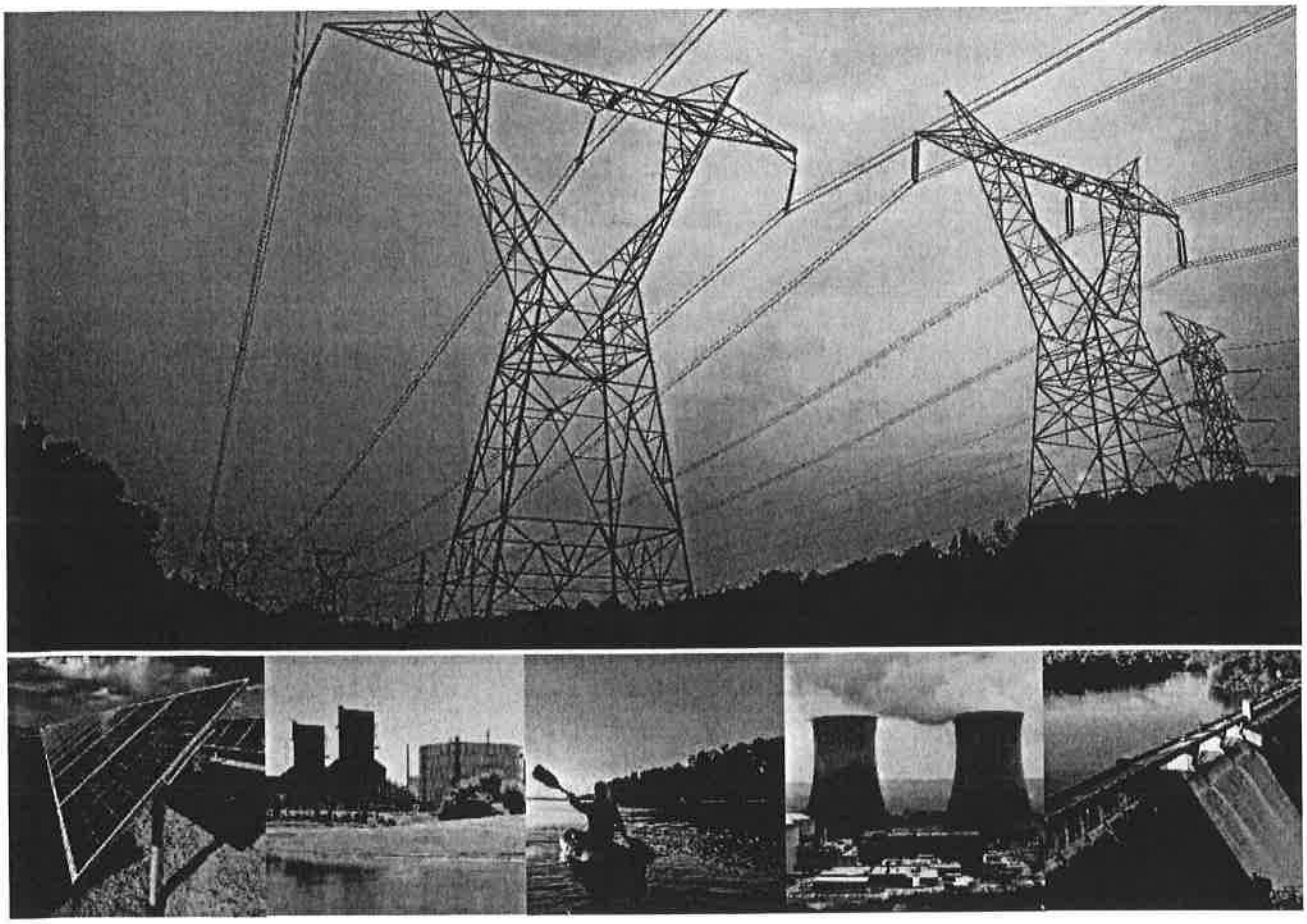
EXHIBIT 7

2019 Integrated Resource Plan

VOLUME I - FINAL RESOURCE PLAN



TENNESSEE VALLEY AUTHORITY

JSC - 000198

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

Message from the CEO

As the largest provider of public power in the nation, TVA provides low-cost, environmentally responsible and reliable power to the 10 million people of the Tennessee Valley region. We've been delivering our mission of service since 1933, all the while ensuring that our capabilities grow and change with the times.

This Integrated Resource Plan examines how TVA can meet future power demand in new and innovative ways. The Plan considers costs, environmental factors, reliability, regulations, energy efficiency, technological advancements, customer demands and other important factors to help us determine the best options for our energy future.

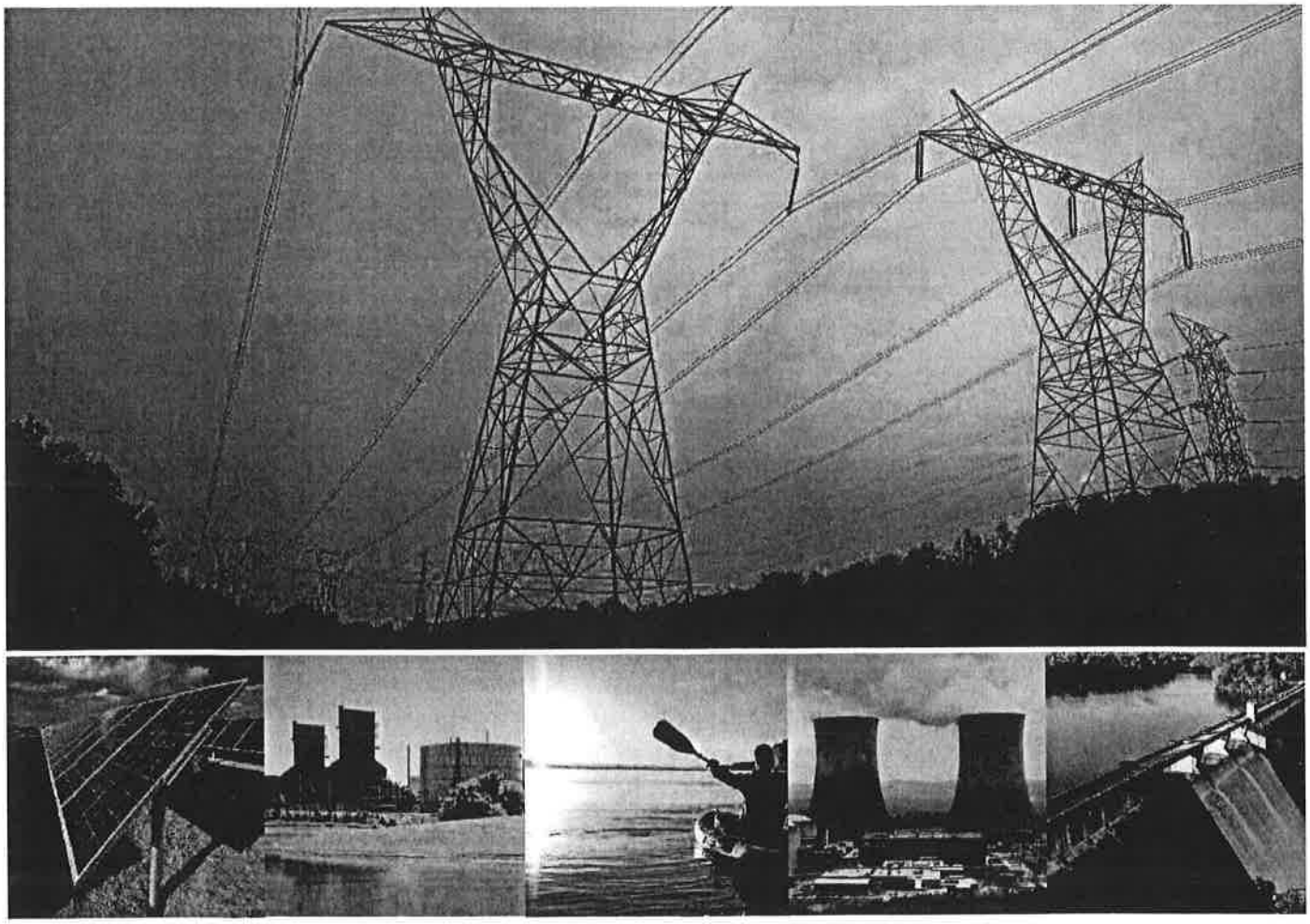
In developing the Plan, TVA enlisted the help of subject matter experts, our Regional Energy Resource Council and the public at large to ensure we considered the best possible options and the most likely future scenarios. TVA also relied on the diverse backgrounds and viewpoints of a working group of industry experts, environmental and business leaders, elected officials and others. This group helped TVA develop this Plan and its associated Environmental Impact Statement, which analyzes the potential impacts to the environment, economy and population of the Valley based on outputs of the Plan.

Collaborative planning efforts like this are an important part of how TVA partners with the people and communities we serve to improve quality of life in our region. In an ever-changing world, this Integrated Resource Plan will guide us on ways to live brighter lives together for decades to come.

Jeff Lyash

2019 Integrated Resource Plan

EXECUTIVE SUMMARY



TENNESSEE VALLEY AUTHORITY

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Introduction

PURPOSE AND NEED

The Tennessee Valley Authority's 2019 Integrated Resource Plan (IRP) is a long-term plan that provides direction on how TVA can best meet future demand for power. It shapes how TVA will provide low-cost, reliable and clean electricity; support environmental stewardship; and foster economic development in the Tennessee Valley for the next 20 years. The plan is a crucial element for TVA's success in a constantly changing business and regulatory environment, and it will better equip TVA to meet many of the challenges facing the electric utility industry in the coming years to benefit the Valley. The IRP will enhance TVA's ability to create a more flexible power-generation system that can successfully integrate increasing amounts of renewable energy sources and distributed energy resources (DER) while ensuring reliability. The IRP also will inform TVA's next Long-Range Financial Plan.

TVA POWER SYSTEM

As the nation's largest public power provider, TVA delivers safe, reliable, clean, competitively priced electricity to 154 local power companies and 58 directly served customers. TVA's power portfolio is dynamic and adaptable in the face of changing demands and regulations. TVA's portfolio has evolved over the past decade to a more diverse, reliable and cleaner mix of generation resources, which today provides 54 percent carbon-free power. In Fiscal Year (FY) 2018, TVA efficiently delivered more than 163 billion kilowatt-hours of electricity to customers from a power supply that was 39 percent nuclear, 26 percent natural gas, 21 percent coal-fired, 10 percent hydro, and 3 percent wind and solar. The remaining one percent results from TVA programmatic energy efficiency efforts.

SUMMARY OF IRP PROCESS AND GOALS

TVA used an integrated, least-cost framework that considered multiple views of the future to determine how potential power-generation resource portfolios could perform in different market and external conditions. We conducted the IRP process in a transparent, inclusive manner that provided numerous opportunities for public education and participation. Stakeholders and the public provided invaluable input that helped shape the IRP. The analysis performed in this IRP study relied on industry-standard models and incorporated best practices while using an innovative methodology to more fully evaluate the role of distributed energy resources as resources in our power supply. Resource cost and performance input data were independently validated. TVA's goal with the IRP was to identify an optimal energy resource plan that performs well under a variety of future conditions, taking into account cost, risk, environmental stewardship, operational flexibility and Valley economics. Per the National Environmental Policy Act (NEPA), TVA also prepared an Environmental Impact Statement (EIS) to analyze the 2019 IRP's potential impacts on the environment, economy and population in the Tennessee Valley.

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TVA's 2019 IRP Recommendation

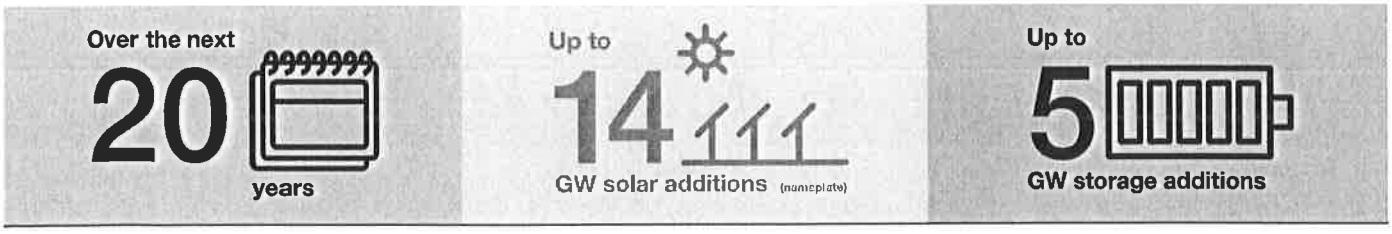
STUDY RESULTS

During the IRP process, TVA — with significant input from stakeholders and the public — considered a wide range of future scenarios, various business strategies and a diverse mix of power-generation resources to build on TVA's existing asset portfolio. IRP study results show:

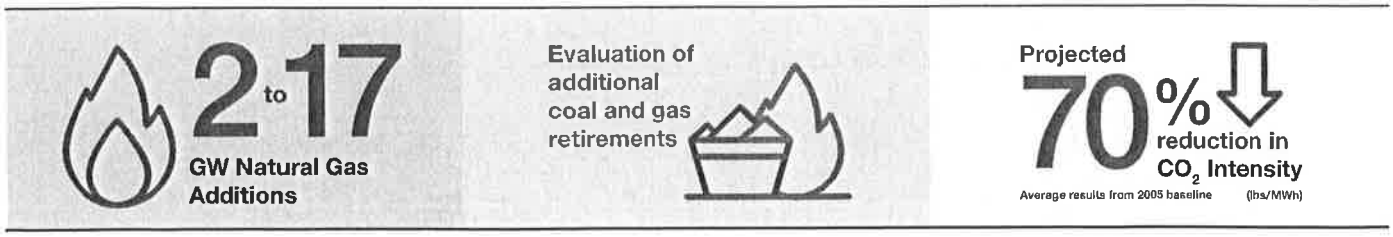
- There is a need for new capacity in all scenarios to replace expiring or retiring capacity.
- Solar expansion plays a substantial role in all futures.
- Gas, storage and demand response additions provide reliability and/or flexibility.
- No baseload resources (designed to operate around the clock) are added, highlighting the need for operational flexibility in the resource portfolio.
- Additional coal retirements occur in certain futures.
- Energy efficiency (EE) levels depend on market depth and cost-competitiveness.
- Wind could play a role if it becomes cost-competitive.
- In all cases, TVA will continue to provide for economic growth in the Tennessee Valley.

OBSERVATIONS

TVA has observed that the scenario, or future environment, it finds itself operating in will have more impact on overall results than the strategy or strategies it implements. TVA also recognizes that all strategies have positive aspects but also have unique tradeoffs to consider. If TVA needs to shift its resource mix, that need will be driven by these key variables: changing market conditions, more stringent regulations and technology advancements. Recognizing that a variety of future scenarios are possible and each strategy has positive aspects, all IRP results are included in the IRP Recommendation to provide flexibility for how the future evolves.



All portfolios point to a TVA power system that will be LOW-COST, RELIABLE, and CLEAN



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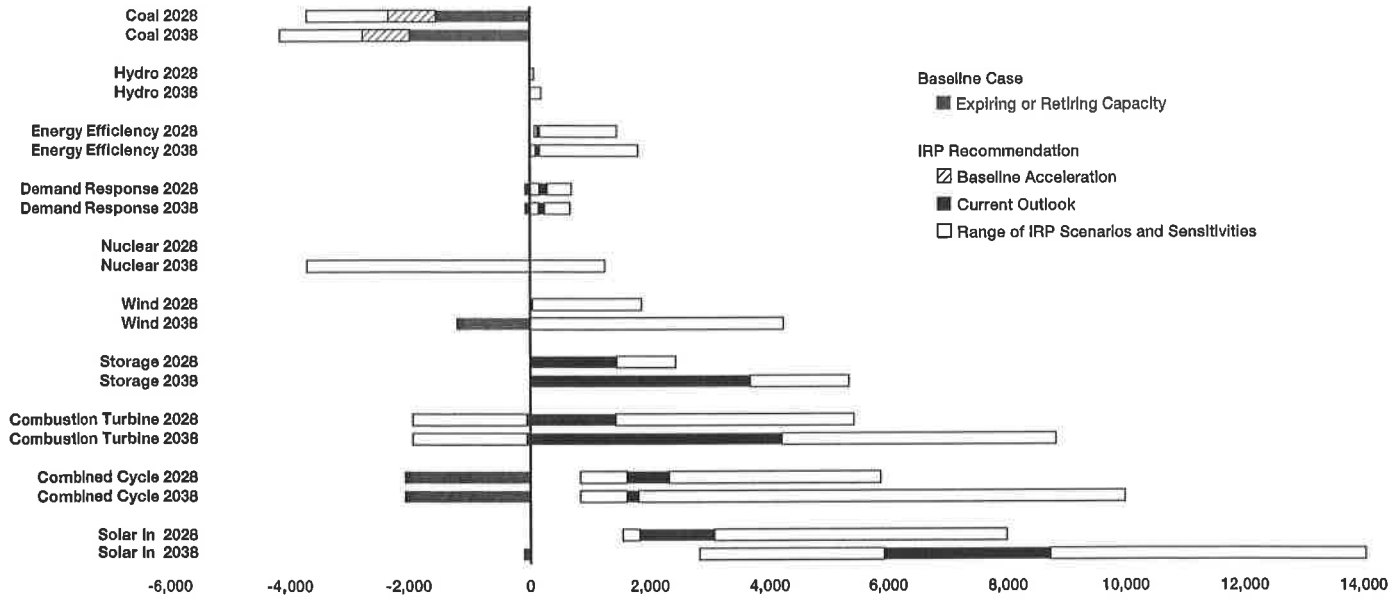
TVA's 2019 IRP Recommendation

Range of MW Additions and Subtractions by 2028 and 2038



Notes

- **MWs are incremental additions from 2019 forward. Board-approved coal retirements are excluded from the totals.**
- **Browns Ferry Nuclear Plant license is not extended in the No Nuclear Extensions Scenario (outside of TVA control).**
- **Upper bounds of potential natural gas and solar additions are driven by the Valley Load Growth Scenario.**
- **Solar and wind are shown in nameplate capacity; accelerated solar additions are reflected in the IRP Recommendation.**
- **Solar, gas, and storage ranges include utility-scale and distributed additions (where promoted in a strategy).**

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TVA's 2019 IRP Recommendation

TVA's recommended planning direction affirms its commitment to a diverse and flexible resource portfolio guided by the least-cost system planning mandate. The ranges shown, stated in megawatts (MW) of capacity, provide a general guideline for resource selections. In developing a Recommendation from the study, TVA elected to establish guideline ranges for key resource types (owned or contracted) that make up the target power supply mix. This general planning direction is expressed over the 20-year study period while also including more specific direction over the first 10-year period. Meeting the Valley's future needs in accordance with the resource technologies and ranges in this Recommendation will position TVA to continue to deliver low-cost, reliable and clean power to the people of the Tennessee Valley.

Coal: Continue with announced plans to retire Paradise in 2020 and Bull Run in 2023. Evaluate retirements of up to 2,200 MW of additional coal capacity if cost-effective.

Hydro: All portfolios reflect continued investment in the hydro fleet to maintain capacity. Consider additional hydro capacity where feasible.

Energy Efficiency: Achieve savings of up to 1,800 MW by 2028 and up to 2,200 MW by 2038. Work with our local power company partners to expand programs for low-income residents and refine program designs and delivery mechanisms with the goal of lowering total cost.

Demand Response: Add up to 500 MW of demand response by 2038 depending on availability and cost of the resource.

Nuclear: Pursue option for second license renewal of Browns Ferry for an additional 20 years. Continue to evaluate emerging nuclear technologies, including small modular reactors, (SMR) as part of technology innovation efforts.

Wind: Existing wind contracts expire in the early 2030s. Consider the addition of up to 1,800 MW of wind by 2028 and up to 4,200 MW by 2038 if cost-effective.

Storage: Add up to 2,400 MW of storage by 2028 and up to 5,300 MW by 2038. Additions may be a combination of utility and distributed scale. The trajectory and timing of additions will be highly dependent on the evolution of storage technologies.

Gas Combustion Turbine: Evaluate retirements of up to 2,000 MW of existing combustion turbines if cost-effective. Add up to 5,200 MW of combustion turbines by 2028 and up to 8,600 MW by 2038 if a high level of load growth materializes. Future CT needs are driven by demand for electricity, solar penetration, and evolution of other peaking technologies.

Gas Combined Cycle: Add between 800 and 5,700 MW of combined cycle by 2028 and up to 9,800 MW by 2038 if a high level of load growth materializes. Future CC needs are driven by demand for electricity and gas prices, as well as by solar penetration that tends to drive CT instead of CC additions.

Solar: Add between 1,500 and 8,000 MW of solar by 2028 and up to 14,000 MW by 2038 if a high level of load growth materializes. Additions may be a combination of utility and distributed scale. Future solar needs are driven by pricing, customer demand, and demand for electricity.

The IRP Recommendation meets the dual objective of ensuring flexibility to respond to the future while providing guidance on how our resource portfolio should change as the future unfolds.

Implementation

CONSIDERATIONS

With the implementation of the IRP Recommendation will come certain challenges. For example, the IRP Recommendation includes significant renewables expansion, which means it will become increasingly important to know the location of renewable resources, both utility and distributed scale, and how weather impacts solar generation. Early experience with battery storage on the system would provide additional insight to how the various storage-use cases might be employed to provide economic benefit and system flexibility, especially with increasing penetration of renewables. TVA will need to partner with local power companies and other stakeholders in the region to better understand the potential for distributed resources in the Valley and their locational value to inform resource decisions. Finally, the IRP Recommendation also includes more conventional resources, primarily gas-fired, and TVA will need to consider the implementation challenges in the areas of siting and permitting, both for the units themselves and associated transmission lines and gas pipelines.

In the process of developing the IRP, stakeholders raised a number of policy-related issues that are outside the scope of the IRP itself but will need to be considered as TVA moves toward implementation of recommendations from the IRP study. These considerations include continued evolution of programs that provide flexibility for customer-owned generation, evolution of federal/state energy and environmental policies, advancements in customer expectations and requirements for clean energy, and enhancing low-income equity and energy/environmental justice.

NEAR-TERM ACTIONS

The scenarios and strategies evaluated in the IRP provide insights to how TVA's resource portfolio may need to evolve as the future becomes clearer. The results indicate there are near-term actions that would provide benefit across multiple futures. The actions include:

RENEWABLES & FLEXIBILITY

- Add solar based on economics and to meet customer demand.
- Enhance system flexibility to integrate renewables and distributed resources.
- Evaluate demonstration battery storage to gain operational experience.

EXISTING FLEET

- Pursue option for license renewal for TVA's nuclear fleet.
- Evaluate engineering end-of-life dates for aging fossil units to inform long-term planning.

ENERGY USAGE

- Conduct market potential study for energy efficiency and demand response.
- Collaborate with states and local communities to address low-income energy efficiency.
- Collaboratively deploy initiatives to stimulate the local electric vehicle market.

DISTRIBUTION PLANNING

- Support development of Distribution Resource Planning for integration into TVA's planning process.

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How TVA Developed the Integrated Resource Plan: An 18-Month Process

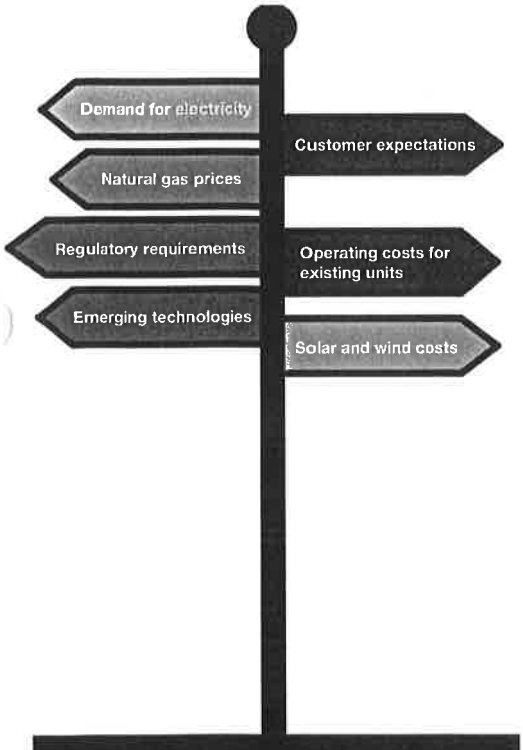
OVERVIEW

Developing the 2019 IRP has been an approximately 18-month process that began in February 2018 and will conclude when a Record of Decision is released. The IRP process will have included the following activities:

- **Scoping,** which took place in winter/spring 2018 and identified issues important to the public and laid the foundation for developing the IRP.
- **Development of Model Input and Framework,** which occurred in spring/summer 2018 and included identifying and developing scenarios, resource options and business strategies to evaluate how a future portfolio might change under different conditions.
- **Analysis and Evaluation,** which took place in fall 2018 and included developing and evaluating the performance of the 30 resource portfolios.
- **Presentation of Initial Results,** which occurred in February 2019 with release of the draft IRP and EIS.
- **Public Comment Period,** which was held from February 15 to April 8, 2019.
- **Additional Analysis,** which was completed in response to stakeholder and public comments.
- **Completion of the Study**, which includes the IRP Recommendation, near-term actions and key signposts, and the final environmental assessment.
- **Publication of the Final IRP and EIS** on June 28, 2019, on TVA's website.
- **Expected Request for Approval** of the IRP Recommendation from the Board in August 2019.
- **Record of Decision** will be published after Board approval.

KEY SIGNPOSTS TO GUIDE DECISIONS IN THE LONGER TERM

As the future unfolds, TVA will monitor key signposts that will guide decisions in the longer term. The signposts relate to key variables that could have a significant influence on the future generation portfolio. These key signposts include:



TVA will closely monitor these key drivers related to changing market conditions, more stringent regulations, and technology advancements to inform appropriate actions within the recommended ranges and appropriate timing for initiating the next IRP.

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Developing the IRP

PLANNING APPROACH

Uncertainties and Scenarios

With input from the IRP Working Group, TVA designed scenarios that are outside of TVA's control but represent possible futures in which TVA may find itself operating. TVA created a list of uncertainties that could alter the future operating environment and affect the cost of electricity and/or mix of optimal resources. The scenarios are:

	SCENARIOS
1	**CURRENT OUTLOOK** which represents TVA's current forecast for these key uncertainties and reflects modest economic growth offset by increasing efficiencies;
2	**ECONOMIC DOWNTURN** which represents a prolonged stagnation in the economy, resulting in declining loads (customers using less power) and delayed expansion of new generation;
3	**VALLEY LOAD GROWTH** which represents economic growth driven by migration into the Valley and a technology-driven boost to productivity, underscored by increased electrification of industry and transportation;
4	**DECARBONIZATION** which is driven by a strong push to curb greenhouse gas emissions due to concern over climate change, resulting in high CO_2 emission penalties and incentives for non-emitting technologies;
5	**RAPID DER ADOPTION** which is driven by growing consumer awareness and preference for energy choice, coupled with rapid advances in technologies, resulting in high penetration of distributed generation, storage and energy management;
6	**NO NUCLEAR EXTENSIONS** which is driven by a regulatory challenge to relicense existing nuclear plants and construct new, large-scale nuclear. This scenario also assumes subsidies to drive small modular reactor (SMR) technology advancements and improved economics.

Strategies

With input from the IRP Working Group, TVA developed five strategies, which are business decisions or directions that TVA could employ in each scenario. As it relates to strategies in the IRP, the word "promote" means an incentive was modeled to make the resource more attractive for adoption or selection. The five strategies are:

	STRATEGIES
A	**BASE CASE** which represents TVA's current assumptions for resource costs and applies a planning reserve margin constraint. This constraint applies in every strategy and represents the minimum amount of capacity required to ensure reliable power;
B	**PROMOTE DISTRIBUTED ENERGY RESOURCES** which incents DER to achieve higher, long-term penetration levels. The DER options include energy efficiency, demand response, combined heat and power, distributed solar and storage;
C	**PROMOTE RESILIENCY** which incents small, agile capacity to maximize operational flexibility and the ability to respond to short-term disruptions on the power system;
D	**PROMOTE EFFICIENT LOAD SHAPE** which incents targeted electrification (by incentivizing customers to increase electricity usage in off-peak hours) and demand response (by incentivizing customers to reduce electricity usage during peak hours). This strategy promotes efficient energy usage for all customers, including those with low income;
E	**PROMOTE RENEWABLES** which incents renewables at all scales (from utility size to residential) to meet growing or existing consumer demand for renewable energy.

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MODELING ASSUMPTIONS AND CANDIDATE TECHNOLOGIES

TVA uses an industry standard model to derive an optimal capacity plan, considering the focus of each strategy evaluated in each scenario. Modeling assumptions, the framework of IRP planning, are the constraints and planning guidelines that are put into the model. The reliability constraint is especially critical, as it ensures we have enough capacity at all times to provide reliable electricity to customers. For the 2019 IRP, it also is crucial to understand how the system would operate with more renewables and DER on the system – driving a greater need for operational flexibility. TVA considered a broader range of mature and emerging technologies in this IRP, including some distributed energy technologies.

STAKEHOLDER & PUBLIC INVOLVEMENT

Throughout the IRP process, TVA engaged external stakeholders to understand diverse opinions and to challenge assumptions. TVA established the IRP Working Group, whose 20 members represent diverse interests in the Valley. The IRP Working Group met approximately monthly to review input assumptions and preliminary results and to enable its members to provide their respective views to TVA. TVA also presented IRP progress updates to the Regional Energy Resource Council (RERC), a federal advisory committee that provides advice to the TVA Board of Directors on a range of energy-related matters, including the IRP.

During a 60-day scoping period from February 15 through April 16, 2018, TVA obtained public comments on the scope of the effort to develop this IRP, which helped shape the draft IRP and EIS. After the release of the draft IRP and EIS on February 15, 2019, TVA provided a public comment period through April 8, 2019. TVA held meetings across the Tennessee Valley and an online webinar, and accepted public comments via mail, email, online and in-person at the meetings. Input was critical in shaping the IRP and EIS, and many of the sensitivity analyses that were performed were informed by stakeholder and public input.

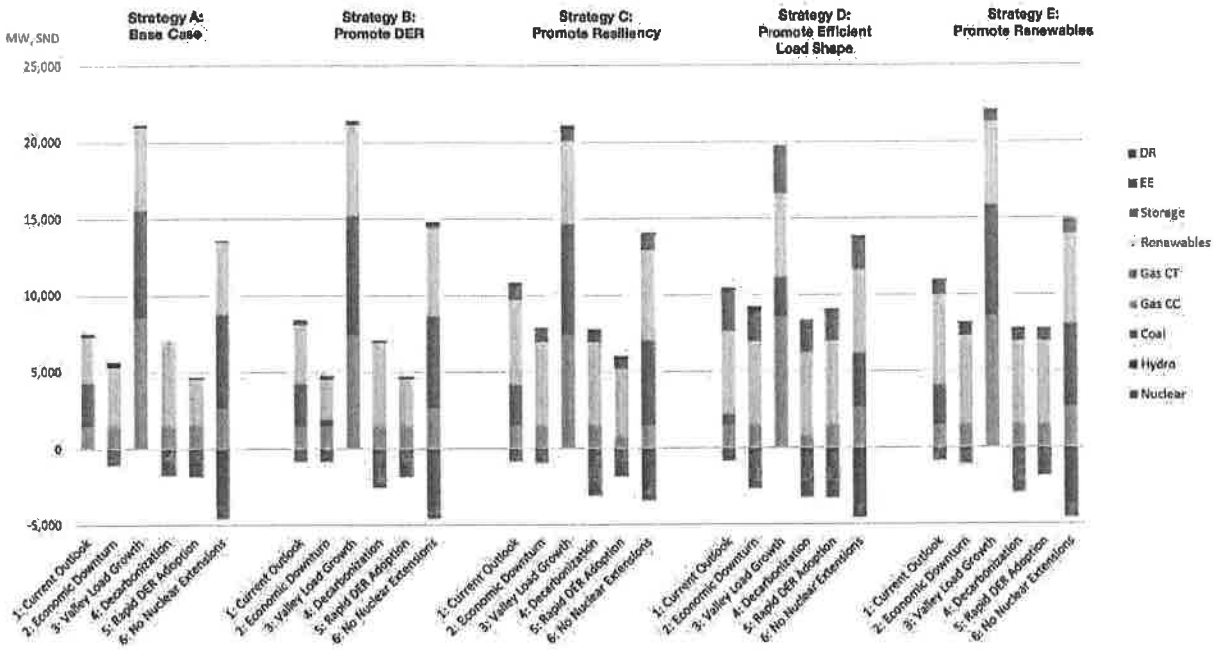
The IRP Working Group included representatives from:

- State and local governments
- Academia and research groups
- Advocacy groups
- Local power companies (LPCs)
- Economic development organizations
- Directly-served/ industrial customers

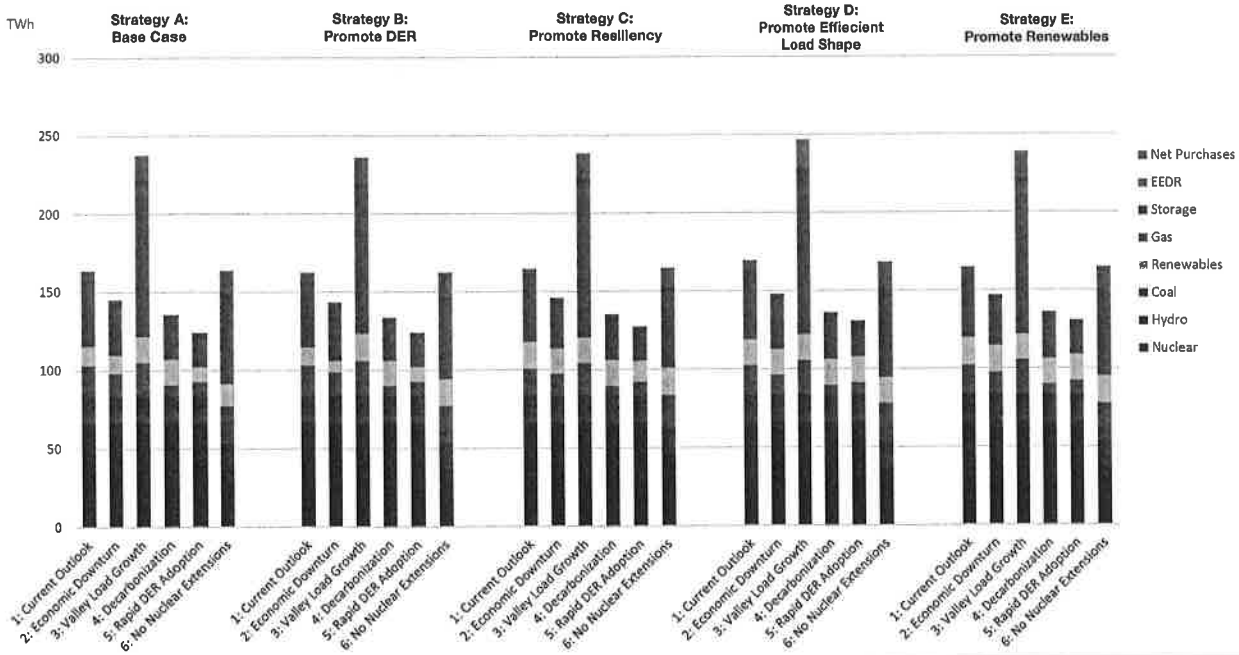
Developing the IRP

EVALUATING THE PORTFOLIOS

Incremental capacity by 2038 consists of additions of new energy resources and retirement of existing energy resources for the portfolios associated with each strategy.



Total Energy in 2038 by resource type in the portfolios associated with each strategy.



EVALUATING THE PORTFOLIOS

Each IRP case represents a combination of expectations about the future environment TVA operates in and potential strategies TVA could employ that result in unique resource portfolios. The modeling process resulted in 30 resource portfolios. The model analyzed how to achieve the lowest-cost portfolio with each strategy in each scenario, looking for the optimal solution within that particular combination. With input from the IRP Working Group and RERC, TVA identified 14 metrics that reflect desired goals and priorities in areas related to cost, risk, environmental stewardship, operational flexibility and Valley economics. The metrics were used to evaluate tradeoffs among the 30 resource portfolios.

Strategy Performance

	COST	RISK	ENVIRONMENTAL STEWARDSHIP		OPERATIONAL FLEXIBILITY	VALLEY ECONOMICS
			CO_2, Water, Waste	Land Use		
STRATEGY A: BASE CASE						All strategies have similar impacts on the Valley economy as measured by per capita income and employment
STRATEGY B: PROMOTE DER						
STRATEGY C: PROMOTE RESILIENCY						
STRATEGY D: PROMOTE EFFICIENT LOAD SHAPE						
STRATEGY E: PROMOTE RENEWABLES						

Good — Better — Best

Developing the IRP

SENSITIVITY ANALYSIS

When analyzing results from the draft IRP, TVA identified issues that warranted further evaluation prior to finalizing the study. In addition, TVA received helpful input from the IRP Working Group and the RERC, as well as from the public during the comment period. Many of the questions raised by TVA, stakeholders and the public focused on certain key assumptions that could influence results. To explore the impacts of changes in key assumptions and to inform the Recommendation, TVA evaluated sensitivities related to the following categories: natural gas prices; storage, wind, combined heat and power (CHP) and small modular reactor (SMR) capital costs; greater energy efficiency (EE) and demand response (DR) market depth; integration cost and flexibility benefit; pace and magnitude of solar additions; higher operating costs for coal plants; more stringent carbon constraints; and variation in climate.

Summary of 2019 IRP Sensitivities

SENSITIVITY CASE Base Case comparison is the Current Outlook unless otherwise noted	CAPACITY EXPANSION IMPACTS BY 2038 GREEN indicates increase and RED indicated decrease in resource						
	NUCLEAR	COAL	GAS	HYDRO	SOLAR	WIND	EEDR
Higher Natural Gas Prices				+55 MW	+2,050 MW		
Lower Natural Gas Prices			2,000 MW CT replaced by CC		-5,900 MW		
Lower Wind Costs			-1,100 MW		-3,100 MW	+4,200 MW	
Greater EE & DR Market Depth			-2,000 MW		-2,200 MW		+2,100 MW
Integration Cost & Flexibility Benefit			Minor timing differences		Minor timing differences		
Pace & Magnitude of Solar Additions					+1,100 MW		
Magnitude of Solar Additions (Valley Load Growth)			1,000 MW CC replaced by CT		+6,000 MW		
Higher Operating Costs for Coal Plants		-2,200 MW	+1,500 MW				
More Stringent Carbon Constraints (Decarbonization)		-2,000 MW accelerated	CC expansion accelerated	+175 MW			
Variation in Climate	Summer derates	Summer derates	CT expansion accelerated		+2,100 MW		

Note

- **Impacts shown in Summer Net Dependable MW, except for solar and wind that are shown in nameplate MW**

The IRP and the Tennessee Valley Environment

FORMING THE IRP RECOMMENDATION

The IRP results — including the 30 primary cases and the sensitivity cases — provide a robust set of potential resource additions and retirements. The final Recommendation is derived from this evaluation. The Recommendation takes into account customer priorities around power cost and reliability across different futures, along with environmental stewardship and Valley economics considerations. In developing a recommendation from the study, TVA elected to establish guideline ranges for key resource types (owned or contracted) that make up the target power supply mix. In order to distill the considerable number of cases evaluated through the original scenario and strategy analysis and the sensitivity cases, the Recommendation uses ranges that are centered on results obtained under the Current Outlook scenario. The other scenario and sensitivity results provide a sense of how the target power supply mix might change as the future changes. Recognizing that a variety of future scenarios are possible and each strategy has positive aspects, all IRP results are included in the Recommendation to provide flexibility for how the future evolves. Implementing the least-cost resource plan with all of these priorities in mind will help ensure TVA continues to fulfill its mission to serve the people of the Tennessee Valley.

PURPOSE OF THE EIS

TVA's EIS assesses the natural, cultural and socioeconomic impacts associated with the 2019 IRP. The five strategies are the basis for the alternatives discussed in the EIS. The Base Case serves as the No-Action Alternative, and the remaining four strategies are the Action Alternatives. The draft EIS analyzed and identified the relationship of the natural and human environment to each of the five alternative strategies. The final EIS includes an additional alternative, the 2019 Recommendation (Target Power Supply Mix). The portfolios associated with each of the five alternative strategies, as well as the 2019 Recommendation, are quantitatively and qualitatively evaluated to determine the environmental impact. This evaluation addresses systemwide topics, including

- Greenhouse gas emissions
- Fuel consumption
- Air quality
- Water quality and quantity
- Waste generation and disposal
- Land requirements
- Socioeconomic impacts
- Environmental justice.

Public comments on the draft EIS and draft IRP are addressed in the final EIS.

The primary study area described in the EIS includes the combined TVA service area; the Tennessee River watershed; and parts of the Cumberland, Mississippi, Green and Ohio Rivers in TVA's power service area. For some resources, such as air quality and climate change, the assessment area extends beyond the TVA region. For some socioeconomic resources, the study area consists of the 170 counties where TVA is a major provider of electric power and/or operates generating facilities.

The IRP and the Tennessee Valley Environment

ENVIRONMENTAL IMPACTS OF THE 2019 IRP

Under all the portfolios and the 2019 Recommendation, there is a need for new capacity, with a significant expansion of solar generation overall. Uncertainty around future environmental standards for carbon dioxide emissions, along with the outlook for loads and gas prices, are key considerations when evaluating potential coal retirements. Emissions of air pollutants, the intensity of greenhouse gas emissions (CO_2 intensity) and generation of coal waste decrease under all strategies. Strategies focused on resiliency, load shape and renewables have the largest amounts of solar and storage expansion and coal retirements, resulting in lower environmental impact overall but higher land use. For most environmental resources, the impacts are greatest for the No Action alternative. The exception is the land area required for new generating facilities, which is greater for the action alternatives, particularly strategies which focus on resiliency, load shape and renewables. Most of this land area would be occupied by solar facilities, which, compared to most other energy resources, have a relatively low level of impact to the land. Additional sensitivity analysis showed the potential for an extended range of resource additions and retirements, which generally resulted in reduced impacts to most environmental resources. The land area occupied by solar facilities, however, could greatly increase.

Conclusion

TVA finds considerable value in undertaking an IRP and EIS, and especially appreciates the input, review and insights of individuals on the IRP Working Group and the Regional Energy Resource Council. They spent considerable time helping TVA develop a robust plan that meets all the criteria outlined in its objectives. TVA values their involvement and the expertise they provided on behalf of their respective stakeholders in making this a better IRP.

As with any long-term plan, TVA's IRP reflects what we know today and can reasonably expect for the coming years. TVA and our employees across the Valley stand ready every day to carry out our three-part mission around energy, the environment and economic development. In an ever-changing world, TVA will do its best to continue to serve the people of the Tennessee Valley by providing low-cost, reliable and clean power in an environmentally responsible manner while promoting economic development across the Valley.

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TVA

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List of Acronyms

Acronym	Description
4th NCA	Fourth National Climate Assessment
AC	Alternating Current
ACS	American Community Survey
APWR	Advanced Pressurized Water Reactor
ARC	Appalachian Regional Commission
B.P.	before present
BART	Best Available Retrofit Technology
BCF	billion cubic feet
Btu	British Thermal Units
CAA	Clean Air Act
CAES	compressed air energy storage
CAGR	compound annual growth rate
CC	Combined Cycle
CCR	Coal Combustion Residuals
CCS	carbon capture and storage/sequestration
CCW	condenser cooling water
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHP	Combined Heat and Power
CO	carbon monoxide
CO_2	carbon dioxide
CO_2-eq	CO_2-equivalent emissions
CRM	Clinch River Mile
CT	Combustion Turbine
CWA	Clean Water Act
DC	Direct Current
DDT	Dichlorodiphenyltrichloroethane
DER	Distributed Energy Resources
DGIX	Distributed Generation Information Exchange
DO	dissolved oxygen
DOE	Department of Energy
DP	Data Profile
DR	demand response
DSM	Demand Side management
dV	deciview
E.O.	Executive Order
EA	Environmental Assessment
EBCI	Eastern Band of Cherokee Indians
EE	energy efficiency

Acronym	Description
EIS	Environmental Impact Statement
EPRI	Electric Power Research Institute
ERM	Emory River Mile
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FGD	flue gas desulphurization
FOM	Fixed operating and maintenance costs
FY	Fiscal Year
gal/d/mi^2	gallons per day per square mile
GDP	Gross Domestic Product
GHG	greenhouse gas
GP	Generation Partners
GPP	Green Power Providers
GW	gigawatt
GWh	gigawatt hours
HAP	Hazardous Air Pollutants
HFC	hydroflurocarbons
Hg	Mercury
HUC	Hydrologic Unit Code
HVAC	heating, ventilation, and air conditioning
HVDC	high voltage direct current
IGCC	integrated gasification combined cycle
IMP	Internal Monitoring Point
IPP	Independent power producers
IRP	Integrated Resource Plan
KDFWR	Kentucky Department of Fish and Wildlife Resources
KPDES	Kentucky Pollutant Discharge Elimination System
kV	kilovolt
KWh	kilowatt-hours
LCA	life cycle assessments
LED	light emitting diode
LPC	Local Power Companies
MAPE	Mean absolute percent error
MATs	Mercury and Air Toxics Standards
MBCI	Mississippi Band of Choctaw Indians
MBTA	Migratory Bird Treaty Act
MBtu	Million British Thermal Units
MGD	million gallons per day
MISO	Midcontinent Independent System Operator
MLGW	Memphis Light, Gas and Water
MSAs	metropolitan statistical areas
MW	Megawatt

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Acronym	Description
MWh	Megawatt-hour
N2O	Nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	Nuclear Regulatory Commission
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NWS	National Weather Service
ORSANCO	Ohio River Valley Water Sanitation Commission
PCB	polychlorinated biphenyl
PEP	Population Estimates Program
PFC	perfluorocarbons
PFOS	Perfluorooctane sulfonate
PM	particulate matter
PPA	Power Purchase Agreement
ppm	parts per million
PSA	Power Service Area
PURPA	Public Utility Regulatory Policies Act
PV	photovoltaic
PVRR	Present Value of Revenue Requirement
PWR	Pressurized Water Reactor
QCN	Quality Contractor Network
RBI	Reservoir Benthic Index
RCP	representative concentration pathway
RCRA	Resource Conservation and Recovery Act
REC	Renewable Energy Certificate
RFAI	Reservoir Fish Assemblage Index
RICE	reciprocating internal combustion engines
ROD	Record of Decision
ROS	Reservoir Operations Study
RSO	Renewable Standard Offer
SAE	Statistically Adjusted End-use model
SCPC	supercritical pulverized coal
SCR	selective catalytic reduction
SDTSA	state-designated tribal statistical areas
SEPA	Southeastern Power Administration

Acronym	Description
SLR	Second License Renewal
SMR	small modular reactors
SND	summer net dependable
SO_2	sulfur dioxide
SOC	Special Opportunities Counties
SPCP	supercritical pulverized coal plant
SPP	Southwest Power Pool
T&D	transmission and distribution
TCP	Traditional Cultural Properties
TDEC	Tennessee Department of Environment and Conservation
TDS	total dissolved solids
TRM	Tennessee River Mile
TSCA	Toxic Substances Control Act
TSS	total suspended solids
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
USACE	U.S. Army Corps of Engineers
USBEA	U.S. Bureau of Economic Analysis
USBLS	U.S. Bureau of Labor Statistics
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USET	United South and Eastern Tribes, Inc.
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compounds
VOM	Variable operating and maintenance costs
WAP	Weatherization Assistance Program
WKWMA	Western Kentucky Wildlife Management Area

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1 Introduction

TVA has developed the 2019 IRP and associated programmatic EIS to address the demand for power in the TVA service area, the resource options available for meeting that demand, and the potential environmental, economic and operating impacts of these options. The IRP will serve as a roadmap for meeting the energy needs of TVA's customers over the next 20 years.

1.1 TVA Overview

1.1.1 TVA's Mission

TVA was created by Congress in 1933 and charged with a unique mission – to improve the quality of life in the Valley through the integrated management of the region's resources. For more than eight decades, TVA has worked to carry out that mission and to make life better for the nearly 10 million people who live, work and play in the Valley. TVA is fully self-financed, funding virtually all operations through electricity sales and power system bond financing. TVA sets rates as low as feasible and reinvests net income from power sales into power system improvements and economic development initiatives. TVA makes no profit and receives no tax money. To achieve its overall mission of providing low-cost, reliable power to the people of the Valley, TVA focuses on four strategic imperatives: balancing power rates and debt so that TVA maintains low rates while living within its means; and recognizing the trade-off between optimizing the value of our asset portfolio and being responsible stewards of the Valley's environment and natural resources (Figure 1-1). Today, TVA continues to serve the people of the Tennessee Valley through its work in three areas: Energy, the Environment and Economic Development.

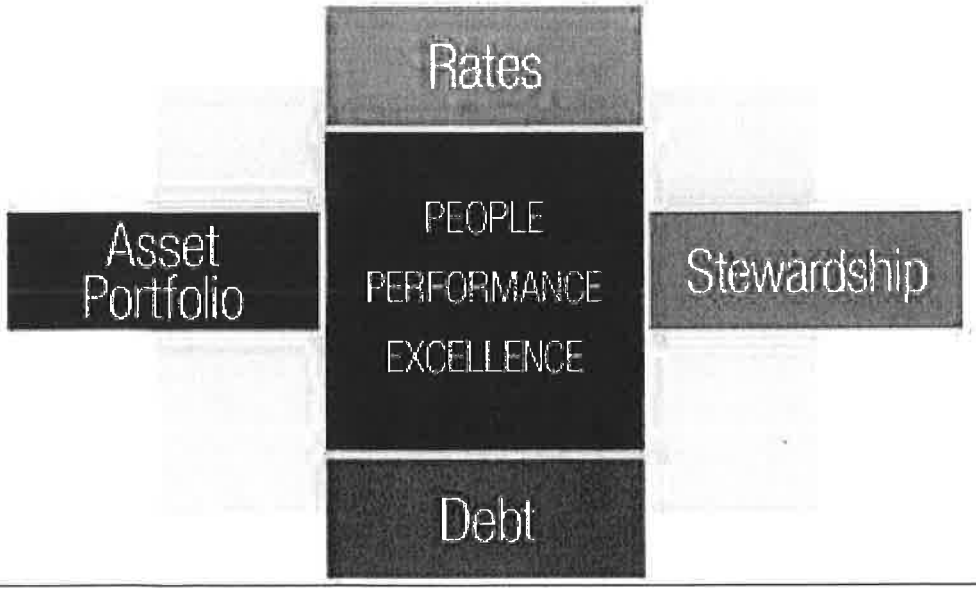

Figure 1-1: Strategic Imperatives

1.1.1.1 Energy

TVA is the largest producer of public power in the United States. TVA provides wholesale power to 154 local power companies and directly sells power to 58 industrial and federal customers. TVA's power system serves nearly 10 million people in a seven-state, 80,000-square-mile region (the Valley).

TVA's generating assets include: six coal plants, three nuclear plants, 29 conventional hydro plants, one pumped storage hydro plant, nine natural gas combustion turbine (CT) gas plants, eight natural gas combined cycle (CC) gas plants, one diesel generator site, and 14 solar sites. TVA has gas-co-firing potential at one coal-fired site as well as biomass co-firing potential at all of its coal-fired sites. In total, these

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assets constitute a portfolio of 33,500 MWs. TVA also purchases a portion of its power supply from third-party operators under long-term power purchase agreements (PPAs).

Safe, clean, reliable and affordable electricity powers the economy of our region and enables greater prosperity and a higher quality of life for everyone. In setting rates, the TVA Board is charged by Section 113 of the Energy Policy Act of 1992 (now the least-cost, system-wide planning provision of the TVA Act) to have due regard for the primary objectives of the TVA Act, including the objective that power be sold at rates as low as are feasible.

TVA operates one of the largest transmission systems in the U.S. It serves an area of 80,000 square miles through a network of about 16,200 miles of transmission lines, 500 substations, switchyards and switching stations, and over 1,300 individual customer connection points. The system connects to switchyards at generating facilities and transmits power from them at primarily either 161 kV or 500 kV to local power companies and directly served customers. For the past 18 years, the system has achieved 99.999 percent power reliability. It efficiently delivered nearly 163 billion kilowatt-hours of electricity to customers in FY 2018.

Also, the TVA transmission system has 69 interconnections with 13 neighboring utilities at interconnection voltages ranging from 69-kV to 500-kV. These interconnections allow TVA and its neighboring utilities to buy and sell power from each other and to wheel power through their systems to other utilities. To the extent that Federal law requires access to the TVA transmission system, the TVA transmission organization offers services to others to transmit power at wholesale in a manner that is comparable to TVA's own use of the transmission system, according to FERC Standards of Conduct for Transmission Providers (FERC 2008).

In recent years, TVA has built an average of 75 miles of new transmission lines and several new substations and switching stations per year to serve new customer connection points and/or to increase the capacity and reliability of the transmission system. TVA has also upgraded many existing transmission lines. A major focus of recent transmission system upgrades has been to maintain reliability when coal units are retired. Between 2011 and 2018, TVA spent about $420 million on these upgrades and anticipates spending $10 million on coal-retirement related transmission system upgrades in 2019 and 2020. The upgrades include modifications of existing lines and substations and new installations as necessary to provide adequate transmission capacity, maintain voltage support, and ensure generating plant and transmission system stability. In May 2017, TVA began a $300 million, multi-year effort to upgrade and expand its fiber-optic network to help meet the power system's growing need for bandwidth as well as accommodate the integration of new distributed energy resources.

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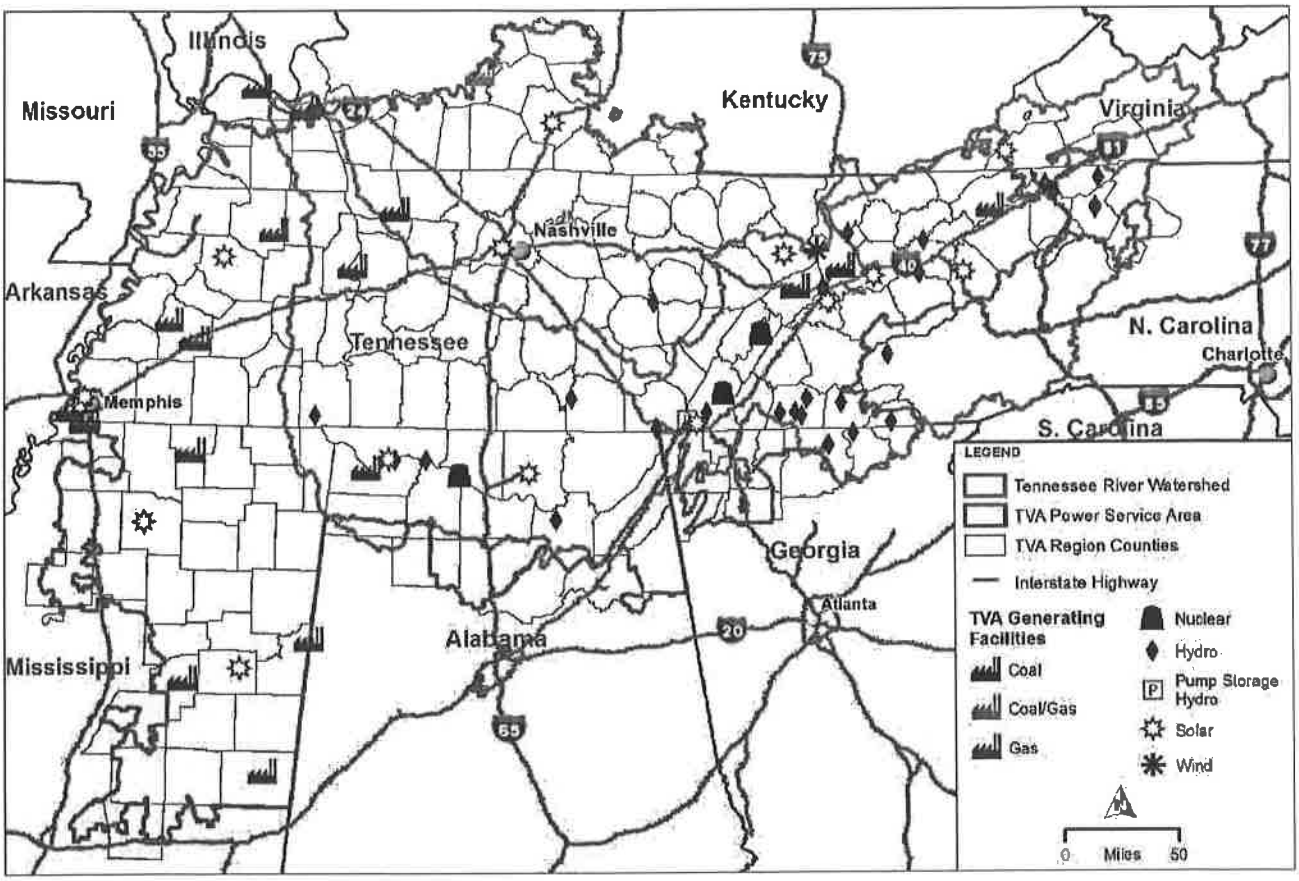

Figure 1-2: Power Service Area and Tennessee River Watershed, herein the TVA region

Additionally, TVA makes annual investments in science and technology innovation that enable TVA to meet future business and operational challenges. Core research activities directly support improving generation and delivery assets, enhancing air and water quality, and integrating clean energy resources.

1.1.1.2 Environmental Stewardship

Environmental stewardship is an important part of TVA's mission of service. TVA is committed to protecting the Valley's natural resources, as well as its historical and cultural heritage. TVA manages and monitors 293,000 acres of reservoir land, 11,000 miles of shoreline and 80 public recreation areas. These areas generate about $12 billion a year in recreation to the regional economy and create or retain about 130,000 jobs each year.

To protect water quality and aquatic life, TVA has installed equipment to add oxygen to the water around TVA dams and committed to releasing minimum flow to keep the downstream riverbed from drying out when power generation is shut off.

To protect air quality, TVA has invested nearly $7 billion installing systems to reduce nitrogen oxides and sulfur dioxide emissions from coal-fired plants. TVA has also reduced carbon dioxide emissions by retiring several of its oldest, least efficient coal-fired units and adding cleaner forms of power generation, including:

- the first nuclear unit of the 21st century,
- more clean-burning natural gas units,
- generating and purchasing more renewable energy.

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Through FY 2018, these actions have helped TVA to achieve:

- a 98 percent reduction in sulfur dioxide (SO_2) from peak levels in 1977,
- a 94 percent reduction in nitrogen oxides (NO_x) emissions from peak levels in 1995,
- reduced water use, wastewater discharges, and waste production from TVA's operations, and
- a 47 percent reduction in carbon dioxide (CO_2) emissions through calendar year 2017 compared to 2005 levels.

1.1.1.3 Economic Development

Economic development is a cornerstone of TVA's mission to make life better for Valley residents. In 2018, TVA worked in partnership with communities and the business sector to spur over $11.3 billion in business investments in the Valley, helping to attract and retain more than 65,400 jobs. This was in addition to assisting more than 200 companies to locate or expand existing operations in the Valley. TVA also assisted communities directly with more than 1,100 outreach activities related to economic growth preparedness and retail business development, including 34 communities in the Valley Sustainable Communities Program, which helps to differentiate those communities by highlighting and increasing local sustainability efforts. TVA is also providing ongoing economic development assistance to communities and companies through financial support, technical services, leadership training, market research and other business offerings.

1.2 Integrated Resource Planning

The purpose of the IRP and EIS process is to evaluate TVA's current energy resource portfolio and alternative future portfolios of energy resource options to meet the future electrical energy needs of the TVA region at a least system-wide cost while taking into account TVA's mission of energy, environmental stewardship and economic development. The Recommended Target Power Supply Mix described in the 2015 IRP was formally approved by the TVA Board of Directors in August 2015 and has guided TVA decisions since then.

Several recent industry-wide changes have led TVA to begin development of the new IRP and associated EIS ahead of the five-year cycle identified in the 2015 IRP.

Natural gas supplies are abundant and are projected to remain available at lower cost. The electric system load is expected to be flat, or even declining slightly, over the next 10 years. The price of renewable resources, particularly solar, continues to decline. Consumer demand for renewable and distributed energy resources (including distributed generation, storage, demand response and energy services, and energy efficiency programs) is growing. Given these recent changes, the main focus areas of the 2019 IRP are:

- System flexibility,
- Distributed energy resources, and
- Portfolio diversity.

The focus on flexibility in this IRP is multi-faceted. The Valley benefits from a diverse power system that provides flexibility for how the future evolves. As the economics of renewables and distributed energy resources continue to improve, operational flexibility will be increasingly important to successfully integrate these resources into the generation portfolio. Due to their intermittent nature, TVA needs flexible resources that can quickly respond to dynamic loads.

1.2.1 IRP Objectives

The following objectives guide the development of this IRP:

- Deliver a plan aligned to mandated least-cost planning principles,
- Ensure the portfolio delivers energy in a reliable manner,
- Manage risk by utilizing a diverse portfolio of supply and demand-side resources,
- Deliver cleaner energy and continue to reduce environmental impacts,
- Evaluate increased use of renewables, energy efficiency, and distributed energy resources,
- Continue to innovate by dynamically modeling energy efficiency and distributed energy resources in the study,

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- Proactively plan to meet future needs for system flexibility,
- Provide flexibility to adapt to changing market conditions and identify significant signposts,
- Increase credibility and trust through a collaborative and transparent process, and
- Integrate stakeholder perspectives throughout the study.

Given these objectives and in consideration of the focus areas listed above, the final, optimal resource plan has been developed with the goals of being low-cost, risk-informed, environmentally responsible, reliable, diverse, and flexible.

1.2.2 IRP Development

TVA developed this new IRP and associated EIS to proactively address several changes within the utility marketplace, both regionally and nationally. Upon adoption by the TVA Board, the IRP will replace the 2015 IRP. The purpose of the IRP and EIS processes is to evaluate TVA's current energy resource portfolio and alternative future portfolios of energy resource options to meet the energy needs of the Valley while taking into account TVA's mission of energy, environmental stewardship and economic development.

To ensure TVA best meets projected future needs, TVA has continued its tradition of incorporating innovations in each succeeding IRP.

- The 2011 IRP focused on diversifying and modernizing its generation portfolio, part of which included adding cost-effective renewables.
- The 2015 IRP identified distributed energy resources (DER) as a growing trend in the utility industry and designed a mechanism where energy efficiency could be chosen as a resource.
- The 2019 IRP:
    - Improves TVA's understanding of the impact and benefit of system flexibility to meet dynamically changing loads with increasing renewable and distributed resources.
    - Explores various DER scenarios, considering the speed and amount of DER penetration.
    - Determines the implications of implementing the selected diverse portfolio mix over the next 20 years.

Distributed energy resources (DER) are power generation and storage systems that are connected to the power distribution system and deliver power to the grid or that are "behind the meter" and deliver power directly to an end-user. Examples include solar panels, combined heat and power systems, microturbines, and battery storage systems. DER also includes energy management, such as energy efficiency and demand response.

1.2.3 IRP Innovations

Building upon previous versions of the IRP, the 2019 IRP includes modeling refinements, updated studies, and additional public outreach. The purpose of these innovations is to provide an IRP that evolves with the industry and helps TVA continue to provide reliable, clean power at the lowest feasible rate.

1.2.3.1 Reserve Margin

TVA's planning reserve margin, which provides reserve capacity for unplanned events, has historically been an annual target based on a study focused on the summer peak. In the 2015 IRP, TVA's planning reserve margin was 15 percent applied across the year. TVA has a dual-peaking system, with similarly high demand in both winter and summer. In winter, there is increased thermal and hydro generating capacity but also greater weather-driven peak variability than in the summer. While solar capacity additions are expected, driven by increasing consumer demand and decreasing prices, solar generation does not coincide with winter peak demand times. Since the 2015 IRP, TVA conducted an updated reserve margin study to evaluate seasonal differences in demand and supply and the impact of increasing solar capacity on the system. The objective was to identify discrete reserve margin targets for summer and winter to ensure an industry best-practice level of reliability across both peak seasons. The study

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also evaluated the cost of reserves and reliability events to the customer. Based on the study, the planning reserve margins being applied in the 2019 IRP are 17 percent for the summer peak season and 25 percent for the winter peak season.

1.2.3.2 Integration Cost and Flexibility Benefit

With increasing penetration of variable energy resources, such as wind farms, utility-scale solar farms and rooftop solar, utilities need to ensure their bulk system is flexible enough to respond to dynamically changing loads, even to load changes within each hour. If variable energy resources are added, the balance of the system must respond to their variability, driving an integration cost. Conversely, if very flexible assets (i.e., those that can rapidly change their output) are added, there is a benefit resulting from the balance of the system running more efficiently. To capture these impacts in long-term planning, TVA recently conducted a study to quantify an integration cost for solar and wind resources and a flexibility benefit for small, agile gas and storage resources. The result is a sub-hourly integration cost or flexibility benefit that was applied to energy or build costs in 2019 IRP modeling performed at an hourly level.

1.2.3.3 DER Modeling

In the 2015 IRP, DER was included in the load forecast as a load modifier that reduced demand for electricity from TVA, and energy efficiency and demand response were modeled as selectable resources. In the 2019 IRP, TVA made further refinements in modeling behind-the-meter generation in the load forecast, including variations across the scenarios. We also modeled distributed generation resources, including combined heat and power, and distributed solar and storage. There are targeted levels of adoption of these distributed resources based on incentive levels in each strategy.

1.2.3.4 Public Outreach and Engagement

Building upon the outreach and engagement work done for the 2015 IRP, TVA developed an outreach strategy to foster broader engagement from different demographic groups; a social media campaign designed to engage various audiences; and ongoing communications about the IRP, rather than communications only at key milestones.

Social media communications included multiple posts targeted to the different demographic groups on platforms such as Twitter, LinkedIn, Facebook and Instagram. Additionally, TVA published videos to build the public's knowledge and understanding of the electrical system as well as the IRP process. Additional details on social media outreach are located in Section 3.3.1 of Volume I.

Figure 1-3: Example of TVA IRP LinkedIn Post

In conjunction with the issuance of the draft IRP and EIS documents for public review, TVA developed an interactive report to enable members of the public to learn about and provide comments on the draft IRP and EIS documents. Materials from public meetings that TVA hosted across the Valley are also on TVA's IRP webpage. The interactive report has been updated to capture final results.

1.3 Overview of Volumes I and II

Volume I contains the 2019 IRP along with descriptions on the methodology and development of the recommendation. This works in conjunction with Volume II, which contains the EIS. The EIS is an assessment conducted under the National Environmental Policy Act (NEPA) that describes the

environmental effects of a proposed action and its alternatives that may have a significant effect on the quality of the human environment.

TVA developed the draft IRP and EIS and made them available to the public and government agencies for review and comment from February 15th, 2019, until April 8th, 2019. During the public comment period, TVA conducted public meetings across the Valley to discuss the IRP process, share draft results, and receive comments on the draft IRP and EIS. Over 1,200 people commented on the draft IRP and EIS. TVA considered all comments received, made revisions as appropriate, and is now publishing the final IRP and EIS. The final EIS includes TVA's responses to public comments on the Draft IRP and EIS.

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2 IRP Process

TVA's 2019 IRP process consisted of seven distinct steps:

1. Scoping
2. Develop Study Inputs and Framework
3. Analyze and Evaluate
4. Present Initial Results and Gather Feedback
5. Incorporate Feedback and Perform Additional Modeling
6. Identify Preferred Target Supply Mix
7. Approval of IRP Recommendations by TVA Board of Directors

Public participation was integral to the process and is explained in more detail in Chapter 3. Steps 2 through 6 are explained in more detail in Chapter 6.

2.1 Scoping

The IRP team collected information from TVA's resource planning, forecasting, and electricity generation experts to begin developing IRP model inputs. A 60-day public scoping period for TVA's 2019 IRP occurred from February 15 to April 16, 2018. The objective in this initial step was to identify resource options, strategies and future conditions that merited evaluation in the IRP process. Public scoping comments covered a wide range of issues, including the nature of the integrated resource planning process, preferences for various types of power generation, input on planning scenarios and strategies, and the environmental impacts of TVA's power generation. The comments received helped to identify issues important to the public and to lay the foundation for the EIS that supports the 2019 IRP. Additional information on the scoping process and results can be found in Volume I, Section 3.1.

2.2 Develop Study Inputs and Framework

When developing a long-term plan for a power system, utilities typically use a least-cost decision making framework that focuses on a single view of the future. TVA also uses a least-cost decision making framework but considers multiple views of the future to determine how potential resource portfolios could perform across multiple futures given different market and external conditions.

TVA's goal is to identify an energy resource plan that performs well under a variety of future conditions (e.g., a strong economy or a weak economy), thereby reducing the risk that a selected strategy or plan would perform well under one set of future conditions, but poorly under a different set of conditions. This increases the likelihood that TVA's plan will provide least-cost solutions to future demands for electricity from its power system regardless of how the future plays out.

This decision-making framework requires use of a scenario planning approach. Scenario planning provides an understanding of how the results of near-term and future decisions would change under different conditions over a 20-year planning horizon.

After review of the scoping comments, suggestions from members of the IRP Working Group (see Volume I, Section 3.2), and further analysis, TVA selected the five unique scenarios summarized in Table 2-1. In addition to these five scenarios, TVA also analyzed an additional Current Outlook scenario based on TVA's current assumptions about future conditions.

Scenarios are alternate plausible futures outside of TVA's control with different economic and regulatory conditions, as well as social trends and pace of adoption of newer technologies. Strategies are alternate business approaches within TVA's control that differ in the type and amount of resources that are promoted in the future. A portfolio is the result of a strategy evaluated inside a scenario. Each strategy and scenario combination will result in a 20-year resource portfolio to meet the energy needs of the Valley.

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Table 2-1: Description of the Six Scenarios

Scenario	Description
1- The Current Outlook	TVA's current forecast for key uncertainties that reflects modest economic growth offset by impact of increasing efficiencies resulting in a flat load outlook
2- Economic Downturn	Represents a prolonged stagnation in the economy, resulting in declining loads and delayed expansion of new generation
3- Valley Load Growth	Represents economic growth driven by migration into the Valley, a technology-driven boost to productivity, and increased electrification of transportation
4- Decarbonization	Represents a strong push to curb GHG emissions due to concern over climate change, resulting in high CO_2 emission penalties and incentives for non-emitting technologies
5- Rapid DER Adoption	Represents growing consumer awareness and preference for energy choice, coupled with rapid advances in technologies driving high penetration of distributed generation, storage, and energy management
6- No Nuclear Extensions	Represents a regulatory challenge to relicensing of existing and construction of new, large scale nuclear and a preference for more secure, modular, and flexible technologies, including subsidies to drive a breakthrough in Small Modular Reactor design and cost

After review of the scoping comments, suggestions from members of the IRP Working Group, and further analysis, TVA selected five distinct strategies, including a base case representing least-cost planning with no specific resources promoted and reflecting decisions made to date by the TVA Board of Directors. The resource strategies TVA evaluated are shown in Table 2-2. These strategies differ in their emphasis on distributed generation, energy efficiency and demand response efforts, renewable energy resources, nuclear generating capacity additions, and coal-fired generation. The alternative strategies were analyzed in the context of six different scenarios (Table 2-1) that described plausible future economic and regulatory conditions, as well as social trends and adoption of newer technologies.

Table 2-2: Description of Strategies

Strategies	Description
A- Base Case	• Represents TVA's current assumptions for resource costs and applies a planning reserve margin constraint, which also applies in every strategy
B- Promote DER	• Promotes DER to high long-term penetration levels by incenting distributed solar and storage, combined heat and power, energy efficiency and demand response
C- Promote Resiliency	• Promotes small, agile capacity to increase operational flexibility of TVA's power system, while also improving the ability to respond locally to short-term disruptions
D- Promote Efficient Load Shape	• Promotes targeted electrification, demand response, and energy management to optimize load shape, including programs targeting low-income energy efficiency
E- Promote Renewables	• Promotes renewables at all scales to meet growing prospective or existing customer demands for renewable energy

2.3 Analyze and Evaluate

After the resource planning scenarios and strategies were developed, the performance of each planning strategy was analyzed in detail across all of the scenarios. This phase of the IRP used industry standard capacity expansion planning and production cost-modeling software to estimate the total cost of each combination of strategy and scenario. Metrics, financial risks and environmental impacts were developed from the cost-modeling results.

Unique resource plans, or "portfolios," were developed, one for each combination of scenario and strategy. Each of the 30 portfolios represented a long-term,

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least-cost plan of different resource mixes that could be used to meet the region's power needs.

Every portfolio was evaluated using metrics within a consistent, standard scorecard. The metrics were chosen based on importance to TVA's mission, and captured financial, environmental, operational and economic impacts. Portfolios were analyzed for their robustness under stress across multiple scenarios and metrics. TVA identified portfolios that performed best overall, and those strategies that performed well in most models of the future.

2.4 Present Initial Results and Gather Feedback

The draft 2019 IRP and EIS were released for public review and comment from February 15th, 2019, until April 8th, 2019. It presented an initial range of viable planning strategies for further consideration, and included scorecards and assessments using key metrics, along with an assessment of environmental impacts based on the draft results. As in the scoping period, TVA encouraged public comments on the draft IRP and associated EIS. Over 300 comment submittals were received, along with a petition from the Sierra Club signed by close to 1,000 individuals. The comments expressed public concerns, questions, and recommendations for the future operation of the TVA power system.

2.5 Incorporate Feedback and Perform Additional Modeling

Following the public comment period, all comments were reviewed. Similar comments were combined into a group, as appropriate. TVA provided responses to all substantive comments either by revising the IRP or associated EIS, or by providing specific answers in the final EIS. Results of any additional technical analysis conducted to respond to comments are included in the final IRP. Comments received, along with TVA's responses, can be found in Appendix F of the Final EIS.

2.6 Identify Target Power Supply Mix

After consideration of IRP Working Group and RERC input, review of the public comments received and additional analysis, TVA identified a target power supply mix based on planning strategies evaluated in the IRP. This target, expressed in ranges, reflects the mix of supply and demand side resources that best position the Valley for success in a variety of alternative futures while preserving the flexibility necessary to respond to uncertainty. Final results and implementation considerations are found in Chapter 9 of the IRP.

2.7 Identify Near-Term Actions and Signposts

Considering the IRP key findings and Recommendation for the target power supply mix over the next 20 years, TVA also identified near-term actions that would provide benefit across multiple futures. Additionally, we have highlighted key signposts, or drivers, that will guide decisions in the longer term.

2.8 Approval of IRP Recommendations

A Notice of Availability of the final 2019 IRP and EIS has been published in the *Federal Register*. No sooner than 30 days after publication of the Notice of Availability in the Federal Register, the TVA Board of Directors will be asked to approve the recommendations included in the study, including the target power supply mix. The Board will decide whether to approve the recommendations presented in the study, to modify them or to approve an alternative. The Board's decision will be described and explained in a Record of Decision.

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Chapter 4: Need for Power Analysis

Figure 4-1 is a comparison of weather-normalized actual annual peaks in megawatts (MW) to peaks forecasted one year earlier. The red "Normalized Actual" line represents what the annual peaks would have been under normal weather conditions. The closer the blue-dotted "Forecast" is to the red "Normalized Actual" line, the more accurate the peak forecast. For example, in FY17, the actual peak was only 1.4 percent lower than forecasted.

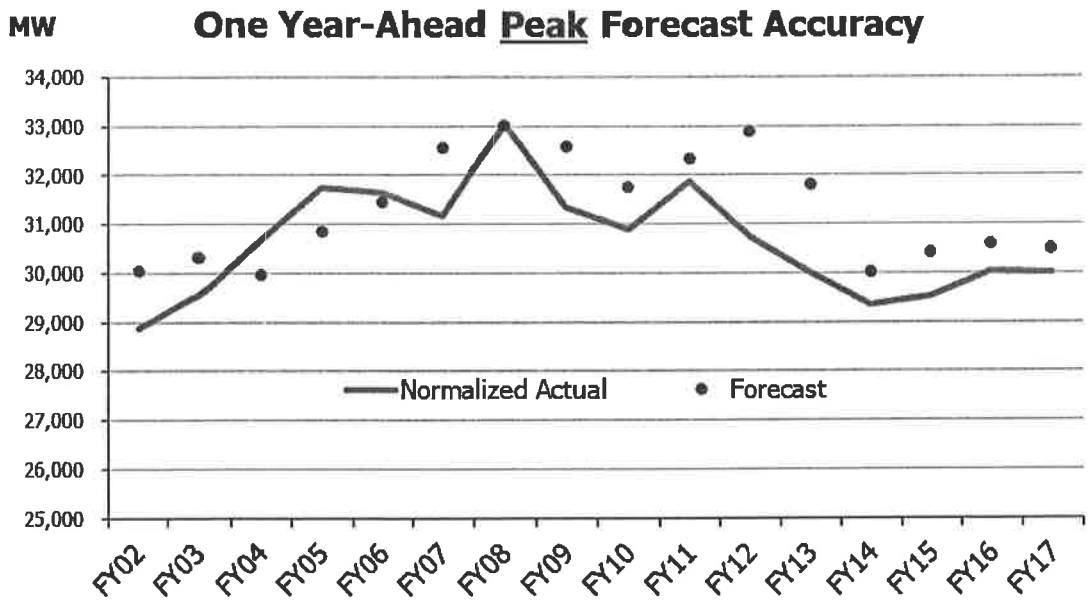

Figure 4-1: Comparison of Actual and Forecasted Annual Peak Demand

Figure 4-2 is a comparison of weather-normalized actual annual energy requirements in gigawatt-hours (GWh) to energy forecasts from one year earlier. Energy is somewhat less volatile than peaks, which are based on a single hour of each year, because energy is the sum of all the hours of the year. This difference makes energy easier to forecast; hence, year-ahead forecast variances tend to be smaller.

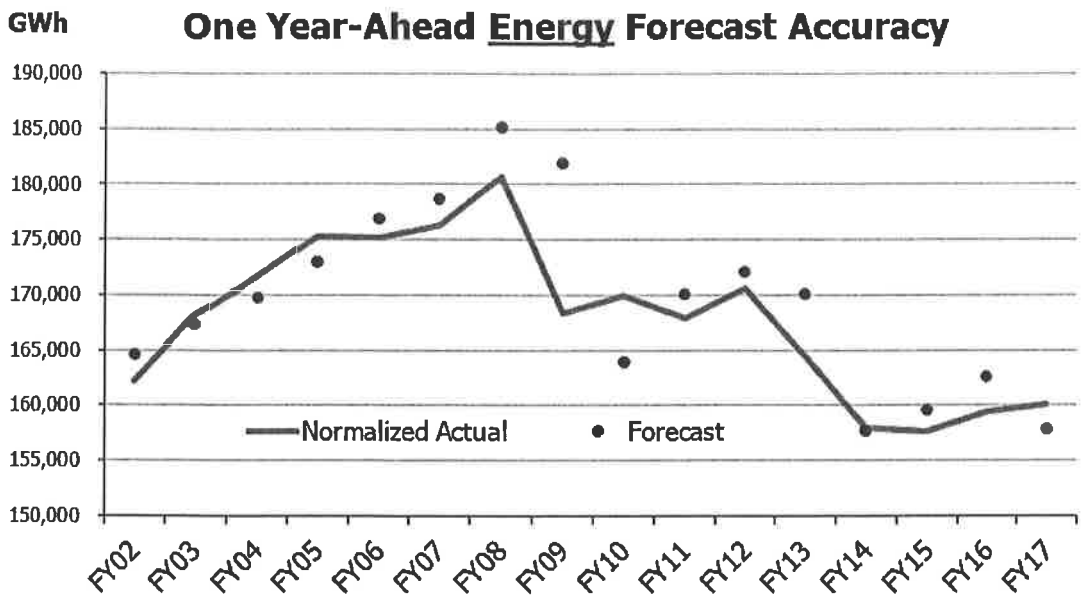

Figure 4-2: Comparison of Weather-normalized Actual and Forecasted Energy

Model accuracy is assessed by using historical actuals for forecast variables and checking to see how close the models reproduce historic power demand. R-squared (R^2) is a statistical measure of how well the regression predictions approximate real data points. This back testing methodology indicates that TVA's forecast model explains 98 percent of the variation, as measured by the R^2, in historic demand and estimates monthly demand within a monthly average absolute error of 1.4 percent. Fundamentally, if TVA had perfect foresight pertaining to the macro environment, the actual demand would be within +/- 1.4 percent. Figure 4-3 compares the back-tested prediction (x-axis) to the actual observations (y-axis).

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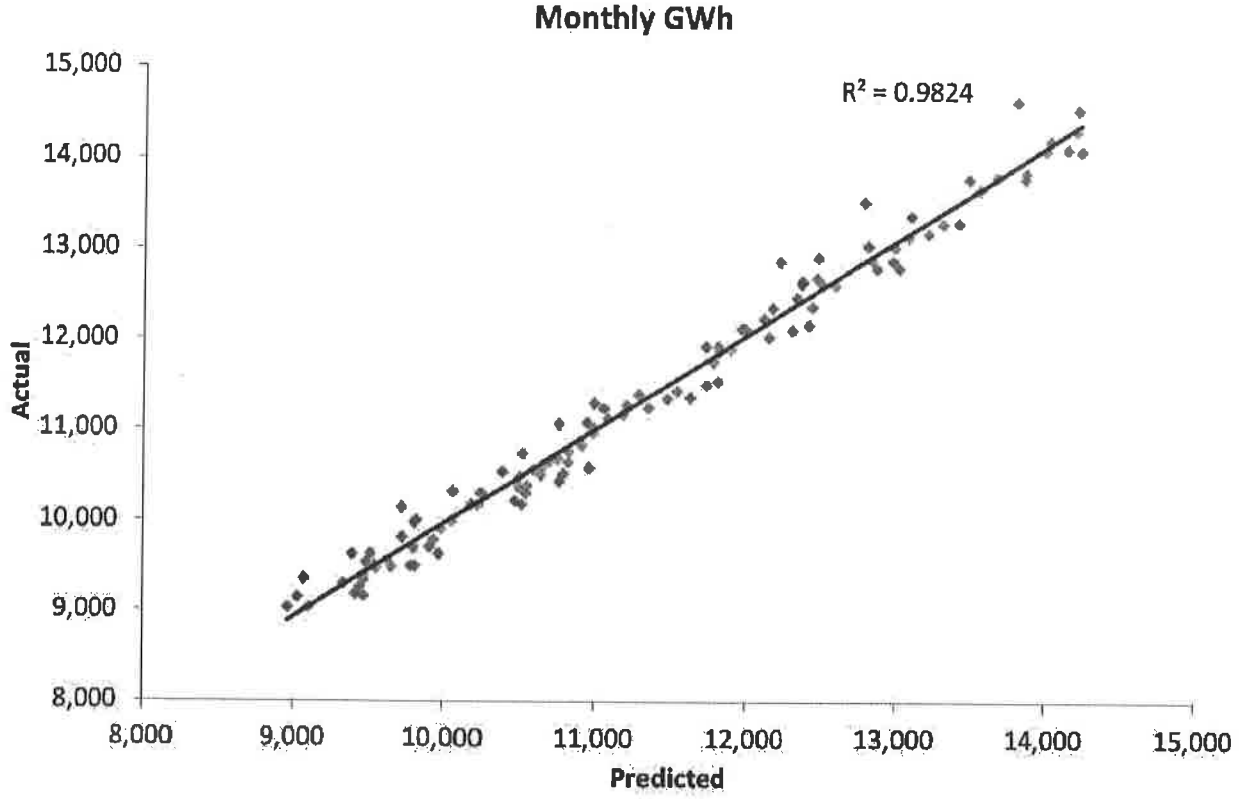

Figure 4-3: Comparison of Predicted versus Actual Monthly Energy

The remainder of the forecast error is caused by assumptions about market fundamentals. Forecasts of future economics, demographics and efficiency improvements drive expected demand for power. Variation in the expected business environment manifest as forecast variance. For example, at the height of the Great Recession (FY09), TVA's weather-normalized forecast variance was 8.0 percent and 4.0 percent for System Energy and Peak, respectively, driven by the significant recession that was not part of the economic forecast. Impacts from changes in the underlying market fundamentals highlights the value in scenario analysis.

4.1.4 Forecasts of Peak Load and Energy Requirements

Over the next couple of decades, the Current Outlook anticipates system energy to remain flat at a 0.0 percent compound annual growth rate (CAGR) and peak demand to grow at a 0.3 percent CAGR. These forecasts are very similar to the actual growth over the FY02 through FY17 period for energy (-0.1 percent CAGR) and peak (0.3 percent CAGR). These expectations are a function of both economics and energy efficiency projections. Slower economic growth, driven by the baby boomers' retirement, and an ever-tightening regulatory environment are both anticipated to moderate future energy growth.

To deal with the inherent uncertainty in forecasting, TVA uses a range of forecasts. Each forecast corresponds to different scenarios that reflect higher or lower loads compared to the Current Outlook. The Current Outlook scenario for the IRP is the forecast that TVA prepared for the FY19 Long Range Financial Plan in the spring of 2018. The range of forecasts for system peak load and energy requirements in the IRP are shown in Figures 4-4 and 4-5, respectively. Both include the Current Outlook scenario and the highest and lowest growth scenarios that are modeled. They are the Valley Growth

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scenario and the Rapid DER Adoption scenario, respectively. Annual peak load growth over the 2019 through 2038 time period is 0.3 percent in the Current Outlook scenario and varies from a -0.7 percent CAGR in the lowest peak scenario to a 1.7 percent CAGR in the highest growth scenario. System energy requirements are flat in the Current Outlook scenario with energy declining annually 1.5 percent in the lowest scenario and going as high as 2.0 percent annually in the highest growth scenario.

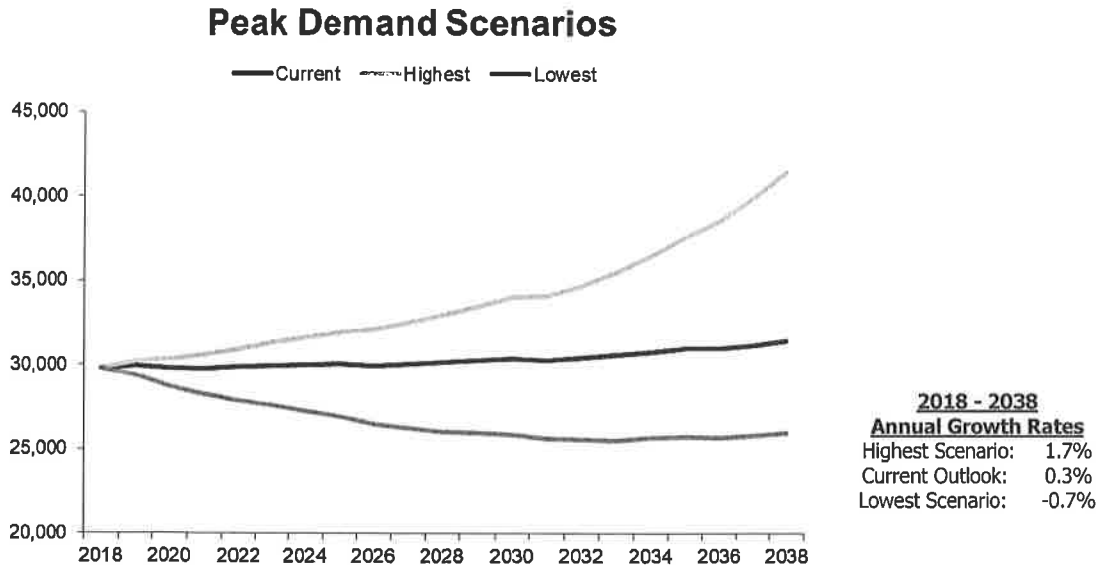

Figure 4-4: Peak Demand (MW) Forecast

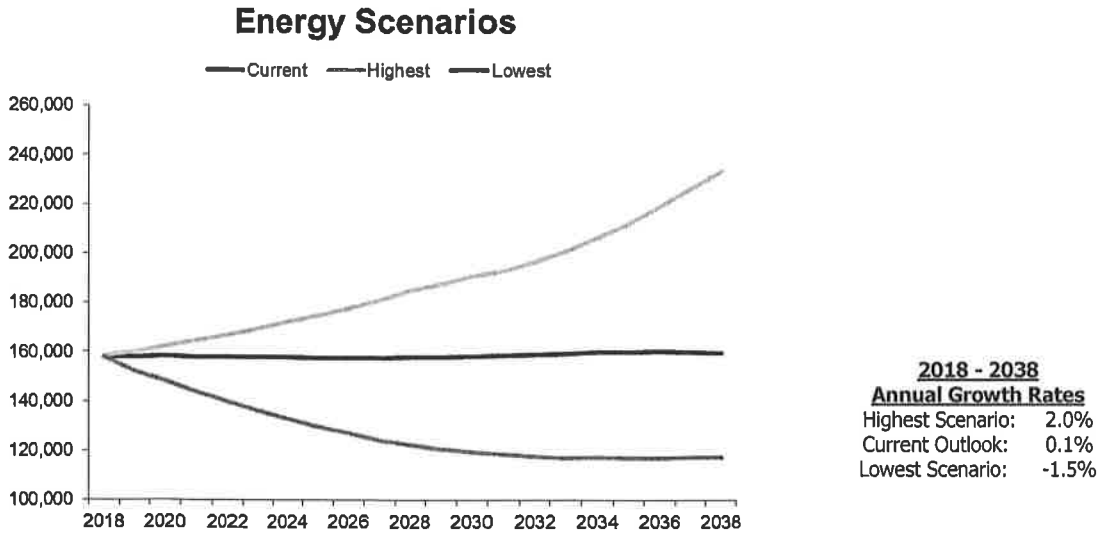

Figure 4-5: Energy (kW-hours) Forecast

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The use of ranges ensures that TVA considers a spectrum of electricity demand in its service territory and reduces the likelihood that its plans are overly dependent on a single-point estimate of demand growth. Alternative scenarios highlight the risk inherent in forecasting and planning to a single point estimate. The scenario-generated ranges are used to inform planning decisions beyond pure least-cost considerations based on a specific demand in each year.

4.2 Determine Reserve Capacity Needs

To maintain reliability, power providers must always have more generating capacity available than required to meet peak demand. This additional generation, called "reserve capacity," must be large enough to cover the loss of the largest single operating unit (contingency reserves), be able to respond to moment-by-moment changes in system load (regulating reserves) and replace contingency resources should they fail (replacement reserves). Total reserves must also be sufficient to cover uncertainties such as unplanned unit outages, undelivered purchased capacity, severe weather events, or load forecasting error.

Through a recent study, TVA identified planning reserve margins for both the summer and winter peak seasons. The reserve margin study is based on a probabilistic analysis that considered the uncertainty of unit availability, transmission capability, weather-dependent unit capabilities (e.g., hydro, wind and solar), economic growth and weather variations to compute expected reliability impacts and costs. TVA selected planning reserve margins for summer and winter that targeted industry best-practice levels of reliability, while also minimizing the cost of reserves and reliability events to the customer. Based on this methodology, TVA's current planning reserve margin is 17 percent above peak load requirements in the summer and 25 percent above peak load requirements in the winter. Additional detail about the Reserve Margin study can be found in Appendix D.

4.3 Estimate Supply

The third step in the process of analyzing future power needs is to identify the supply- and demand-side resources currently available to meet future power demand. TVA's generation supply consists of a combination of existing TVA-owned resources; budgeted and approved projects such as new plant additions and updates to existing assets; and existing power purchase agreements (PPAs).

Generating assets can be categorized both by whether the power they produce is used to meet base, intermediate or peak demand or used for storage, and by capacity type or energy/fuel source.

4.3.1 Baseload, Intermediate, Peaking and Storage Resources

Figure 4-6 illustrates the uses of baseload, intermediate and peaking assets. Although these categories are useful, the distinction between them is not always clear-cut. For example, a peaking unit, which is typically used to serve only intermittent but short-lived spikes in demand, may be called on from time to time to run continuously for a limited period even though it may be less economical to do so. This may be due to transmission or other power system constraints. Similarly, some baseload units are capable of operating at different power levels, giving them some characteristics of an intermediate or peaking unit. This IRP considered strategies that take advantage of this range of operations.

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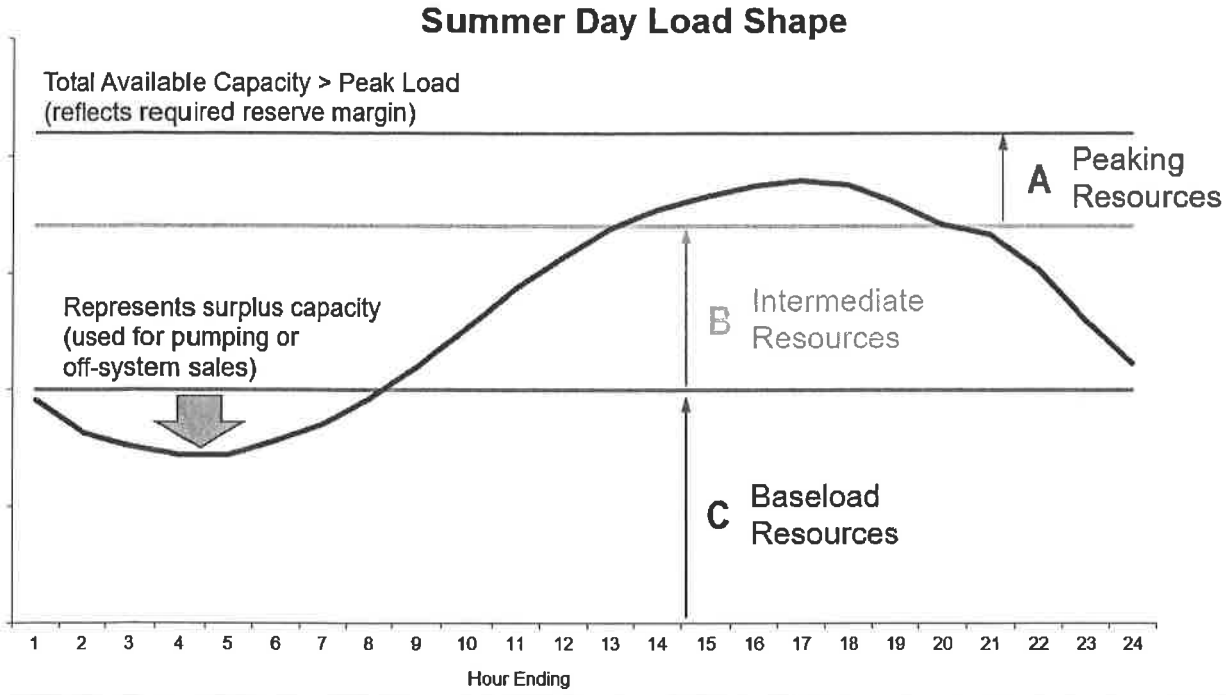

Figure 4-6: Illustration of Baseload, Intermediate and Peaking Resources

4.3.1.1 Baseload Resources

Due to their lower operating costs and high availability, baseload resources are used primarily to provide continuous, reliable power over long periods of uniform demand. Baseload resources typically have higher construction costs than other alternatives, but also have lower fuel and variable costs, especially when fixed costs are expressed on a unit basis (e.g., dollars per MWh). An example of a baseload resource is a nuclear power plant.

Some energy providers also use larger coal units and natural gas-fired combined cycle (CC) plants as incremental baseload generators. Natural gas-fired CC plants have become more attractive for baseload generation as the fundamentals of fuel supply and demand have changed and as access to shale gas has grown.

4.3.1.2 Intermediate Resources

Intermediate resources are used primarily to fill the gap in generation between baseload and peaking needs. They also provide backup and balance the supply of energy from intermittent wind and solar generation.

Intermediate units are required to produce more or less output as the energy demand increases and decreases over time, both during the course of a day and seasonally. Given current fuel prices and relative generating efficiencies, these units are typically more costly to operate than baseload units but less expensive than peaking units.

Intermediate generation comes from natural gas-fired CC plants and smaller coal units and also from wind and solar generation. Solar's energy profile aligns more closely with summer load shapes and wind with winter load shapes, and the availability of energy storage technologies increases the ability to leverage these intermittent resources.

Hydro generating assets can generally be categorized as intermediate resources, but their flexibility allows them to operate the full range from baseload to peaking. The limitation of hydro generation is restricted more by water availability and the various needs of the river system such as navigation, flood control and recreation.

4.3.1.3 Peaking Resources

Peaking units are expected to operate infrequently during short-duration, high demand periods. They are essential for maintaining system reliability requirements, as they can start up quickly to meet sudden changes in either demand or supply. Typical peaking resources are natural gas-fired frame combustion turbines (CTs), aeroderivative CTs, reciprocating internal combustion engines (RICE), and conventional hydro generation.

4.3.1.4 Storage Resources

Storage units usually serve the same power supply function as peaking units but use low-cost, off-peak electricity to store energy for generation at peak times. An example of a storage unit is a hydro pumped-storage plant. These plants pump water to a reservoir during periods of low demand and release it to generate electricity during periods of high demand. Consequently, a storage unit is both a power supply source and an electricity user. Lithium-ion batteries are another example of a storage resource.

4.3.2 Capacity and Energy

Power system peaks are measured in terms of capacity, the instantaneous maximum amount of energy that can be supplied by a generating plant and collectively by the power system.

For long-term planning purposes, capacity can be defined in several ways:

- **Nameplate capacity** is the theoretical design value or intended maximum megawatt output of a generator at the time of installation.
- **Capability** is the maximum dependable load-carrying ability of units or the number of megawatts that can be delivered by a generating unit without restrictions (i.e., does not reflect temporary capacity restrictions caused by known fuel or mechanical derates) and less station power.
- **Net dependable capacity** is the maximum dependable output less all known adjustments (e.g., transmission restrictions, station service needs and fuel derates) and is dependent on the season. This value, which is used by capacity planners, is typically determined by performance testing during the respective season. TVA uses both summer and winter net dependable capacities of units in the analysis, given the dual-peaking nature of the system.

Overall power system production is measured in terms of energy (i.e., megawatt-hour). Energy is the total amount of power that an asset delivers in a specified time frame. For example, one MW of power delivered for one hour equals one megawatt-hour (MWh) of energy.

The capacity factor of a power plant is a measure of the actual energy delivered by a generator compared to the maximum amount it could have produced at the nameplate capacity. Assets that run constantly, such as nuclear plants, provide a significant amount of energy with capacity factors greater than 90 percent.

Assets that are used infrequently, such as a combustion turbine, provide relatively little energy with capacity factors of typically less than five percent, although the energy they produce is crucial since it is often delivered at peak times.

Variable energy resources such as solar and wind have capacity factors based on their shapes, or pattern of generation across the days and seasons. Utility-scale solar capacity factors can approach 25 percent, and wind capacity factors from Midwest farms average around 40 percent. Capacity factors for these resources vary by location. For example, solar capacity factors in very sunny regions of the U.S. are higher than in less sunny regions, and wind farms in the Midwest plains have higher capacity factors than in-Valley installations.

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Capacity Factor Examples

High capacity factor unit:
A 1,200-MW nuclear unit could theoretically produce 10,510 GWh of energy if it ran every hour of the year. After planned annual outages, the unit will typically produce 9,460 GWh or 90 percent of its theoretical capacity.

Low capacity factor unit:
A 250-MW natural gas-fired combustion turbine (CT) unit could theoretically produce 2,190 GWh of energy if it ran every hour of the year. However, CT units generally have a capacity factor less than 5 percent, which means the unit would likely operate about 440 hours of the year and produce about 110 GWh.

Energy efficiency also can be measured in terms of capacity and energy. Even though energy efficiency does not input power into the system, the effect is similar because it represents power that is not required from another resource. Demand response also is measured in capacity and energy. However, unlike energy efficiency, it does not offer a significant reduction in total energy used.

4.3.3 Current TVA Capacity and Energy Supply

TVA uses a wide range of technologies to meet the needs of the Valley residents, businesses and industries. Figure 4-7 shows the current projection for capacity demand and for capacity supply from existing resources and power purchase agreements, highlighting the capacity gap. Applying the Base Case strategy, TVA then uses the planning model to optimize the resource portfolio to fill this gap while scheduling the contribution of current energy efficiency, demand response, and renewable programs and considering retirements where economic. The optimized result for the Base Case strategy evaluated in the Current Outlook scenario is shown later in the results section of this document.

Figure 4-7 includes both owned and purchased resources, in megawatts of summer net dependable capacity, and is divided into fuel-type (i.e., nuclear, hydro, coal). The chart builds up from the bottom generally in a baseload, intermediate and peaking order, as some assets can serve dual roles.

Figure 4-7 shows how TVA's existing capacity portfolio is expected to change through 2038. This projection serves as the baseline firm capacity for optimizing all portfolios. The existing assets only include resources that currently exist; assets that are under contract; TVA Board-approved changes to existing resources such as refurbishment projects; and TVA Board-approved additions. Existing resources decrease through 2038 primarily because of the retirement of coal-fired units and the expiration of existing contracts (power purchase agreements). The renewable component of the existing portfolio is primarily composed of wind PPAs that expire in the early 2030s. Because the power generated from wind and other renewable resources is intermittent, the firm capacity (or the amount of capacity that can be applied to firm requirements) for these assets is lower than the nameplate capacity. Figure 4-8 identifies expiring and retiring resources that are currently on the TVA system and their respective capacities.

Having a diverse portfolio of resource types – coal, nuclear, hydro, natural gas and renewable resources – and being able to use these resources in different ways enables TVA to provide reliable, low-cost power while minimizing the risk of disproportionate reliance on any one type of resource.

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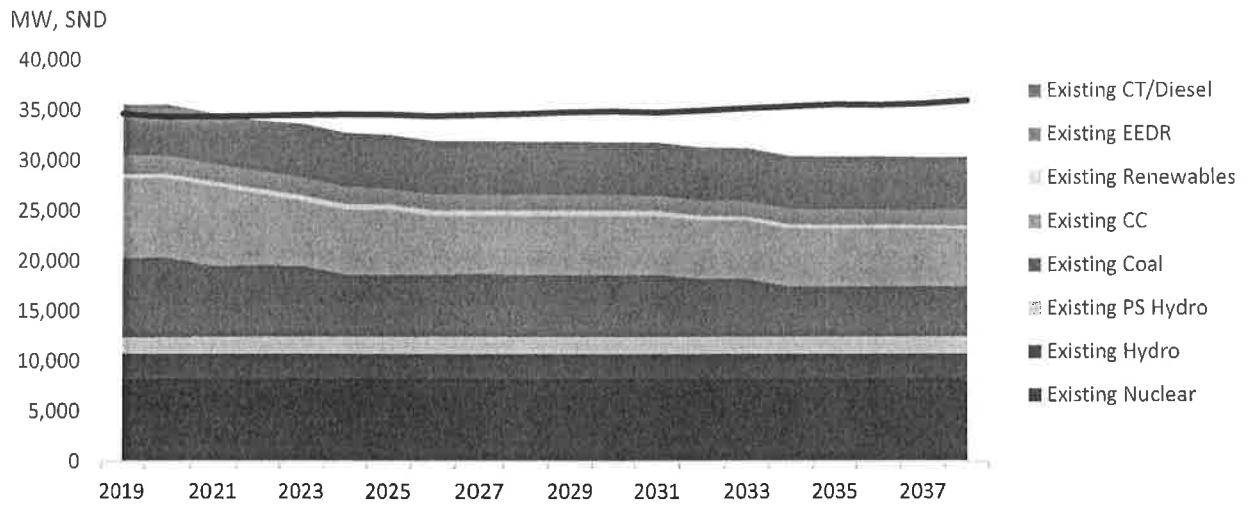

Figure 4-7: Baseline Firm Capacity, Summer Net Dependable MW

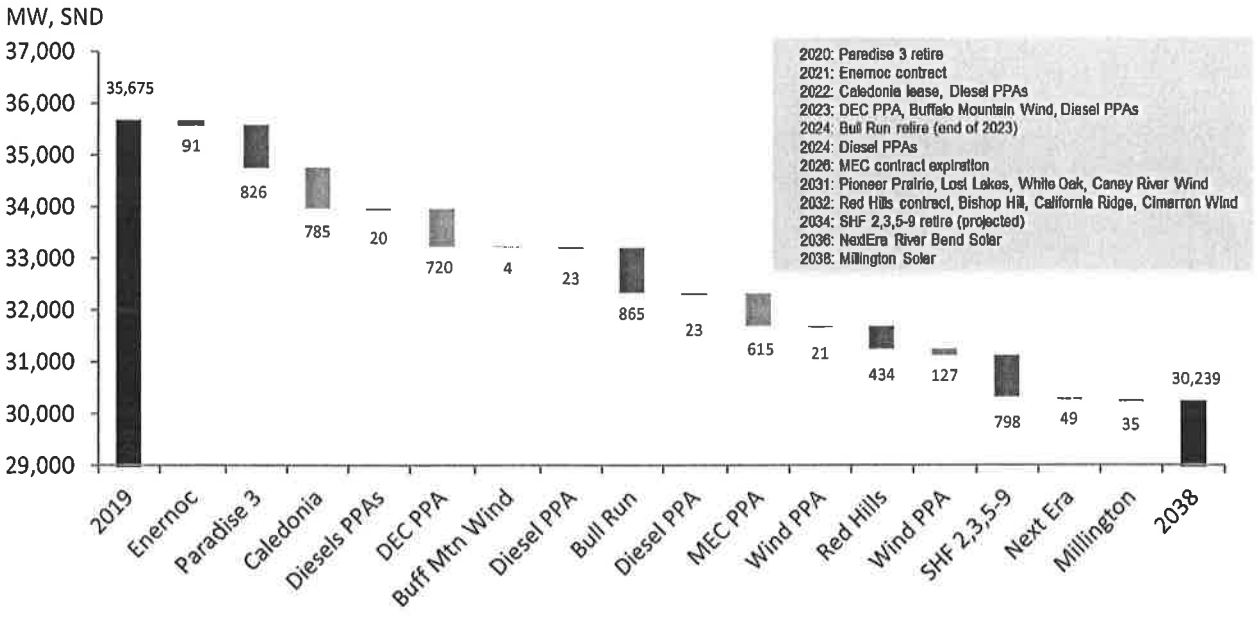

Figure 4-8: Changes in Baseline Firm Capacity, Summer Net Dependable MW

Approximately 36 percent of TVA's capacity is currently sourced from emission-free assets such as nuclear power, renewable resources including hydro, and interruptible load management. The renewable category shown throughout this document is based on modeled outputs of energy from renewable sources such as wind, solar, and biomass. This metric is not intended to represent a quantity of certified renewable energy credits.

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In FY18, 39 percent of TVA's energy was produced from the nuclear fleet. Coal plants produced about 21 percent of the generation, while the gas fleet produced about 26 percent. Hydro plants produced approximately 10 percent, and 3 percent was produced from wind and solar sources. The remaining one percent results from TVA programmatic energy efficiency efforts, which have been reduced due to increasingly effective USDOE codes and standards.

4.3.4 Calculate the Capacity Gap

As noted previously, a capacity gap is the difference between total supply and total demand. More specifically, it is the difference in megawatts between a power provider's existing firm capacity and the forecast annual peak adjusted for any interruptible customer loads and long-term planning reserve requirements (i.e., (i.e., 17 percent for summer and 25 percent for winter).

Figure 4-9 shows TVA's estimated capacity gap or shortfall based on the existing firm capacity and the annual firm requirement for the Current Outlook scenario for the summer and winter peaks. The aim of the IRP is to evaluate strategies and portfolios to meet the capacity gap across a wide range of potential future scenarios.

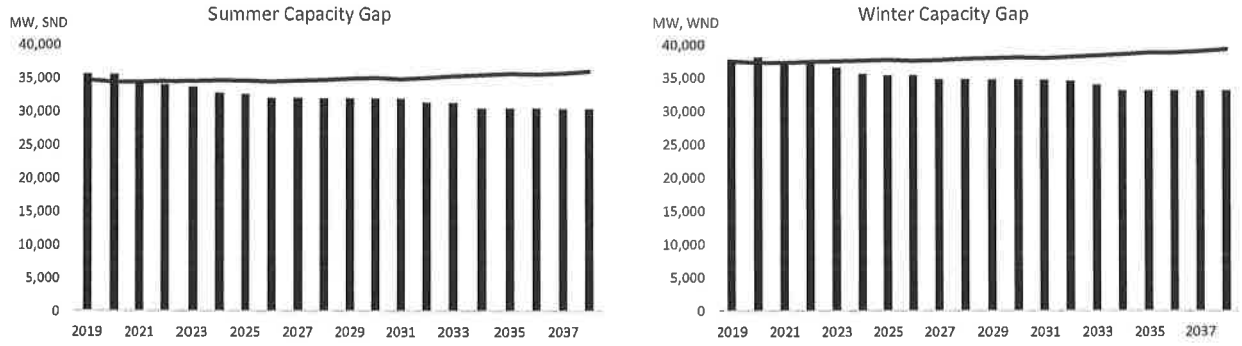

Figure 4-9: Estimating the Capacity Gap

TVA also considers the capacity gaps that might occur within the other scenarios. Figure 4-10 shows the range of capacity gaps corresponding to all the scenarios, ranging from the Valley Load Growth scenario on the high end to the Rapid DER Adoption scenario on the low end. All scenarios are described in detail in Chapter 6.

When optimizing the portfolio, power system analysis evaluates the most economical way to meet the capacity gap and associated energy needs, considering resource options and promotions applicable in each strategy.

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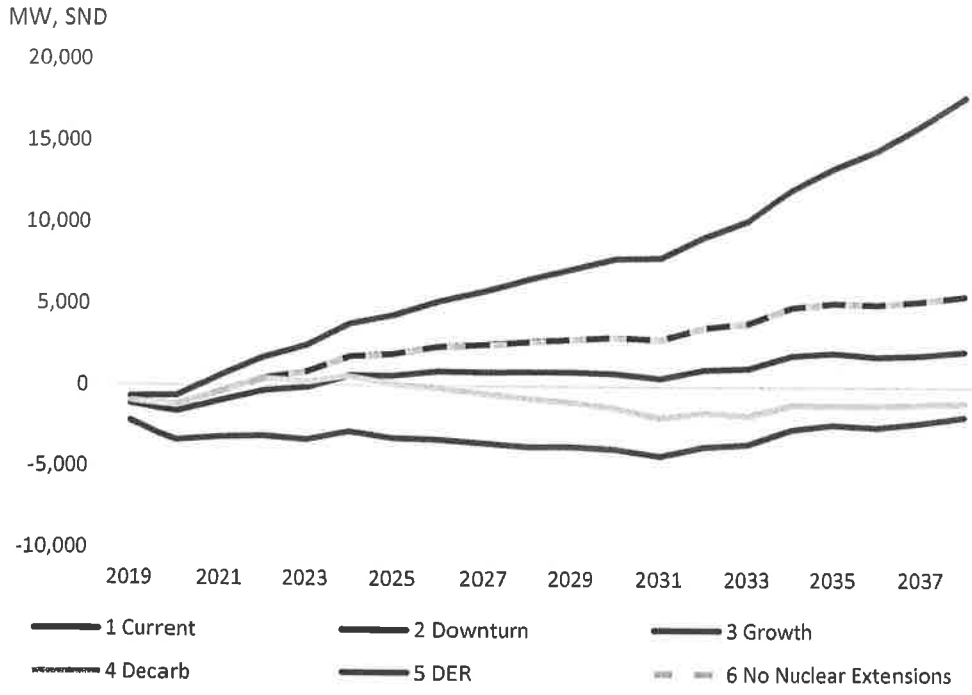

Figure 4-10: Capacity Gap Range

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5 Energy Resource Options

Maintaining the diversity of energy resources is fundamental to TVA's ability to provide low-cost, reliable and clean electric power to Valley residents, businesses and industries. For this reason, TVA considered the addition of a wide range of supply-side generating resources, as well as energy efficiency and other demand-side resource options, to fill the forecasted 20-year capacity and energy gaps identified through the power needs analysis described in Chapter 4.

The power needs analysis indicates that, under the Current Outlook scenario, TVA will require additional capacity and energy of about 1,200 MW and 7,100 GWh by 2028, growing to about 4,400 MW and 13,800 GWh by 2038.

5.1 Energy Resource Selection Criteria

During the scoping process, TVA identified a broad range of energy resources that could be used to fill the predicted capacity and energy gaps. The next two sections explain the criteria that were used to reduce this list to a manageable portfolio of expansion options. For a complete list of resource options considered, see Chapter 5, Energy Resource Options, of the associated EIS.

5.1.1 Criteria for Considering Resource Options

Two criteria were used to ensure that only viable energy resource options were considered in the IRP analysis. To be considered, resource options must:

- Use a proven technology, or one that has reasonable prospects of becoming commercially available in the planning horizon
- Be available to TVA within the region or be available to be imported through market purchases.

Technology is a key factor in TVA's ability to fulfill its mission in a balanced way. TVA continues to pursue technological advances to become more efficient and sustainable. As part of its mission under the TVA Act, the agency is called upon to be a leader in technology innovation.

In the 2015 IRP, DER was included in the load forecast as a load modifier that reduced demand for electricity from TVA, and energy efficiency and demand response were modeled as selectable resources. In the 2019 IRP, TVA has made further refinements in modeling behind-the-meter generation in the load forecast, including variations across the scenarios. We have also modeled distributed generation resources, including combined heat and power, and distributed solar and storage. There are targeted levels of adoption of these distributed resources based on incentive levels in each strategy. Further information on how these resources were modeled is included in Appendices A, B and C.

5.1.2 Criteria Required for Resource Options

To compare energy resource options available for new generation objectively, it is important to have consistent data regarding the cost and operating characteristics of each option. A list of characteristics used in the 2019 IRP are identified and defined in Table 5-1 and Table 5-2. Section 5.2.2 provides the numerical values for some of these parameters for the new assets.

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Table 5-1: Cost Characteristics

Type of Characteristic	Description
Cost characteristics	
Unit capital costs	Each technology type must have a representative $/kW unit, which is considered a total installed cost. Total installed cost includes equipment, engineering and interest during construction in present day dollars.
Capital escalation rates	Since capital costs typically increase over time, TVA assumes that capital costs escalate at the forecast rate of inflation for most resources. However, some energy technologies (e.g. solar and battery storage) are rapidly evolving, so TVA assumes declining costs for these resources.
Construction spend schedule	Some technologies take a long time to build. Construction times for nuclear units, for example, average about 10 years. To estimate the cash flow for the construction of a long-lead time build unit such as a nuclear unit, the percent of total capital dollars spent in each year is required. This metric is typically not needed for renewable assets which are smaller in scale and generally built in less than a year.
Fixed operating and maintenance costs (FOM)	FOM costs are independent of the number of hours of operation or amount of electricity produced and are generally expressed in dollar per kilowatt per year ($/kW-yr). FOM includes operating and maintenance labor, plant support equipment, administrative expenses and fees required by regulatory bodies.
Variable operating and maintenance costs (VOM)	VOM costs are dependent on the number of hours of operation and are generally expressed as a dollar per megawatt-hour ($/MWh). VOM costs include consumables like raw water, waste and water disposal expenses, and chemicals and reagents. VOM costs do not include fuel expenses.
Fuel expenses	Fuel is the material that is consumed to generate electricity – for example, coal, natural gas, uranium and biomass. These costs are typically expressed in dollar per million British thermal units ($/mmBtu) and include the delivery charges.
Transmission	A new generating resource has to be connected to the transmission system. Costs are typically expressed in a dollar per kilowatt ($/kilowatt) unit.
Integration cost	Intermittent resources require the balance of system resources to absorb sub-hourly fluctuations, driving an integration cost. Further details on the cost study are included in Appendix D. New solar and wind resources have integration costs, expressed in $/MWh.
Flexibility benefit	Highly flexible resources provide a sub-hourly benefit associated with ability to more efficiently absorb sub-hourly fluctuations in intermittent resources. Further details on the benefit study are included in Appendix D. New aeroderivative CTs and utility battery storage resources have flexibility benefits, expressed in $/kW.

Table 5-2: Operating Characteristics

Type of Characteristic	Description
Operating characteristics	
Net dependable capacity	Each unit must have a summer and winter net dependable capacity rating in megawatts.
Capacity credit	The capacity credit is the amount of capacity immediately available at the highest demand times. The capacity credit must be estimated for variable units or non-dispatchable resources.
Full load heat rate	A heat rate must be specified for each unit for summer and winter. A heat rate is a measure of the consumption of fuel necessary for a unit to produce electricity. Heat rates are expressed in British thermal units per kilowatt hour (Btu/kWh) and are based on a full-load heat rate. Heat rates are considered long-term planning assumptions and include the expected degradation in the heat rate of a unit after the first two years. Although a heat rate is not typically associated with a nuclear unit, one is necessary to model the fuel costs.
Unit availability	A date when each unit would be available for operation must be specified. Unit availability is restricted by technical feasibility or commercial availability, as well as permitting and construction times. For example, if it takes five years to build a combined cycle plant, then a new CC could not be selected prior to five years into the planning horizon.
Book life	The book life of a unit is the number of years a resource is expected to be in service for accounting purposes. Book life is the financial payback period which represents the amount of time the asset is expected to be used and useful. A license extension, beyond the original asset life, is not assumed with any new generating option.

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5.2 Resource Options Included in IRP Evaluation

TVA's existing assets, budgeted and approved projects, and power purchase agreements are considered as the baseline firm capacity in the IRP evaluation. These assets are generally expected to continue operating through the duration of the planning period or through the terms of existing power purchase agreements and other contracts, where applicable.

Options to meet the forecast net system requirements identified in Chapter 4 include:

- Building new generating units
- Entering into new power purchase agreements
- Developing energy efficiency and demand response programs
- Retiring existing resources

The next two sections describe existing and potential new generation by resource category, as well as retirement options. For a comprehensive description of all resource option attributes, characteristics and technologies, see Chapter 5, Energy Resource Options, of the associated EIS.

5.2.1 Existing Assets by Resource Category

5.2.1.1 Nuclear

TVA currently operates seven nuclear reactors: three at Browns Ferry Nuclear Plant, two at Sequoyah Nuclear Plant and two at Watts Bar Nuclear Plant. These plants have a combined generating capacity of about 7,700 MW. Extended power uprates for the three Browns Ferry units have been approved by the TVA Board and will be completed by the end of 2019. These uprates will add about 450 MW of additional capacity at the Browns Ferry plant.

The three units at Browns Ferry Nuclear Plant have license expiration dates of 2033, 2034, and 2036, respectively. TVA will evaluate non-renewal of these licenses in the No Nuclear Extensions scenario, where no nuclear units in the U.S. will be allowed to operate beyond 60 years. All other scenarios assume that TVA is granted a Second License Renewal (SLR) by the Nuclear Regulatory Commission (NRC). The two units at Sequoyah are licensed for operation through 2040 and 2041, respectively. Watts Bar Unit 1 is licensed for operation through 2035 (initial 40 year license), and Watts Bar 2 began commercial operation in October 2016.

5.2.1.2 Coal

TVA operates six coal-fired power plants consisting of 26 active generating units with a total capability of almost 7,900 MW. TVA uses a value lower than the capability of a resource, based on its summer and winter net dependable capacity. Table 5-3 is a snapshot of the planning assumptions for the coal units, including the forecasted retirement of the uncontrolled Shawnee units in 2034 to meet air quality standards. Following detailed evaluation, on February 14, 2019, the TVA Board of Directors voted to retire Paradise Unit 3 by the end of 2020 and Bull Run by the end of 2023. All cases reflect retirements of these units in 2020 and 2023, respectfully.

In addition to TVA-owned coal-fired units, TVA has access to the output from a coal-fired power plant with a generating capacity of about 440 MW through a long-term power purchase agreement that expires in 2032.

5.2.1.3 Natural Gas

TVA operates 87 natural gas-fired combustion turbines (CT) at nine power plants with a combined generating capability of about 5,700 MW and 14 combined cycle (CC) units at eight plants with approximately 6,800 MW of capability. TVA has power purchase agreements for about 1,300 MW of capability from two merchant combined cycle gas plants, with agreements expiring in the early to mid-2020s.

5.2.1.4 Petroleum Fuels

TVA currently owns five diesel generators with a total capability of 9 MW.

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Table 5-3: Coal Fleet Portfolio Plans

Coal Plant	Total Number of Original Units	Current Operating Status	Operational Plan
Allen	3	Retired	
Bull Run	1	Operational	Retire by end of 2023
Colbert	5	Retired	
Cumberland	2	Operational	Continue to operate
Gallatin	4	Operational	Continue to operate
John Sevier	4	Retired	
Johnsonville	10	Retired	
Kingston	9	Operational	Continue to operate
Paradise	3	Units 1-2 Retired Unit 3 Operational	Retire Unit 3 by end of 2020
Shawnee	10	Units 1-9 Operational Unit 10 Retired	Retire Units 2,3,5-9 in 2034
Widows Creek	8	Retired	

5.2.1.5 Hydro

TVA operates 109 conventional hydro generating units at 29 dams. These units have the capability to generate about 3,800 MW of electricity. All IRP portfolios reflect investing in and maintaining TVA's existing hydroelectric fleet. TVA has completed 60 hydro unit modernization projects out of 109 conventional hydro units. TVA plans to modernize two to three units per year, and the program is perpetual in nature to maintain capacity over time.

In addition, TVA has a long-term power purchase agreement with the U.S. Army Corps of Engineers for eight dams on the Cumberland River system. These facilities provide about 400 MW of capability.

TVA anticipates about 70 percent of this hydro capability to be available at the summer peak hour, given the operational constraints of the hydro units.

5.2.1.6 Energy Storage

TVA operates one large energy storage facility. The Raccoon Mountain Pumped-Storage Plant has four generating units with a Summer Net Dependable (SND) capacity of about 1,600 MW. Raccoon Mountain is TVA's largest hydro facility and provides critical flexibility to the TVA system by storing water at off-peak times for use when demand is high.

5.2.1.7 Wind

TVA purchases all of the power produced by the Buffalo Mountain wind farm in Anderson County, Tennessee. Buffalo Mountain is one of the largest wind farms in the Southeast, with 15 turbines and 27 MW of nameplate capacity. As defined in section 4.3.2, the nameplate capacity is the maximum technical output of a generator, or the theoretical design value.

TVA has long-term power purchase contracts with seven wind farms located in Illinois, Kansas and Iowa. These facilities provide about 1,200 MW of nameplate capacity. TVA anticipates about 14 percent and 31 percent of the nameplate to be available for peak summer and winter requirements, respectively. These agreements expire in the early 2030s. TVA obtains the renewable energy credits from these farms. Renewable energy credits are a separate commodity formed from the production of energy at designated sites.

5.2.1.8 Solar

TVA owns 14 photovoltaic (PV) installations with a summer capability of approximately 1 MW. TVA also purchases solar power through several programs and

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long-term power contracts totaling 370 MW of nameplate capacity with about 250 MW expected to be available at the summer peak hour. TVA obtains the renewable energy credits from these sites, and the existing PPAs extend through the late 2030s. Solar power purchase agreements signed subsequent to the spring of 2018 when baseline firm capacity was established for this IRP are not included in existing assets. This includes agreements signed for about 700 MW of solar nameplate capacity to meet specific customer needs.

5.2.1.9 Biomass

TVA purchases about 50 MW of biomass-fueled generation through existing programs.

5.2.1.10 Energy Efficiency

TVA's energy efficiency portfolio focuses on reduction in peak demand and energy savings. From FY07-FY18, these efforts contributed about 400 MW of summer peak demand reduction and saved about 2450 GWh of energy annually. These savings are adjusted for applicable transmission and distribution (T&D) losses, free rider/driver discounts, realization rates, and performance adjustments for actual weather.

5.2.1.11 Demand Response

Demand response programs focus on reduction of peak demand. Under these programs, TVA direct-served customers and local power companies can reduce their power bills by allowing TVA to suspend availability of power in the event of a power system, economic, or reliability need. These programs provide about 1800 MWs of peak reduction.

5.2.2 New Assets Considered by Resource Category

A complete list of viable new resource options for evaluation in this IRP is provided below. All options are based on a generic location and unit availability rounded to the next full year. A detailed discussion by resource category follows.

With a focus on DERs in this IRP, TVA also leveraged input from the Distributed Generation Information Exchange (DGIX) to inform resource characteristics and costs. DGIX input specifically helped inform inputs for distributed solar and storage, CHP, and electric vehicles.

An independent third-party reviewed and compared the parameters to proprietary and other industry sources to ensure the modeled unit characteristics and assumptions were representative of the respective generating technologies. See Appendix A for the letter summary of the benchmarking efforts of Navigant Consulting, Inc. as well as a brief discussion of TVA's internal benchmarking on resource costs ($/kW).

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Nuclear
- Pressurized Water Reactor (PWR)
- Advanced Pressurized Water Reactor (APWR)
- Small Modular Reactor (SMR)

Coal
- Supercritical Pulverized Coal 1x8
- Supercritical Pulverized Coal 2x8
- Integrated Gasification Combined Cycle (IGCC)
- Integrated Gasification Combined Cycle with Carbon Capture and Storage (IGCC CCS)
- Supercritical Pulverized Coal 1x8 with Carbon Capture and Storage
- Supercritical Pulverized Coal 2x8 with Carbon Capture and Storage

Natural Gas
- Combustion Turbine 6x (LMS 100)
- Combustion Turbine 4x (LMS 100)
- Combustion Turbine 2x (LMS 100)
- Combustion Turbine 3x (7FA)
- Combustion Turbine 4x (7FA)
- Combined Cycle 1x1
- Combined Cycle 2x1
- Combined Cycle 3x1
- Combined Cycle Supplemental Duct-firing (1x1, 2x1, 3x1)
- Combined Cycle With Carbon Capture and Storage
- Reciprocating Internal Combustion Engine (RICE) 12x
- Reciprocating Internal Combustion Engine (RICE) 6x
- Reciprocating Internal Combustion Engine (RICE) 2x
- Commercial & Industrial Combined Heat and Power (CHP)

Hydroelectric
- Hydro Spill Addition
- Hydro Space Addition
- Hydro Run of River

Energy Storage
- Pumped Storage
- Utility Battery Storage
- Residential Battery Storage
- Compressed Air Energy Storage (CAES)
- Fuel Cells
- Advanced Chemistry Battery

Wind
- Midcontinent Independent System Operator (MISO)
- Southwest Power Pool (SPP)
- In-Valley
- High Voltage Direct Current (HVDC)

Solar
- Utility-scale Single-axis Tracking
- Utility-scale Fixed-Axis
- Large Commercial-scale
- Small Commercial-scale
- Residential Scale

Biomass
- New Direct Combustion Biomass
- Repowering Existing Coal with Biomass

Energy Efficiency
- Residential
- Commercial
- Industrial

Demand Response

Electrification

Retirement Options
- Gas Combustion Turbines > 40 years old (as early as 2020)
- Uncontrolled Shawnee units (as early as 2020)
- All Other Coal Units (as early as 2025)
- Browns Ferry Nuclear Units 1-3 (as early as 2033)

Figure 5-1: List of New Assets

5.2.2.1 Nuclear

There are three nuclear expansion options available to fill the expected capacity gap: a Pressurized Water Reactor (PWR), an Advanced Pressurized Water Reactor (APWR) and a Small Modular Reactor (SMR).

SMRs are a new type of nuclear reactor in which the components are manufactured in a factory and then assembled together onsite. The individual units are smaller in size, allowing for increased flexibility in installation and use. New units could be located at existing nuclear plants or at other sites beneficial to the transmission system or local resiliency.

As mentioned previously in Chapter 4, the retirement of the three Browns Ferry units is being evaluated in the No Nuclear Extensions scenario. In this scenario, it was mentioned there could be subsidies to drive small modular reactor technology advancements and improved economics. What is contemplated is more about demonstrating modular construction processes efficiently in a nuclear application, in order to reduce cost and schedule uncertainties for subsequent SMR facilities. Strategy C, which emphasizes small, agile resources, includes two SMRs totaling 1,200 MW forced in to replace one of three Browns Ferry units.

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Table 5-4 shows some of operating characteristics used to model each option. Summer net dependable capacity, summer full load heat rate, unit availability and book life are explained earlier in this section. The annual outage rate percentage includes forced and planned outages. See Chapter 4, Section 4.3.2, for a discussion of the different types of capacity ratings.

Table 5-4: Nuclear Expansion Options

Unit Characteristics	PWR	APWR	SMR
Summer Net Dependable Capacity (MW)	1,260	1,117	600
Summer Full Load Heat Rate (Btu/kWh)	9,853	9,715	10,046
Unit Availability (Yr)	2029	2029	2025
Annual Outage Rate (%)	10%	10%	10%
Book Life (Yrs)	40	40	40

5.2.2.2 Coal

The 2019 IRP includes six coal expansion options, including two integrated gas combined cycle (IGCC) options and four supercritical pulverized coal (SCPC) options as shown in Table 5-5.

IGCC technology converts coal into gas. One IGCC option has carbon capture and sequestration (CCS) and one does not. The CCS technology option is assumed to be commercially available starting in 2028 and has a 90 percent carbon dioxide (CO_2) capture rate. Coal units typically have a CO_2 emission rate of 205 pounds per million BTUs of coal burned; therefore, the CCS technology would reduce the CO_2 rate to 20.5 pounds per million BTUs of coal burned. The modeled CO_2 emissions incur an emission penalty in the form of a dollar per ton of CO_2 emitted.

Two of the four SCPC options have one steam generator with a supercritical steam cycle. One of these options includes CCS technology; the other does not. The other two SCPC options have two steam generators with supercritical steam cycles. Again, one of these options includes CCS technology, and one does not.

In addition to the approved retirements of Paradise Unit 3 in 2020 and Bull Run in 2023, there are several additional coal retirement options available for model selection:

- Uncontrolled Shawnee Units (2,3,5-9) as early as 2020
- All other coal units as early as 2025

Table 5-5: Coal Expansion Options

Unit Characteristics	IGCC	IGCC CCS	SCPC 1x8	SCPC 2x8	SCPC 1x8 CCS	SCPC 2x8 CCS
Summer Net Dependable Capacity (MW)	550	515	800	1,600	617	1,200
Summer Full Load Heat Rate (Btu/kWh)	8,000	10,412	8,674	8,674	11,965	10,843
Unit Availability (Yr)	2027	2028	2030	2030	2030	2030
Annual Outage Rate (%)	17%	15%	10%	10%	10%	11%
Book Life (Yrs)	40	40	40	40	40	40

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5.2.2.3 Natural Gas

The IRP evaluation includes three reciprocating internal combustion engine (RICE) options, five simple cycle combustion turbine (CT) options, and four combined cycle (CC) natural gas fueled options. The RICE engines are available in packages of two, six, or twelve engines. The simple cycle frame CTs are available with either three or four turbines. The other three CT options are aeroderivatives in packages of two, four, or six turbines as shown in Table 5-6.

The CC options have one turbine and one steam generator (CC 1 by 1), two turbines and one steam generator (CC 2 by 1), or three turbines and one steam generator (CC 3 by 1). CC units have supplemental capacity termed duct-firing capacity that adds approximately 100 MW to the base capacity shown. The fourth CC option is a 3 by 1 integrated gasification combined cycle (IGCC) with carbon capture and storage (CCS). The CO_2 emission rate for a typical gas unit is 117 pounds of CO_2 per million Btus of gas burned. The modeled gas units incur emission charges based on a dollar-per-ton emission penalty for those scenarios with a CO_2 penalty.

In addition to options for TVA to build gas-fueled units, the IRP evaluation includes options for continuing to purchase power from existing merchant gas plants or acquiring those plants. PPAs are available for selection based on competitive information which cannot be disclosed. PPA options are evaluated similar to build options with a few slight differences. One difference is that when present value revenue requirements resulting from the expansion model selections are converted into cash flows, then the build options have significant capital expenditures that match the construction spend schedule (noted in section 5.1.2) versus the PPA options which have levelized cash flow payments based on the terms of the contract (similar to a mortgage). The other difference for PPAs is that if the asset is located outside of the TVA transmission area, then the necessary transmission wheeling charges are included.

Combined heat and power (CHP), a distributed gas resource, is offered as an option. Rather than being selectable, various levels of CHP adoption are included to represent consumer response to incentive levels applicable in each strategy, as described in Appendix F.

In addition, there are options for retirement of TVA's older simple cycle frame CTs as early as 2020.

Table 5-6: Gas Expansion Options

Unit Characteristics	RICE 2X	RICE 6X	RICE 12x	LMS100 2X	LMS100 4X	LMS100 6X
Summer Net Dependable Capacity (MW)	36	113	226	192	384	576
Summer Full Load Heat Rate (Btu/kWh)	8,266	8,266	8,266	9,350	9,150	9,150
Unit Availability (Yr)	2023	2023	2023	2023	2023	2023
Annual Outage Rate (%)	4%	4%	4%	3%	3%	3%
Book Life (Yrs)	30	30	30	30	30	30

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Table 5-6: Gas Expansion Options (con't)

Unit Characteristics	7FA CT 3X	7FA CT 4X	CC 1x1	CC 2x1	CC 3x1	CC 3X1 CCS
Summer Net Dependable Capacity (MW)	703	934	591	1,182	1,773	1,593
Summer Full Load Heat Rate (Btu/kWh)	10,132	10,132	6,520	6,520	6,520	7,530
Unit Availability (Yr)	2023	2023	2023	2023	2023	2028
Annual Outage Rate (%)	4%	4%	7%	7%	7%	7%
Book Life (Yrs)	30	30	30	30	30	30

5.2.2.4 Petroleum Fuels

TVA expects to phase out petroleum power purchases by 2028. There are no diesel fuels or other petroleum-based resource options as a primary fuel source under consideration in the IRP because of emissions from these facilities.

5.2.2.5 Hydro

Two new hydro projects are included in the IRP evaluation. They include adding additional hydro turbines to existing dam facilities where there is space available with structural modifications. The other project would add turbines at existing dam facilities where water that is now spilled could be used to power more turbines.

Both projects are similar to the larger TVA hydro system and are energy-limited units. Energy-limited units are resources that cannot be dispatched (in the model) based on price ($/MWh) as are traditional thermal generating resources, such as nuclear, coal and gas. Hydropower cannot be dispatched based on price alone because water releases in the Tennessee River system also are required for municipal and industrial uses, navigation, flood damage reduction, recreation, water quality and other purposes. For this reason, TVA includes a fixed amount of monthly energy in the model for conventional hydro stations. The model then uses the hydro energy to level the load shape served by other stations.

Since hydro plants do not use fuel, a heat rate is not needed for modeling.

Small- and low-head hydropower, called run of river, also is included as an IRP resource option. The hydro expansion options are shown in Table 5-7.

Table 5-7: Hydro Expansion Options

Unit Characteristics	Dam Spill Addition	Dam Space Addition	Run of River
Summer Net Dependable Capacity (MW)	40	30	25
Unit Availability (Yr)	2023	2023	2023
Annual Outage Rate (%)	-	-	4%
Book Life (Yrs)	40	40	40

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5.2.2.6 Energy Storage

The IRP evaluation includes a new hydro pumped-storage unit as a resource option. The pumped-storage option would use three reversible turbine generators to either take electricity from the grid by pumping water into a higher altitude reservoir during periods of excess power or add electricity to the grid by using the pumped water to power a turbine as it falls from the upper to the lower reservoir.

A compressed air energy storage (CAES) option also is included. A CAES plant is similar to a pumped-storage plant but, instead of pumping water from a lower to an upper reservoir, a gas turbine is used to compress air often into an underground cavern where it can be stored under pressure until electricity is required. The pressurized air is then heated and directed through a conventional generator to produce electricity.

Battery storage is included as an option at the utility scale and the residential scale. Rather than being selectable, distributed storage is modeled at various levels of adoption to represent consumer response to incentive levels applicable in each strategy, as described in Appendix F. TVA is also including fuel cells and advanced chemistry batteries as options in this IRP. The storage options are shown in Table 5-8.

Storage efficiency is included in modeling all these energy storage options because of the energy losses inherent to the energy conversion process and due to the loss of water or air during storage. The storage efficiency percentage for these energy storage options represents the efficiency of one cycle (i.e., pumping water, then releasing).

Table 5-8: Storage Options

Unit Characteristics	Utility Battery	Pumped Storage	CAES	Fuel Cell	Adv. Chem. Batt.
Summer Net Dependable Capacity (MW)	100	850	330	25	25
Summer Full Load Heat Rate (Btu/kWh)	-	-	-	6,824	-
Unit Availability (Yr)	2023	2028	2024	2023	2023
Annual Outage Rate (%)	2%	7%	10%	2%	2%
Storage Efficiency (%)	88%	81%	70%	-	88%
Book Life (Yrs)	20	60	40	20	20

5.2.2.7 Wind

Because TVA cannot take direct advantage of the tax credits and other investment incentives offered by the federal government to encourage wind power development, it has been more financially advantageous to acquire wind power resources through PPAs. This approach allows TVA to include wind as a resource option in the IRP. The purchase of wind resources as a PPA, whether produced in or imported to the TVA region, lowers the costs of these resources to TVA and its customers. TVA may evaluate the option of building wind facilities in the future if investment incentives and/or future federal or state renewable mandates change.

Four wind options are included in the IRP evaluation as shown in Table 5-9. The Midcontinent Independent System Operator (MISO), the Southwest Power Pool (SPP) and the In-Valley options represent various wind resources in different regional transmission areas. The High Voltage Direct Current (HVDC) option would use a direct current (DC) bulk transmission system. The HVDC transmission system would reduce power losses that are typical of the more common alternating current (AC) transmission systems. The HVDC option would require a third-party to permit and build a new transmission line, driving a later availability date than the other options.

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Wind resources are energy- and capacity-limited resources. For this reason, TVA uses an energy production profile to dispatch wind energy rather than price. The method used for wind resources is somewhat similar to hydro resources except that an hourly generation schedule (not a monthly amount) is pre-loaded into the capacity expansion model. TVA also applies a capacity credit since the total nameplate capacity of a wind turbine cannot be expected at the time of the system peak. To determine the capacity credit, TVA used historical data to estimate the typical wind power output at the time of the peak power demand on the TVA system. This resulted in a 14 percent capacity credit, meaning that 14 percent of nameplate capacity is expected to be available at the system summer peak. This reduced capacity is considered the summer net dependable capacity. Appendix A includes a more detailed discussion about the determination of the data assumptions for the modeling of the wind options included in this IRP.

Table 5-9: Wind Expansion Options

Unit Characteristics	MISO	SPP	In Valley	HVDC
Nameplate Capacity (MW)	200	200	120	200
Summer Net Dependable Capacity (MW)	62	62	37	62
Unit Availability (Yr)	2023	2023	2023	2023
Annual Outage Rate (%)	4%	4%	4%	4%
Book Life (Yrs)	20	20	20	20

5.2.2.8 Solar

Similar to new wind generation, TVA cannot take direct advantage of the current investment incentives offered to promote solar power development, making it more financially advantageous to acquire solar power resources through PPAs. TVA may evaluate the option of building solar facilities in the future if investment incentives and/or federal or state renewable mandates change.

Five solar options are included in the IRP evaluation as shown in Table 5-10. All capacities are stated in AC terms. The utility tracking option is a single-axis tracker that allows the solar panels to follow the sun. The utility fixed option represents ground mounted fixed-axis/fixed-tilt solar installations. Distributed solar options are offered at large commercial, small commercial, and residential scales. Rather than being selectable, various levels of distributed solar adoption are included to represent consumer response to incentive levels applicable in each strategy, as described in Appendix F.

Like wind resources, solar resources are energy-limited and therefore dispatched in the model using an hourly energy production profile to ensure that solar generation is not utilized by the model when the sun is not available. Solar resources also are similar to the capacity-limited wind resources where the availability of the unit at the time of the TVA system peak is less than the full nameplate capacity. TVA applied a 68 percent capacity credit for the utility tracking unit and a 50 percent capacity credit for the fixed axis options. The unit availability date was rounded to the first full year. More details about the assumptions used in the development of the unit characteristics for these solar options can be found in Appendix A.

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Table 5-10: Solar Expansion Options

Unit Characteristics	Utility tracking	Utility fixed	Commercial small	Commercial large	Residential
Nameplate Capacity (MW)	50	25	0.2	1	0.006
Summer Net Dependable Capacity (MW)	34	13	0.1	0.5	0.003
Unit Availability (Yr)	2023	2023	2023	2023	2023
Annual Outage Rate (%)	-	-	-	-	-
Book Life (Yrs)	30	30	30	30	30

5.2.2.9 Biomass

Two biomass options are included in the IRP evaluation as shown in Table 5-11: a new direct combustion biomass facility and a repower option, which is the conversion of existing coal-fired units to biomass-fired units. Because biomass co-firing is considered a fuel switch opportunity, it was not included as a capacity expansion option.

Table 5-11: Biomass Expansion Options

Unit Characteristics	Direct Combustion	Repower
Summer Net Dependable Capacity (MW)	115	124
Summer Full Load Heat Rate (Btu/kWh)	17,000	18,000
Unit Availability (Yr)	2024	2023
Annual Outage Rate (%)	14%	12%
Book Life (Yrs)	30	20

5.2.2.10 Demand Response

Demand response programs enable participating customers to reduce their power costs by allowing TVA to limit their power during peak demand times. These programs were modeled in the 2019 IRP, as shown in Table 5-12, based on unit characteristics similar to those used for natural gas CTs. Demand response programs are operated much like CTs, or peaking units, and focus on reduction of peak demand. However, the terms of the demand response customer contracts are shorter than the expected book life of a CT unit. In all strategies, TVA assumed that current interruptible pricing products and third-party aggregation of small commercial and industrial demand response will continue with current program size limitations at the carrying cost of a CT. Also included are residential demand response expansion options for space conditioning and water heating, available beginning in 2020.

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Table 5-12: DR Expansion Options

Unit Characteristics	Res 1	Res 2
Summer Capacity (MW)	36	4
Winter Capacity (MW)	82	10
Unit Availability (Yr)	2020	2020
Book Life (Yrs)	8	8

5.2.2.11 Energy Efficiency

The 2019 IRP builds on the innovative modeling approach used in the 2015 IRP to evaluate EE as a supply-side resource, with characteristics and costs structured similarly to conventional generating resources or power plants. More details about this modeling approach can be found in Appendix D.

This IRP includes EE programs for residential (Res), commercial (Com) and industrial (Ind) sectors as shown in Table 5-13. Each was divided into tiers, representing distinct price points. The 2019 IRP includes low-income residential EE programs, which are designed to facilitate EE improvements for those least able to afford them. The costs for these programs vary by strategy, but are enforced as required resources at the incentive level dictated by the strategy goals. For all programs, all tiers are available beginning in 2020. These programs are energy limited, similar to hydro, wind and solar units, and use annual hourly production profiles.

Table 5-13: EE Expansion Options

Unit Characteristics	Res Prog. 1 Tier 1	Res Prog. 1 Tier 2	Res Prog. 2 Tier 1	Res Prog. 2 Tier 2	Res Prog. 2 Tier 3	Res Prog. 3 Tier 1	Com Prog. 1 Tier 1	Com Prog. 1 Tier 2	Com Prog. 1 Tier 3
Summer Capacity (MW)	2	3	1	3	6	0	1	24	36
Winter Capacity (MW)	3	4	2	4	8	3	0	18	27
Unit Availability (Yr)	2020	2020	2020	2020	2020	2020	2020	2020	2020
Book Life (Yrs)	6	6	15	15	15	6	13	13	13

Unit Characteristics	Ind Prog. 1 Tier 1	Ind Prog. 1 Tier 2	Ind Prog. 1 Tier 3
Summer Capacity (MW)	1	11	23
Winter Capacity (MW)	1	15	31
Unit Availability (Yr)	2020	2020	2020
Book Life (Yrs)	11	11	11

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Table 5-13: EE Expansion Options (con't)

Unit Characteristics	Low Income Low	Low Income Mid	Low Income High
Summer Capacity (MW)	0.49	2.06	4.60
Winter Capacity (MW)	0.79	3.29	7.37
Unit Availability (Yr)	2020	2020	2020
Book Life (Yrs)	14	14	14

5.2.2.12 Electrification

Electrification is the increased adoption of electric end-use technologies displacing other commercial energy forms. Promotion of smart energy technologies with a favorable load shape should decrease carbon emissions and increase profitability for Valley businesses. While electrification is not a "resource" like the others described in this section, potential electrification offerings for the residential, commercial and industrial sectors are included as selectable options in this IRP. The residential electrification programs focus on retrofit and new construction markets, while commercial and industrial programs focus on diverse technology offerings to help shape load. These options are also offered in three tiers at distinct price points as shown in Electrification Expansion Options Table 5-14.

Table 5-14: Electrification Expansion Options

Unit Characteristics	Res Prog. 1 Tier 1	Res Prog. 1 Tier 2	Res Prog. 1 Tier 3	Res Prog. 2 Tier 1	Res Prog. 2 Tier 2	Res Prog. 2 Tier 3	Res Prog. 3 Tier 1	Res Prog. 3 Tier 2	Res Prog. 3 Tier 3
Summer Capacity (MW)	1.2	1.0	0.8	0.2	0.2	0.3	0	0	0
Winter Capacity (MW)	8.6	6.9	6.0	0.7	0.6	0.8	0.06	0.05	0.08
Unit Availability (Yr)	2020	2020	2020	2020	2020	2020	2020	2020	2020
Book Life (Yrs)	15	15	15	15	15	15	15	15	15

Unit Characteristics	Res Prog. 4 Tier 1	Res Prog. 4 Tier 2	Res Prog. 4 Tier 3	Com Prog. 1 Tier 1	Com Prog. 1 Tier 2	Com Prog. 1 Tier 3	Ind Prog. 1 Tier 1	Ind Prog. 1 Tier 2	Ind Prog. 1 Tier 3
Summer Capacity (MW)	0.08	0.06	0.09	8.6	7.5	5.4	9.0	7.9	5.6
Winter Capacity (MW)	10.3	8.3	12.4	18.2	16.0	11.4	9.4	8.2	5.9
Unit Availability (Yr)	2020	2020	2020	2020	2020	2020	2020	2020	2020
Book Life (Yrs)	15	15	15	13	13	13	10	10	10

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6 Resource Plan Development and Analysis

This chapter describes the process TVA used to identify a target power supply mix that was based on the analysis done in the IRP. The process involves choosing the types of resources that TVA could use to meet the future power needs of its customers, recognizing that the future is uncertain and the choices need to provide flexibility to adapt. The approach tests several options around resource choices TVA could make (called strategies) in different sets of uncertain future conditions (called scenarios). The set of resource choices selected in any one future defines how TVA would provide power to its customers under those conditions; TVA calls that set of resource choices a portfolio, and it is created by modeling a strategy in a particular scenario. These portfolios are then evaluated using key factors (called metrics) that allow TVA to capture cost, risk, environmental footprint and other aspects that should be considered when deciding the best target power supply mix.

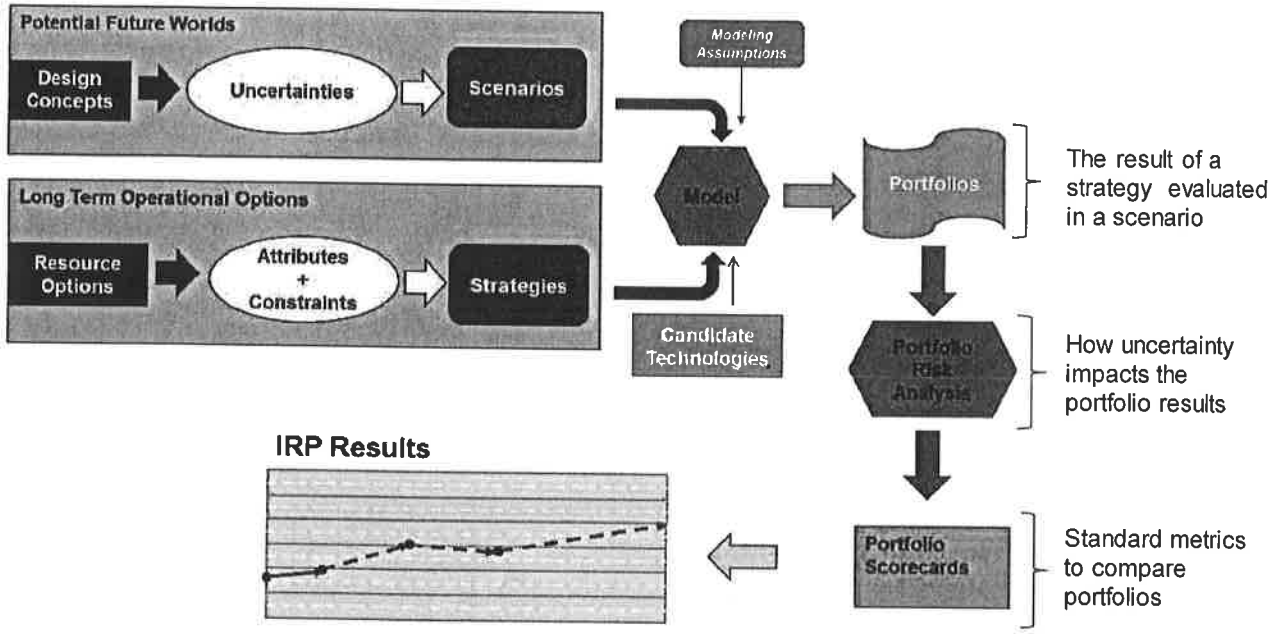

Figure 6-1: Process Graphic Development of Scenarios and Strategies

TVA uses a scenario planning approach in integrated resource planning, a common approach in the utility industry. Scenario planning is useful for determining how various business decisions will perform in an uncertain future. The goal is to develop a least-cost strategy that is consistent with TVA's legislatively mandated mission and also delivers rate stability to its customers over a variety of future environments.

Multiple strategies, which represent business decisions that TVA can control, are modeled against multiple scenarios, which represent uncertain futures outside of TVA's control. The intersection of a single strategy and a single scenario results in a resource portfolio. A portfolio is a 20-year capacity plan that is unique to that strategy and scenario combination.

6.1 Development of Scenarios

While most quantitative models used in long-range planning focus on what is statistically likely based on history, market data and projected future patterns, TVA uses scenario analysis that allows for the possibility that the future could evolve along paths not suggested solely by historical trends.

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The scenarios used in the IRP analysis were developed during the scoping phase of the study in 2018. The process used to develop these scenarios is described below.

6.1.1 Identification of Key Uncertainties

The first step in developing scenarios was to work with the individuals on the IRP Working Group to identify key uncertainties. Uncertainties are factors that are likely to change in the future, affecting economics, demand for electricity, commodity prices, etc. While TVA can forecast future values for these uncertainties, they are difficult to predict. The goal of scenario analysis is to study broad variations in uncertainties to cover a wide range of potential futures. The 12 uncertainties, shown in Table 6-1, were used as building blocks to construct scenarios.

These uncertainties address a range of economic, financial, regulatory and legislative conditions, as well as social trends and adoption of newer technologies. The 12 uncertainties used in defining each scenario are described in Table 6-1.

Table 6-1: Uncertainties

Uncertainty	Description
Electricity Demand	The customer energy requirements (in gigawatt hours) for the TVA service territory (including losses), representing the load to be served by TVA
Market Power Price	The hourly price of energy ($/megawatt hour) at the TVA boundary, used as a proxy for market price of power
Natural Gas Prices	The price ($/million BTUs) of natural gas, including transportation
Coal Prices	The price ($/million BTUs) of coal, including transportation
Solar Prices	The price ($/megawatt hour) of solar power purchase agreements delivered to TVA
Storage Prices	The price ($/kW) of storage new builds
Regulations	All regulatory and legislative actions, including applicable codes and standards, that impact the operation of electric utilities, excluding CO_2 regulations
CO_2 Regulation/Price	The cost of compliance with possible CO_2 related regulation and/or the price of cap-and-trade legislation, represented as a $/ton value
Distributed Generation Penetration	National trending of distributed generation resources and potential regional activity by customers or third-party developers (not TVA)
National Energy Efficiency (EE) Adoption	An estimate of EE measure adoption by customers nationally, recognizing the impacts of technology affordability, electricity price, and consumer interest on the willingness to adopt efficiency measures
Electrification	An estimate of electric end-use technology adoption displacing other commercial energy forms and providing new services
Economic Outlook (National/Regional)	All aspects of the regional and national economy, including general inflation, financing considerations, population growth, GDP and other factors that drive the overall economy

6.1.2 Construction of Scenarios

Scenarios were constructed using combinations of the key uncertainties shown in Table 6-1 and then refined to ensure that each scenario:

- Represented a plausible, meaningful future in which TVA could find itself operating within over the 20-year study period;
- Was unique among the scenarios being considered for study;
- Placed sufficient stress on resource selection and provided a foundation for analyzing the robustness, flexibility and adaptability of each combination of supply- and demand-side options; and
- Captured relevant key stakeholder interests.

Based on overlapping characteristics, the potential scenarios were grouped into the categories of declining economy, economic growth, stringent environmental regulation, changing paradigm, and emerging technology. The IRP Working Group members provided their individual rankings on the list of scenarios

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that would be considered in the IRP. Based on the scoping comments, IRP Working Group member rankings and further analysis, TVA selected the five unique scenarios summarized in Table 6-2 along with their respective attributes. In addition to these five scenarios, TVA also analyzed a Current Outlook scenario based on TVA's current assumptions about future conditions. In the modeling process, TVA considers each scenario as equally plausible.

Table 6-2: Attributes of the Six Scenarios

Scenario	Description and Attributes
1- The Current Outlook	• Economic outlook reflects slowing expected in 2020, transitioning to a long-term growth rate of 2% for TVA region GDP and 1.9% inflation • Demographic changes slow customer count growth, while declining household size and increasing efficiencies drive lower energy use per customer • Gas supply more than adequate to meet demand, and power prices follow seasonality of gas prices and volatility of weather
2- Economic Downturn	• Prolonged, stagnant economy results in weak growth and delayed expansion of new generation • Rising budget deficits and public debt constrain federal economic policy options • Stringent environmental regulations are delayed due to concerns of adding further pressure to the economy • Weaker demand lowers cost of new plant construction
3- Valley Load Growth	• Technology-driven investment in automation and artificial intelligence raise electricity use, boosting labor productivity and economic growth while lowering inflation • Rapid economic growth, driven by migration into the Valley and growth in emerging markets and developing economies, translates into higher energy sales • Lower battery prices due to economies of scale drive increased electrification of transportation, magnifying growth • Preference for lower emissions, DER and EE drives lower demand for emitting generation, offsetting some of the upward fuel price pressure from robust economic conditions
4- Decarbonization	• Increasing climate-driven effects create strong federal push to curb greenhouse gas (GHG) emissions, increasing CO_2 emission penalties for the utility industry and incentives for non-emitting technologies • Compliance with new rules that are stringent by global standards increases energy prices and U.S.-based industry becomes less competitive, resulting in lagging economic growth that fails to rebound to trend levels • Fracking regulations never materialize, but gas demand is impacted by the CO_2 penalty • New expansion units are necessary to replace existing CO_2-emitting fleet
5- Rapid DER Adoption	• Growing consumer awareness of and preference for energy choice, coupled with rapid advances in energy technologies, drive high penetration of distributed generation, storage, and energy management • Utilities are no longer the sole source of generation and multiple options are available to consumers • Market shift results in lower loads, decreased need for supply-side generation, but increased potential impacts to transmission and distribution planning and infrastructure
6- No Nuclear Extensions	• Driven by aging assets and desire for national energy security and resiliency, there is a regulatory challenge to relicensing existing and constructing new, large scale nuclear plants • National energy policy drives carbon regulation or legislation and promotes small modular reactor (SMR) technology through subsidies to drive advancements and improved economics

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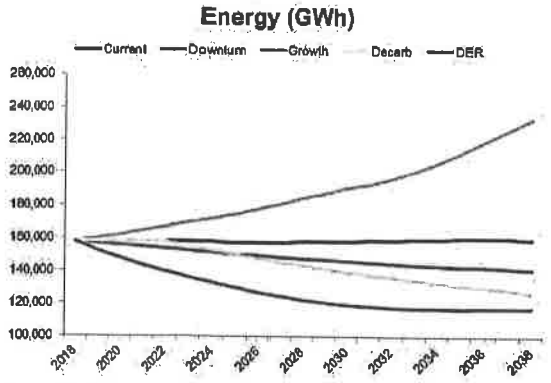
6.1.3 Determination of Key Scenario Assumptions

The final step in scenario development was to forecast key assumptions for each scenario.

Figure 6-2 shows the forecasted assumptions for TVA's energy and peak demand loads for each scenario. The Current Outlook scenario projects energy growth to be flat, as does the No Nuclear Extensions scenario. Three scenarios – Economic Downturn, De-Carbonization and Rapid DER Adoption – project declining energy forecasts, with the largest energy decline of about 1.5 percent per year in the Rapid DER Adoption scenario. The Valley Load Growth scenario projects energy growth of about 2 percent per year.

Each scenario contains unique assumptions around sector forecasts and behind-the-meter impacts that influence load shape, which drives different energy and peak growth patterns. The Current Outlook scenario projects slight peak load growth of about 0.3 percent per year, as does the No Nuclear Extensions scenario. The three scenarios that have declining energy forecasts also have declining peak load forecasts, with the largest peak decline of about -0.7 percent per year in the Rapid DER Adoption scenario. The Valley Load Growth scenario reflects peak load growth of about 1.7 percent per year.



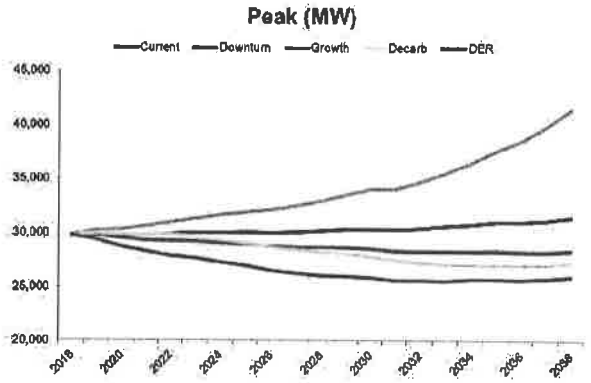


Figure 6-2: Energy and Peak Assumptions

Figure 6-3 shows the forecasted assumptions for natural gas prices. Gas prices are similar for the Current Outlook and No Nuclear Extensions scenarios. The Valley Load Growth and Decarbonization scenarios assume higher gas prices, with the Valley Load Growth increase happening more gradually and the Decarbonization trajectory ratcheting up as assumed regulations take effect. The Economic Downturn and Rapid DER Adoption scenarios assume lower gas prices on somewhat different trajectories.

Figure 6-4 shows the forecasted assumptions for coal prices. Steadily increasing coal prices are forecasted for all scenarios, with modest variations across the scenarios resulting from projected movements in real coal prices and inflation.

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Chapter 6: Resource Plan Development and Analysis

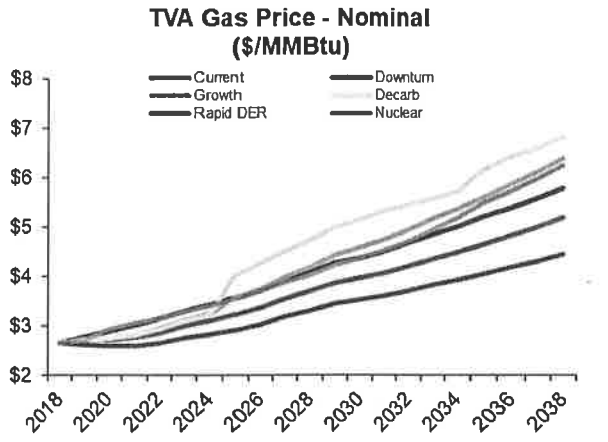

Figure 6-3: Gas Price Assumptions

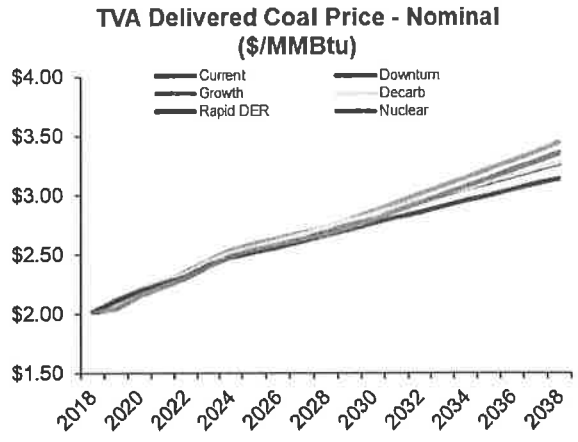

Figure 6-4: Coal Price Assumptions

Figure 6-5 shows the forecast assumptions for on-peak and off-peak electricity prices. Electricity prices are similar for the Current Outlook and No Nuclear Extensions scenarios. The Valley Load Growth and Decarbonization scenarios assume higher energy prices, with the Valley Load Growth increase happening more gradually and the Decarbonization trajectory ratcheting up as assumed regulations take effect. The Economic Downturn and Rapid DER Adoption scenarios assume lower electricity prices on similar trajectories.

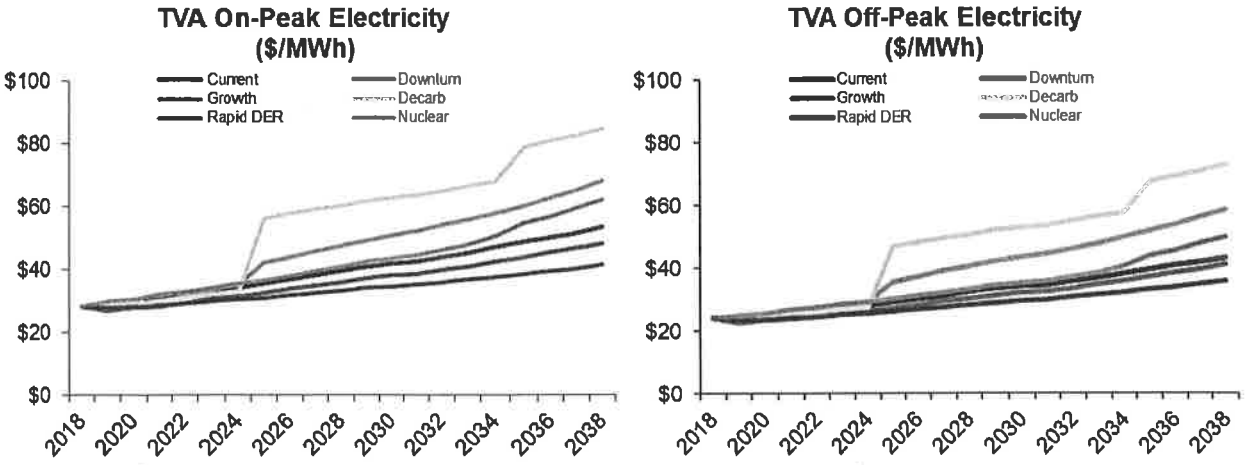

Figure 6-5: On-peak & Off-peak Price Assumptions

Figure 6-6 shows the forecasted assumptions for CO_2 prices. The Current Outlook assumes no carbon penalty, which is also the case in the Economic Downturn, Rapid DER Adoption and No Nuclear Extension scenarios. The Valley Load Growth scenario assumes a modest carbon penalty beginning in 2025 to spur faster adoption of electric vehicles. The Decarbonization scenario assumes a larger carbon penalty driven by regulations or legislative actions that takes effect in 2025 and that is ratcheted up further in 2035.

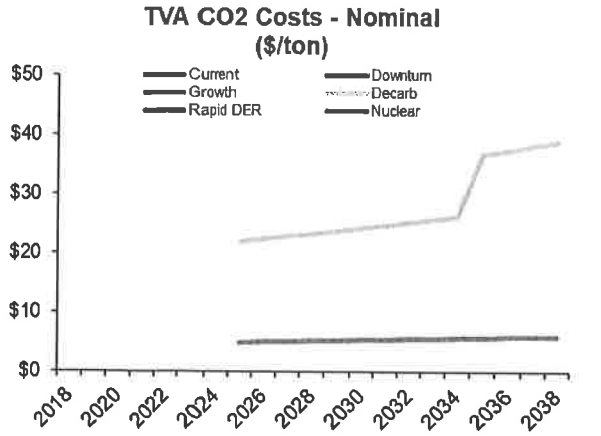

Figure 6-6: CO_2 Price Assumptions

6.2 Development of Strategies

After the scenarios were developed, the next step in the IRP process was to design planning strategies. Scenarios and strategies are very different. Whereas scenarios describe plausible futures and include uncertainties that TVA cannot control, strategies describe business decisions or approaches that TVA could employ.

Generally speaking, strategies promote certain resources, and in some cases also limit certain resources to support promotion of others. In IRP modeling terms, strategies that constrain how resources are selected may not be fully optimized nor produce plans that have the lowest possible financial cost. When a resource is promoted, the cost of the resource is lowered for model selection within a particular strategy. The full cost (resource and incentive) will be captured in the financial metrics. Several strategies evaluated in this IRP explore the promotion of distributed resources, and the costs of promoting adoption of those resources is shared between TVA and the DER participants. These shared costs will be analyzed further using metrics. The process used to develop strategies is described below.

6.2.1 Identification of Key Strategy Components

The first step in developing strategies was to identify the key components, or attributes, to be included in each strategy. Ten distinct attributes were identified using input from individuals on the IRP Working Group and comments received during the public scoping period. These attributes are described in Table 6-3.

Table 6-3: Key Planning Strategy Attributes

Attributes	Description
Existing Nuclear	Constraints related to the existing nuclear fleet; EPUs are considered part of existing nuclear
Nuclear Additions	Limitations on technologies and timing related to the addition of new nuclear capacity; A/P 1000s and SMRs are considered in this category
Existing Coal	Constraints related to the existing coal fleet
New Coal	Limitations on technology and timing on new coal-fired plants; includes CCS on conventional coal plus IGCC technology

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Attributes	Description
Gas Additions	Limitations on technologies and timing related to the expansion options fueled by natural gas (CT, CC)
Energy Efficiency	Considers energy efficiency programs that are offered by TVA and/or LPCs (excludes impacts from naturally occurring efficiency/conservation)
Demand Response	Considers demand response programs that are offered by TVA and/or LPCs
Renewables (Utility Scale)	Limitations on technologies and timing of renewable resources; considers options that would be pursued by TVA or in collaboration with LPCs
Storage (Utility Scale)	Limitations on technologies and timing of storage resources; considers utility scale storage options varying in size or storage capacity
Distributed Generation/Storage	Includes customer-driven resource options or third party projects that are distributed in nature

6.2.1.1 Development of Strategies Using Attributes

TVA combined these 10 attributes to initially create seven strategies for consideration by the IRP Working Group. After review of the scoping comments, suggestions from members of the IRP Working Group, and further analysis, TVA selected five distinct strategies. Table 6-4 lists the five strategies and their key characteristics.

Table 6-4: Key Characteristics of the Planning Strategies

Strategies	Description and Attributes
A- Base Case	• Planning Reserve margins for summer and winter peak seasons are applied, targeting an industry best-practice level of reliability (applies in all strategies) • No specific resource types are promoted beyond continuation of existing programs as currently forecasted.
B- Promote DER	• DER is incented to achieve higher end of long-term penetration levels • New coal is excluded, and all other technologies are available while EE, demand response, distributed generation and storage are promoted • Programs targeting low-income customers will be part of EE promotion

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Strategies	Description and Attributes
C- Promote Resiliency	• Small, agile capacity is incented to maximize flexibility and promote ability to respond to short-term disruptions on the power system • All technologies are available while small modular reactors (SMRs) and small gas additions (aeroderivative turbines, reciprocating engines), demand response, storage and distributed generation are promoted • Combinations of storage and distributed generation could be installed as microgrids • Flexible loads and DERs are aggregated to provide synthetic reserves to the grid to promote resiliency
D- Promote Efficient Load Shape	• Targeted electrification and demand and energy management are incented to minimize peaks and troughs and promote an efficient load shape • All technologies are available but those that minimize load swings, including EE, DR and storage, are promoted • Programs targeting low-income customers will be a part of EE promotion
E- Promote Renewables	• Renewables at all scales are incented to meet growing prospective or existing customer demands for renewable energy • New coal is excluded, and all other technologies are available while renewables are promoted

Strategy attributes were used in the modeling in several different ways. The Base Case represents least-cost planning with no specific resources promoted and reflects decisions made to date by the TVA Board of Directors. The remaining strategies provide incentives to promote adoption of certain resources, with consideration of market potential, pace of adoption and reserve margin. Resources that were promoted generally received a modeled incentive that improved economics for adoption or selection. In some cases, a resource category may be limited, such as new coal being excluded in the Promote DER and Promote Renewables strategies. Others have temporal restrictions, such as allowing retirements to take effect in a certain year when transmission work to allow plant separation could be completed.

6.2.1.2 Definition of Strategies

After defining each strategy's key characteristics, incentive levels were determined to achieve the objectives of the strategy as shown in Figure 6-7. The Strategy Design Matrix provided the roadmap for how resource promotions were applied in capacity planning. Further information on strategy design can be found in Appendix F.

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Strategy	Distributed Resources & Electrification						Utility Scale Resources					
	Distributed Solar	Distributed Storage	Combined Heat & Power	Energy Efficiency	Demand Response	Beneficial Electrification	Solar	Wind	Biomass & Biogas	Storage	Aero CTs & Recip Engines	Small Modular Reactors
Base Case	Base	Base	Base	Base	Base	Base	Base	Base	Base	Base	Base	Base
Promote DER	High	Moderate	High	Moderate	Moderate	Base	Base	Base	Base	Base	Base	Base
Promote Resiliency	Moderate	High	Moderate	Base	Moderate	Base	Base	Base	Base	Moderate	Moderate	Moderate
Promote Efficient Load Shape	Base	Moderate	Base	High	High	Moderate	Base	Base	Base	High	Base	Base
Promote Renewables	Moderate	Moderate	Base	Base	Base	Base	Moderate	Moderate	Moderate	Moderate	Base	Base

Figure 6-7: Strategy Design Matrix

6.3 Resource Portfolio Optimization Modeling

The development of resource portfolios was a two-step process. First, an optimized portfolio, or capacity plan, was generated, followed by a detailed financial analysis. This process was repeated for each strategy/scenario combination and for additional sensitivity runs. Sensitivity runs change one variable in a strategy, such as the level of promotion for a certain resource, to lend insight to the impact of a specific input.

6.3.1 Development of Optimized Capacity Expansion Plans

TVA uses a capacity optimization model called System Optimizer.[1] This model employs an optimization technique where an "objective function" is minimized subject to a number of constraints.

Energy resources were selected by adding or subtracting assets based on minimizing the present value of revenue requirements (PVRR). PVRR represents the cumulative present value of total revenue requirements for the study period based on an 8 percent discount rate. In other words, PVRR is the present day value of all future costs for the study period, discounted to reflect the time value of money and other factors such as investment risk.

In addition, the following constraints were applied in the optimization runs:

- Balance of supply and demand
- Energy balance
- Reserve margin
- Generation and transmission operating limits
- Fuel purchase and utilization limits
- Environmental stewardship
- Distributed generation/storage adoption.

In order to promote certain resources within a strategy, incentive levels for distributed generation and storage resources were developed to increase adoption in each strategy. These resulting adoption levels were modeled as constraints prior to optimizing the balance of the portfolio.

The System Optimizer model uses a simplified dispatch methodology to compute production costs and a "representative hours" approach in which average generation and load values in each representative period within a week are scaled up appropriately to span all hours of the week and days of the months. The least-cost path (based on lowest PVRR) from all feasible states in the study period is identified as the optimized capacity plan.

[1] System Optimizer is an industry standard software model developed by ABB.

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6.3.2 Financial Analysis

Next, each capacity plan was evaluated using an hourly production costing methodology, which calculated detailed production costs of each plan, including fuel and other variable operating costs. These detailed cost simulations provided total strategy costs and financial metrics that were used in the strategy assessment process.

This analysis was accomplished using a strategic planning software tool called MIDAS[2]. MIDAS uses a chronological production costing approach coupled with financial planning data to assess plan cost, system rate impacts and financial risk. It uses a Monte Carlo analysis,[3] which is a sophisticated analytical technique that allows for a better understanding of portfolio performance by testing the variability of key assumptions and expressing portfolio results as a range around an expected case.

The total cost for each resource plan (PVRR) was calculated taking into account additional considerations, including the cash flows associated with financing. The model generated multiple combinations of the key assumptions for each year of the study period and computed the costs of each combination. Capital costs for supply-side options were amortized for investment recovery using a real economic carrying cost method that accounted for unequal useful lives of generating assets.

In addition to computation of the total plan cost (PVRR) over the full 20-year study period, a system average cost metric was calculated. This metric provides an alternative view of the revenue requirements for the study period expressed per MWh. It is not intended as a forecast of wholesale or retail rates over the study period. Rather, it was developed to gauge the potential rate impact associated with a given portfolio and provides an indication of relative rate pressure across the strategies being studied. Reviewing this metric in combination with PVRR and the financial risk measures provides a clearer picture of the cost/risk balance for each resource plan.

6.3.3 Uncertainty/Risk Analysis

While scenarios explore step changes in possible futures, stochastic analysis evaluates risk of uncertainty around key planning assumptions for each portfolio. Stochastic analysis of production cost and financials bounds the uncertainty and identifies the risk exposure that is inherent in long-range power supply planning, because the fundamental forecasts used in those studies are inevitably wrong. Variability will result due to supply/demand disruptions, weather, market conditions, technology improvements and economic cycles. A Monte Carlo simulation allows for a better understanding of the richness of possible futures, as well as their likelihoods, so that plans can be made proactively as opposed to reactively. A stochastic model is used to estimate probability distributions of potential outcomes by allowing for simultaneous random-walking variation in many inputs over time.

At TVA, a representative Monte Carlo distribution using Latin hypercube sampling (efficient method for generating probability distributions) comprised of 120 stochastic iterations is developed for each of the scenario/strategy combinations to more fully assess the likely plan costs, generation, and performance for each portfolio. To illustrate the iterations, Figure 6-8 shows a trade-off graph comparing PVRR versus CO_2 intensity for each iteration of a portfolio as well as the expected value, or average, and the 5th percentile and the 95th percentile, or P(5) and P(95), respectively.

A sample stochastic result which compares revenue requirements of two hypothetical portfolios is shown in Figure 6-9. This example illustrates the range of possible results of costs for each portfolio from the P(5) to P(95). The point where the color of the bars changes represents the expected cost for that portfolio.

[2] MIDAS is also an ABB product.

[3] Monte Carlo analysis is also referred to as stochastic analysis.

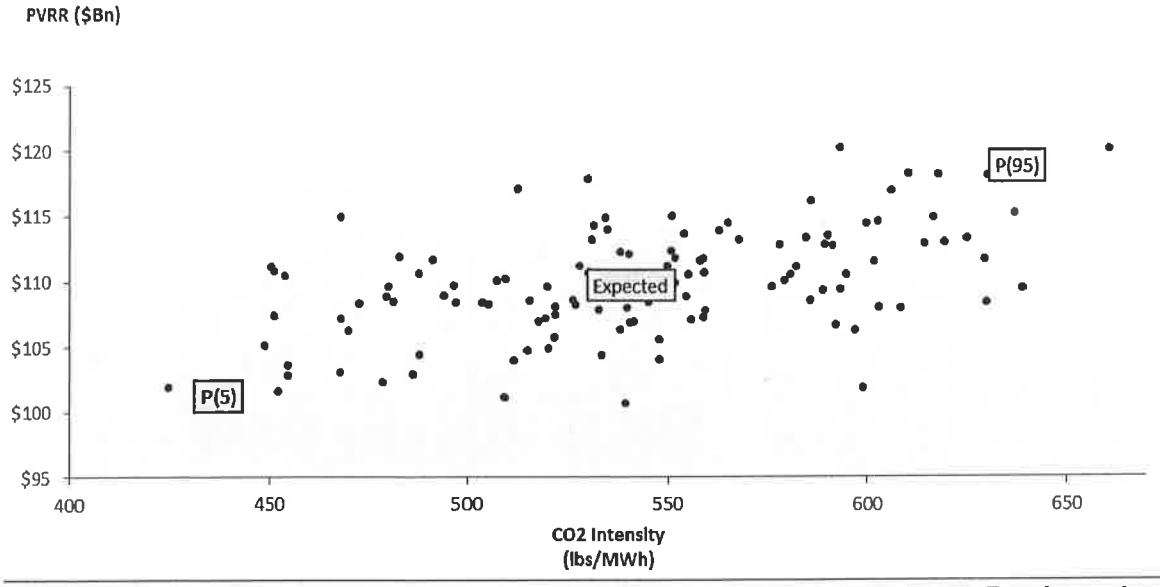

Figure 6-8: Sample Stochastic Result with Trade-off between Present Value of Revenue Requirements and CO_2 Intensity

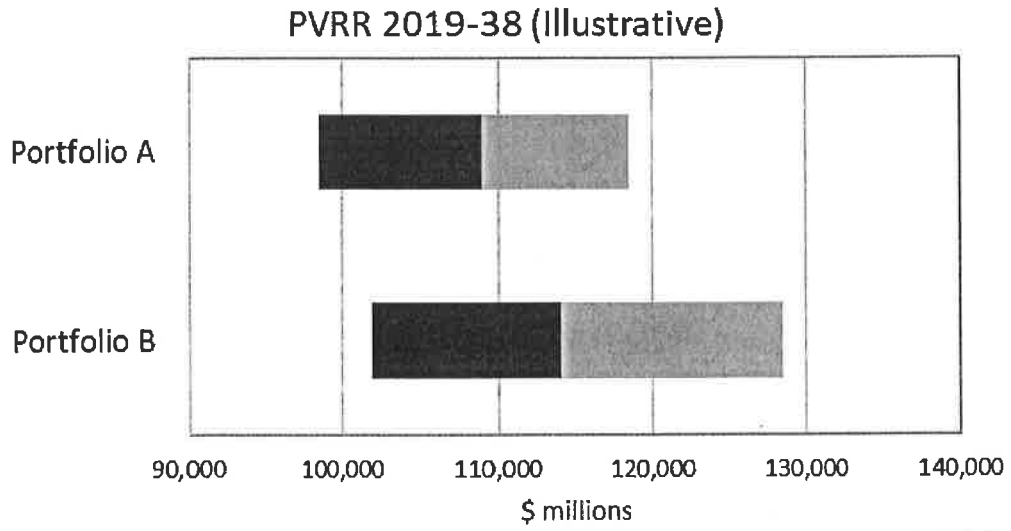

Figure 6-9: Sample Stochastic Result for Present Value of Revenue Requirements

Cost and risk metrics shown later in this report are calculated from the distribution of stochastic iterations. The cost and metrics are primarily the expected values while the risk metrics are functions of the P(5), P(95), and the expected value. The MIDAS tool allows TVA to explicitly consider uncertainty and risk exposure in the evaluation of the planning strategies. This analysis is based on applying probability distributions around the key variables used to frame the scenarios and define assumptions used in the strategies.

The Monte Carlo analysis in MIDAS includes 16 key variables:

- Commodity prices: natural gas, coal, oil, CO_2 allowances, electricity price[4]
- Financial parameters: interest rates, capital costs, operation and maintenance costs
- Availability: hydro, coal, gas, nuclear, solar, and wind
- Net sales forecast uncertainty: peak and energy, (includes demand, EE, electrification, behind-the-meter solar, and CHP)

The fundamental (expected value) forecasts for these key variables differ across the six scenarios and, as a result, the uncertainty ranges (stochastic envelope) are also different. The evaluation of the uncertainty around the performance of the strategies considers both the variation across the scenarios (different plausible futures) and the probability distribution around the expected forecasts represented by the stochastic envelope. As an example, Figure 6-10 shows these different uncertainty ranges around the TVA peak load forecast.

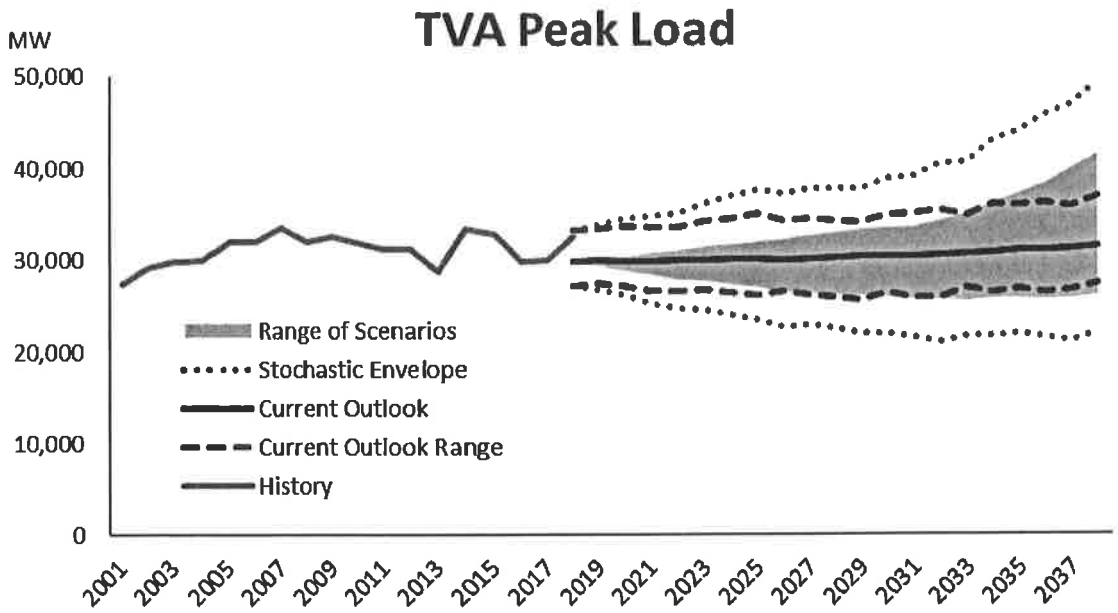

Figure 6-10: Example Uncertainty Ranges

Figure 6-10 shows the range of variation in the expected forecast of peak demand across all six scenarios (represented by the blue shaded area). For orientation, the Current Outlook scenario's fundamental forecast and its associated uncertainty range is shown in the black solid and dotted lines. The stochastic envelope, representing the uncertainty ranges from all six scenarios, is shown as the blue dotted line and bounds the uncertainty range evaluated in MIDAS. Each of the 16 key variables has a set of scenario ranges and stochastic envelopes that ensure a more dynamic assessment of the variability in the performance of each planning strategy.

6.4 Portfolio Analysis and Scorecard Development Process

Modeling multiple strategies within multiple scenarios resulted in a large number of portfolios. So, initially, the portfolio analysis focused on common characteristics

[4] Stochastic electricity price was derived fundamentally in MIDAS using stochastic variables as inputs.

that strategies exhibited over multiple scenarios rather than on specific outcomes in individual portfolios. Strategies that behaved in a similar manner in most scenarios were considered to be "robust" – i.e., more flexible, less risky over the long-term and able to lessen the impacts of uncertainty. Conversely, strategies that behaved differently or poorly in most scenarios were considered more risky with a higher probability for future regret.

The first step in the portfolio evaluation process was to develop a scorecard to assess and compare the performance of strategies in each scenario. The process used to develop an evaluation scorecard is described below.

6.4.1 Selection of Metric Categories

TVA's mission and stakeholder concerns related to resource planning were key considerations in developing a set of metrics for use in evaluating the performance of the portfolios generated in the IRP.

To achieve its overall mission of providing low-cost, reliable power to the people of the Valley, TVA focuses on four strategic imperatives, as mentioned previously in Chapter 1. These imperatives are: balancing rates and debt so that TVA maintains low power rates while living within its means; and recognizing the trade-off between optimizing the value of our asset portfolio and being responsible stewards of the Valley's environment and natural resources.

Optimizing TVA's asset portfolio is the primary purpose of integrated resource planning, but other imperatives also shape the process:

- As part of the financial analysis, a balance sheet and income statement are created for each portfolio to determine the revenue requirements to fund each resource plan.
- A coverage ratio method is used to ensure that the overall debt limit is respected in each optimization run.
- Stewardship obligations are considered in modeling of various compliance requirements, including portfolio optimization which factors in a carbon penalty and includes key environmental metrics in the assessment of each resource plan (air, water, waste and land-use impacts).

Based on TVA's strategic imperatives and feedback from stakeholders, five metric categories were selected for use in evaluating the performance of planning strategies:

- **Cost**, including both the long-range cost of the resource plan as well as a look at average system cost, which is an indicator of possible rate pressure
- **Financial Risk**, which measures the variation (uncertainty) around the cost of the resource plan by assessing a risk/benefit ratio and computing the likely amount of cost at risk using data from probability modeling
- **Environmental Stewardship**, which captures multiple measures related to the environmental footprint of the resource plans, including air emissions and water, waste and land use impacts
- **Operational Flexibility**, which measures how responsive the generation portfolio of each resource plan is by evaluating the portfolio's ability to ramp up and down to respond to changes in demand
- **Valley Economics**, which computes the macro-economic effects of the resource plans by measuring the change in real per capita income (where real references the fact that the income streams have been adjusted to remove the impacts of inflation, such that future income streams and present income streams all possess a consistent purchasing capability) and employment compared to a reference case.

6.4.2 Development of Metrics

After establishing the metric categories, the next step was to identify candidate metrics for each category to be used in the scorecard to assess the performance of each strategy in different scenarios.

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Considering input from the IRP Working Group and Regional Energy Resource Council, TVA selected 14 metrics that clearly and effectively measure the performance of each portfolio as summarized in Figure 6-11.

Category	Metric	Definition
Cost	PVRR ($Bn)	Total plan cost (capital and operating) expressed as the expected (stochastic) present value of revenue requirements over the 20-year study period
	System Average Cost ($/MWh)	Expected average system cost for the study period, computed as the levelized annual average system cost (annual revenue requirements divided by annual sales)
	Total Resource Cost ($Bn)	Total plan cost (capital and operating) expressed as the expected present value of revenue requirements over the study period plus participant cost net of bill savings and tax credits
	Risk/Benefit Ratio	Area under the plan cost distribution curve between P(95) and expected value divided by the area between expected value and P(5) based on stochastic analysis
	Risk Exposure ($Bn)	The point on the plan cost distribution below which the likely plan costs will fall 95% of the time based on stochastic analysis
Environmental Stewardship	CO_2 (MMTons)	Expected annual average tons of CO_2 emitted over the study period
	CO_2 Intensity (lbs/MWh)	Expected CO_2 emissions expressed as an emission intensity, computed by dividing emissions by energy generated and purchased
	Water Consumption (MMGallons)	Expected annual average gallons of water consumed over the study period
	Waste (MMTons)	Expected annual average quantity of coal ash, sludge and slag projected based on energy production in each portfolio
	Land Use (Acres)	Expected acreage needed for expansion units in each portfolio in 2038
Operational Flexibility	Flexible Resource Coverage Ratio	The ratio of flexible capacity available to meet the maximum 3-hour ramp in demand in 2038
	Flexibility Turn Down Factor	Ability of the system to serve low load periods as measured by the percent of must-run and non-dispatchable generation to sales
Valley Economy	Percent Difference in Real Per Capita Income	The change in real per capita personal income expressed as a change from a reference portfolio in each scenario
	Percent Difference in Employment	The change in non-farm employment expressed as a change from a reference portfolio in each scenario

Figure 6-11: Metrics Definitions

Figure 6-12 shows the formulas used to compute the metrics.

Category	Metric	Formula
Cost	PVRR ($Bn)	Present Value of Revenue Requirements over Planning Period
	Total Resource Cost ($Bn)	PVRR + Participant cost net of savings (bill savings, tax credits)
	System Average Cost ($/MWh)	$\frac{\text{NPV Rev Reqs (2019–2038)}}{\text{NPV Sales (2019–2038)}}$
Risk	Risk/Benefit Ratio	$\frac{95\text{th }_{(PVRR)} - \text{Expected }_{(PVRR)}}{\text{Expected }_{(PVRR)} - 5\text{th }_{(PVRR)}}$
	Risk Exposure ($Bn)	95th Percentile $_{(PVRR)}$
Environmental Stewardship	CO2 (MMTons)	Average Annual Tons of CO2 Emitted During Planning Period
	CO2 Intensity (lbs/MWh)	$\frac{\text{Pounds CO2 (2019–2038)}}{\text{MWh Generated \& Purchased (2019–2038)}}$
	Water Consumption (MMGallons)	Average Annual Gallons of Water Consumed During Planning Period
	Waste (MMTons)	Average Annual Tons of Coal Ash and Scrubber Residue During Planning Period
	Land Use (Acres)	Acreage Needed for Expansion Units in Each Portfolio (2038)
Operational Flexibility	Flexible Resource Coverage Ratio	$\frac{\text{Flexible Capacity Available for Max 3-Hour Ramp in each Strategy (2038)}}{\text{Capacity Required for Max 3-Hour Ramp in each Scenario (2038)}}$
	Flexibility Turn Down Factor	$\frac{\text{"Must Run" + "Non-Dispatchable" (2038)}}{\text{Sales (2038)}}$
Valley Economics	Percent Difference in Real Per Capita Income	Percent Difference in Real Per Capita Personal Income Compared to the Base Case (for each scenario)
	Percent Difference in Employment	Percent Difference in Non-Farm Employment Compared to the Base Case

Figure 6-12: Metric Formulas

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The scorecard metrics selected align with TVA's mission as shown in Figure 6-13.

	IRP Scorecard Metrics	Low-Cost Reliable Power	TVA Mission Economic Development	Environmental Stewardship
Cost	PVRR ($Bn)	✓	✓	
	System Average Cost ($/MWh)	✓	✓	
	Total Resource Cost ($Bn)	✓		
Risk	Risk/Benefit Ratio	✓		
	Risk Exposure ($Bn)	✓		
Environmental Stewardship	CO2 (MMTons)		✓	✓
	CO2 Intensity (lbs/MWh)		✓	✓
	Water Consumption (MMGallons)			✓
	Waste (MMTons)			✓
	Land Use (Acres)			✓
Operational Flexibility	Flexible Resource Coverage Ratio	✓		
	Flexibility Turn Down Factor	✓		
Valley Economics	Percent Difference in Real Per Capita Income	✓	✓	
	Percent Difference in Employment		✓	

Figure 6-13: Scorecard Alignment Scorecard Design

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Scorecard Metric	Scenarios					
	Current Outlook	Economic Downturn	Valley Load Growth	Decarbonization	Rapid DER Adoption	No Nuclear Extensions
PVRR ($Bn)						
Total Resource Cost ($Bn)						
System Average Cost ($/MWh)						
Risk/Benefit Ratio						
Risk Exposure ($Bn)						
CO2 (MMTons)						
CO2 Intensity(lbs/MWh)						
Water Consumption (MMGallons)						
Waste (MMTons)						
Land Use (Acres)						
Flexible Resource Coverage Ratio						
Flexibility Turn Down Factor						
Percent Difference in Real Per Capita Income						
Percent Difference in Employment						

Figure 6-14: Scorecard Template

Once the metrics were selected, the strategy scorecard could be designed. Using a format similar to the 2015 IRP, the scorecard summarizes the performance of an individual planning strategy in each of the scenarios. To evaluate differences within a given scenario, all five scorecards were reviewed. Interpretation of the performance of each strategy is presented in Chapter 7.

6.5 Strategy Assessment Process

Finally, scorecards were populated based on an assessment of overall performance of each strategy in the five metric categories: cost, risk, environmental stewardship, operational flexibility, and Valley economics.

Each metric category was assessed individually and graphics were developed to facilitate interpretation of trends and to identify preliminary observations. Examples of key graphics include a comparison of cost and risk and a comparison of cost and CO_2 emissions to enable investigation of possible trade-offs. These observations guided the development of an action plan for further case analysis.

The strategy assessment graphics, along with information about observations from the IRP study and the action plan, can be found in Chapter 8.

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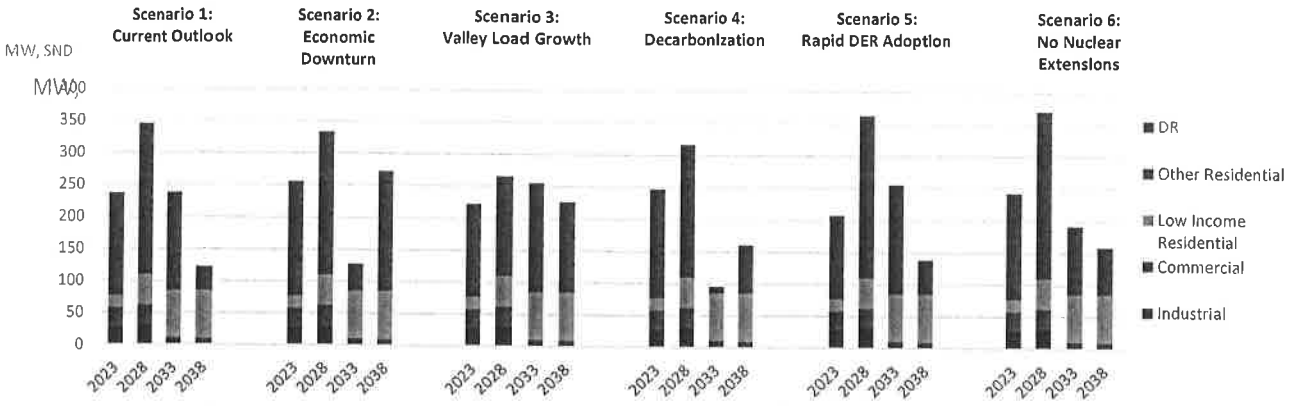

Figure 7-10: Incremental EEDR Capacity by 2038

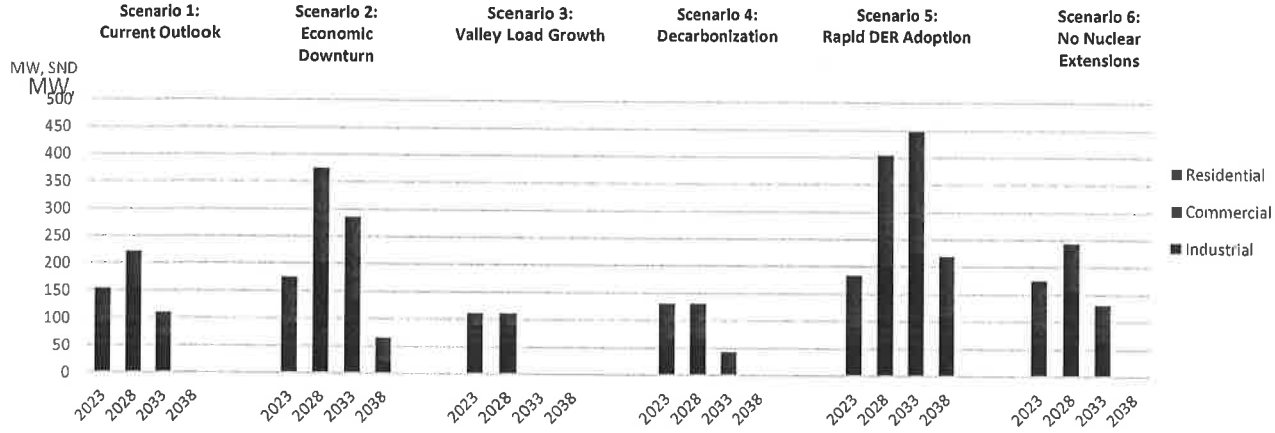

Figure 7-11: Incremental BE Capacity by 2038

7.1.10 Summaries by Strategy

Strategy A: Base Case is TVA's least-cost optimization plan that applies no additional incentives or targets. Resources are chosen economically to meet the reserve margin constraint for reliability.

Figure 7-12 presents the modeled capacity results for Strategy A. The capacity portfolios show the summer net dependable megawatts in 2038. The **nuclear** portfolio is the same in all scenarios, except for Scenario 6 where Browns Ferry units are retired. **Hydro** capacity is the same in all cases. **Coal** capacity is the same in all scenarios, except for Scenario 4, where carbon regulation leads to additional coal retirements. **Solar** assets are added beginning in the mid-2020 time frame, and continue to be added throughout most of the planning horizon. Including hydro, renewables account for 18 percent of the capacity portfolio on average. Natural **gas** assets increase over time, beginning with Gas CC additions that could be achieved through renewal of existing contracts, acquisitions or builds. These are augmented by Gas CT additions in Scenario 3 and 6 cases. With current cost projections and no promotion in Strategy A, no **storage** appears in any portfolios. **Energy efficiency** increases modestly in all scenarios, with impacts lessened as efficiencies from codes and standards increase. **Demand response** increases similarly across scenarios, with some differentiation due to load shape and strategic focus.

Figure 7-13 shows the energy portfolios that correspond to the capacity charts in Figure 7-12.

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Nuclear energy remains the same over time across the cases, with the exception of the Scenario 6 case where energy from the retired Browns Ferry units is replaced primarily with solar and gas generation. **Hydro** energy remains the same across portfolios. **Coal** generation decreases over the planning horizon as units are retired and declines further in lower load cases, especially in Scenario 4. **Solar** generation increases substantially in all cases, with the highest increases seen in Scenario 3 and 4 portfolios. Including hydro, renewables account for 20 percent of total generation on average. Natural **gas** generation varies with load and strategic focus, with the highest gas generation seen in the Scenario 3 and 6 cases. Demand response, which produces low energy volumes, has been combined with the energy efficiency into one group termed EEDR. Incremental **EEDR** contributes a small amount to the portfolio, with increasing impacts from codes and standards reflected in the load forecast without additional TVA incentives. Strategy A results in 61 percent carbon-free generation in 2038 on average.

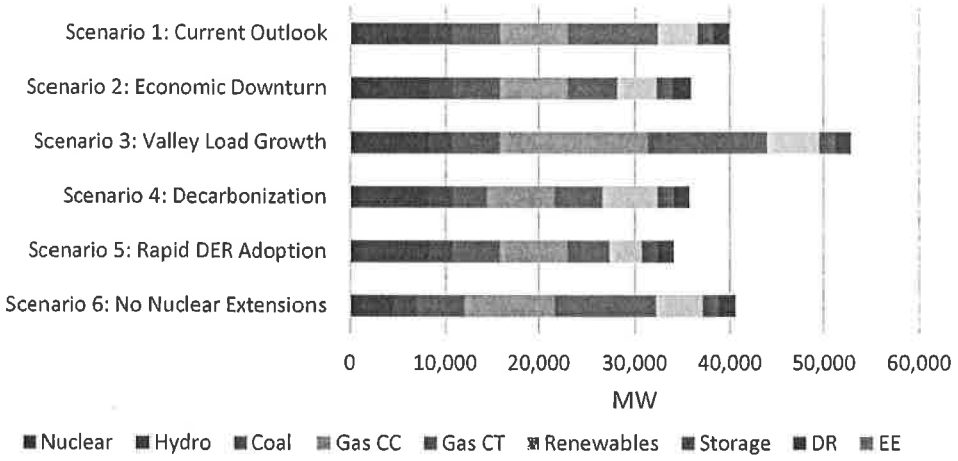

Figure 7-12: Capacity (Summer Net Dependable Megawatts) in 2038 for Strategy A by Scenario

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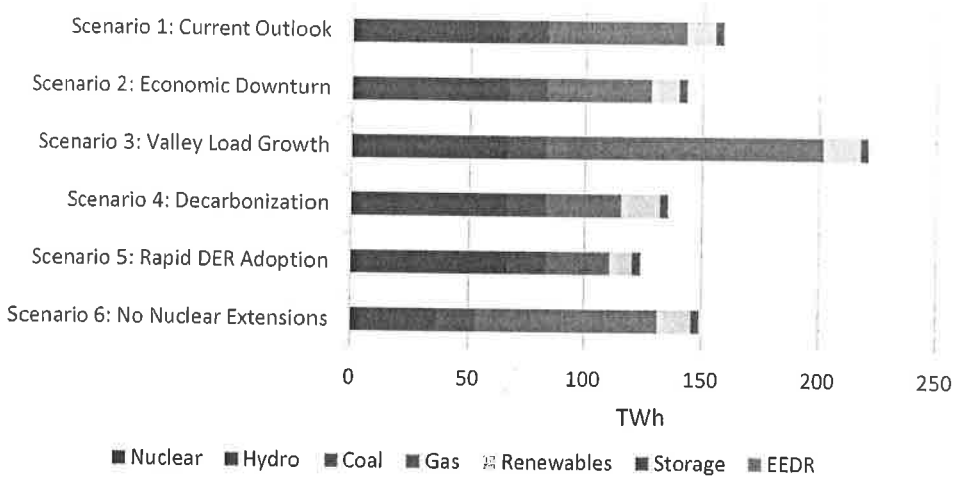

Figure 7-13: Energy (Terawatt Hours) in 2038 for Strategy A by Scenario

Strategy B: Promote DER focuses on increasing the pace of DER adoption by incenting distributed solar and storage, combined heat and power, energy efficiency and demand response. Promotions are first applied, and then the balance of the system is optimized in a least-cost manner. The approach used to model increased adoption through an incentive mechanism is discussed further in Appendix C.

Figure 7-14 shows the capacity resources added by 2038 in Strategy B across the six scenarios. The results from this strategy are very similar to Strategy A with a few notable differences. Distributed **solar** is promoted in this strategy and generally replaces a portion of lower cost utility solar. Distributed **storage** is also promoted, replacing a portion of demand response but at a higher cost. Finally, **CHP** is promoted, driving slightly lower utility-scale gas additions.

Figure 7-15 shows how the energy portfolios for Strategy B play out driven by the capacity changes and other factors in the scenarios. Including hydro, renewables account for 20 percent of total generation on average. Strategy B results in 61 percent carbon-free generation in 2038 on average, similar to Strategy A.

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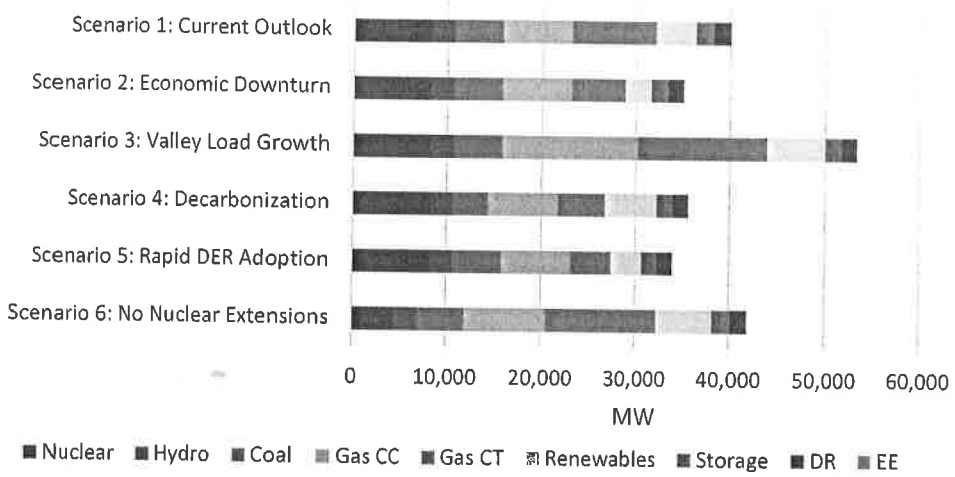

Figure 7-14: Capacity (Summer Net Dependable Megawatts) in 2038 for Strategy B by Scenario

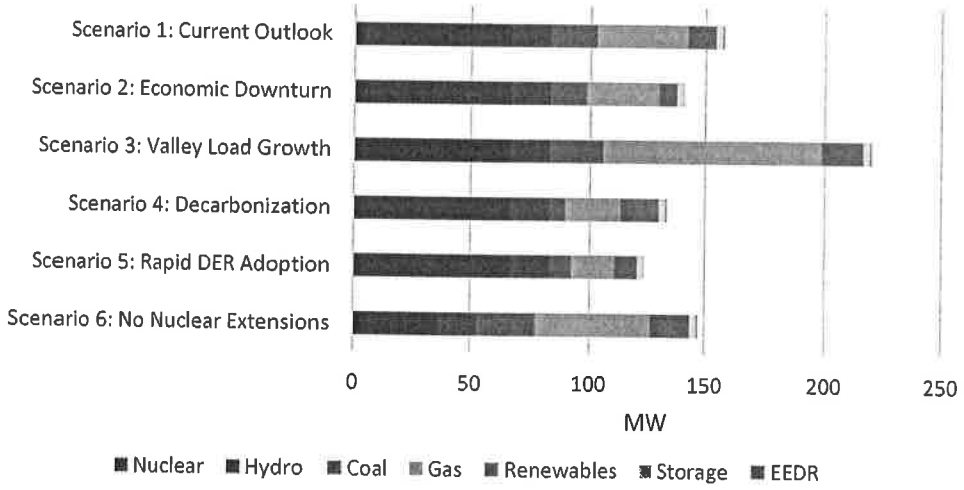

Figure 7-15: Energy (Terawatt Hours) in 2038 for Strategy B by Scenario

Strategy C: Promote Resiliency incents higher adoption of small, agile capacity to increase the operational flexibility of TVA's power system, while also improving the ability to respond locally to short-term disruptions. Promotions are first applied, and then the balance of the system is optimized in a least-cost manner. The approach used to model increased adoption through an incentive mechanism is discussed further in Appendix C.

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Figure 7-16 presents the total capacity portfolios in 2038 for Strategy C. The **hydro** portfolio is the same as in Strategy A. **Nuclear** capacity is the same as in Strategy A, with the exception of Scenario 6 where 1,200 MW of SMRs are added to replace one Browns Ferry nuclear unit. **Coal** capacity is the same across all scenarios, except for Scenario 4 in which carbon regulation leads to additional coal retirements. When more coal is retired, **solar** capacity increases at both utility and distributed scales. **Storage** additions are promoted, resulting in somewhat lower **gas** capacity additions on average. **EEDR** volumes remain similar across the scenarios in this strategy.

Figure 7-17 shows the resulting energy portfolios for Strategy C driven by the capacity changes and other factors in the scenarios. Including hydro, renewables account for 22 percent of total generation on average. Strategy C results in 63 percent carbon-free generation in 2038 on average, compared to 61 percent in Strategy A.

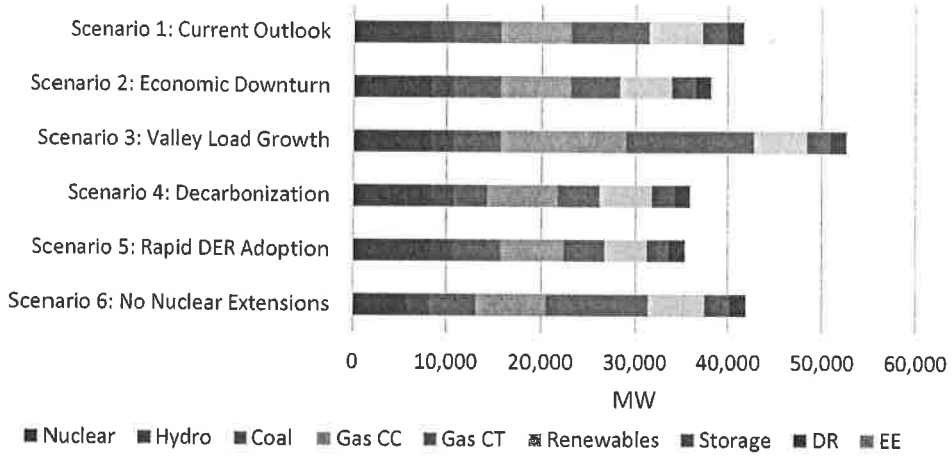

Figure 7-16: Capacity (Summer Net Dependable Megawatts) in 2038 for Strategy C by Scenario

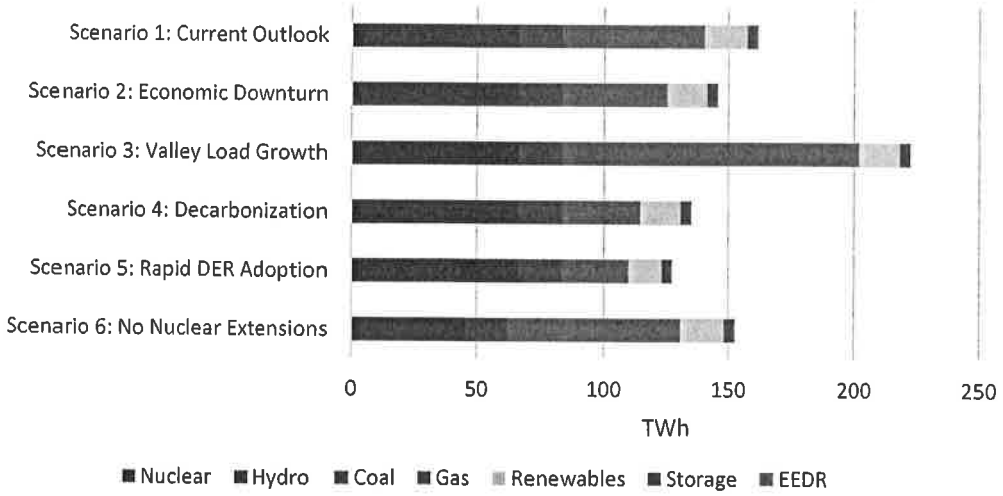

Figure 7-17: Energy (Terawatt Hours) in 2038 for Strategy C by Scenario

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Strategy D: Promote Efficient Load Shape incents targeted electrification, demand response, and energy management to optimize load shape, including programs targeting low-income energy efficiency. Promotions are first applied, and then the balance of the system is optimized in a least-cost manner.

Figure 7-18 shows the capacity resources added by 2038 in Strategy D across the six scenarios. The **nuclear** and **hydro** portfolios are the same as in Strategy A. This strategy results in the highest amount of **coal** retirements on average. That capacity is replaced with a combination of solar, storage and gas additions, with a high penetration of **solar** achieved in all cases. **Storage** is promoted to the greatest degree in this strategy, resulting in the highest storage capacity overall. The storage additions drive the lowest need for gas capacity, especially CT peaking units. The highest **EE** volumes are seen in this strategy, and **DR** volumes are similar to Strategy A by 2038, as the promotion of storage meets peaking needs.

Figure 7-19 shows the corresponding energy portfolios for Strategy D driven by the capacity changes and other factors in the scenarios. Including hydro, renewables account for 22 percent of total generation on average. Strategy D results in 61 percent carbon-free generation, similar to Strategy A.

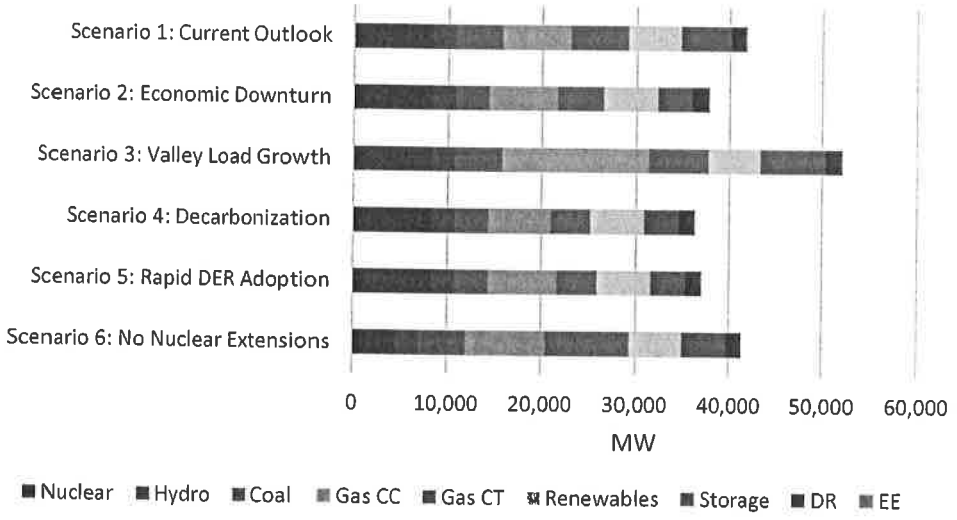

Figure 7-18: Capacity (Summer Net Dependable Megawatts) in 2038 for Strategy D by Scenario

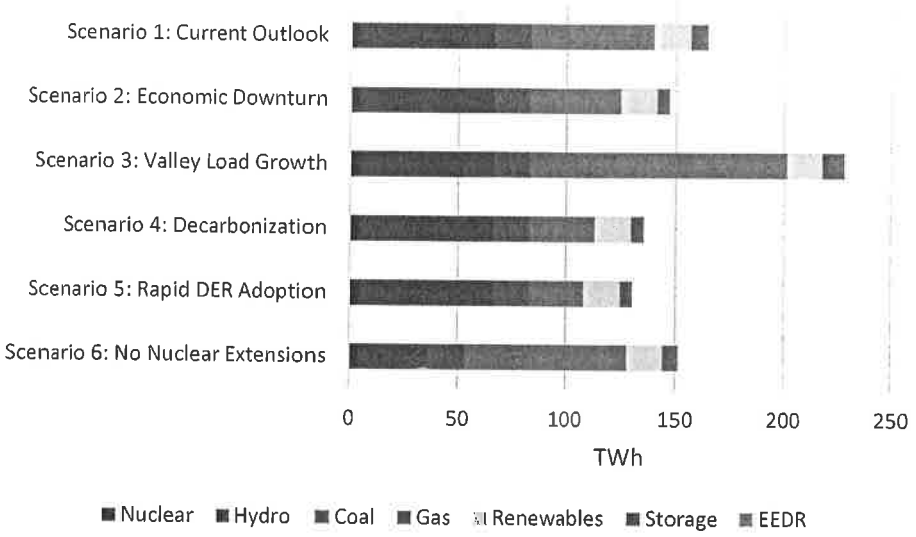

Figure 7-19: Energy (Terawatt Hours) in 2038 for Strategy D by Scenario

Strategy E: Promote Renewables incents renewables at all scales to meet growing prospective or existing customer demands for renewable energy. Promotions are first applied, and then the balance of the system is optimized in a least-cost manner. The approach used to model increased adoption through an incentive mechanism is discussed further in Appendix C.

Figure 7-20 presents the total capacity portfolios in 2038 for Strategy E. The **nuclear** and **hydro** portfolios are the same as in Strategy A. Coal capacity is the same across all scenarios, except for Scenario 4 in which carbon regulation leads to additional coal retirements. The highest levels of **solar** additions are seen in this strategy across all scenarios, averaging nearly 6,000 MW summer NDC and 9,000 MW nameplate. Including hydro, renewables account for 20 percent of the capacity portfolio on average. **Storage** is also promoted, resulting in a comparable level of storage additions as in Strategy C, and similarly reducing the need for **gas** capacity additions. **EEDR** volumes remain similar across the scenarios in this strategy, also resembling Strategy C.

Figure 7-21 shows the corresponding energy portfolios for Strategy E driven by the capacity changes and other factors in the scenarios. Including hydro, renewables account for 22 percent of total generation on average. Strategy E results in 62 percent carbon-free generation in 2038 on average, compared to 61 percent in Strategy A.

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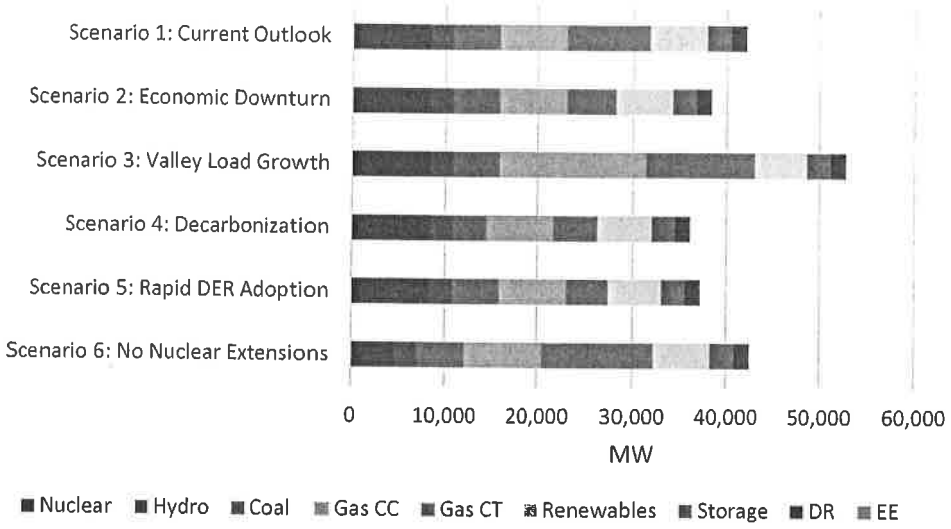

Figure 7-20: Capacity (Summer Net Dependable Megawatts) in 2038 for Strategy E by Scenario

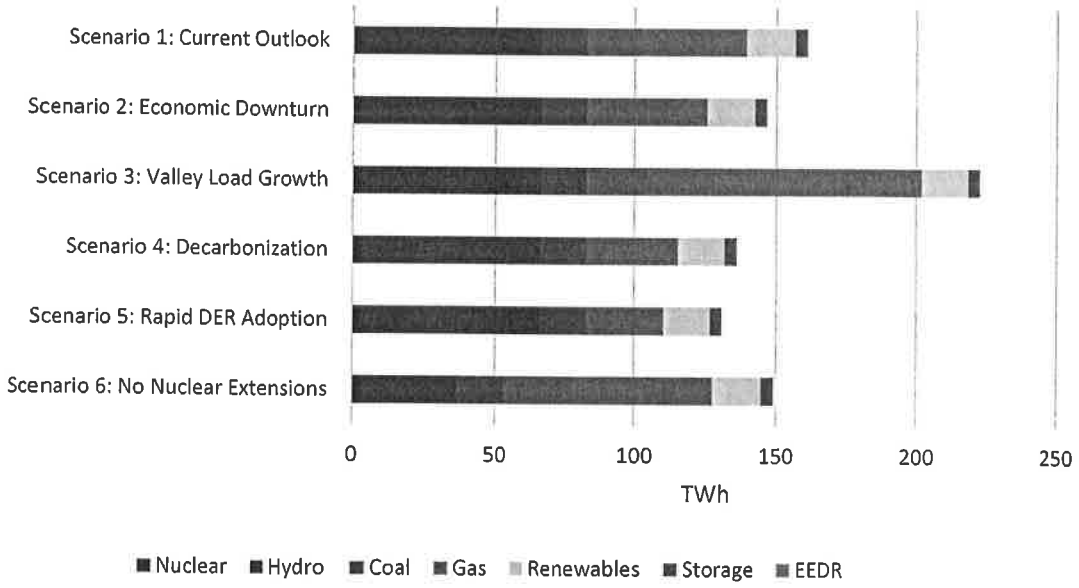

Figure 7-21: Energy (Terawatt Hours) In 2038 for Strategy E by Scenario

		Scenario					
		1	2	3	4	5	6
	Strategy	Current	Economic Downturn	Growth	Decarbonization	Rapid DER Adoption	No Nuclear Extensions
Flexible Resource Coverage Ratio	A	1.98	1.37	2.17	0.98	1.14	2.22
	B	1.97	1.71	2.11	0.98	1.14	2.03
	C	1.65	1.29	2.09	1.04	1.02	1.75
	D	1.60	1.39	1.79	1.15	1.13	1.83
	E	1.65	1.26	2.15	1.04	1.02	1.98
Flexibility Turn Down Factor (2038)	A	50%	56%	36%	66%	63%	32%
	B	50%	53%	36%	66%	63%	34%
	C	53%	59%	36%	66%	66%	40%
	D	53%	59%	36%	66%	69%	34%
	E	53%	60%	36%	66%	67%	34%
Percent Difference in Real Per Capita Income (Relative to Strategy A)	A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	B	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C	-0.01%	0.00%	-0.02%	0.00%	0.00%	-0.03%
	D	-0.01%	-0.02%	-0.09%	-0.02%	-0.02%	-0.01%
	E	0.00%	0.00%	-0.01%	0.00%	-0.01%	0.00%
Percent Change in Employment (Relative to Strategy A)	A	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	B	0.01%	0.00%	0.00%	0.01%	0.10%	0.00%
	C	0.01%	0.01%	0.00%	0.01%	0.10%	0.01%
	D	0.02%	0.01%	-0.06%	0.01%	0.11%	0.00%
	E	0.01%	0.01%	0.00%	0.00%	0.10%	0.00%

Figure 7-27: Scorecard Metrics by Strategy and Scenario

7.4 Observations from Modeling Results

Based on the results of the modeling, TVA made the following observations about incremental capacity across the portfolios.

- There is a need for new capacity in all scenarios, even in low load futures, to replace expiring or retiring capacity
- Solar expansion plays a substantial role in all futures, driven by its attractive energy value beginning in the mid-2020 time frame
- Gas, storage and demand response additions provide reliability and/or flexibility across all seasons
- No baseload resources (designed to operate around the clock) are added, except for the promotion of SMRs in one case
- Additional coal retirements occur in certain futures, especially in a carbon-constrained world
- EEDR levels are relatively similar across the portfolios, with EE opportunity decreasing as efficiency impacts from codes and standards increase over time
- In all cases, TVA will continue to provide for economic growth in the Tennessee Valley.

These observations are further explored in the assessments presented in Chapter 8.

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Chapter 8: Strategy Assessment and Next Steps

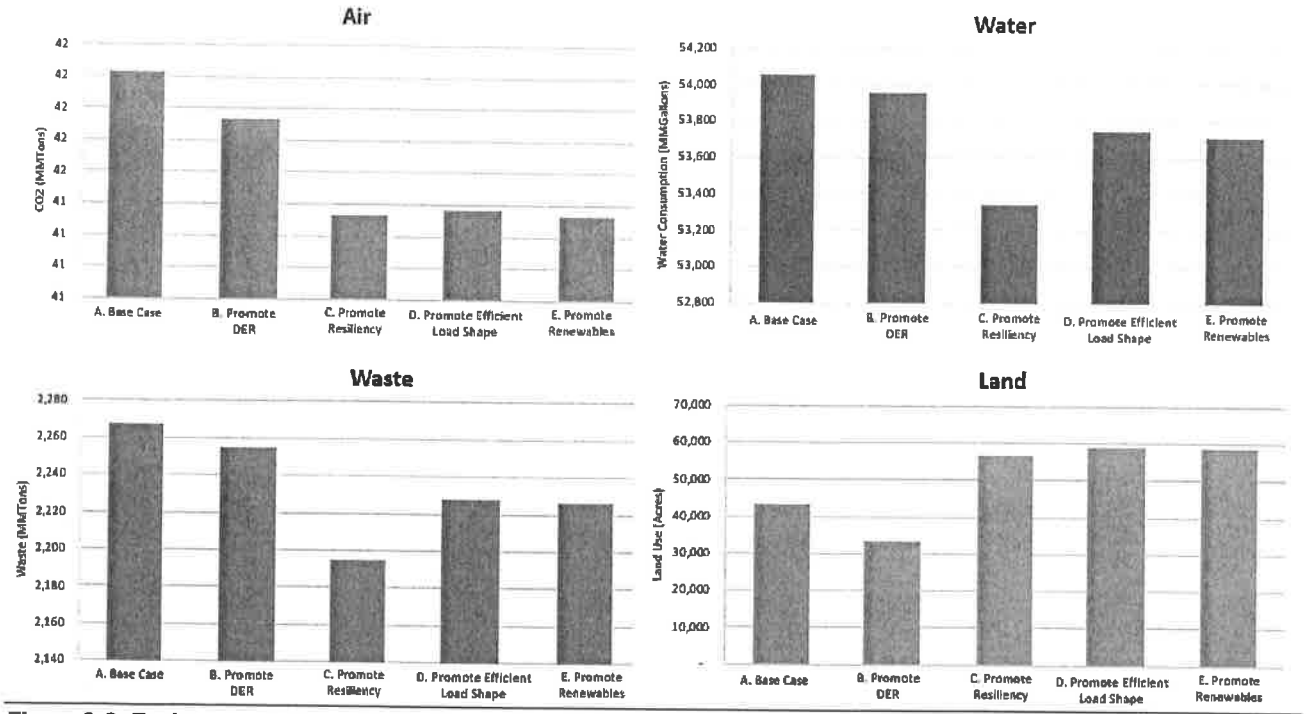

Figure 8-8: Environmental Impacts for Scenario 1 (Current Outlook)

All strategies show improvement in air, water and waste compared to the current resource portfolio, with Strategy C the most favorable. All strategies show increased land use compared to the current resource portfolio driven by various levels of solar expansion. Strategies that promote solar tend to have favorable environmental profiles, except for increased land use. While overall land use is higher for solar facilities on a per MW basis, the impacts to the land are generally low level and have the potential to be readily returned to the previous condition or use.

Strategy C has the lowest environmental impact with respect to air, water and waste. Strategy A has the highest environmental impact overall but low land use. The other strategies generally fall somewhere in between, except for land use where Strategy B has the lowest acreage.

Another helpful view is a comparison of CO_2 intensity across all 30 portfolios. As shown in Figure 8-9, the scenario has the greatest influence on CO_2 intensity, with variations across strategies as described in the Current Outlook example. Range of stochastic results are included in Appendix I.

Figure 8-10 shows trade-offs between system average cost and CO_2 intensity across all portfolios. The scenario that materializes will drive CO_2 intensity at relatively similar system average cost, regardless of the strategy.

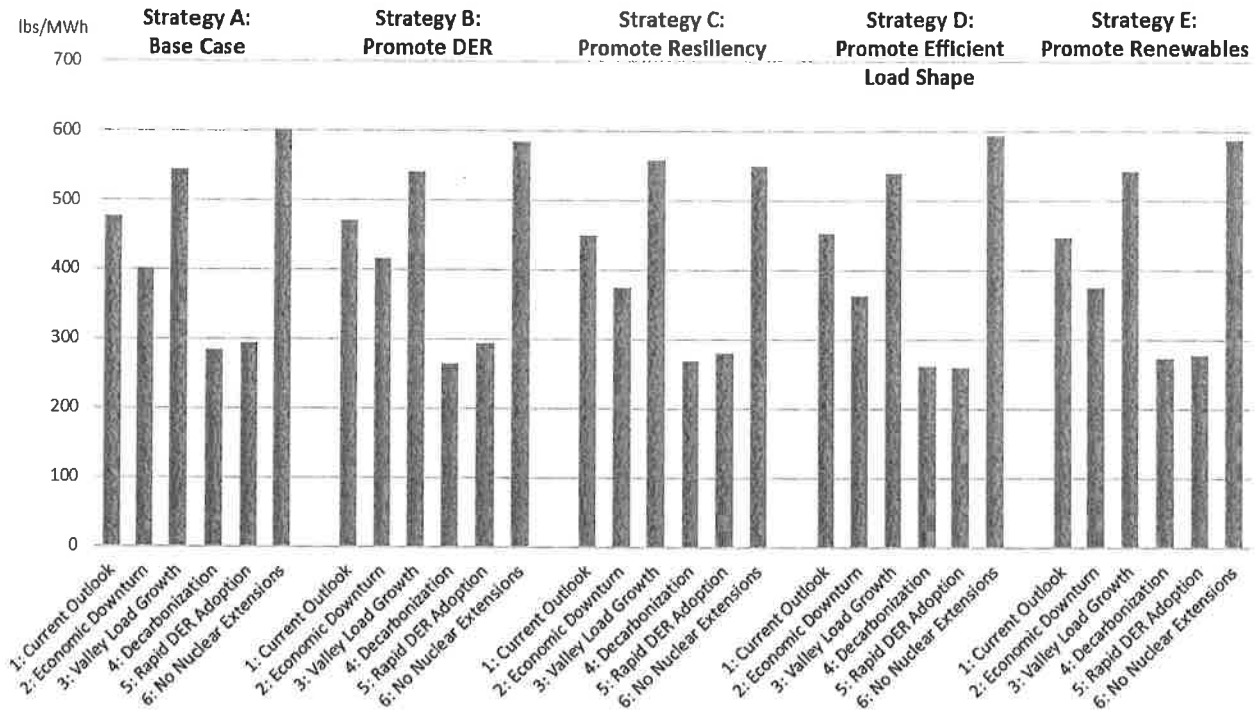

Figure 8-9: Portfolio CO_2 Intensity

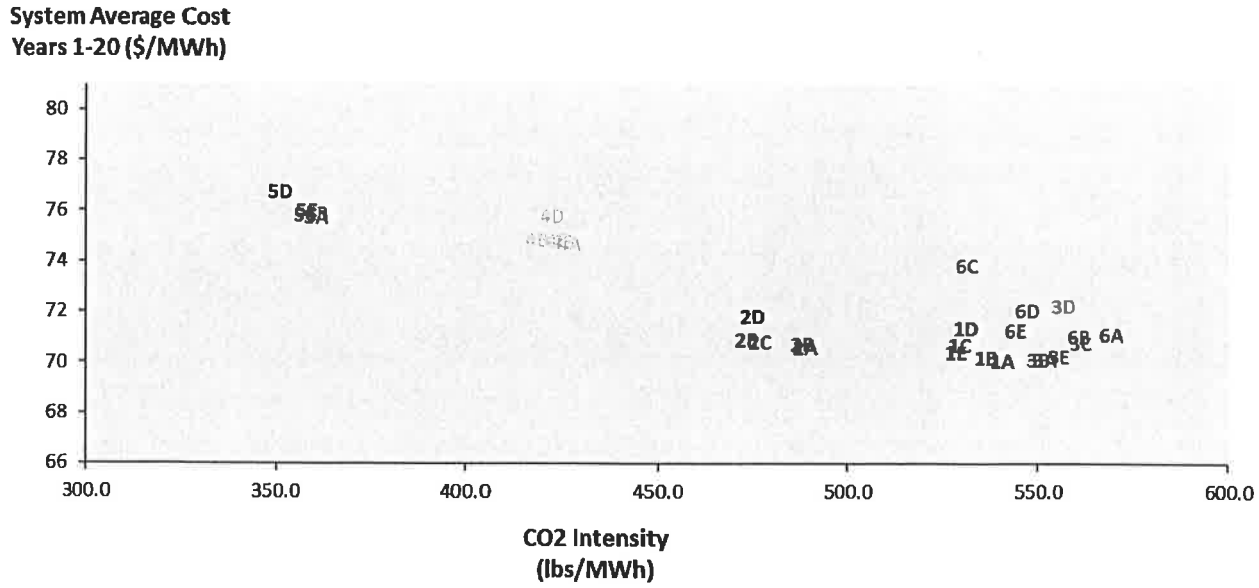

Figure 8-10: Cost and CO_2 Trade-Offs

8.1.3 Operational Flexibility

As described in Chapter 6, understanding system flexibility is a focus in this IRP. Strategy scorecards include two measures of operational flexibility:

- Flexible Resource Coverage Ratio – the ratio of flexible capacity available to meet the maximum 3-hour ramp in demand in 2038
- Flexibility Turn Down Factor – the ability of the system to serve low load periods as measured by the percent of must-run and non-dispatchable generation to sales.

TVA views system flexibility – the ability to cover rapid changes in load demand and to serve low load periods – as a key future consideration for long-range resource planning. This is especially true as the resource mix shifts from conventional, fully dispatchable central station units toward more diverse and dispersed generating assets that introduce more intermittency.

This is the first time TVA has used flexible resource coverage as a metric to assess the performance of a resource portfolio. TVA based this measure in part on research of other utilities and independent system operators in an effort to represent a portfolio's ability to meet rapid changes in demand.

Figure 8-11 shows a comparison of flexible resource coverage ratio and flexibility turn down factor for the Current Outlook. Figure 8-12 displays cost and flexibility trade-offs across all portfolios.

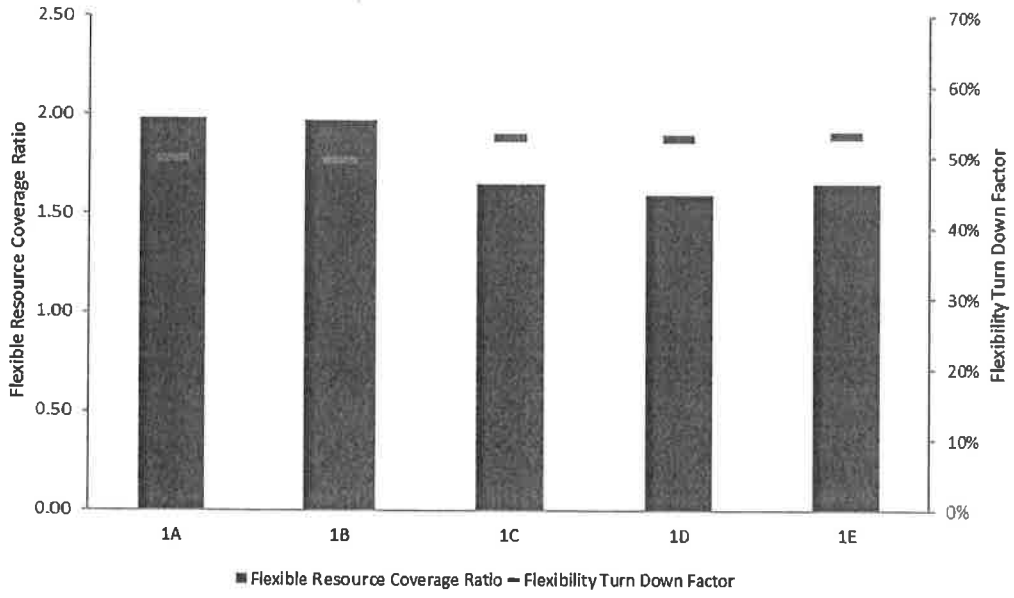

Figure 8-11: Portfolio Flexibility Profiles (Current Outlook)

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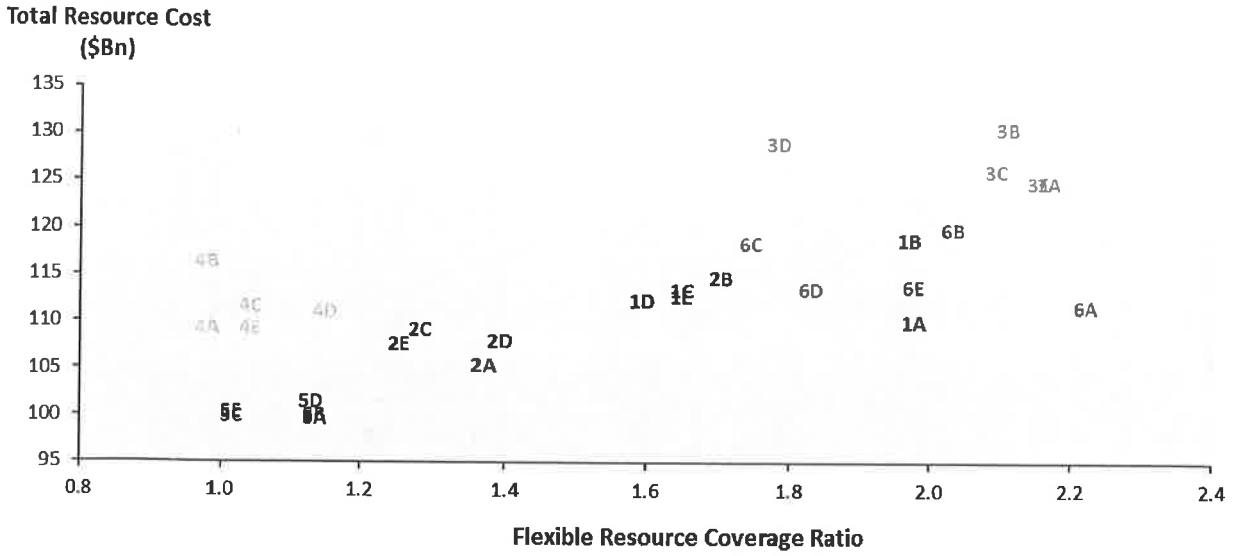

Figure 8-12: Cost and Flexibility Trade-offs

TVA's analysis indicates that Strategies A and B result in a more flexible system than other strategies on average. Strategies that drive more solar expansion tend to have lower flexibility. In portfolios where nuclear units are retired (Scenario 6) and replaced in part with gas units, overall system flexibility increases. In general, portfolios with a higher percentage of non-dispatchable resources will have relatively less ability to respond to unexpected load swings.

8.1.4 Valley Economics

The impact of different planning strategies on the Valley economy was assessed based on two measures:

- Percent Difference in Real Per Capita Income – the change in real per capita personal income expressed as a change from a reference portfolio in each scenario
- Percent Change in Non-Farm Employment – the change in employment expressed as a change from a reference portfolio in each scenario.

The reference portfolio is the level of impact to per capita income or employment in Strategy A in each scenario. More details about how TVA has computed this macro-economic impact can be found in Appendix J. All strategies have comparable impacts on the Valley economy based on these two standard measures.

Strategy D consistently outperformed the reference income level across all scenarios. This is likely due to the retention of more investment in the Valley under this strategy driven by the commitment to energy efficiency, which results in increased investment in the Valley relative to other resource options. However, the overall variation in per capita income estimates is very small across the strategies, in part due to changes in other factors such as underlying population growth (e.g., in some cases employment increases are matched or even exceeded by larger corresponding increases in Valley population), changes in the composition of employment (increased total non-farm employment yet declining manufacturing employment), and/or changes in regional inflation levels due to higher electricity costs. Furthermore, the scale of TVA incremental investments across the various scenarios and strategies are modest in relation to the overall size of the Valley economy. This suggests that the Valley Economics metric is unlikely to be a key definitive determinate when selecting a preferred target power supply mix.

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8.1.5 Summary of Observations

Based on analysis of scorecard results, TVA makes the following observations about metric performance across the portfolios:

- The strategy that most leverages utility-scale resources is the most economic and has the lowest risk exposure (Strategy A).
- The strategy that most leverages distributed resources has the highest Total Resource Cost (Strategy B).
- The strategy that most leverages storage has the highest PVRR, driven by current projections for storage prices (Strategy D).
- Strategies that most leverage solar and coal retirements have lower environmental impact overall, but higher land use (Strategies C, D and E).
- Strategies that drive more solar expansion tend to have lower operational flexibility (Strategies C, D and E).
- All strategies have comparable impacts on the Valley economy as measured by real per capita income and employment.

The overall performance of the five planning strategies is explained in more detail below, by metric category in Table 8-1 and by strategy in Table 8-2.

Table 8-1: Summary of Observations by Metric Category

Metric Category	Assessment Observations
Cost	• PVRR is similar across the strategies, with Strategy D typically the most expensive • Average system costs are also similar, with Strategies A and B typically lower and Strategy D typically the highest • Total Resource Cost has more variation, with Strategy A the least expensive and Strategy B typically the most expensive
Risk	• Strategies with lower costs generally have lower risk exposure • Strategy A has the lowest risk exposure but least favorable risk/benefit ratio, while Strategy D has the opposite profile • Other strategies have moderate risk overall
Environmental Stewardship	• All strategies show improvement in air, water and waste categories compared to the current resource portfolio, with Strategy C the most favorable • All strategies show increased land use compared to the current resource portfolio driven by various levels of solar expansion, with the exception of Strategy B
Operational Flexibility	• Strategies A and B result in a more flexible system than other strategies, on average • Strategies that drive more solar expansion tend to have lower flexibility • In portfolios where nuclear units are retired (Scenario 6) and replaced in part with gas units, overall system flexibility increases
Valley Economics	• All strategies have comparable impacts on the Valley economy as measured by real per capita income and employment

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Table 8-2: Summary of Observations by Strategy

Strategy	Assessment Observations
Strategy A: Base Case	• Lowest PVRR, Total Resource Cost, and System Average Cost across scenarios • Lowest risk exposure, but highest risk/benefit ratio • Highest environmental impact overall, but low land use • Best flexibility performance across scenarios
Strategy B: Promote DER	• Similar to Strategy A in PVRR and System Average Cost, but most expensive with respect to Total Resource Cost • Risk exposure similar to Strategy A, with moderate risk/benefit profile • Higher environmental impact overall, but lowest land use • Flexibility performance comparable to Strategy A
Strategy C: Promote Resiliency	• Mid-range in PVRR, System Average Cost, and Total Resource Cost • Moderate financial risk • Lowest environmental impact overall, but higher land use • Moderate flexibility, comparable to Strategies D and E
Strategy D: Promote Efficient Load Shape	• Highest PVRR and System Average Cost due to promotion of storage, and mid-range in Total Resource Cost • Highest risk exposure across the strategies • Low environmental impact overall, but higher land use • Moderate flexibility, comparable to Strategies C and E
Strategy E: Promote Renewables	• Mid-range in PVRR and System Average Cost, but lower in Total Resource Cost (second only to Strategy A) • Moderate financial risk • Low environmental impact overall, but higher land use • Moderate flexibility, comparable to Strategies C and D

8.2 Sensitivity Analysis

Each IRP case represents a combination of expectations about the future environment TVA operates in and potential strategies TVA could employ that result in unique resource portfolios. When analyzing results from the draft IRP, TVA identified issues that warranted further evaluation prior to finalizing the study. In addition, TVA received helpful stakeholder input from the IRP Working Group and the Regional Energy Resource Council (RERC), as well as through comments received from the public during the comment period.

Many of the questions raised by TVA and stakeholder review focused on certain key assumptions that could influence results. To explore the impacts of changes in key assumptions and to inform the recommendation ranges in Chapter 9, TVA evaluated sensitivities related to the following categories:

- Natural gas prices
- Storage, wind, CHP, and SMR capital costs
- Greater EE and DR market depth
- Integration cost and flexibility benefit
- Pace and magnitude of solar additions
- Higher operating costs for coal plants
- More stringent carbon constraints

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- Variation in climate.

Sensitivity analyses are typically run as variations from the Base Case strategy in the Current Outlook scenario, except where noted, to isolate the impact of a change in one key assumption.

8.2.1 Natural Gas Prices

Natural gas generation makes up a significant part of TVA's existing fleet, and several types of gas generation are offered as expansion options. Changes in natural gas prices change the variable cost of gas units and may change the economics of different types of gas capacity relative to other resource options. Two standard deviations above and below the expected value were simulated in the Current Outlook. Figure 8-13 shows the range of natural gas prices for the IRP scenarios and for two standard deviations above and below the Current Outlook forecast.

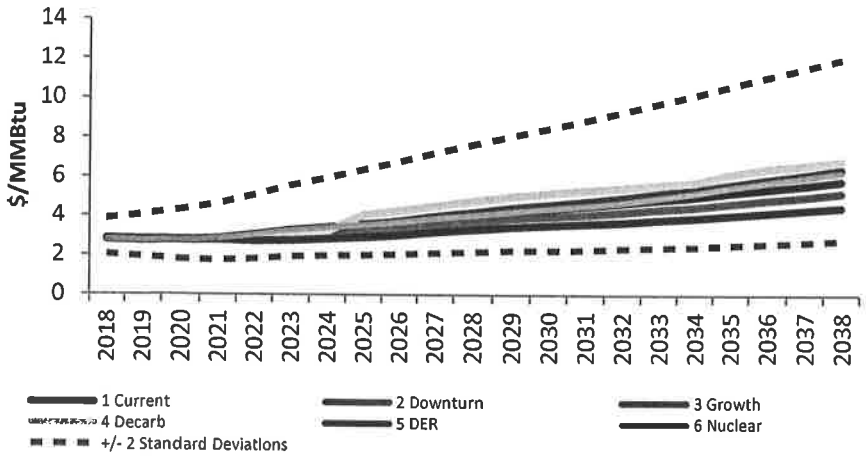

Figure 8-13: Natural Gas Price Assumptions

Higher Natural Gas Prices

Higher natural gas prices increase the cost of gas generation, making the generation of competing resources more valuable. Solar is projected to become economic compared to gas beginning in the mid-2020s, resulting in 5,900 MW nameplate of solar expansion in the base plan. In the high gas sensitivity, about 2,050 MW nameplate of additional solar capacity is added by 2038 compared to the base case, bringing total nameplate solar expansion to about 8,000 MW in this case. Other changes in the expansion plan include the addition of 55 MW of new hydro, as well as reduced electrification programs driven by the overall higher operating cost for the fleet. The Total Resource Cost increased by about $6 billion due to higher fuel costs. Carbon emissions increased 21 percent driven by an overall increase in coal capacity factors.

Lower Natural Gas Prices

Lower natural gas prices improve the economics of gas generation, especially higher efficiency CCs. In the low gas sensitivity, no solar is added, which represents a reduction of 5,900 MW in nameplate solar compared to the base case. Additionally, about 2,000 MW of CT capacity is replaced by CC capacity to better leverage lower gas prices. This sensitivity does not take into account customer demand for renewables that would likely drive more solar additions than economics would dictate. The Total Resource Cost decreased by about $6 billion due to lower fuel costs. Carbon emissions decreased 21 percent driven by an overall increase in gas capacity factors.

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8.2.2 Battery, Wind, CHP, and SMR Capital Costs

Several resource options that were promoted in an IRP strategy were not selected based on economics in any of the primary portfolios. Of particular interest were battery storage, wind, CHP, and SMRs. TVA, stakeholder groups, and the public expressed interest in understanding how much lower the costs of these resources would need to be for the resource to become economic. TVA performed a breakeven analysis to determine how the IRP costs for battery storage, wind, CHP, and SMR compared to the benefits those units could provide to the system.

The IRP cost is the levelized cost of the resource using Current Outlook assumptions. To determine the benefits the resource could provide to the system, TVA added the resource to the portfolio in the earliest year available at zero cost and calculated the levelized benefit in $/MWh. This approach effectively describes the value of these resources in terms of the avoided energy and capacity from competing resources. As IRP cost approaches breakeven cost, the resource is more likely to be selected in a portfolio.

Battery Costs

Even though the IRP assumed a downward trajectory in costs, utility-scale battery storage was not selected based on economics. Due to the varying ways that augmentation and warranty costs can be included in the initial capital investment or paid on an ongoing basis as a fixed cost, direct comparisons between benchmarks requires calibration. As described in Appendix C, TVA matched storage additions to solar additions in strategies where storage was promoted to explore the potential impacts of storage on overall portfolio results. Additionally, TVA performed a breakeven analysis. As battery storage is a higher-value resource, the breakeven value to the system is higher than for wind or CHP. However, using current projections for utility scale battery storage costs, IRP costs are still triple the breakeven value. TVA will continue to monitor rapidly evolving battery storage technologies for improving economics.

Combined Heat and Power (CHP) Costs

Although a small amount of CHP did appear in the Promote DER strategy portfolios, the IRP stakeholder working group expressed interest in understanding the breakeven value for CHP without promotion. Analysis indicates that IRP costs for CHP are double the breakeven value. CHP systems also provide steam for space heating, driving additional value for the end-use customer that was not included in the breakeven analysis.

Wind Costs

Wind from both outside and inside the Valley has challenging economics. Out-of-Valley wind must be imported to TVA across interconnected systems, driving significant transmission expense. In-Valley wind has lower intensity and efficiency, driving lower capacity factors and higher effective costs. Additionally, the production tax credit is set to expire which will increase costs for all wind options, and IRP costs assume no decreasing technology curve. TVA performed a breakeven analysis for out-of-Valley wind, which had the better cost profile. Analysis indicates that IRP costs for wind are triple the breakeven value.

A further sensitivity case was evaluated to test the effects of a substantially lower wind forecast than the IRP cost assumptions. While IRP assumptions for wind costs were in the range of the National Renewable Energy Laboratory (NREL) ATB mid-case forecast, TVA used the lower bound of NREL's mid-case adjusted to nominal dollars for this sensitivity. Lower prices could be the result of technology improvements, cost efficiencies, tax incentives, or a reduction in transmission costs. Figure 8-14 compares the IRP wind cost assumptions and the NREL lower mid-case cost trajectory, and it includes solar cost projections as an additional reference point.

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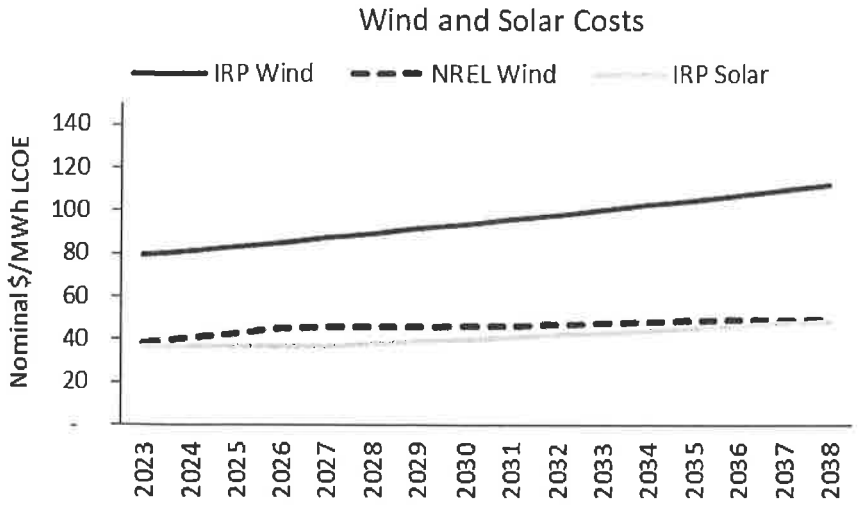

Figure 8-14: Wind and Solar Cost Comparison

In the NREL lower mid-case sensitivity, 4,200 MW nameplate of wind capacity was added by 2038. Because wind resources contribute about a third of their nameplate capacity toward meeting winter reserve margin targets, some gas additions were displaced early in the plan. If the lower wind cost materializes, wind would also compete with solar in the latter part of the plan and displace about 3,100 MW nameplate of solar by 2038, reducing solar additions roughly by half.

Small Modular Reactors (SMR)

SMR investment would be capital-intensive and represent first-of-a-kind technology deployment at utility scale. Given this, TVA performed a breakeven analysis to help understand the cost gap and inform ongoing discussions with the Department of Energy, a stakeholder that may be willing to share in costs and risks associated with potential SMR deployment. SMRs were evaluated assuming operation beginning in 2028 and running through the end of the study window in 2038. A limitation of this analysis is that capital-intensive resources have long economic lives, and two thirds of SMR economic life would be outside the study window. Analysis indicates that IRP costs for SMRs are more than double the breakeven value. Refinements in design may improve SMR costs, but cost and risk sharing are essential to close the gap.

8.2.3 Greater EE and DR Market Depth

Across the primary IRP cases, the amount of available programmatic EE and DR is limited in yearly additions and total cumulative volumes based on projected opportunity. TVA performed a sensitivity to determine the potential impact if EE and DR market depth was greater than projected. Additional tiers of programmatic EE and DR were offered at incrementally increasing costs and with no cumulative volume limit. Analysis indicates about 2,100 MW of additional EE and DR was economic compared to the base case, if higher volumes could be realized at assumed costs. Additional EE and DR displaces about 2,200 MW nameplate of solar and about 2,000 MW of CT capacity. An assumed increase in EE and DR market depth results in a similar PVRR, higher system average cost, and 10 percent lower carbon emissions.

8.2.4 Integration Cost and Flexibility Benefit

Integration cost is the sub-hourly economic signal used to represent the cost of balancing an intermittent resource with dispatchable resources. This cost is not recognized in hourly planning models. Conversely, flexibility benefit is the sub-hourly value that highly flexible and dispatchable resources have that also isn't recognized in hourly models. More detail can be found

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on integration cost and flexibility benefit in Appendix D. Reflecting a sub-hourly integration cost and flexibility benefit was a recent addition to our modeling framework, so TVA performed a sensitivity to evaluate the impact of removing them from our models. Removing integration cost and flexibility benefit drove a very similar end result for resource selection, indicating that these costs and benefits alone do not drive macro-level decision making but would inform evaluation of specific deals, contracts, and decisions.

8.2.5 Pace and Magnitude of Solar Additions

Limits on the pace, timing, and magnitude of resource additions are common in modeling, as they serve to create more realistic resource plans. For example, the ability to construct or contract resources may be limited by the market or by the ability of operations to integrate new resources into the portfolio. Annual limits in a model that has perfect foresight also prevents over-optimizing resource selections in any single year. TVA, stakeholder groups and the public raised questions about the impact of limitations on solar, in particular. Solar was limited in three ways in the primary cases, as follows:

- 2023 earliest online date, driven by August 2019 IRP publication date and subsequent time required for interconnection requests and environmental permitting
- Annual addition limit of 500 MW nameplate, reflecting other utilities' experience with average annual solar additions
- Cumulative limit of 10,000 MW nameplate based on the study window time frame and system turndown capability.

TVA performed a sensitivity to evaluate the impact of accelerating solar additions to as early as 2021 to align with two programs to support accelerated renewable investment launched after the IRP base case was established. These programs include the Renewable Investment Agreement (RIA) and the Flexibility Research Project (FRP) pilot. RIA supports utility scale buildouts for large commercial and industrial customers, and FRP supports community solar in partnership with LPCs. In this sensitivity, TVA reflected recent solar signings of about 700 MW scheduled to come online in 2020/2021 (contracted after the IRP base case was established) and assumed 500 MW per year of accelerated solar additions thereafter until economic solar additions pick up in the mid-2020s. Analysis of potential acceleration indicates about 1,100 MW nameplate of additional solar by 2038 compared to the base case.

TVA also performed a sensitivity that doubled the annual addition limit to 1,000 MW and removed the cumulative limit. This analysis indicates a similar result of about 1,100 MW nameplate of additional solar by 2038 compared to the base case.

In discussions about the solar sensitivities evaluated in the Current Outlook, stakeholder groups inquired if results might be different in other scenarios. TVA performed an additional sensitivity to test the impact of increasing annual and cumulative limits in the Valley Load Growth base case (3A). Higher electricity demand with no additional base load resources added would lower the turndown pressure in the growth case. This additional sensitivity was run with an annual addition limit of 1,000 MW and a cumulative limit of 14,000 MW, which is roughly the difference between the growth scenario load profile and the output of baseload nuclear and hydro resources adjusted for pumped storage ability to shift some baseload. Analysis indicates 6,000 MW nameplate of additional solar compared to the growth scenario base case, or 14,000 MW nameplate of solar additions in total. Other expansion changes include 1,000 MW of CCs replaced with CTs.

8.2.6 Higher Operating Costs for Coal Plants

When reviewing results of the primary cases, TVA and stakeholders had questions about the ongoing operating costs for TVA's coal fleet. Aging coal units expected to operate more frequently outside their design, driven by low gas prices and increasing renewables on the system, have a greater risk of substantially increased operating costs. To assess the potential impact, TVA performed a sensitivity simulating a high trajectory for operations and maintenance costs

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and capital costs for the coal plants, as well as higher environmental spend. Unit performance assumptions remained the same as in the base case, while total non-fuel costs were increased by over 60 percent on average on a present value basis.

Analysis indicates the potential for about 2,200 MW of coal to be retired by 2028. As the retired coal capacity had relatively low capacity factors overall, CTs were the preferred replacement resource.

8.2.7 More Stringent Carbon Constraints

When reviewing results of the primary cases, stakeholders inquired about the potential impact of a higher than projected carbon penalty in the Decarbonization scenario.

To assess this, TVA performed a sensitivity off the Decarbonization base case (4A) that doubled the carbon penalty to $40-80/ton and reflected the cascading impact in natural gas and power price forecasts. Figures 8-15 through 8-17 shows a comparison of the key assumptions in the Current Outlook and Decarbonization base cases compared to the double decarbonization sensitivity case.

Analysis indicates an acceleration of about 2,200 MW of coal retirements that were already present in the Decarbonization base case. CC expansion was accelerated, displacing coal generation, and 175 MW of hydro generation was added by 2038.

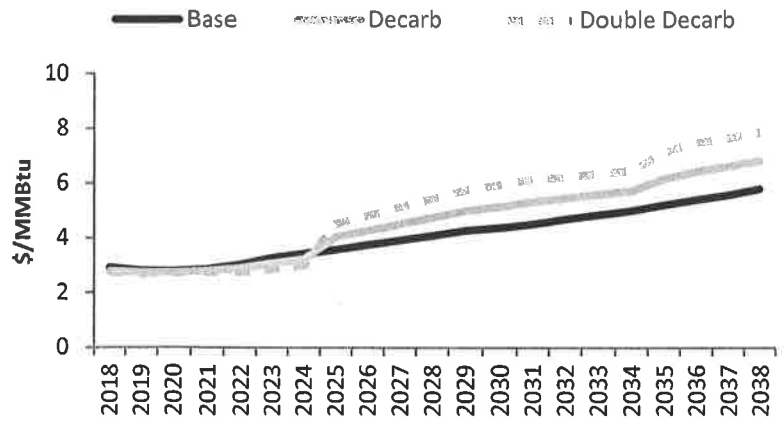

Figure 8-15: Natural Gas Price Forecast

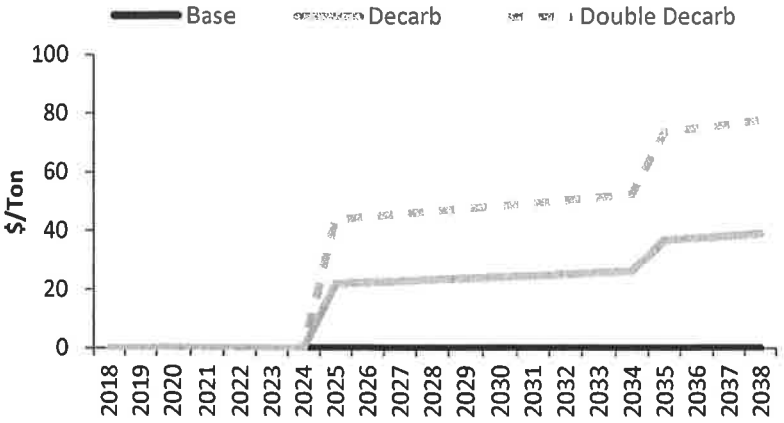

Figure 8-16: Carbon Price Forecast

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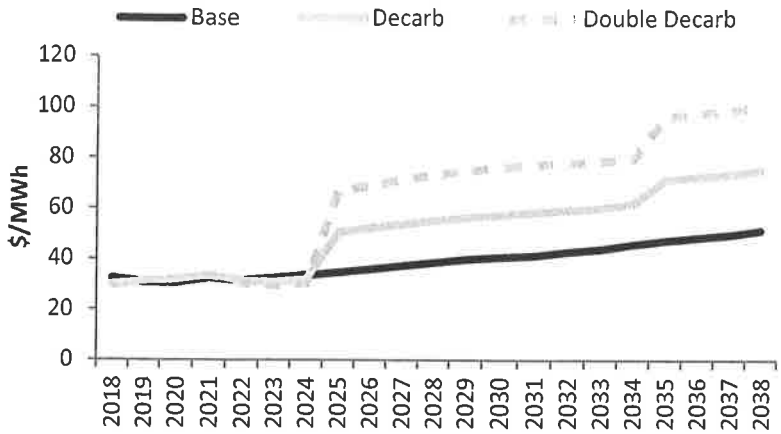

Figure 8-17: Power Price Forecast

8.2.8 Variation in Climate

Stakeholders also expressed interest in understanding how variation in climate may impact capacity expansion plans. Based on an USEPA report (USEPA 430-F-16-004, "What Climate Change Means for Tennessee"), the effects of climate change may mean hotter, drier summers and warmer, wetter winters. Hotter and drier summers will reduce the output of thermal and hydro resources and increase loads. On the other hand, a warmer and wetter winter will decrease loads and increase hydro generation. TVA performed a sensitivity to gauge the impact of a 3° F increase in the average annual temperature across the Tennessee Valley, coupled with changes in seasonal rainfall.

Analysis for this sensitivity indicates that the TVA system would become summer peaking. CT additions are accelerated to replace the impact of derated coal and nuclear capacity in the summer until about 2,100 MW nameplate of additional solar can be added to help maintain summer reserve margins. Total Resource Cost increased by about $3 billion due to the increased summer peak and thermal derates in the summer, while carbon emissions improved slightly due to increased solar and hydro generation and decreased coal generation.

8.2.9 Summary of Sensitivity Cases

The sensitivity cases TVA performed that have the potential to impact capacity expansion are summarized below in Figure 8-18. Capacity expansion impacts are shown by resource type, with increases highlighted in green and decreases highlighted in red. The results from the sensitivity cases were considered in developing the IRP Recommendation.

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Chapter 8: Strategy Assessment and Next Steps

SENSITIVITY CASE Base Case comparison is the Current Outlook unless otherwise noted	CAPACITY EXPANSION IMPACTS BY 2038 GREEN indicates increase and RED indicates decrease in resource type						
	Nuclear	Coal	Gas	Hydro	Solar Nameplate	Wind Nameplate	EEDR
Higher Natural Gas Prices				+55 MW	+2,050 MW		
Lower Natural Gas Prices			2,000 MW CT replaced by CC		-5,900 MW		
Lower Wind Costs			-1,100 MW		-3,100 MW	+4,200 MW	
Greater EE & DR Market Depth			-2,000 MW		-2,200 MW		+2,100 MW
Integration Cost & Flexibility Benefit			Minor timing differences		Minor timing differences		
Pace & Magnitude of Solar Additions					+1,100 MW		
Magnitude of Solar Additions (Valley Load Growth)			1,000 MW CC replaced by CT		+6,000 MW		
Higher Operating Costs for Coal Plants		-2,200 MW	+1,500 MW				
More Stringent Carbon Constraints (Decarbonization)		-2,200 MW accelerated	CC expansion accelerated	+175 MW			
Variation in Climate	Summer derates	Summer derates	CT expansion accelerated		+2,100 MW		

Figure 8-18: Summary of Sensitivity Cases

10 Implementation

This chapter outlines some of the challenges and next steps TVA faces in implementing the recommendations of the IRP study, and discusses key policy considerations and improvements to modeling and the study process.

10.1 Overview of Next Steps

In finalizing the IRP and EIS and developing the IRP Recommendation, TVA considered the input received during the comment period. No earlier than 30 days after publication of the notice of availability of the Final IRP/EIS in the Federal Register, the TVA Board of Directors will be asked to make a decision on the IRP Recommendation. After the Board makes a decision, the NEPA process is completed by issuing a Record of Decision that documents the Board's action and its basis.

10.2 Implementation Challenges

The Regional Energy Resource Council (RERC), after reviewing the recommendations in the IRP, offered the following advice to the TVA Board:

1. TVA should monitor federal and state regulations, legal challenges, and industry changes that may alter the broader energy environment and take appropriate actions to mitigate risks to the power system's reliability and costs.
2. TVA should continue to work with local power companies, directly served customers, and stakeholders to collaborate on Distributed Energy Resources (DER) and distribution planning; build greater visibility into customer needs; and prepare for associated data management. Standardization of cost-effective DER smart technologies will enable the system to efficiently utilize distributed resources.
3. TVA should continue engaging with stakeholders early in any decision process on the site selection for solar, gas power generation, and utility-scale energy storage to avoid land-use conflicts, encourage the utilization of existing infrastructure assets, and maximize system benefits. In addition, TVA should continue to analyze small-scale, flexible, carbon-free nuclear resources for their potential inclusion in a diverse portfolio.
4. TVA should continue evaluating gaps in data, including customer needs and desires, the speed of technology advancement, locational value, flexibility value, etc., in order to inform and be prepared for future IRPs. TVA should also explore advanced data tools to support the analysis.

(Above excerpt from the advice provided by the TVA Regional Energy Resource Council on June 27, 2019. See www.tva.gov/rerc for the full advice statement).

The IRP Recommendation includes significant renewables expansion, introducing operational challenges required to manage intermittency and dynamic loads. Enhanced awareness of the location of renewable resources, both utility and distributed scale, and to weather impacts on solar generation, will become increasingly important. Early experience with battery storage on the system will provide additional insight as to how the various storage use cases might be employed to further support renewables integration and provide economic benefit.

Implementing the recommendations from the IRP will require close cooperation between TVA, local stakeholders, Local Power Company (LPC) partners and Valley electric customers, particularly around deployment of distributed energy resources. TVA is primarily a wholesale power provider and the LPCs have the relationship with most end-use customers. TVA will need to partner with LPCs and other stakeholders in the region to better understand the potential for distributed resources in the Valley and their locational value to inform resource decisions.

The IRP Recommendation also includes more conventional resources, primarily gas-fired, that come with their own implementation challenges in the areas of siting and permitting, both for the units themselves and for the transmission lines and gas pipelines associated with them. TVA has several teams working on various aspects of the siting and permitting work necessary to ensure that when these resources are

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needed as part of the generation portfolio, TVA will be better positioned to add them to the resource mix.

10.3 Policy Considerations

The IRP is a resource planning study focused on identifying a target power supply mix for TVA. In the process of developing the cases and reviewing the results with stakeholders, a number of policy-related issues were raised that are outside the scope of the IRP itself, but will need to be considered as we move toward implementation of recommendations from the study.

- Continued evolution of programs that provide flexibility for customer-owned generation
- Evolution of Federal/State energy and environmental policies
- Advancements in customer expectations and requirements for clean energy
- Enhancing low income equity and energy/environmental justice

We also realize that the level of electric rates and job growth are critical concerns for Valley governments, businesses and residents. The IRP uses two specific metrics for the macro-economic impacts of resource strategies. These metrics and underlying analyses provide important information about future revenue requirements that affect future rate levels and will help inform the future direction of TVA's economic development program. However, none of the strategies had a significantly different impact from the others on the Valley economy. Section 5.5.6 of the EIS provides more information about socioeconomic effects.

10.4 Next Steps

The scenarios and strategies evaluated in the IRP provide insights to how TVA's resource portfolio may need to evolve as the future unfolds. The results also indicate near-term actions that provide benefit across multiple futures. TVA is planning to implement the following near-term actions as part of the IRP:

- Add solar based on economics and to meet customer demand
- Enhance system flexibility to integrate renewables and distributed resources
- Evaluate demonstration battery storage projects to gain operational experience
- Pursue option for license renewal for TVA's nuclear fleet
- Evaluate engineering end-of-life dates for aging fossil units to inform long-term planning
- Conduct market potential study for energy efficiency and demand response
- Collaborate with states and local stakeholders to address low-income energy efficiency across the Valley
- Collaboratively deploy initiatives to stimulate the local electric vehicle market
- Support development of Distribution Resource Planning for integration into TVA's planning process.

As the future evolves, TVA will monitor key signposts that will guide decisions for the long-term. Signposts relate to key variables that could have a significant influence on the future generation portfolio. Key signposts include:

- Demand for electricity
- Natural gas prices
- Customer expectations
- Regulatory requirements
- Operating costs for existing units
- Solar and wind costs
- Emerging and developmental technologies.

TVA will closely monitor these key drivers related to changing market conditions, more stringent regulations, and technology advancements to inform appropriate actions within the recommended ranges and appropriate timing for initiating the next IRP.

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10.5 Conclusion

TVA finds considerable value in undertaking an IRP and especially appreciates the input, review and insights of individuals on the IRP Working Group and the RERC. The IRP Working Group and RERC members spent considerable time helping TVA develop a robust plan that meets the criteria outlined in TVA's objectives. TVA values their involvement and the expertise they provided on behalf of their stakeholders in the development of this IRP.

As with any long-term plan, TVA's IRP reflects what we know today and can reasonably expect for the coming years. TVA, along with our employees across the Valley, stands ready to carry out its three-part mission around energy, the environment and economic development. In an ever-changing world, TVA will do its best to continue to serve the people of the Tennessee Valley by providing low cost, reliable and clean power in an environmentally responsible manner while promoting economic development across the Valley.

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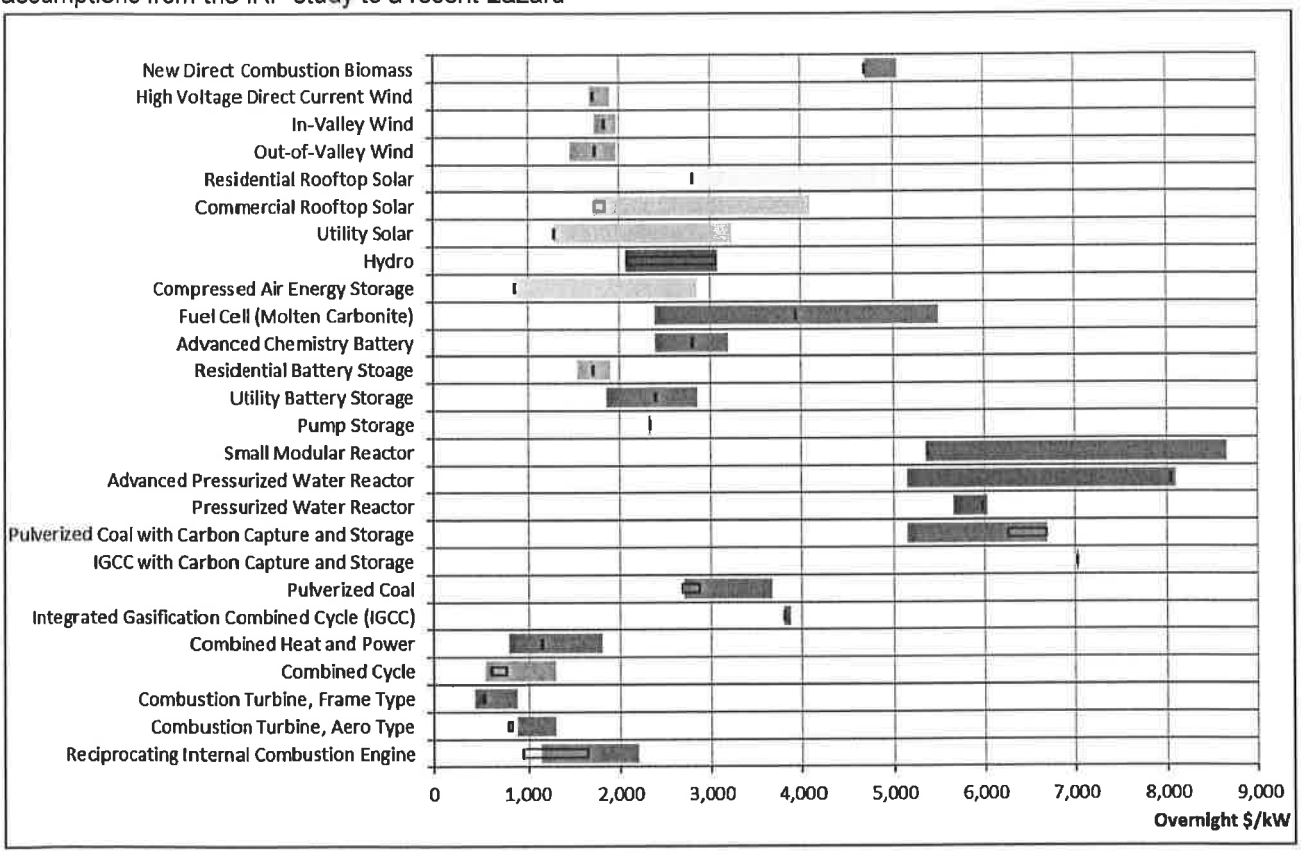
Appendix A – Generating Resource Cost and Performance Estimates

that the majority of assumptions proposed for the study were consistent with typical values used in the industry. Many of the remaining assumptions were modified, based on Navigant's recommendations, prior to running the IRP cases. The data in the table presented in the preceding section reflects adjustments recommended by Navigant.

TVA also prepared a comparison of its capital cost assumptions from the IRP study to a recent Lazard report, EIA data and other utility IRPs to further verify the reasonableness of TVA's assumptions. This comparison chart, Figure A-1, shows how TVA's assumptions on capital costs compare to those recently published sources. The cost comparisons are generally consistent given that the majority of the data points are based on national averages and TVA's costs are specific to the TVA system and reflect recent project experience and quotes.



Colored bars reflect benchmark ranges and black outlines represent TVA assumptions;
TVA assumptions outside of benchmark ranges are based on actual costs of TVA projects or vendor quotes.

Figure A-1: Benchmark Ranges of Capital Costs and IRP Values.

A.4 Modeling Approach for Wind & Solar Options

Wind and solar resources have unique operating characteristics that are different from thermal and other more traditional resources. To properly account for the contribution from these intermittent resources, the energy contribution is represented using hourly energy profiles that are imported into the model, and the seasonal capacity of these resources is represented by a computed Net Dependable Capacity (NDC) value. The annual capacity factor of the hourly energy profiles is also computed to ensure the total amount of energy is comparable to industry benchmark sources. This appendix discusses the methodology TVA used to determine both the energy profiles and NDC values for wind and solar options that are considered in the IRP.

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Appendix A – Generating Resource Cost and Performance Estimates

A.4.1 Wind Modeling

Generation from wind is weather and location dependent and not dispatchable like more conventional resources. Therefore, utilities need to develop a reasonable representation of the output from wind for use in long-range planning models. This "wind shape" is based on actual data collected from specific sites, or modeled data using wind turbine design assumptions.

TVA uses a combination of data from 3TIER, a third-party company specializing in renewable energy assessment and forecasting, and data from TVA wind PPAs to develop the planning assumptions around wind shape and capacity factor for use in the IRP. A "typical week" hourly shape for each month was developed by 3TIER for each wind option. From these shapes, the amount of energy produced can be determined and a capacity factor computed (actual generation expressed as a percentage of maximum possible generation).

A.4.2 Wind Capacity Factors

TVA used actual results from its wind contracts (1,200 MW in Oklahoma, Illinois, Kansas and Iowa), simulated and actual data for the in-Valley sites, and proposals for various projects to determine the capacity factors for the wind resources options included in the IRP. Since each of the options originates from different regions, TVA used a region-specific estimate for annual capacity factors. For modeling purposes, TVA assumed the MISO and SPP option had a 40 percent capacity factor, the HVDC option originating from Oklahoma had a 55 percent capacity factor, and the in-Valley option had a 30 percent capacity factor.

The HVDC project has a 55 percent annual capacity factor due to the availability of wind in Oklahoma and the newer technology of the wind turbines, which were assumed to be GE 1.7-100 wind turbines at a height of 80 meters. This capacity factor is much higher than TVA's existing wind contracts in other locations. Figure A-2 shows the range of capacity factors:

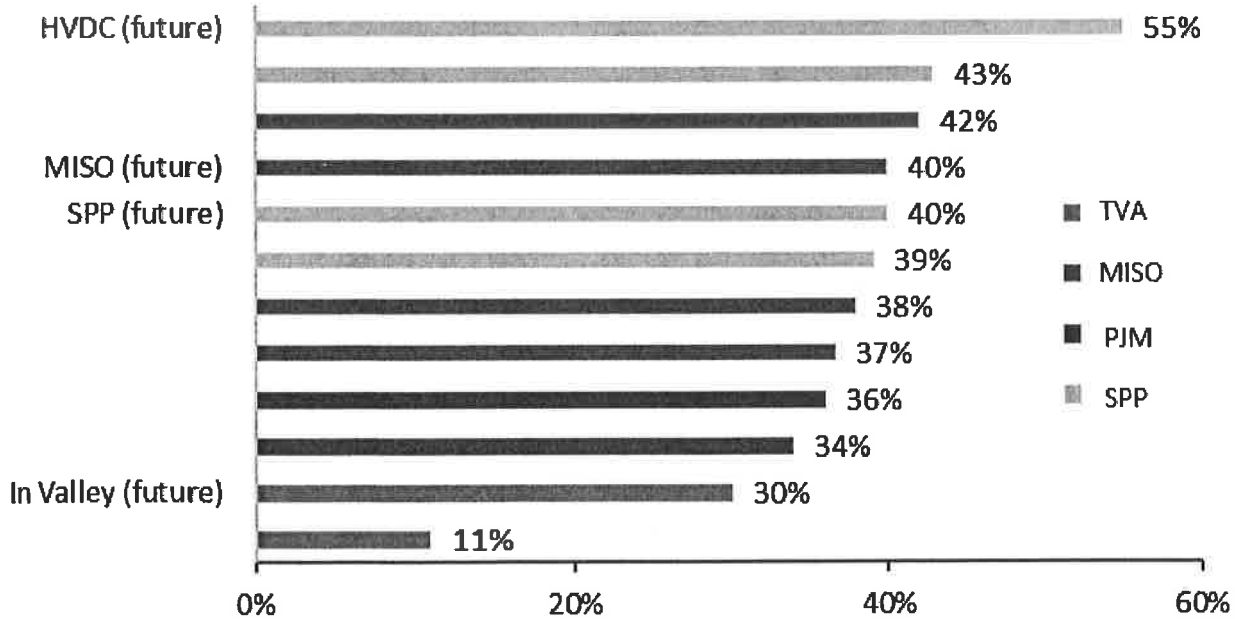

Figure A-2: Wind Capacity Factors.

Appendix A – Generating Resource Cost and Performance Estimates

A.4.3 Wind Net Dependable Capacity

Planners must determine how much wind generation is likely at the summer and winter peak hours so that appropriate Net Dependable Capacity (NDC) credit can be given to wind resources when computing the capacity/load balance to determine if the required reserve margins have been met in a given year. The NDC is applied to the nameplate capacity and is used by the expansion model as a wind resource's contribution toward meeting reserve margin requirements.

For this IRP study, TVA used 39 years of simulated and actual hourly wind data ranging from 1980 to 2018. This 3TIER study simulated data was not updated for this IRP as material changes in historical and simulated wind data were not expected. The wind generation was based on simulation of TVA's existing wind contracts in MISO, SPP, and PJM as well as a site in Kansas near the proposed HVDC site. TVA and 3TIER data were used to assess the long-term variability of the wind for each site in a retrospective analysis of historical wind speed and power. These data points were derived from a mesoscale Numerical Weather Prediction (NWP) model that was statistically calibrated to match the observed data during the measurement period at the height of the towers. An example of the variability of the wind net power is shown in Figure A-3.

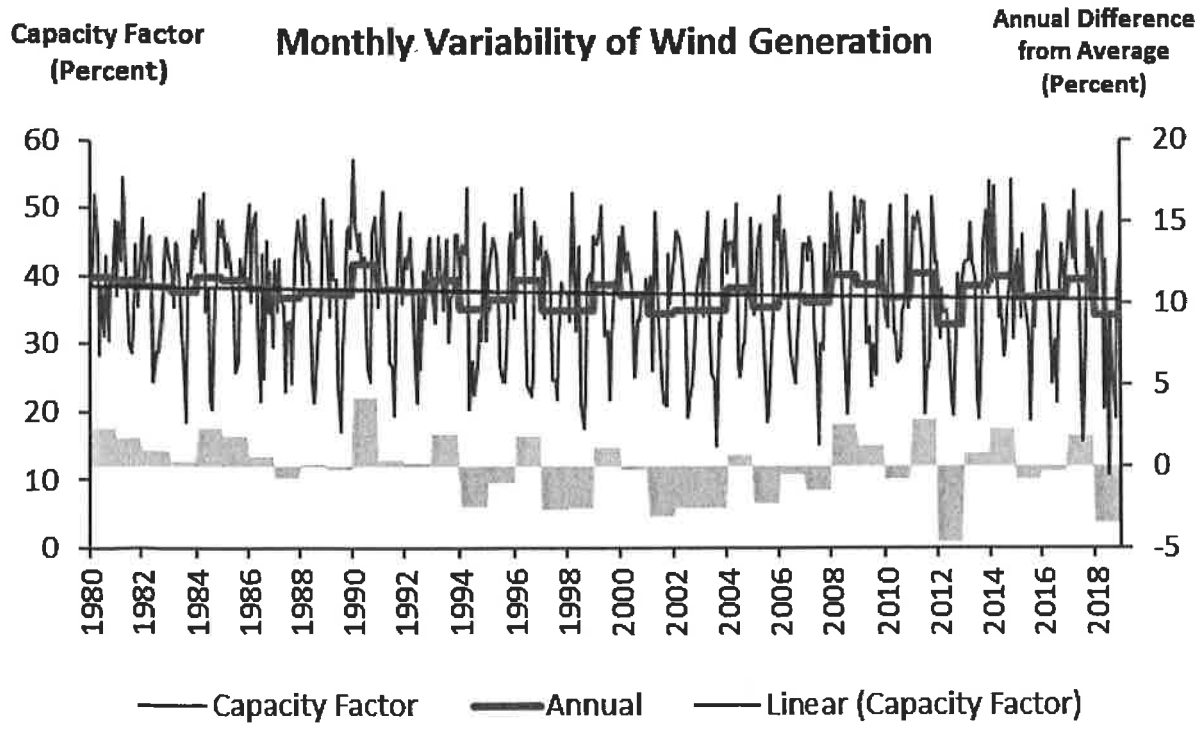

Figure A-3: Example of Wind Monthly-mean variability.

NDC was calculated as 14 and 31 percent for summer and winter, respectively, based on a portfolio view of all current wind contracts to capture the diversity of location across the different states of the region (i.e., Oklahoma, Kansas, Illinois, Iowa). These NDC values were used for all wind options. Further detail on how wind NDC values were calculated is included in the Intermittent Resources Study section of Appendix D.

Because specific sites of future wind in MISO, SPP or In-Valley is unknown, it would be inappropriate to assume a different NDC at this time. A more specific NDC would be incorporated into the wind portfolio NDC calculation once specific sites are known. TVA

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did not consider over-subscription contracts where transmission is limited to a level below the nameplate rating of the wind capacity which tends to improve both the annual capacity factor and the NDC rating. The costs associated with the wind projects modeled in the IRP do not reflect oversubscription. In TVA's experience with several existing wind contracts, this over-subscription provision is negotiated through the terms and costs of a particular contract and is not easily comparable to industry benchmarks.

A.4.4 Solar Modeling

Similar to wind, solar resources are also weather and location dependent. Modeling of solar options in the IRP proceeds in a similar fashion to wind, and requires determination of solar shapes, capacity factors and NDC values. Solar data for the 2015 IRP was provided by members of the TVRIX stakeholder group who commissioned Clean Power Research (CPR) to provide TVA with the solar energy profiles for 26 sites across the Tennessee Valley shown in the map below. CPR provided SolarAnywhere® data for 15 years (1998-2013) of consistent, validated, time-series irradiance measurements that provided the historical basis for the NDC, capacity factors and hourly energy patterns. This data was collected for the 2015 IRP and was not updated as material changes were not expected. However, TVA also incorporated capacity factors and hourly generation patterns from TVA solar PPAs to inform assumptions in the 2019 IRP.

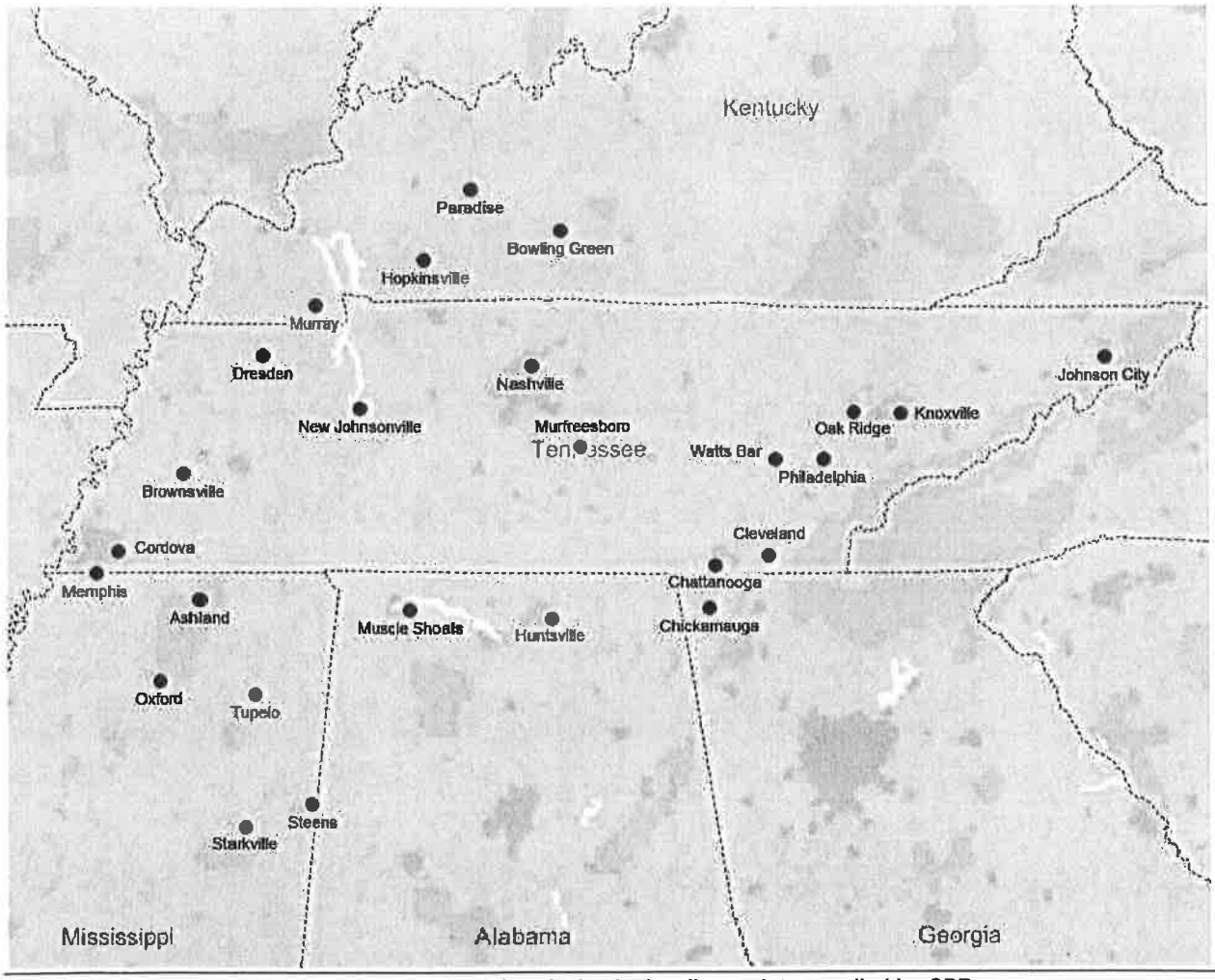

Figure A-4: Sites across Tennessee Valley with historical solar irradiance data supplied by CPR.

Appendix A – Generating Resource Cost and Performance Estimates

A.4.5 Solar Capacity Factors

Using the data supplied through CPR as well as PPA data, TVA determined that annual capacity factors are 20 percent for the fixed axis and 23 percent for the single-axis tracking option. The monthly capacity factors vary as shown in the following chart.

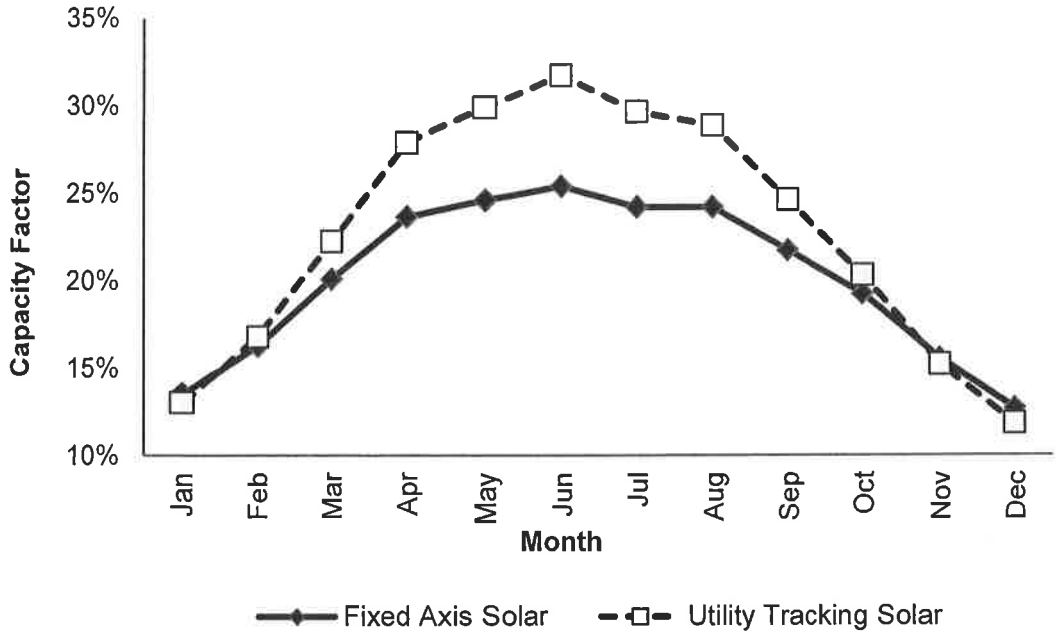

Figure A-5: Solar Fixed Axis and Utility Tracking Capacity Factors by Month.

A.4.6 Solar Net Dependable Capacity

The determination of the NDC for solar resources utilizes the same process as described for wind resources. The figure below shows the range of NDC values for solar fixed-axis systems computed using the CPR and TVA PPA data.

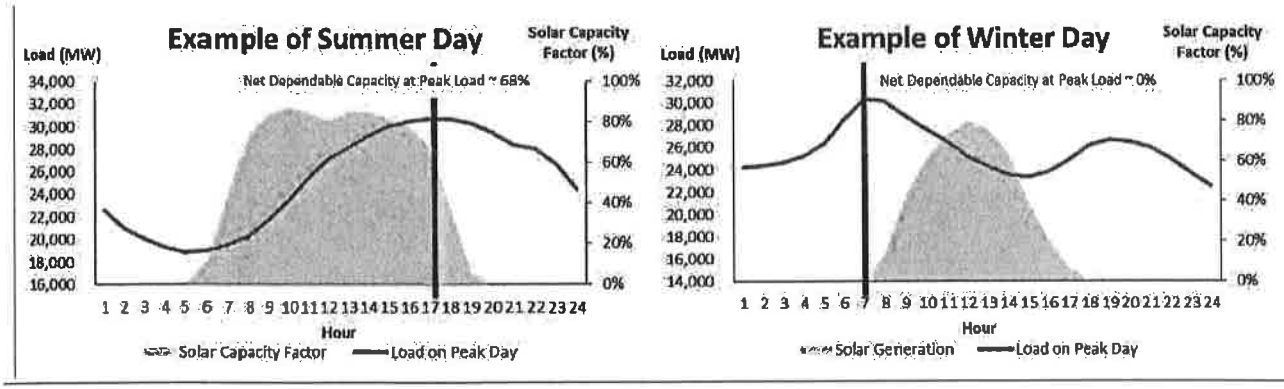

Figure A-6: NDC by hour for Summer and Winter.

In the summer, TVA normally has a peak load at 5:00 p.m. CST, but can also see a peak load between the hours of 2:00 p.m. and 6:00 p.m. CST. The 25th percentile of solar generation of those hours would occur at 5:00 p.m. or 6:00 p.m. CST as the sun is setting. Therefore, the summer NDC was set at 50 percent for fixed axis at all scales. The utility tracking option has a 68 percent summer NDC. All solar options have a zero percent NDC during the winter, since TVA's winter peaks normally occur around 7:00

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a.m. CST when solar is not available. Further detail on how solar NDC values were calculated is included in the Intermittent Resources Study section of Appendix D.

Appendix C: Distributed Generation Methodology

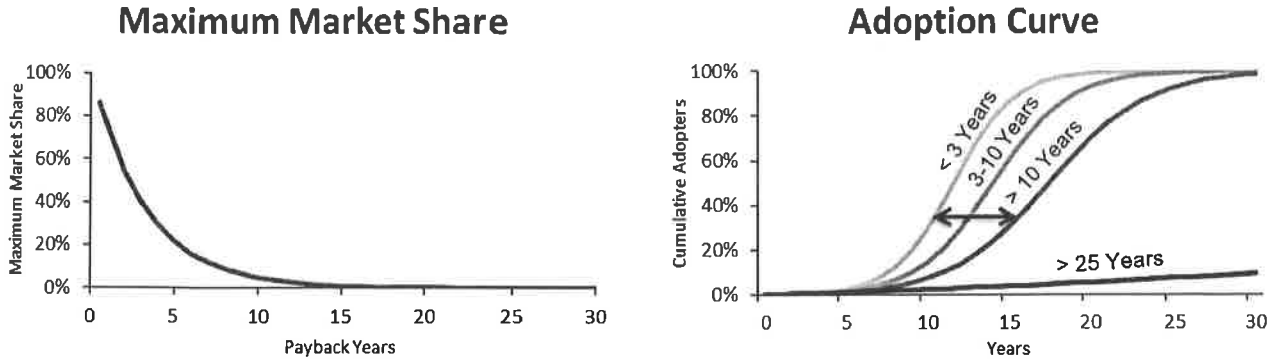

Figure C-6: Concept Illustration of NREL's Distributed Market Demand Model.

C.3.1 Payback Period

A key element in the model is the payback period, which is simply the number of years required for a consumer to recoup the upfront costs of an investment. Ignoring discount rates, an example project requiring an upfront capital investment of $10,000 that saves a net $1,000/year will have a payback period of 10 years. The lower the payback, the greater the market depth, as more Valley residents see value in adopting a particular technology. Even with an acceptable payback, not all consumers will adopt the technology at the same time. This occurs for a variety of reasons. Some consumers are more comfortable using new technologies than others and are likely to adopt sooner, while others will wait. Also, a consumer must have access to the capital required to cover the initial costs of the technology investment. Even with the necessary capital, whether or when a consumer purchases a technology depends on competing uses for the funds and other practical considerations. All these factors impact the pace of DG adoption, which happens over the course of years and is generally faster with quicker paybacks.

C.3.2 Payback Components

There are two primary components in calculating payback for a DG investment – electricity bill savings and DG investment. To estimate electricity bill savings, forecasts for residential and commercial average effective rates were applied to the average annual energy output of a DG system. Next, it was necessary to estimate projected prices for distributed solar, storage and CHP systems. Pricing information for DG resources was derived from a variety of sources, both internal and external to TVA. Distributed solar prices were obtained from Navigant Consulting, with references to NREL studies. These studies contained historical solar prices for all customer segments, up to 2017. These prices were then projected into the future, using pricing improvements TVA has seen in recent solar requests for information and proposals as a directional guide for near-term movements.

Distributed battery prices, including installation costs, were derived from market prices for Tesla Powerwall 2 systems. These prices were projected into the future using IEEE mid-range projections as a directional guide. CHP prices were derived from a combination of information sourced from the Southeast CHP Technical Assistance Partnership and internal TVA surveys of universities, hospitals and commercial entities. Escalation rates for all DG resources can vary by scenario, driven by assumptions around tax policy and pace of technology advancement. Figure C.7 shows assumptions for distributed solar and storage cost projections.

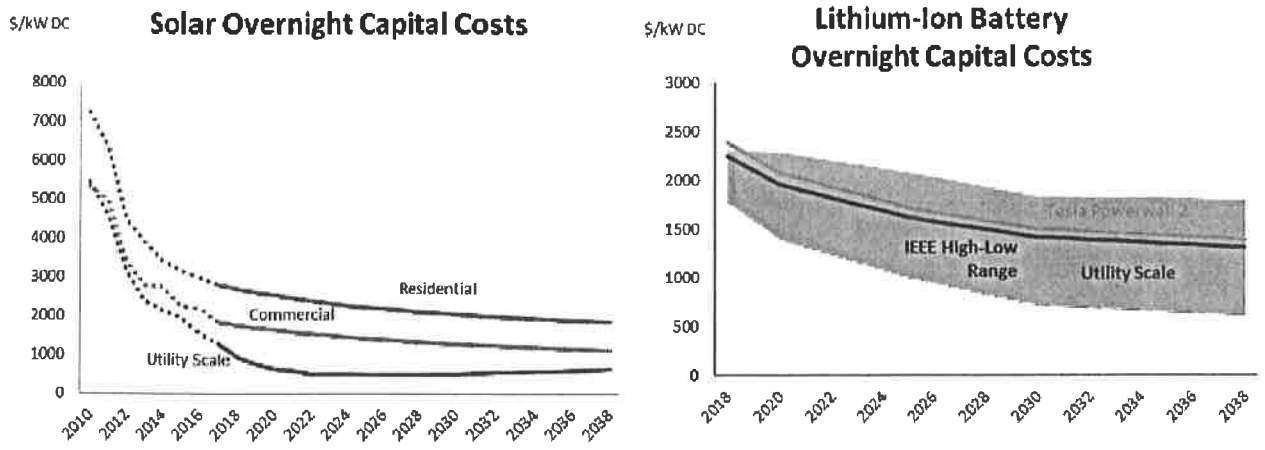

Figure C-7: Distributed Solar and Storage Price Forecast.

Further information about resource options and assumptions can be found in Chapter 5 and in Appendix A: Generating Resources.

C.3.3 Adoption Levels

Using assumptions for payback, considering assumptions unique to each scenario and strategy combination, the DG model provides forecasts for the following:

- Base levels of DG, considering TVA programs and payback without additional incentives
- Level of DG with moderate incentives
- Level of DG with high incentives

An example of the DG model output, specifically the resulting levels of DG adoption for Scenario 1 (Current Outlook), is shown in the figures below.

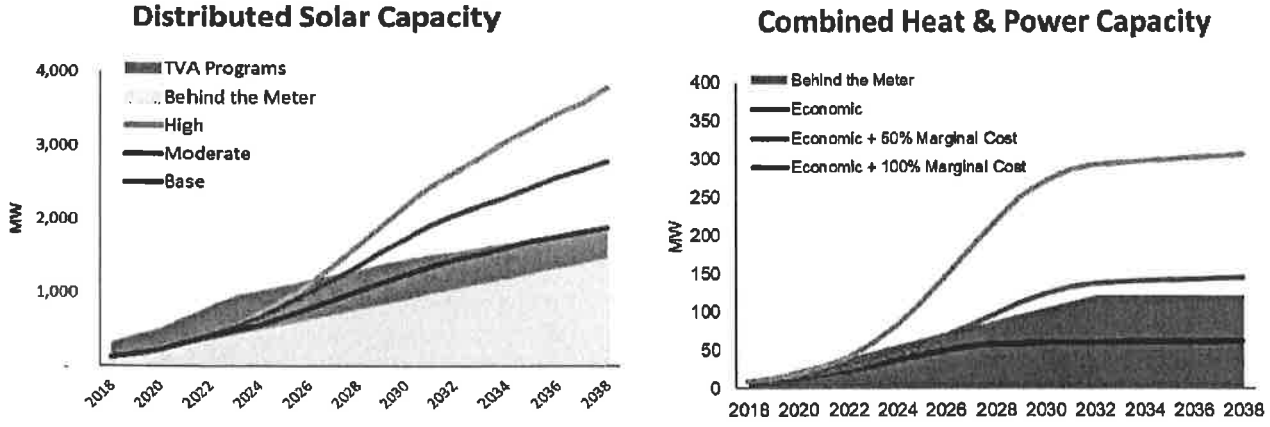

Figure C-8: Distributed Solar and CHP Capacity, Current Outlook Scenario.

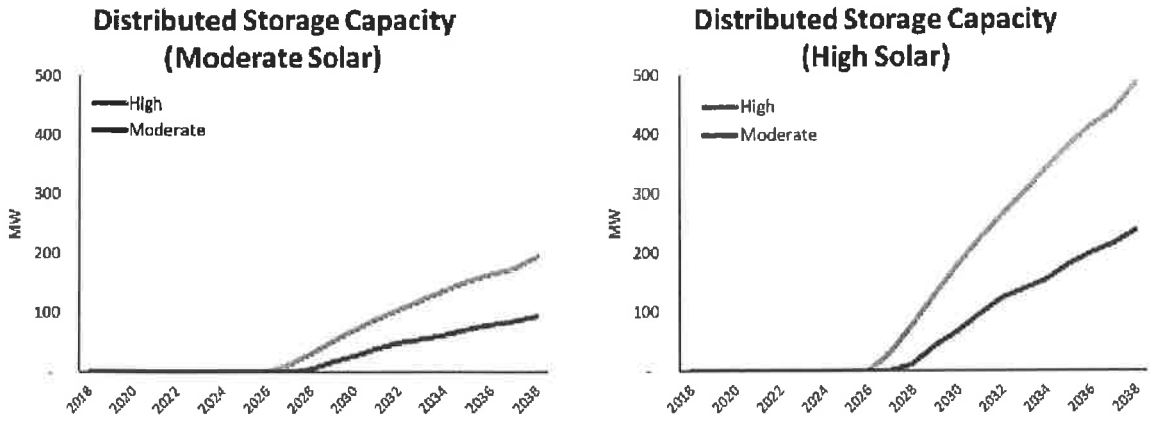

Figure C-9: Distributed Storage Capacity, Current Outlook Scenario.

C.4 Step 4: Enforce New Adoption Level in Expansion Model

Once the DG profiles are created for distributed solar, distributed storage and CHP, they are imported into the expansion model. A unique set of DG adoption levels is fed into the expansion model for each scenario and strategy combination. The DG adoption levels are treated as required resources, or effectively a constraint the model has to operate with prior to optimization of other resources.

C.5 Step 5: Optimize Balance of Resources for the Portfolio

After the DG profiles for distributed solar, distributed storage and CHP are imported into the expansion model as required resources, the expansion model will then be run to optimize the remainder of the portfolio. This action is performed for each scenario and strategy combination, considering the aims and bounds of the strategy and all available generation and programmatic resources. The Reserve Margin is an important consideration in this step, ensuring that the expansion path chosen results in a portfolio that meets or exceeds seasonal reserve margin requirements to support a reliable system at the lowest feasible cost for a given strategy.

C.6 Conclusion

TVA's 2019 IRP utilizes an innovative methodology to forecast the impact of different strategies on DG penetration across various future scenarios. The method simulated the effect of monetary incentives reducing payback and driving higher adoption of DG technologies. Results from the model allow TVA to gain insights into the impact that distributed generation could have on the TVA system under a variety of different future states. This knowledge will further inform future planning to meet TVA's mission of providing reliable, low-cost energy to the residents of the Tennessee Valley.

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Appendix D: Modeling Framework Enhancements

After evaluating both the NDC and ELCC methods to determine solar and wind capacity, study results indicate that a mixed approach is most suitable.

Peak capacity contribution of wind varies greatly from year to year. Thus, NDC is the preferred method because it considers every year of historical performance to determine capacity contribution, whereas ELCC only looks at the years of loss-of-load expectation due to high load or low plant availability. Using the NDC approach, wind capacity at peak would be valued at 14 percent in summer and 31 percent in winter. This result is similar to the results from a 2016 MISO study that evaluated dependable capacity of wind from a similar geographic region at a similar level of penetration.

As solar generation at the summer and winter peaks tends to be fairly consistent year to year, ELCC is the preferred method for solar peak capacity contribution. Using the ELCC approach, solar capacity at peak would be valued at 68 percent in summer and 0 percent in winter. The study found contribution to winter peak, typically around 7 a.m., to be less than 1 percent. Increasing solar penetration typically shifts the summer peak and reduces ELCC, as has occurred in regions with higher solar penetration, and future ELCC studies will be able to capture this impact.

D.3.5.2 Integration Costs

Study results for solar and wind integration costs at additional penetration levels are summarized in Figure D-6. The results also show the breakdown between additional operating and maintenance costs.

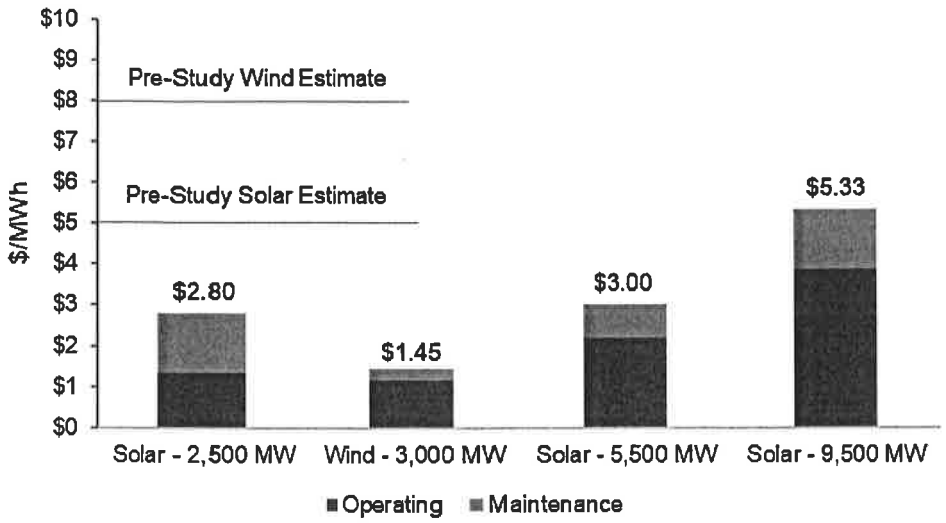


Figure D-6: Integration Costs at Additional Solar and Wind Penetration Levels.

Results overall were notably lower than pre-study estimates. Projected solar integration costs averaged about $3/MWh from 2,500 MW to 5,500 MW penetration, then began increasing up to about $5.5/MWh at 9,500 MW penetration. Projected wind integration costs were about $1.5/MWh at 3,000 MW additional penetration. With the diversity of the portfolio, including the ability to leverage the flexibility of conventional hydro assets, the TVA system is well positioned to absorb up to 5,500 MW of solar and 3,000 MW of wind at relatively small additional cost.

D.3.5.3 Peer Comparisons

Other utilities and Independent System Operators have conducted studies to evaluate the challenges and costs associated with integrating renewable resources. One of the most comprehensive studies was performed by Synapse in 2015. Synapse

researched integration costs and found that system operators implemented measures to integrate large amounts of wind and solar resources at costs generally less than $5/MWh of energy produced. At the time of this publication, more information about the Synapse study was available on the Synapse website at the following link:

http://www.synapse-energy.com/sites/default/files/Costs-of-Integrating-Renewables.pdf

Integration costs are only a piece of the equation, and other factors such as state renewable mandates or goals, declining solar prices, regional capacity factors, cost of competing resources, and consumer demand are playing into resource selection and timing. Understanding the impacts of intermittency also informs the need for flexible resources to support successful integration of renewables.

D.3.6 Conclusion

Based on study results, summer and winter net dependable capacities of 68 percent and 0 percent for solar and 14 percent and 31 percent for wind will be used. Given TVA's system is well-positioned to absorb up to 5,500 MW of solar and 3,000 MW of wind and current projections are within those bounds for the next decade, study results from those penetration levels informed the recommendation. Sub-hourly integration cost results were rounded to $3/MWh for solar and $2/MWh for wind for use as inputs in resource planning. These planning factors account for the contribution of solar and wind at TVA's summer and winter peaks and for the sub-hourly costs of intermittency that can be captured in TVA's hourly resource planning models.

Identifying net dependable capacities and sub-hourly integration costs for solar and wind resources provides a fuller picture of the operating characteristics of intermittent resources to inform resource selection. The following section further explores the relationship between increasing penetration of intermittent resources and the value of more flexible resources on TVA's system. The NDCs and integration costs are being used in the 2019 IRP as well as in annual resource planning. TVA expects to update the Intermittent Resources Study before the next IRP or as changes in drivers (including intermittent resource penetration) warrant.

D.4 Flexibility Study

D.4.1 Purpose

The purpose of the Flexibility Study was to understand the potential benefits of adding more flexible resources on the system and how those benefits may change as renewable penetration increases. The study sought to identify the sub-hourly impacts of introducing highly flexible resources to the portfolio at various levels of intermittent resource penetration. Study results can be applied in hourly capacity planning models to more fully reflect the impacts of adding more flexible resources to the portfolio.

D.4.2 Background

The Intermittent Resources Study and Flexibility Study go hand in hand, in that they reflect two sides of the same equation. While intermittent resources introduce additional sub-hourly variability in operations, highly flexible resources introduce additional sub-hourly flexibility in operations. Over the next decade, TVA expects to see more solar on the system, both behind and in front of the wholesale meter. It is important to understand the full value that highly flexible resources can offer now and in the future so that value can be proactively considered in capacity planning.

D.4.3 Study Scope and Approach

This study evaluated the benefit of highly flexible resources, specifically aero-derivative combustion turbines and lithium-ion batteries, with increased solar generation in TVA's system. Specifically, this study sought to:

- Identify sub-hourly flexibility benefits of adding aero-derivatives, batteries, hydro and pumped storage to the portfolio at varying levels of penetration
- Determine how this benefit changes at differing solar penetration levels.

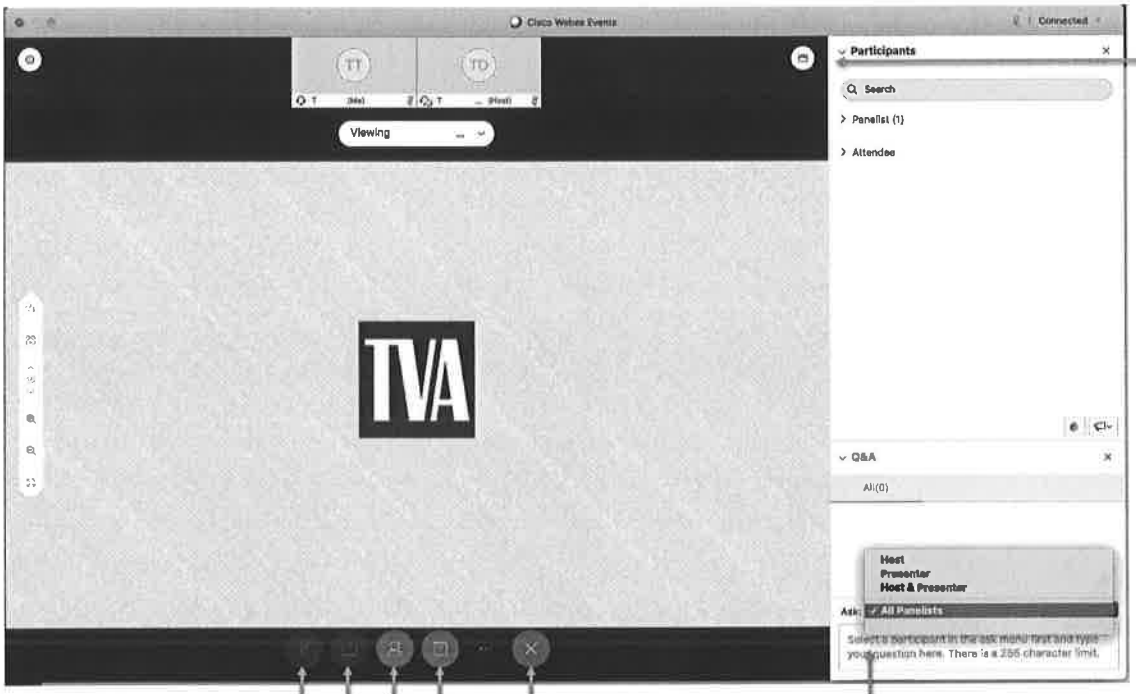
This first step involved determining a set of operating parameters for aero-derivatives, batteries, hydro and pumped storage. Figure D-7 highlights study assumptions about aero-derivatives relative to frame combustion turbines (CTs), currently the most flexible resource in TVA's portfolio. Compared to frame CTs,

JSC - 000316

EXHIBIT 8

TVA Renewable Energy

August 21, 2020



To change the view, select icon. In Thumbnail view (1 default), the focus shifts to the shared content when someone starts sharing. The Side-by-Side View (2 middle selection) allows you to view the shared content next to videos of presenters.

1 2

Exit event

Mute

Ask a question

Share (disabled)

Participants

Q&A: When available, ask a question here and direct to All Panelists or an individual.

Disasters Don't Wait. Make Your Plan Today.

Week 1: September 1-5
Make a Plan

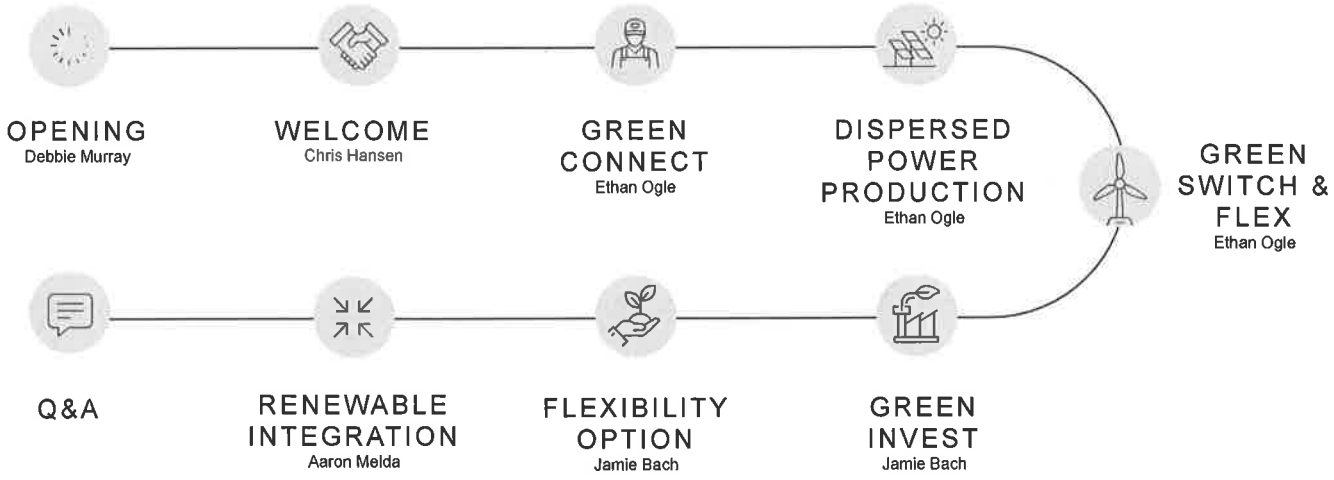
Week 2: September 6-12
Build a Kit

Week 3: September 13-19
Prepare for Disasters

Week 4: September 20-26
Teach Youth About Preparedness

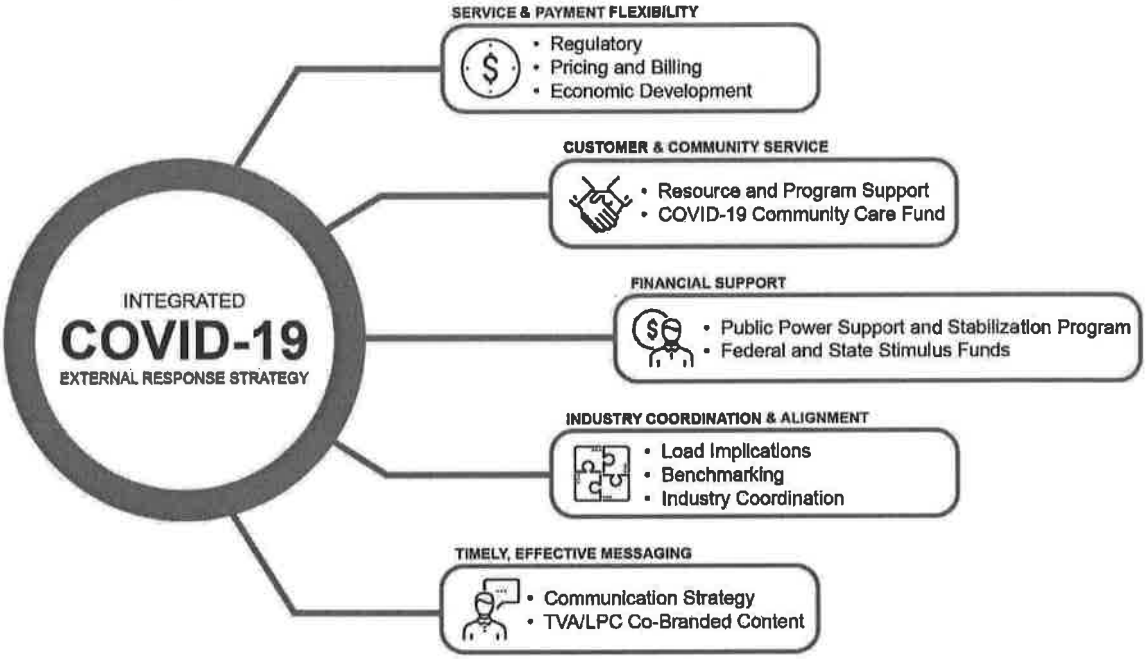
https://www.ready.gov/september

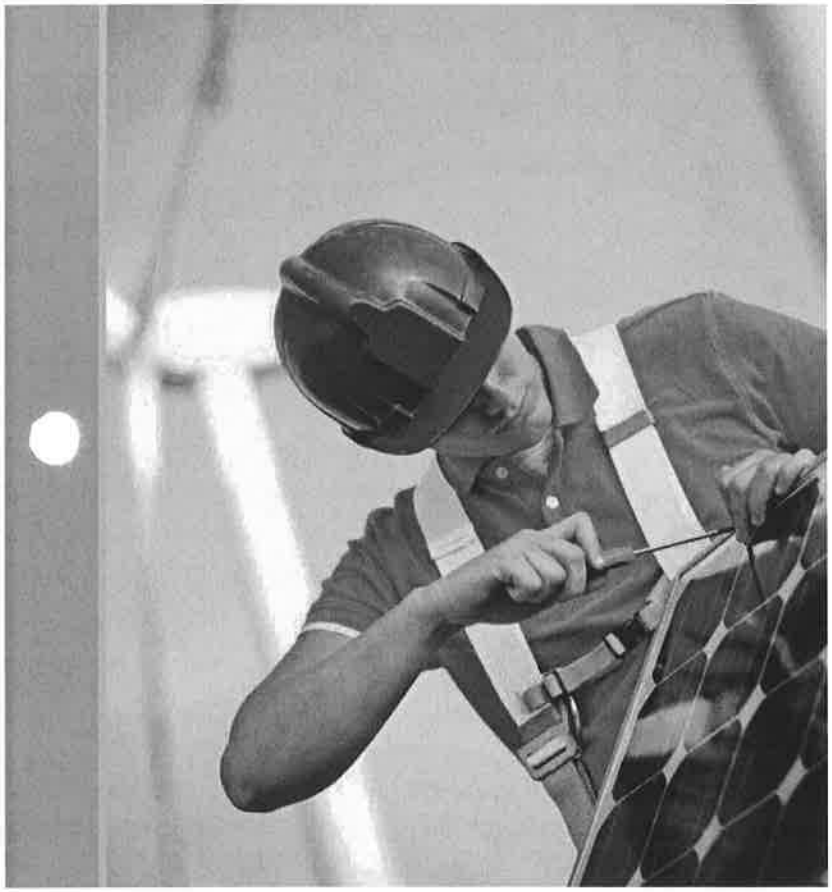
Agenda


OPENING
Debbie Murray
WELCOME
Chris Hansen
GREEN CONNECT
Ethan Ogle
DISPERSED POWER PRODUCTION
Ethan Ogle
GREEN SWITCH & FLEX
Ethan Ogle
Q&A
RENEWABLE INTEGRATION
Aaron Melda
FLEXIBILITY OPTION
Jamie Bach
GREEN INVEST
Jamie Bach

WELCOME

CHRIS HANSEN


INTEGRATED
COVID-19
EXTERNAL RESPONSE STRATEGY
SERVICE & PAYMENT FLEXIBILITY
• Regulatory
• Pricing and Billing
• Economic Development
CUSTOMER & COMMUNITY SERVICE
• Resource and Program Support
• COVID-19 Community Care Fund
FINANCIAL SUPPORT
• Public Power Support and Stabilization Program
• Federal and State Stimulus Funds
INDUSTRY COORDINATION & ALIGNMENT
• Load Implications
• Benchmarking
• Industry Coordination
TIMELY, EFFECTIVE MESSAGING
• Communication Strategy
• TVA/LPC Co-Branded Content



AUGUST 2020

We have a variety of renewable programs that align to the vast interests of our customers.

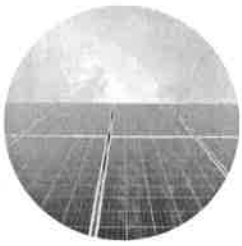
TVA Green
renewables@tva.gov

TVA Green

Renewable Solutions

Green Connect

Dispersed Power Production



Green Switch

Green Flex

Green Invest

Flexibility Option

TVA Green

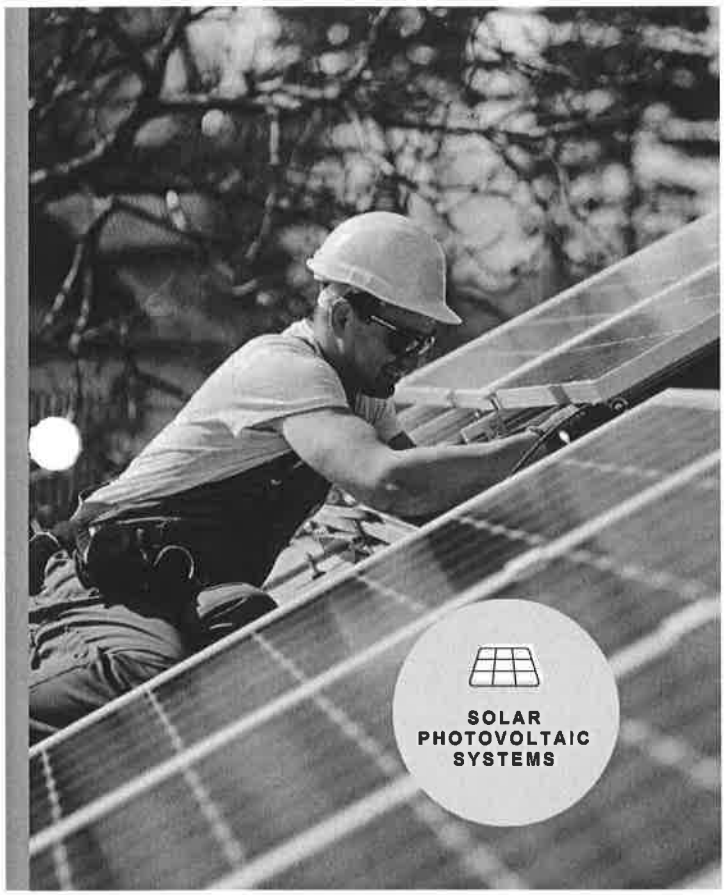
JSC - 000325

COMING JANUARY 2021

GREEN CONNECT

TVA GREEN

TVA Green



GREEN CONNECT

Program benefits

FOR INSTALLERS

- Increased standardization
- Customer leads
- Green Connect contact center

FOR CUSTOMERS

- Access to quality solar installers
- Educational resources
- Installation verifications

TVA Green

JSC - 000327

GREEN CONNECT

Customer portal

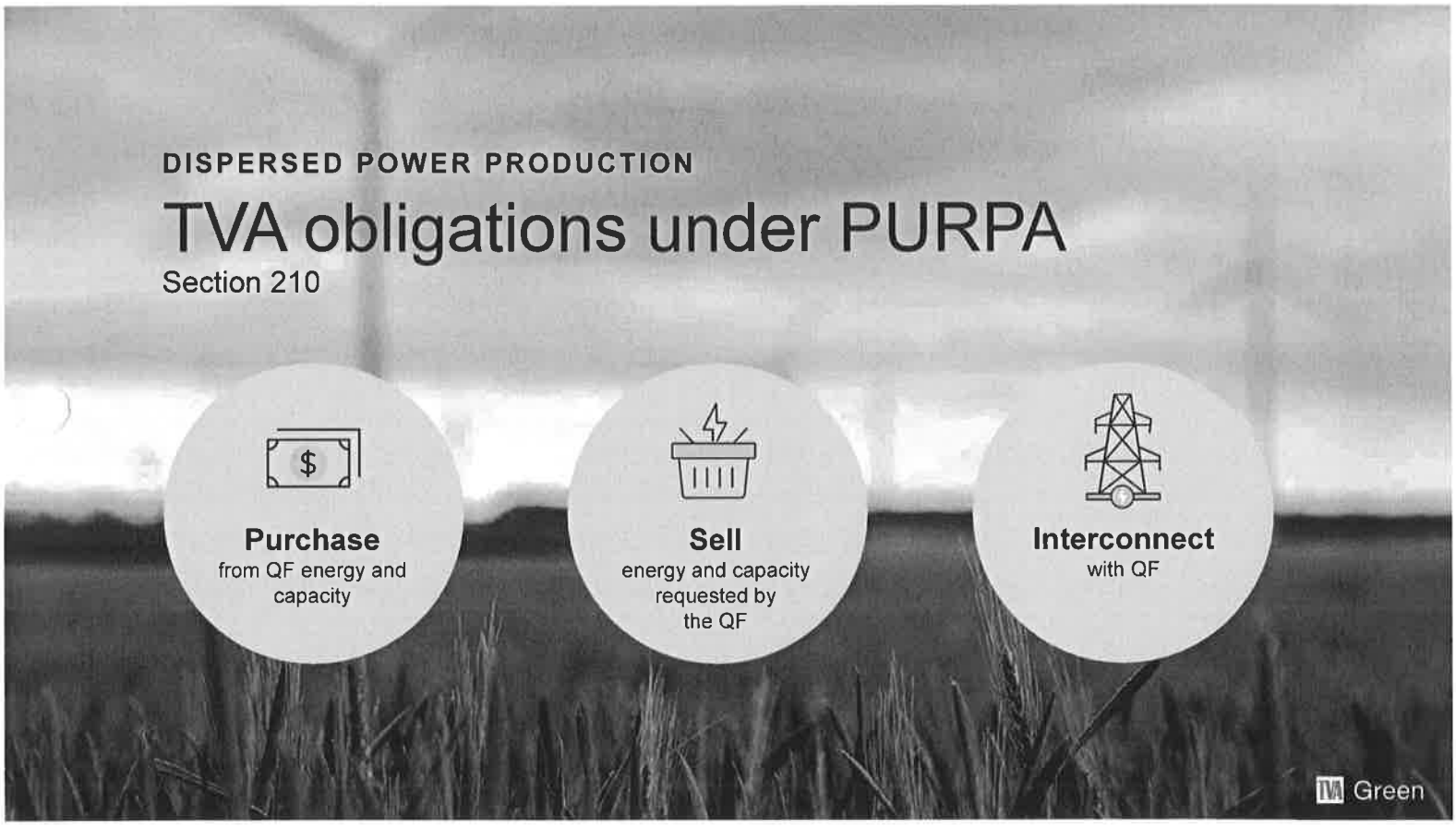
GREEN CONNECT

Installer portal

DISPERSED POWER PRODUCTION

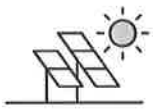
TVA GREEN

TVA Green


DISPERSED POWER PRODUCTION
TVA obligations under PURPA
Section 210
Purchase
from QF energy and capacity
Sell
energy and capacity requested by the QF
Interconnect
with QF
Green

DISPERSED POWER PRODUCTION

A program that allows residential, business and industry customers to **sell power from qualified facilities** to TVA.



SOLAR

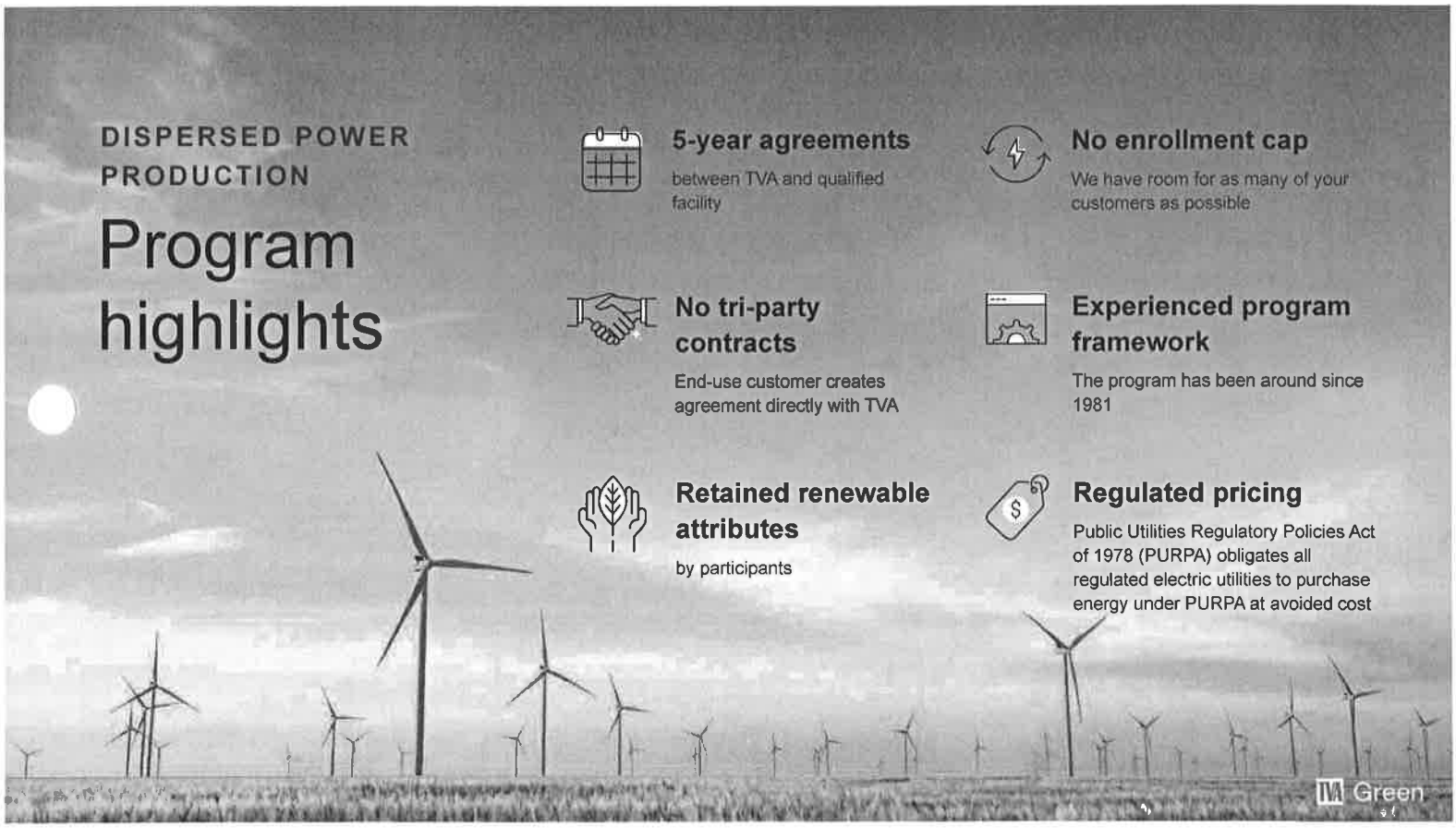
WIND

BIOMASS

WASTE

GEOTHERMAL

Green


DISPERSED POWER PRODUCTION
Program highlights
5-year agreements
between TVA and qualified facility
No enrollment cap
We have room for as many of your customers as possible
No tri-party contracts
End-use customer creates agreement directly with TVA
Experienced program framework
The program has been around since 1981
Retained renewable attributes
by participants
Regulated pricing
Public Utilities Regulatory Policies Act of 1978 (PURPA) obligates all regulated electric utilities to purchase energy under PURPA at avoided cost
Green

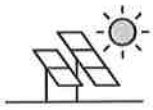
GREEN SWITCH

TVA GREEN

TVA Green

GREEN SWITCH

Helping residential, business and industrial customers support renewable energy generated **within the Valley.**



70%

SOLAR

GPP Sites

20%

WIND

Invenergy-Owned Buffalo Mountain Wind Purchase Power Agreement

10%

BIOMASS

GPP Sites

IVA Green

GREEN SWITCH COST

Customers purchase renewable energy to match their electricity usage. For as little as $2 per month, they reduce their environmental impact.

$2

for a

200 kWh BLOCK

through the Green-e Energy certification program

Energy A GREEN-E ENERGY CERTIFIED PRODUCT

TVA Green

GREEN SWITCH
Program highlights
No long-term commitment
No contract with participants – they can enroll and un-enroll on a monthly basis
No upfront cost
Payments can be added to your customers monthly utility bill
No infrastructure needed
Your customers do not need any additional infrastructure to get started using renewable energy
For as little as
$2
a month
customers can reduce their environmental impact
Green

GREEN FLEX

TVA GREEN

TVA Green

GREEN FLEX

A program that allows businesses and industries inside the Tennessee Valley to purchase **out-of-Valley wind** renewable energy certificates (RECs).

100%

WIND

Sourced from Iowa, Illinois, or Kansas

TVA Green

GREEN FLEX COST

Customers purchase RECs, the full MWh of renewable energy generated and delivered to the grid, which allow your customers to make renewable claims.

Energy A GREEN-E ENERGY CERTIFIED PRODUCT

Green

GREEN FLEX
Program highlights
1-year
agreement
January – December
Certified
through Green-e,
guaranteeing renewable generation coverage for all purchased RECs
Free
to sign up
and get started with no additional infrastructure needed
2,000
RECs
Annual minimum purchase
Purchase may not exceed
105%
of participant's annual electricity consumption
IVA Green

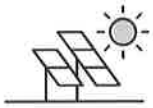
GREEN INVEST

TVA GREEN

TVA Green

GREEN INVEST

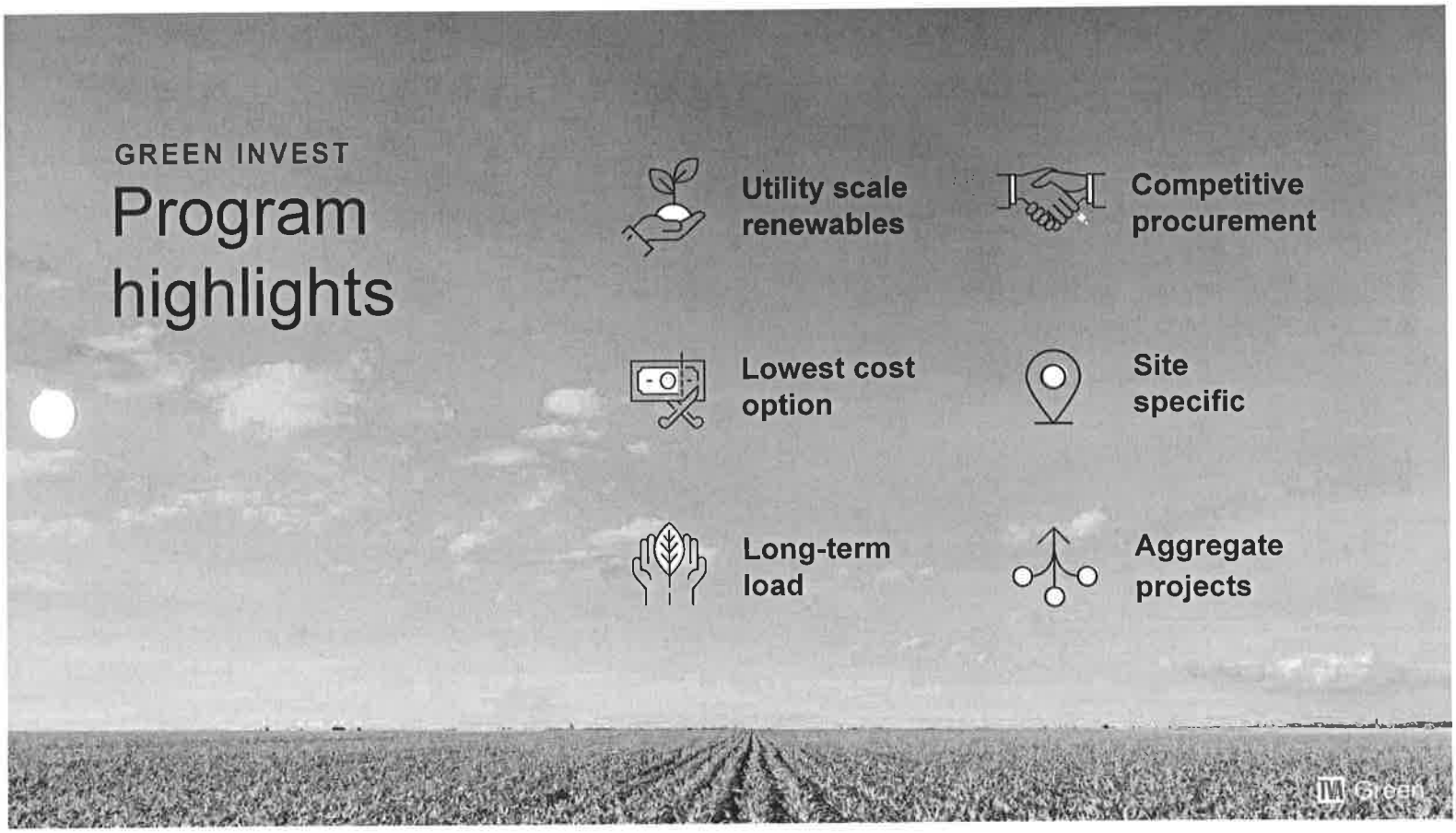
Help your end-use customers meet their sustainability goals through partnering with us to bring new, renewable energy to the Tennessee Valley.



100%

RENEWABLE

TVA Green


GREEN INVEST
Program highlights
Utility scale renewables
Competitive procurement
Lowest cost option
Site specific
Long-term load
Aggregate projects
Green

FLEXIBILITY OPTION

TVA VALLEY Partners

FLEX
Valley Partners now have the ability
to provide cleaner, greener power.
TVA VALLEY Partners

up to
5%
can be locally generated
MINIMUM 1MW
TVA VALLEY Partners

FLEXIBILTY OPTION

Partner benefits

- Lowers wholesale bill from TVA
- Long-term customer load commitments
- Partners with local businesses
- Mitigates behind-the-meter threats
- Pursues a variety of ownership and operating options (e.g., PPA)

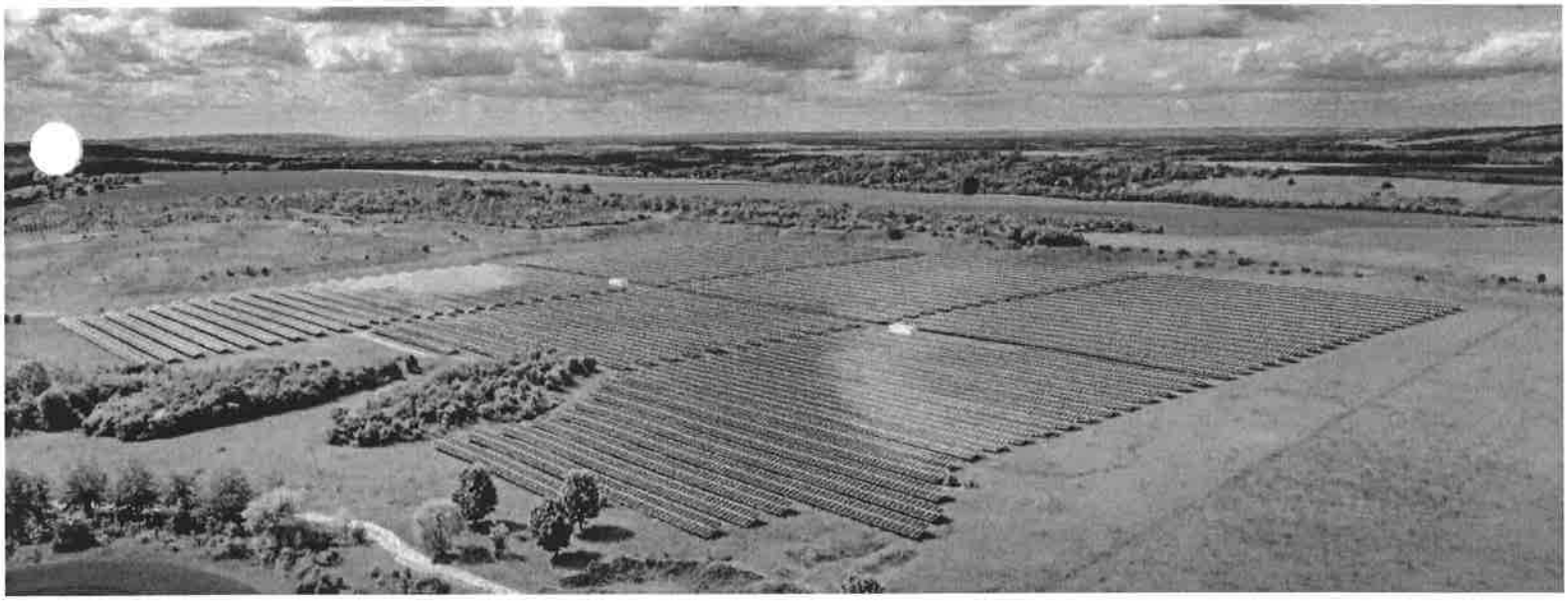
TVA VALLEY Partners

RENEWABLE INTEGRATION

Aaron Melda

TVA

TVA continues to look for ways to efficiently integrate renewable energy into our portfolio, while providing low cost, reliable energy.



SEEM

Southeast Energy Exchange Market

Exploring a centralized, automated intra-hour energy market with a goal of lowering customer costs and optimizing renewable energy, while maintaining reliable service

Q&A

LAURA DUNCAN & DEBBIE MURRAY

Thank you and be safe

TVA Green

QUESTIONS?

www.tvagreen.com

renewables@tva.gov

EXHIBIT 9

SITE DEVELOPER

COMMUNITY DEVELOPMENT ENTERPRISES
1104 WHITEHALL STREET
JACKSON, TN 38301
PHONE: 731-240-5001
CONTACT: DENNIS EMBERLING

BUILDING & CODES

CITY OF JACKSON
BUILDING & CODES DEPARTMENT
119 EAST MAIN STREET, SUITE 208
JACKSON, TN 38301
PHONE: 731-425-8255
CONTACT: ORED ROWLAND

CIVIL ENGINEER

LJ. SMITH AND ASSOCIATES
302 N. CALDWELL STREET
PARIS, TN 38242
PHONE: 731-644-1014
CONTACT: PATRICK SMITH

FIRE DEPARTMENT

CITY OF JACKSON FIRE DEPARTMENT
720 SOUTH HIGHLAND AVENUE
JACKSON, TN 38301
PHONE: 731-425-8350
CONTACT: CHIEF DARRYL SAMUELS

LAND SURVEYOR

LJ. SMITH AND ASSOCIATES
302 N. CALDWELL STREET
PARIS, TN 38242
PHONE: 731-644-1014
CONTACT: PATRICK SMITH

SANITARY SEWER DEPT.

JACKSON ENERGY AUTHORITY
351 MARTIN LUTHER KING JR. DRIVE
JACKSON, TN 38301
PHONE: 731-423-7371

TELEPHONE

AT&T
208 SOUTH AKARD STREET
DALLAS, TX 75202
PHONE: 800-288-2020

WATER DEPT.

JACKSON ENERGY AUTHORITY
351 MARTIN LUTHER KING JR. DRIVE
JACKSON, TN 38301
PHONE: 731-423-7371

ELECTRIC

[illegible] ENERGY AUTHORITY
[illegible] LUTHER KING JR. DRIVE
[illegible] TN 38301
[illegible]-423-7371

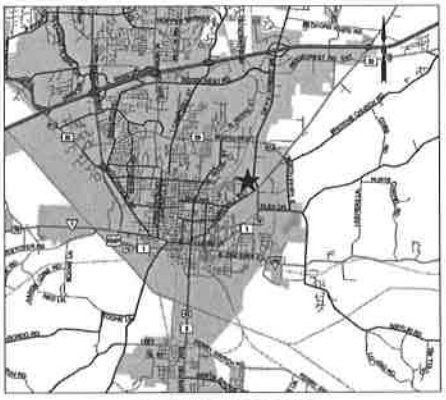
NATURAL GAS

JACKSON ENERGY AUTHORITY
351 MARTIN LUTHER KING JR. DRIVE
JACKSON, TN 38301
PHONE: 731-423-7371

NOTICE OF COVERAGE HAS BEEN ISSUED FOR A GENERAL CONSTRUCTION PERMIT AND ASSOCIATED GEN/ARAP PERMIT THROUGH TDEC.

PERMITTED DISTURBANCE: 12 ACRES
TDEC PERMIT NUMBERS:
TNR 123489
NR 9163814

COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE



VICINITY MAP - NOT TO SCALE

SITE DATA

A. OWNERS OF RECORD: HUNT PROPERTIES, 1031 GREYSTONE SQUARE, JACKSON, TN 38305; MORRIS CROCKER, 15 BUTTON PLACE, JACKSON, TN 38305

DEVELOPER: COMMUNITY DEVELOPMENT ENTERPRISES, 1104 WHITEHALL STREET, JACKSON, TN 38301

B. SOURCE OF TITLE: BOOK 733, PAGE 731 AND BOOK 257, PAGE 455; TAX MAP 68, PARCEL 103.00 AND 104.00

CITY OF JACKSON, MADISON COUNTY, TENNESSEE

SITE AREA ± +/- 32 ACRES
TOTAL AREA ± +/- 34.27 ACRES

C. THE SITE IS LOCATED IN UNSHADED FLOOD ZONE "X", AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN AS DETERMINED BY THE NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP NO. 47113C0146E, DATED AUGUST 03, 2006.

PLANNING INFORMATION

A. ZONING DESIGNATION: GENERAL RESIDENTIAL DISTRICT
FRONT SETBACK: 25 FEET
SIDE SETBACK: 8 FEET
REAR SETBACK: 10 FEET

B. INTENDED USE: SOLAR MICROGRID

C. PARKING: NONE REQUIRED FOR INTENDED USE
REQUIRED: 0 SPACES
PROPOSED: 0 SPACES

SHEET NO.	SHEET NAME	SCALE
C-000	COVER SHEET	
C-001	NOTES	
C-100	EXISTING	1"= 100'
C-101	VEGETATIVE IMPACT EVAL.	1"= 100'
C-200	LAYOUT	1"= 100'
C-201	LANDSCAPING	1"= 100'
C-300	GRADING	1"= 100'
C-400	E.P.S.C. PHASE 1	1"= 100'
C-401	E.P.S.C. PHASE 2	1"= 100'
C-402	E.P.S.C. PHASE 3	1"= 100'
C-403	A.R.A.P.	1"= 30'
C-404	E.P.S.C. PHASE 4	1"= 100'
C-800	DETAILS	
C-801	DETAILS	
C-802	DETAILS	
C-803	DETAILS	
C-804	DETAILS	

Ownership and Quality of Construction

CERTIFICATE OF QUALITY OF CONSTRUCTION

I (We), certify that I (we) am (are) the owner(s) shown hereon and submit(s) that they have the requirements and specifications of the Jackson Energy Authority and are subject to the review and approval of the Jackson Municipal Regional Planning Commission and Subdivision Power Agreement.

Date _____ Owner/Developer _____

Sanitary Sewerage Systems

CERTIFICATE OF APPROVAL OF SANITARY SEWERAGE SYSTEMS

I hereby certify that the sanitary sewerage utility plans depicted within these construction drawings meet the minimum requirements of the Jackson Energy Authority and are hereby recommended for approval for construction as shown hereon.

Date _____ Jackson Energy Authority _____

Engineering Certification

CERTIFICATE OF ACCURACY OF DESIGN

I hereby certify that I am a registered engineer licensed to practice engineering under the laws of the State of Tennessee, hereby certify that the plan and accompanying drawings, specifications and calculations conform to the standards of good engineering practice and to all applicable provisions of the Subdivision and Land Development Regulations, as may be from time to time amended and submitted as a report filed with the Jackson Municipal Regional Planning Commission, if applicable.

Date _____ Registered Engineer
Tennessee Certificate No. _____

Streets and Storm Drainage

CERTIFICATE OF APPROVAL OF STREETS AND STORM DRAINAGE

I hereby, certify that the above construction and all site drainage plans depicted within are currently in processing and of the minimum requirements of the City of Jackson and are hereby recommended for approval for construction as shown hereon.

Date _____ City of Jackson Engineering Department _____

Public Water Systems

CERTIFICATE OF APPROVAL OF WATER SYSTEMS

I hereby certify that the water utility plans depicted within these construction drawings meet the minimum requirements of the Jackson Energy Authority and are hereby recommended for approval for construction as shown hereon.

Date _____ Jackson Energy Authority _____

Construction Drawing Approval

CERTIFICATE OF CONSTRUCTION DRAWING APPROVAL

I hereby certify that these construction drawings have been reviewed by all applicable review agencies and are hereby approved by the Jackson Municipal Regional Planning Commission and all waivers are noted, approved for construction as shown hereon.

Date _____ Jackson Municipal Regional Planning Commission _____

LJ. Smith and Associates, Inc.
LAND DEVELOPMENT | INFRASTRUCTURE DESIGN
SURVEYING SERVICES
302 North Caldwell Street, Paris, TN 38242 | 731-644-1014 | www.ljsmith.com
475 Metroplex Drive, Suite 212 Nashville, TN 37211 | 615-256-0290

SHEET: COVER
SHEET NUMBER: C-000
REVISIONS

CITY OF JACKSON ENGINEERING DEPARTMENT

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL NOTIFY THE CITY OF JACKSON BEFORE COMMENCING CONSTRUCTION.

2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING ANY UTILITY COMPANY, WHICH MAINTAINS A UTILITY LINE WITHIN THE BOUNDARIES OF THE PROJECT BEFORE THE INITIATION OF ANY CONSTRUCTION ON THE PROJECT OR IN THE STREETS BORDERING THE PROJECT.

3. BEFORE ANY GRADING IS STARTED, THE DEVELOPER/CONTRACTOR MUST OBTAIN A DEVELOPMENT PERMIT FROM THE CITY OF JACKSON.

4. ALL CONSTRUCTION SHALL MEET THE CITY OF JACKSON STANDARD SPECIFICATIONS CONTAINED WITHIN THE SUBDIVISION AND LAND DEVELOPMENT REGULATIONS.

5. THE CONTRACTOR MUST HAVE WRITTEN APPROVAL FROM THE CITY OF JACKSON ENGINEER AND THE PROJECT ENGINEER BEFORE ANY CHANGE IN DESIGN IS MADE.

6. ALL CONSTRUCTION SHALL BE TESTED BY A LICENSED INDEPENDENT MATERIAL TESTING COMPANY TO ENSURE COMPLIANCE WITH COMPACTION REQUIREMENTS AND TO ENSURE THE MINIMUM THICKNESS OF BASE AND PAVEMENT. A COPY OF THE TEST RESULTS SHALL BE FURNISHED TO THE CITY OF JACKSON AND LABELED AS TEST REPORTS "SUBDIVISION NAME", JACKSON, TENNESSEE.

7. ALL BOX FILL AREAS IN THE STREET SHALL BE COMPACTED TO 95% OF STANDARD PROCTOR DENSITY, TESTED PER ASTM D-698. THE TOP SIX INCHES OF ALL FILLS AND CUT AREAS IN THE STREET SHALL BE COMPACTED TO 100% OF STANDARD PROCTOR DENSITY PER ASTM D-698.

8. FILLS SHALL BE CONSTRUCTED IN LIFTS WITH A MAXIMUM LOOSE LIFT THICKNESS OF EIGHT (8) INCHES.

9. SUBGRADE COMPACTION TESTING MUST BE COMPLETED AFTER INSTALLATION OF ALL UTILITIES IN THE STREET AND IMMEDIATELY PRECEDING BASE MATERIAL APPLICATION. THE SUBGRADE COMPACTION TEST RESULTS MUST BE SUBMITTED TO AND APPROVED BY THE CITY ENGINEER 3 DAYS PRIOR TO THE APPLICATION OF THE BASE MATERIAL. BASE MATERIAL COMPACTION TESTING MUST BE COMPLETED IMMEDIATELY PRECEDING THE APPLICATION OF THE BINDER COAT. THE BASE MATERIAL TEST RESULTS MUST BE SUBMITTED TO AND APPROVED BY THE CITY ENGINEER'S OFFICE PRIOR TO THE APPLICATION OF THE BINDER COAT. THE BINDER COAT COMPACTION AND THICKNESS TEST RESULTS MUST BE SUBMITTED TO AND APPROVED BY THE CITY ENGINEER'S OFFICE PRIOR TO THE APPROVAL OF THE FINAL PLAT. ALL STORM DRAIN AND OTHER UTILITIES LOCATED UNDER THE STREETS SHALL HAVE TRENCHES COMPACTED AT 95% STANDARD PROCTOR DENSITY PER ASTM D-698.

10. THE MINIMUM FREQUENCY OF SOIL TESTS SHALL BE ONE TEST PER 100 FEET OF STREET LENGTH WITH A MINIMUM OF THREE (3) TESTS PER PROJECT PHASE. TESTING SHALL BE PERFORMED AT THE ABOVE FREQUENCY ON EACH TEN (10) INCH LIFT OF FILLS AND ON THE FINAL SUBGRADE WHETHER IN CUT OR FILL.

11. PRIOR TO PLACING GRANULAR BASE ON THE STREET THE SUBGRADE SHALL BE PROOF ROLLED WITH A LOADED DUMP TRUCK WITH A GROSS WEIGHT OF APPROXIMATELY 36 TONS IN THE PRESENCE OF THE CITY / ENGINEER OR HIS DESIGNEE. NOTIFY THE CITY ENGINEER A MINIMUM OF TWO WORKING DAYS IN ADVANCE FOR SCHEDULING.

12. ROADWAY BASE SHALL BE COMPACTED TO A MINIMUM DENSITY OF 98% STANDARD PROCTOR DENSITY (ASTM D-698).

13. THE GRANULAR BASE SHALL BE TESTED FOR DENSITY AND THICKNESS EVERY 100 FEET OF STREET LENGTH WITH A MINIMUM OF THREE (3) TESTS PER PROJECT PHASE.

14. PRIOR TO PLACING ASPHALT ON THE STREET THE GRANULAR BASE SHALL BE PROOF ROLLED WITH A LOADED DUMP TRUCK WITH A GROSS WEIGHT OF APPROXIMATELY 36 TONS IN THE PRESENCE OF THE CITY ENGINEER OR HIS DESIGNEE. NOTIFY THE CITY ENGINEER A MINIMUM OF TWO WORKING DAYS IN ADVANCE FOR SCHEDULING.

15. ALL ASPHALTIC COURSES SHALL BE COMPACTED TO A MINIMUM OF 92% OF MAXIMUM THEORETICAL DENSITY.

16. ASPHALT SHALL BE RANDOMLY TESTED FOR DENSITY AND THICKNESS EVERY 300 FEET OF STREET LENGTH WITH A MINIMUM OF THREE (3) TESTS PER PROJECT PHASE.

17. CONCRETE FOR CURB AND GUTTER AND SIDEWALK SHALL BE A MINIMUM 3000 PSI AT 28 DAYS AND SHALL BE TESTED FOR CONSISTENCY AND STRENGTH IN ACCORDANCE WITH AASHTO TEST METHODS T 119, T 22 AND T 23. THE TEST SHALL BE PERFORMED EVERY 500 FEET OF STREET LENGTH WITH A MINIMUM OF ONE (1) TEST PER DAY.

18. TYPE, USE AND LOCATION OR ORNAMENTAL STREET SIGNS AND SIGNPOSTS MUST BE APPROVED BY THE CITY OF JACKSON ENGINEERING DEPARTMENT PRIOR TO SUBMISSION OF THE FINAL PLAT.

19. ADJUST MANHOLE LIDS TO MATCH GRADE OF CROSS SLOPE OF CURB FROM CENTERLINE. ALL MANHOLE LIDS TO BE FLUSH WITH BASE LAYER OF PAVEMENT THEN ADJUSTED AS REQUIRED BY CONTRACTOR WITH FINAL PAVEMENT LAYER INSTALLATION.

20. ALL STREETS ADJACENT TO THE SITE SHALL BE KEPT CLEAN DURING CONSTRUCTION.

21. TRAFFIC CONTROL SHALL BE PROVIDED AS APPROPRIATE AND SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

GRADING & DRAINAGE NOTES:

1. CONTRACTOR SHALL VERIFY EXISTING ELEVATIONS PRIOR TO BEGINNING WORK.

2. CONTOUR LINES AND SPOT ELEVATIONS ARE THE RESULT OF A DETAILED ENGINEERING GRADING DESIGN AND REFLECT A PLANNED PATTERN WITH REGARD TO DRAINAGE AND MOVEMENT OF MATERIALS. SHOULD THE CONTRACTOR HAVE ANY QUESTION OF THE INTENT OR ANY PROBLEMS WITH CONTINUITY OF GRADES, THE ENGINEER SHOULD BE CONTACTED IMMEDIATELY PRIOR TO BEGINNING WORK.

3. CONTRACTOR SHALL REFER TO AND ADHERE TO THE RECOMMENDATIONS IN THE GEOTECHNICAL ENGINEERING REPORT, IF AVAILABLE.

4. ALL BEDDING PIPE LAYING AND BACKFILLING SHALL BE IN ACCORDANCE WITH FEDERAL OSHA REGULATIONS.

5. ANY RETAINING WALLS REQUIRED SHALL BE BY DESIGN/BUILD AND MUST BE DESIGNED AND SEALED BY AN ENGINEER LICENSED IN THE STATE OF TENNESSEE AND SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO ISSUANCE OF A PERMIT. REFER TO THE VENDOR'S PLANS FOR RETAINING WALL AND FENCE DETAILS. GUARDS (42" HIGH) SHALL BE PROVIDED FOR ALL RETAINING WALLS WHERE GRADE ARE EQUAL TO OR EXCEED 30 INCHES IN HEIGHT, IN ACCORDANCE WITH APPLICABLE CODES.

EROSION CONTROL NOTES:

1. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN EROSION CONTROL DURING CONSTRUCTION AS REQUIRED BY THE CITY OF JACKSON RULES AND REGULATIONS FOR CONTROL OF EROSION AND STORMWATER AND THE LATEST EDITION OF THE TENNESSEE EROSION AND SEDIMENT CONTROL HANDBOOK TO PREVENT SITUATION DOWNSTREAM IN ANY DITCHES, PIPES, DRAINAGE STRUCTURES, STREETS, OR ADJACENT PROPERTIES.

2. ADDITIONAL EROSION CONTROL MEASURES MAY BE NECESSARY AS WORK PROGRESSES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AND ADJUSTING THE EROSION CONTROL MEASURES AS NECESSARY THROUGHOUT THE LIFE OF CONSTRUCTION AND UNTIL FULL STABILIZATION OF THE AREA IS ACHIEVED.

3. ALL TEMPORARY EROSION CONTROL MEASURES MUST BE IN PLACE BEFORE BEGINNING EARTH-MOVING OPERATIONS. AREAS OF EXPOSED EARTH SHALL BE KEPT TO A MINIMUM. EMBANKMENTS AND EXCAVATED AREAS SHALL BE PROMPTLY STABILIZED TO MINIMIZE EROSION.

4. THE CONTRACTOR OR OWNER SHALL FILE ALL DOCUMENTS NECESSARY FOR RECEIVING A NPDES PERMIT WHEN REQUIRED FOR STORMWATER DISCHARGE (FILING THE N.O.I., INCLUDING PAYMENT OF PERMIT FEES) MAINTAIN AN ON-SITE EROSION PLAN DOCUMENT THE EFFECTIVENESS OF THE PLAN AND ADJUST THE PLAN AS NECESSARY TO COMPLY WITH THE CONDITIONS OF THE PERMIT. THIS PLAN SHALL BE REVISED AS NECESSARY AND SHALL BE MADE A PART OF THE STORMWATER POLLUTION PREVENTION PLAN. ALL PROPOSED REVISIONS SHALL BE IN CONSULTATION WITH THE DESIGN ENGINEER.

5. ALL EXCAVATION AND FILL ACTIVITIES MUST BE CONDUCTED IN THE DRY.

6. CHECK DAMS SHALL BE INSTALLED IN THE TOE OF ALL FILL SLOPES, DITCHES, AND OTHER AREAS AS NECESSARY TO PREVENT SILTS FROM ENTERING ADJACENT PROPERTIES. ALL INSTALLED STRAW SHALL BE REPLACED AT 60-DAY MINIMUM INTERVALS, UNTIL FULL STABILIZATION IS ACHIEVED.

7. ANY STOCKPILED SOILS FOR FILL MATERIAL, SHALL BE LOCATED AND TREATED IN A MANNER TO PREVENT SILT FROM LEAVING THE PROPERTY EITHER THROUGH STORM DRAINS OR OVER LAND.

8. CONTRACTOR SHALL MAINTAIN A RAIN GAUGE ON SITE AT ALL TIMES AND RECORD RAINFALL DAILY. CONTRACTOR MUST INSPECT EROSION CONTROL TYPES PER CALENDAR WEEK. INSPECTIONS MUST TAKE PLACE AT LEAST 72 HOURS APART.

9. ALL AREAS SHALL BE SEEDED AND MULCHED AT MINIMUM. STABILIZING MATERIALS SHALL BE APPLIED AS SOON AS POSSIBLE UPON COMPLETION OF FINAL GRADING AND IN NO CASE GREATER THAN 15 DAYS.

10. AFTER FULL STABILIZATION OF ALL DISTURBED AREAS THE CONTRACTOR SHALL REMOVE ALL TEMPORARY EROSION CONTROL ITEMS. AFTER FULL STABILIZATION THE CONTRACTOR SHALL FILE A "NOTICE OF TERMINATION" WITH THE STATE OF TENNESSEE.

11. WHERE EARTH-DISTURBING ACTIVITY HAS BEEN TEMPORARILY CEASED, TEMPORARY STABILIZATION WILL BE APPLIED WITHIN (7) SEVEN DAYS IF THE ACTIVITY WILL NOT RESUME WITHIN (15) FIFTEEN DAYS.

12. THE DEVELOPER OR ANY DESIGNEE PERFORMING CONSTRUCTION ACTIVITIES ON HIS BEHALF IS RESPONSIBLE FOR COMPLYING WITH APPLICABLE STATE AND FEDERAL REGULATIONS WITH REGARD TO SEDIMENT/EROSION CONTROL.

COMMUNITY DEVELOPMENT ENTERPRISES

JACKSON SOLAR MICROGRID

ROOSEVELT PARKWAY

JACKSON, MADISON COUNTY, TENNESSEE

REVISIONS

NOTES

SHEET C-001

L.S. Smith and Associates, Inc.

DESIGNED BY: MPS

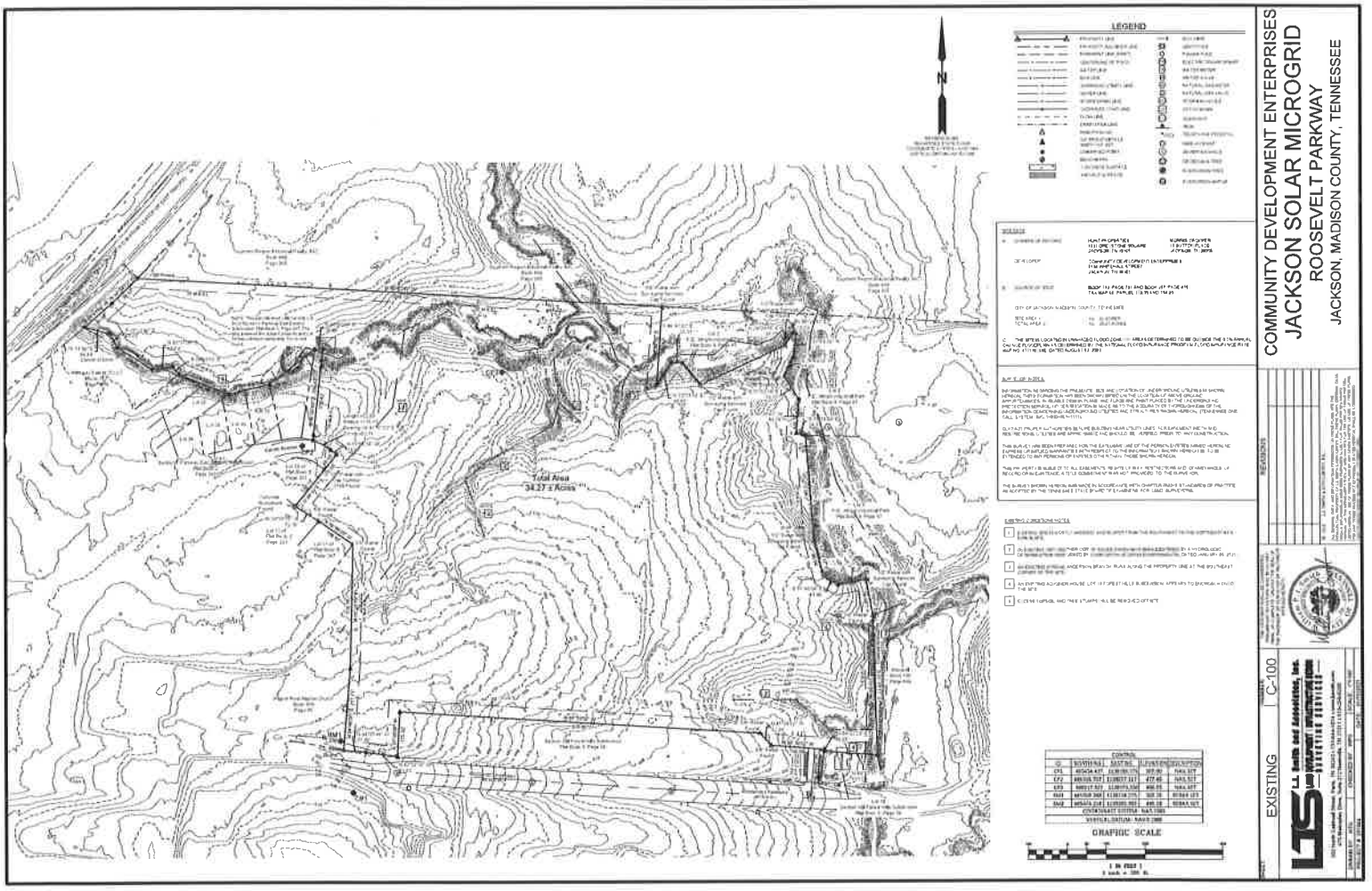
DRAWN BY: MPS

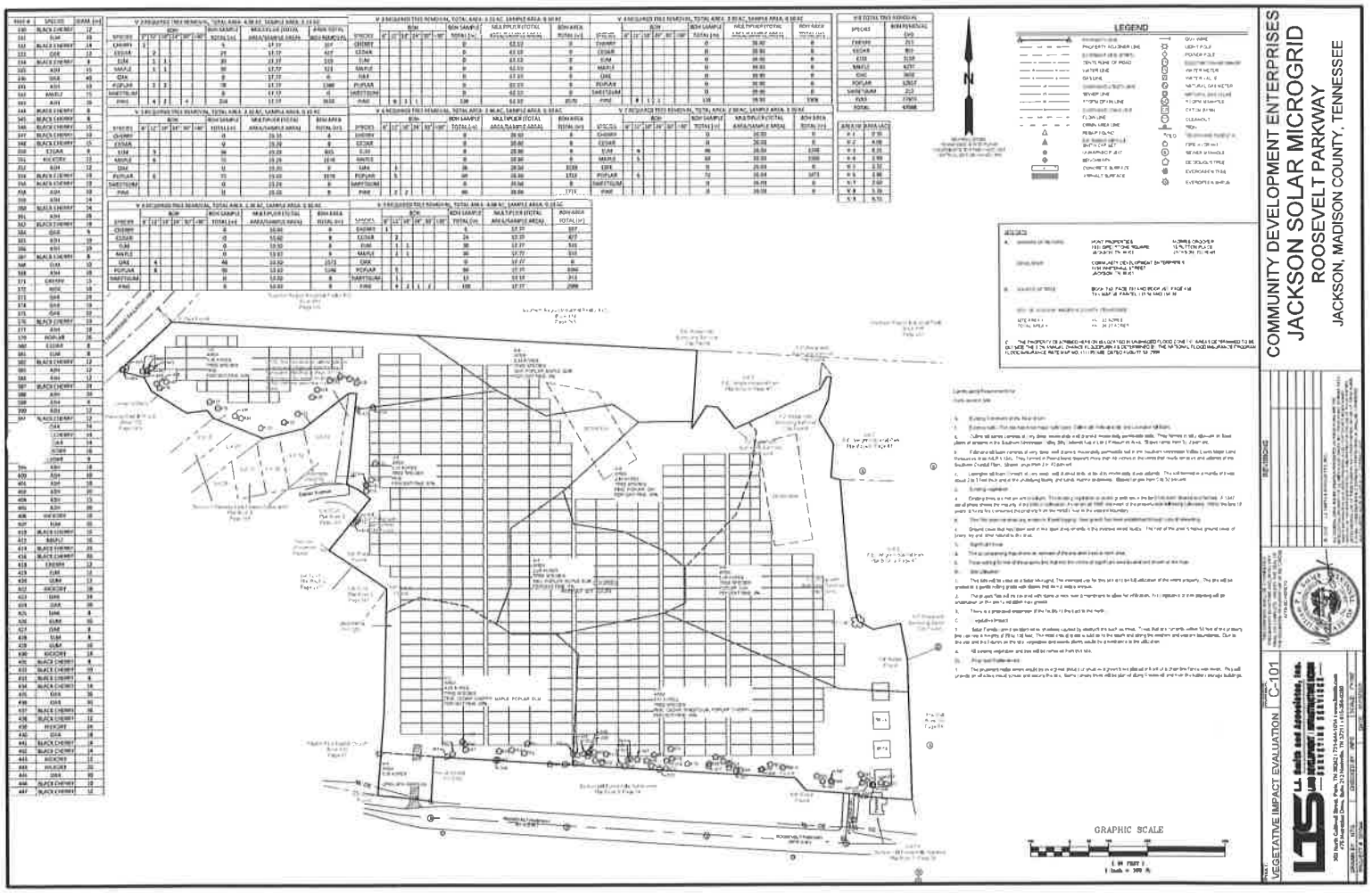
CHECKED BY: MPS

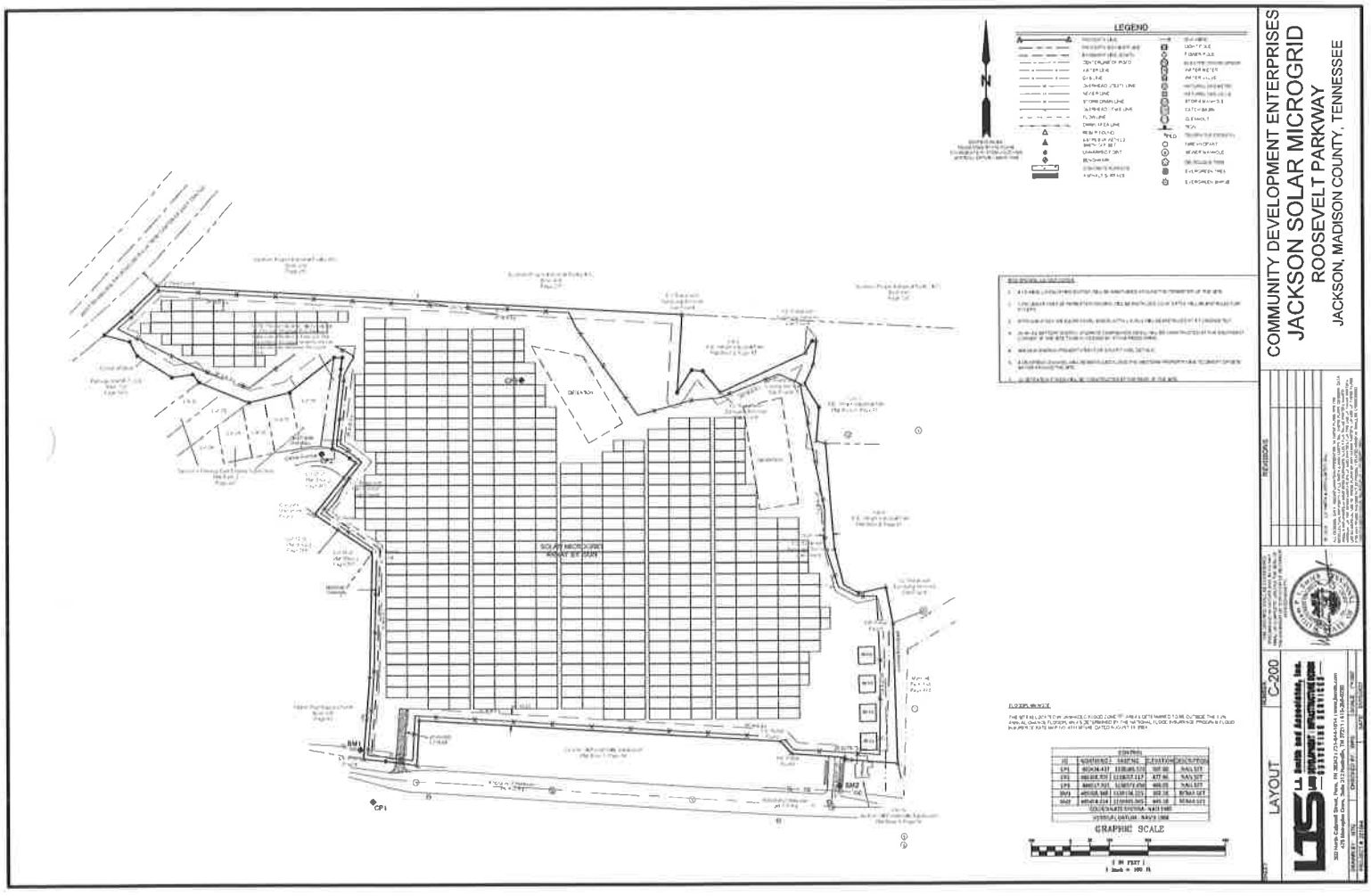
DATE:

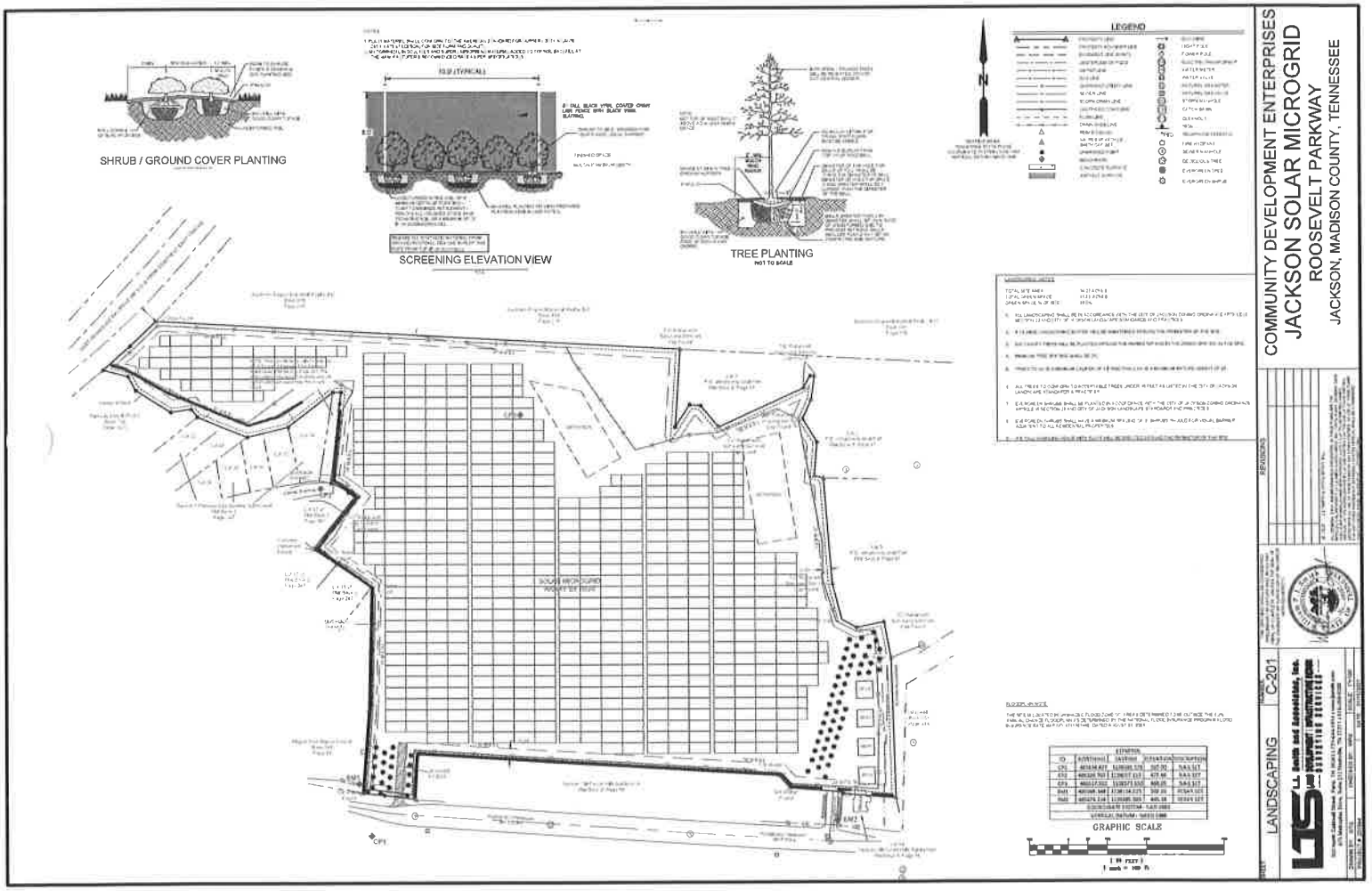
PROJECT #

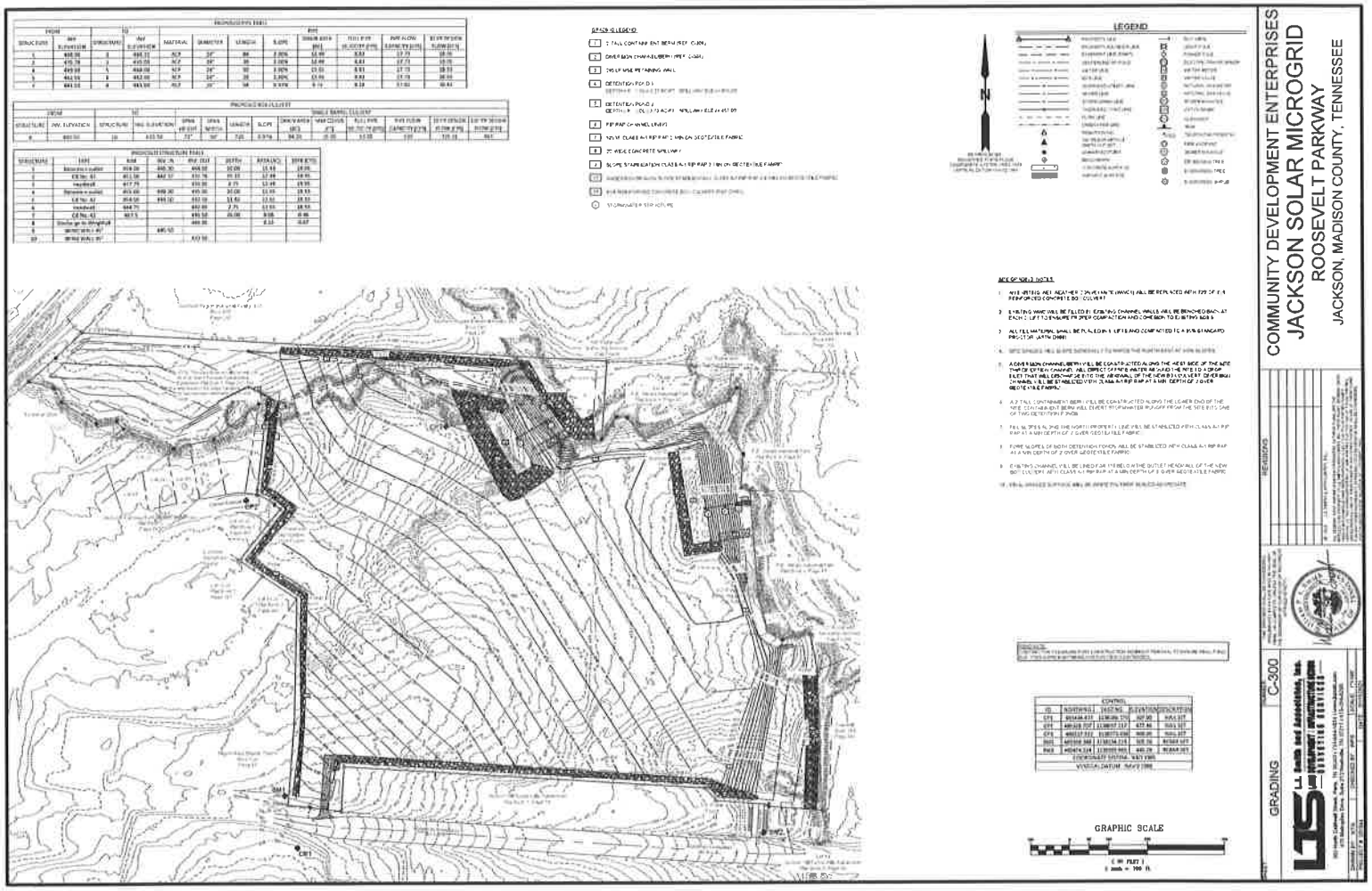
JSC - 000356


LEGEND
N
Total Area
34.27 ± Acres
GRAPHIC SCALE
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
EXISTING
C-100


COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
LEGEND
GRAPHIC SCALE
VEGETATIVE IMPACT EVALUATION
C-101


LEGEND
N
GRAPHIC SCALE
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
REVISIONS
LAYOUT
C-200
L.J. Smith and Associates, Inc.


SHRUB / GROUND COVER PLANTING
SCREENING ELEVATION VIEW
TREE PLANTING
NOT TO SCALE
LEGEND
GRAPHIC SCALE
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
LANDSCAPING
C-201


PROPOSED PIPE TABLE
PROPOSED INLET
PROPOSED STRUCTURE TABLE
SPCP SWPPP LEGEND
1 SILT FENCE
2 DIVERSION CHANNEL/BERM (REF. C-300)
3 DROP INLET PROTECTION
4 DETENTION POND 1
5 DETENTION POND 2
6 RIP RAP CHANNEL LINER
7 NON-WOVEN GEOTEXTILE FABRIC
8 CONCRETE SPILLWAY
9 SLOPE STABILIZATION CLASS A-1 RIP RAP OVER GEOTEXTILE FABRIC
10 CONCRETE BOX CULVERT (REF. C-300)
11 STORMWATER STOP VALVE
LEGEND
N
NOTES:
1. ALL EXISTING AND PROPOSED UTILITIES SHALL BE LOCATED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED IMMEDIATELY FOLLOWING GRADING.
3. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED AS REQUIRED BY THE SWPPP.
4. ALL EXISTING AND PROPOSED UTILITIES SHALL BE LOCATED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
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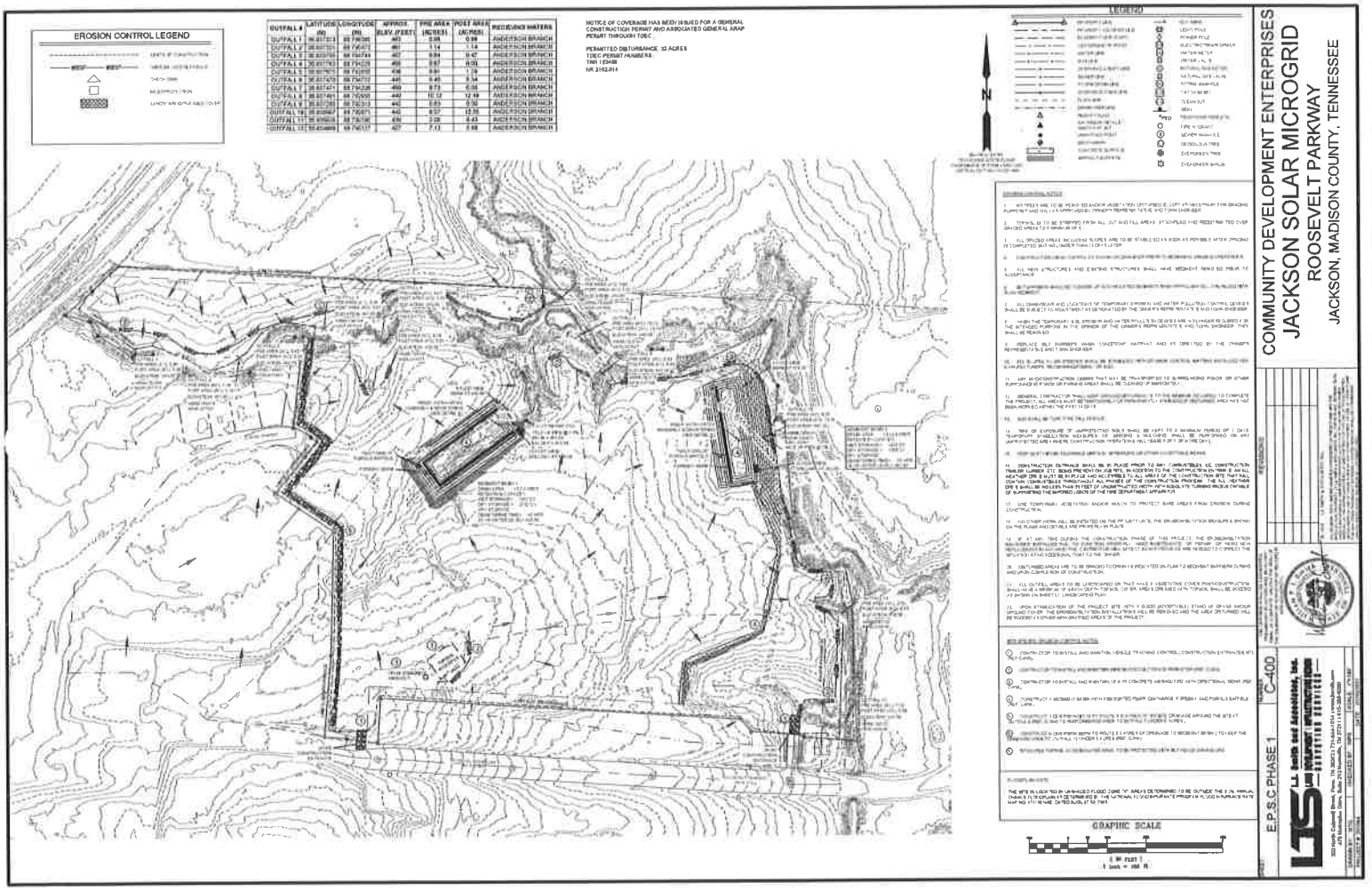
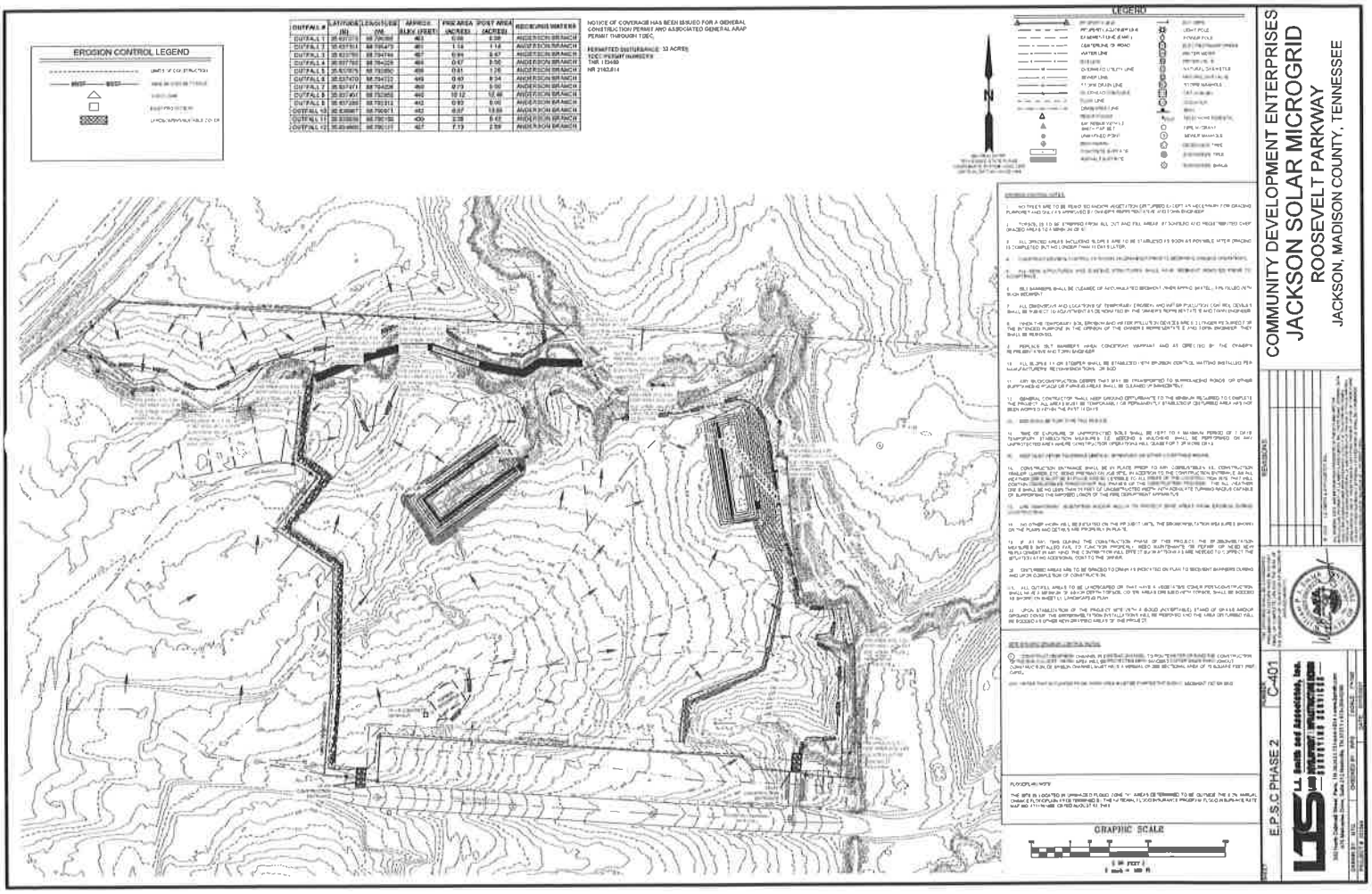
27. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED AS REQUIRED BY THE SWPPP.
28. ALL EXISTING AND PROPOSED UTILITIES SHALL BE LOCATED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
29. ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED IMMEDIATELY FOLLOWING GRADING.
30. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED AS REQUIRED BY THE SWPPP.
CONTROL
GRAPHIC SCALE
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
GRADING
C-300


EROSION CONTROL LEGEND
LEGEND
GRAPHIC SCALE
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
E.P.S.C PHASE 1
C-400

JSC - 000362

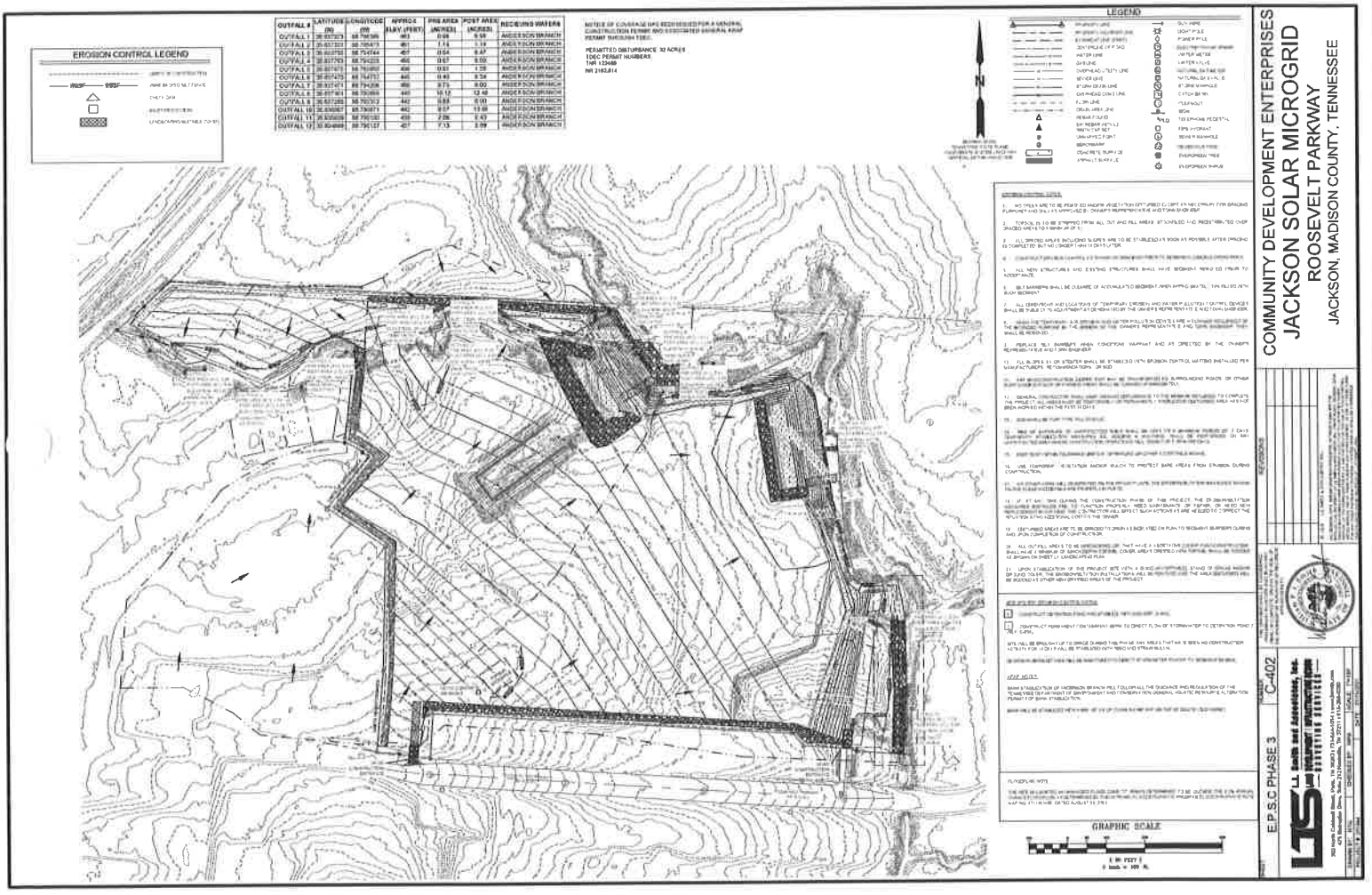


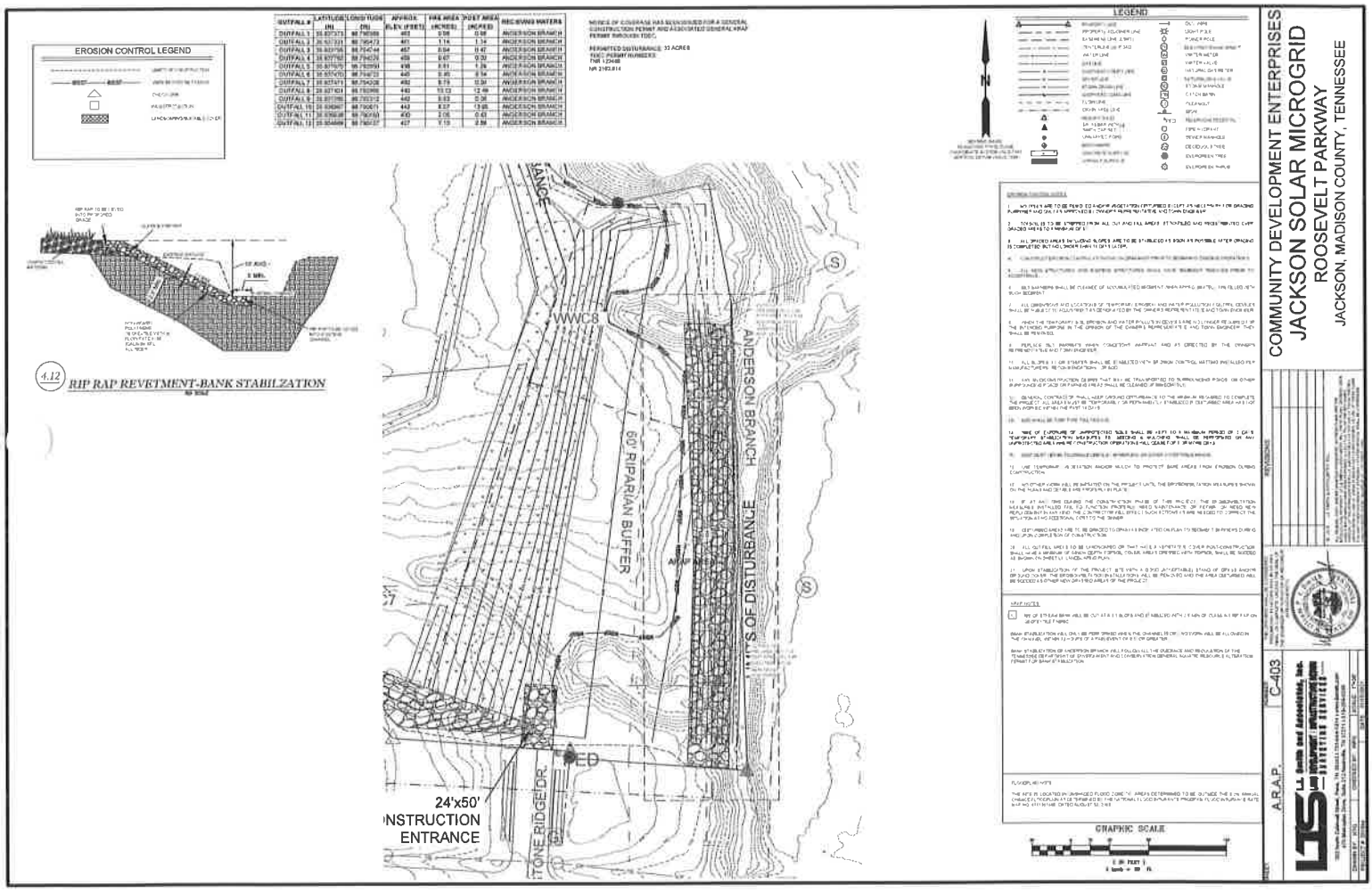
OUTFALL #	LATITUDE (N)	LONGITUDE (W)	ARRIVE. FLOW (CFS)	PRE AREA (ACRES)	POST AREA (ACRES)	RECEIVING WATERS
OUTFALL 1	35.637215	88.795284	463	5.08	5.08	ANDERSON BRANCH
OUTFALL 2	35.637151	88.795473	461	1.14	1.14	ANDERSON BRANCH
OUTFALL 3	35.637760	88.794746	461	9.84	9.47	ANDERSON BRANCH
OUTFALL 4	35.637760	88.794229	461	0.47	0.56	ANDERSON BRANCH
OUTFALL 5	35.637875	88.793850	459	0.81	1.26	ANDERSON BRANCH
OUTFALL 6	35.637470	88.794122	459	0.40	0.34	ANDERSON BRANCH
OUTFALL 7	35.637371	88.794404	460	0.73	0.90	ANDERSON BRANCH
OUTFALL 8	35.637361	88.793955	440	10.12	12.46	ANDERSON BRANCH
OUTFALL 9	35.637266	88.793313	443	0.93	0.90	ANDERSON BRANCH
OUTFALL 10	35.636987	88.793071	442	0.87	13.89	ANDERSON BRANCH
OUTFALL 11	35.636836	88.792156	430	0.38	0.43	ANDERSON BRANCH
OUTFALL 12	35.636660	88.792137	427	7.13	2.59	ANDERSON BRANCH

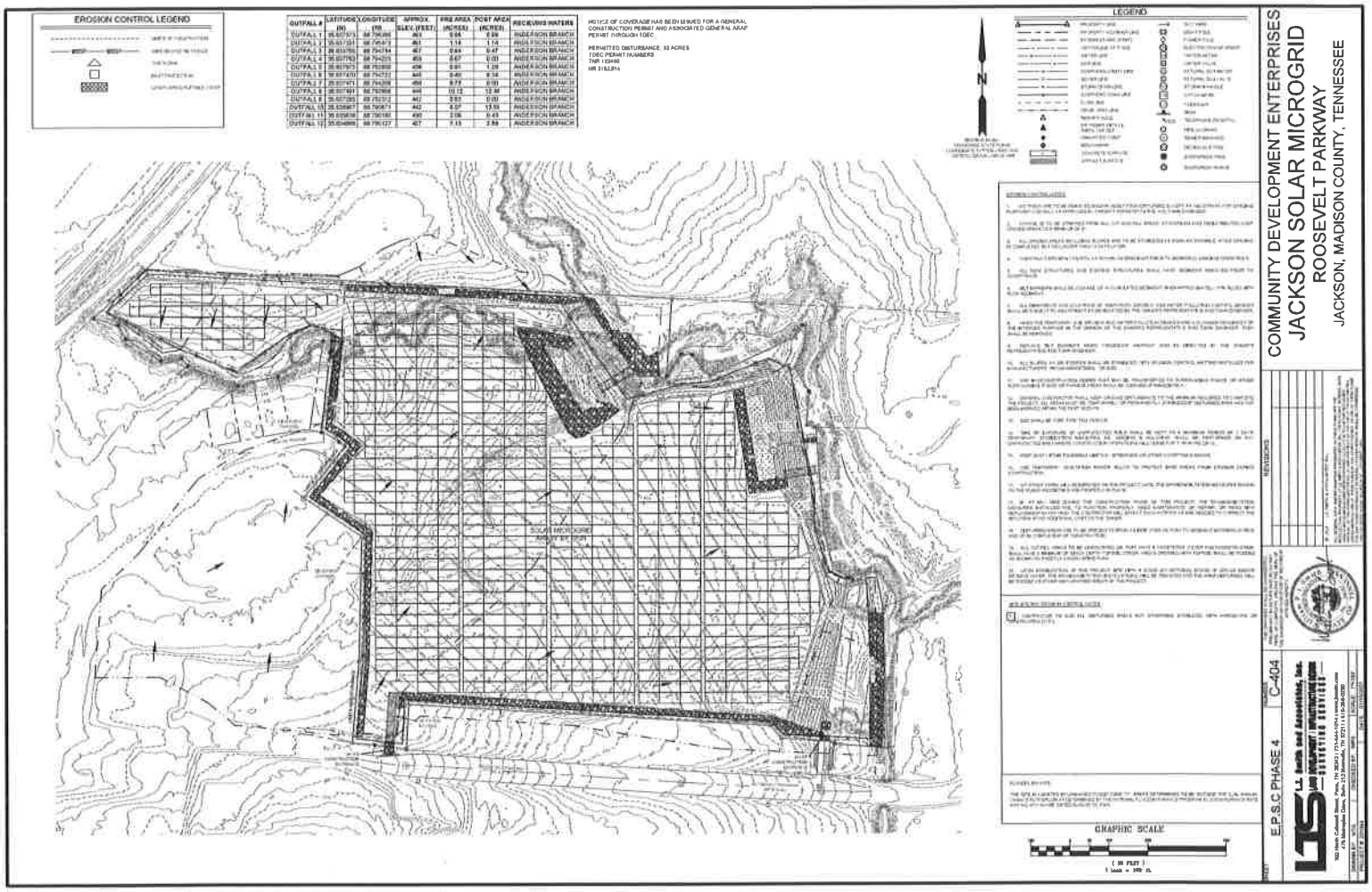
NOTICE OF COVERAGE HAS BEEN ISSUED FOR A GENERAL CONSTRUCTION PERMIT AND ASSOCIATED GENERAL ARAP PERMIT THROUGH TDEC.

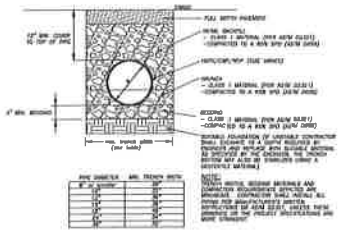
PERMITTED DISTURBANCE: 33 ACRES
TDEC PERMIT NUMBERS
TNR 175450
NR 2162,814

JSC - 000363

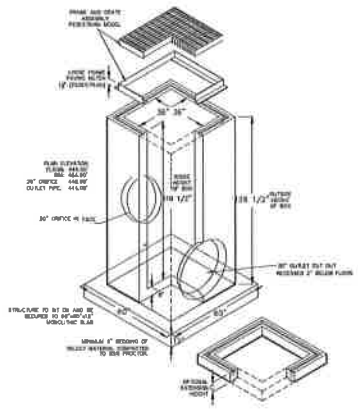

EROSION CONTROL LEGEND
LEGEND
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
E.P.S.C PHASE 3
C-402
GRAPHIC SCALE


EROSION CONTROL LEGEND
LEGEND
N
GRAPHIC SCALE
4.12
RIP RAP REVETMENT-BANK STABILZATION
60' RIPARIAN BUFFER
TOP OF DISTURBANCE
ANDERSON BRANCH
24'x50'
CONSTRUCTION
ENTRANCE
STONE RIDGE DR.
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
A.R.A.P.
C-403

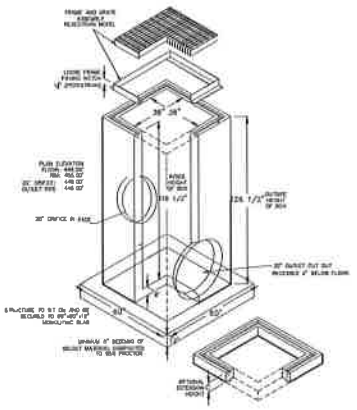

EROSION CONTROL LEGEND
OUTFALL #
LATITUDE (N)
LONGITUDE (W)
APPROX. SLEV. (FEET)
PRE AREA (ACRES)
POST AREA (ACRES)
RECEIVING WATERS
OUTFALL 1
OUTFALL 2
OUTFALL 3
OUTFALL 4
OUTFALL 5
OUTFALL 6
OUTFALL 7
OUTFALL 8
OUTFALL 9
OUTFALL 10
OUTFALL 11
OUTFALL 12
NOTICE OF COVERAGE HAS BEEN ISSUED FOR A GENERAL CONSTRUCTION PERMIT AND ASSOCIATED GENERAL ARAP PERMIT THROUGH TDEC.
PERMITTED DISTURBANCE: 93 ACRES
TDEC PERMIT NUMBERS
TNR 132490
NR 3182,814
LEGEND
N
GRAPHIC SCALE
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
REVISIONS
E.P.S.C PHASE 4
C-404



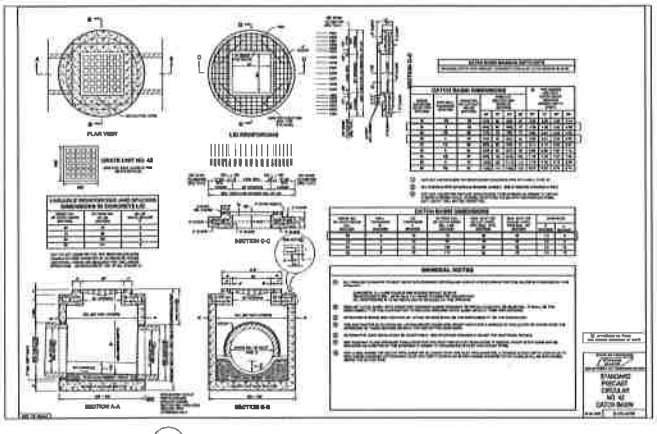
3.01 DRAINAGE PIPE TRENCH DETAIL
NO SCALE



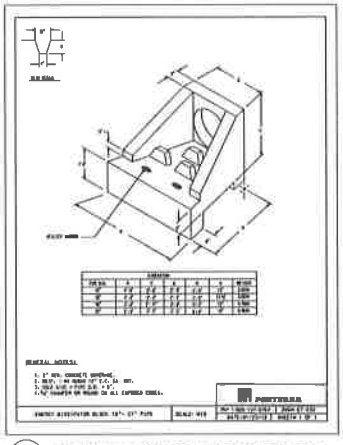
3.02 DETENTION POND 1 OUTLET STRUCTURE
NO SCALE



3.03 DETENTION POND 2 OUTLET STRUCTURE
NO SCALE



3.04 TYPE 42 DROP INLET
NO SCALE

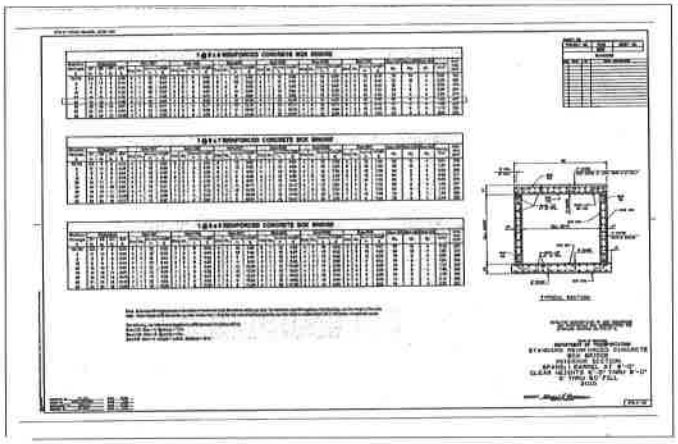


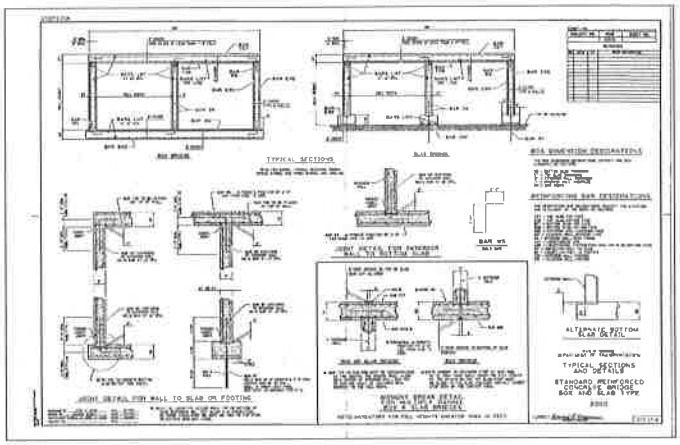
3.05 HEADWALL WITH ENERGY DISSIPATOR
NO SCALE

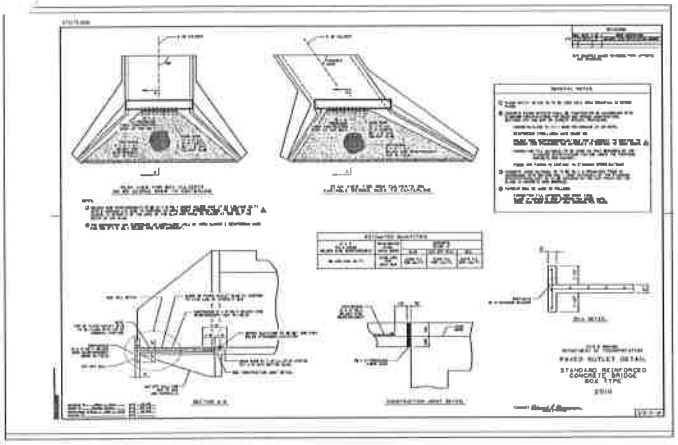
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE

SITE DETAILS
C-900

L.L. Smith and Associates, Inc.
Civil Engineering Consultants
302 Inverness Parkway, Suite 110, Birmingham, AL 35242 (205) 991-9910 www.llsmith.com







EMERGENCY SPILLWAY

NO SCALE

COMMUNITY DEVELOPMENT ENTERPRISES

JACKSON SOLAR MICROGRID

ROOSEVELT PARKWAY

JACKSON, MADISON COUNTY, TENNESSEE

SITE DETAILS

C-901

COMMUNITY DEVELOPMENT ENTERPRISES

JACKSON SOLAR MICROGRID

ROOSEVELT PARKWAY

JACKSON, MADISON COUNTY, TENNESSEE

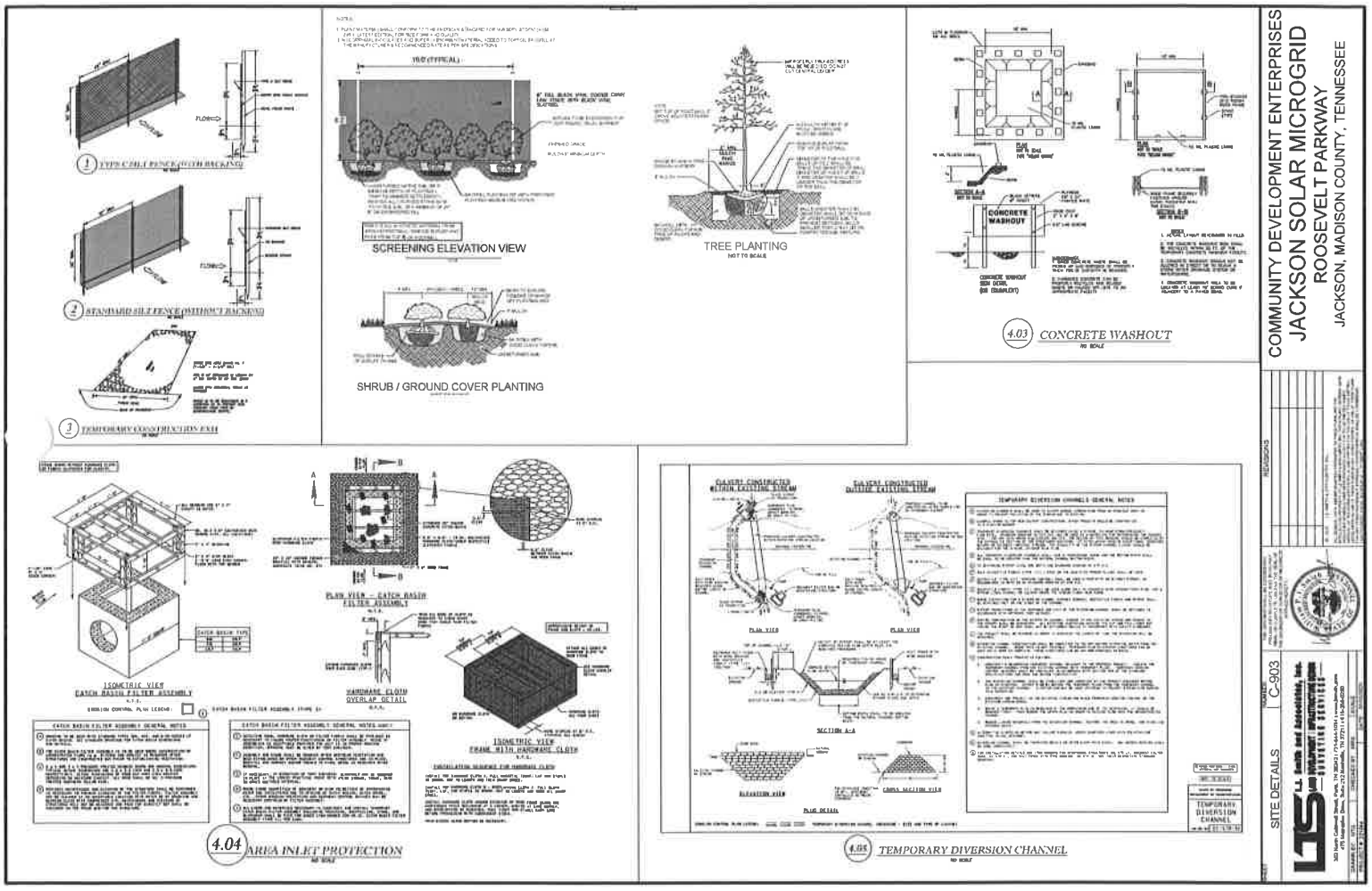
REVISIONS

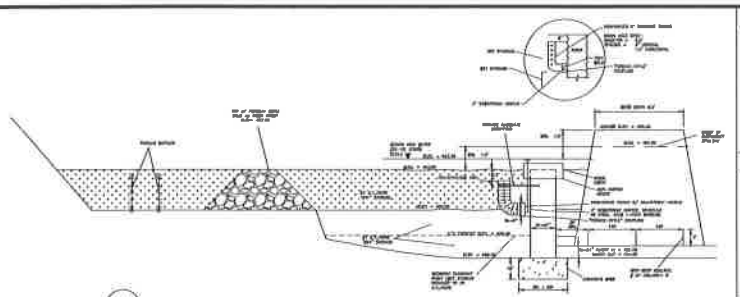
SHEET C-902

SITE DETAILS

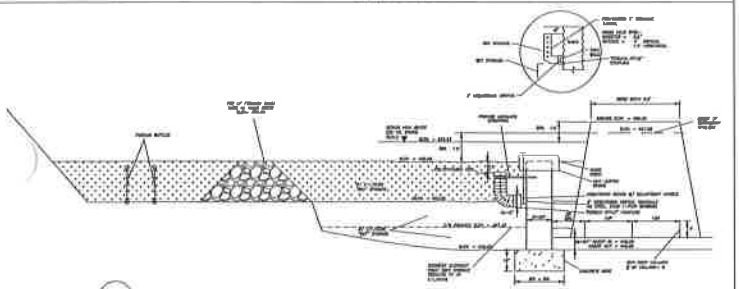
L & S Smith and Associates, Inc.

DESIGNED BY: MTG | CHECKED BY: RPS | DRAWN BY: RDAS | DATE: 4/20/2021

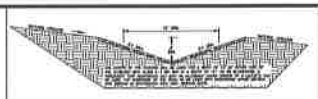

TYPE I CHAIN LINK FENCE WITH FILTER FABRIC BACKING
STANDARD SILT FENCE WITHOUT BACKING
TEMPORARY CONSTRUCTION EXIT
SCREENING ELEVATION VIEW
SHRUB / GROUND COVER PLANTING
TREE PLANTING
NOT TO SCALE
CONCRETE WASHOUT
CONCRETE WASHOUT SIGN DETAIL
4.03 CONCRETE WASHOUT
NO SCALE
ISOMETRIC VIEW
CATCH BASIN FILTER ASSEMBLY
PLAN VIEW - CATCH BASIN FILTER ASSEMBLY
HARDWARE CLOTH OVERLAP DETAIL
ISOMETRIC VIEW
FRAME WITH HARDWARE CLOTH
4.04 AREA INLET PROTECTION
NO SCALE
PLAN VIEW
SECTION A-A
ELEVATION VIEW
CROSS SECTION VIEW
PLAN DETAIL
TEMPORARY DIVERSION CHANNEL
4.05 TEMPORARY DIVERSION CHANNEL
NO SCALE
COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE
REVISIONS
SITE DETAILS
C-903



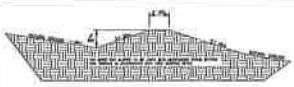
4.06 SEDIMENT BASIN 1 (OUTFALL 8) CROSS SECTION & DEWATERING APPARATUS WITH DRAWDOWN DEVICE
NOT TO SCALE



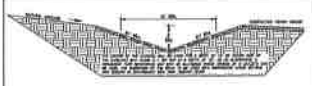
4.07 SEDIMENT BASIN 2 (OUTFALL 10) CROSS SECTION & DEWATERING APPARATUS WITH DRAWDOWN DEVICE
NOT TO SCALE



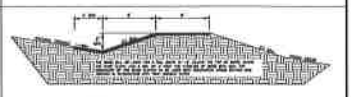
4.08 TEMPORARY DIVERSION DITCH



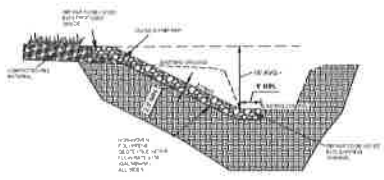
4.10 DIVERSION BERM



4.09 PERMANENT DIVERSION DITCH



4.11 CONTAINMENT BERM



4.12 RIP RAP REVETMENT-BANK STABILIZATION

COMMUNITY DEVELOPMENT ENTERPRISES
JACKSON SOLAR MICROGRID
ROOSEVELT PARKWAY
JACKSON, MADISON COUNTY, TENNESSEE

REVISIONS

SITE DETAILS

C-904

LS Smith and Associates, Inc.

EXHIBIT 13

SynEnergy

Economic Impact of the

Jackson Solar Facility

Economic Impact is the sum of the value of all goods & services produced in a region

- Gross Regional Product (GRP) – the local equivalent to GDP
- Only includes goods & services produced in Madison County and Jackson, and does not include the value of goods and services imported from outside the County
    - For example, you buy a TV at the local Walmart
        - The service provided by the stockers, cashiers & managers are all counted as *local* production and their contribution to Economic Impact is measured by their compensation
        - And the wages that those employees spend *locally* are also counted towards Economic Impact
        - The TV itself, and the transportation to get it here, are imported goods & services and are not counted in GRP

- The construction of the Jackson Solar Facility will add ***$100 million*** to the county economy in 2021, and at peak employment will create an additional ***678 jobs***
    - $67 million will be invested in the construction of the system.
    - An additional $33 million in economic benefit will occur from secondary effects such as local purchase of tools and materials, equipment rentals, food and lodging – and additional employee wages for firms providing those goods and services.
- After the construction is complete, the power generation and shared supplemental energy will provide for ***8 permanent jobs*** and ***$6.8 million*** of value annually
- Reinvestment of customer energy savings into production capacity would result in creation of an additional **$5.4 million** economic impact and **14 permanent jobs**
- Assuming an annual growth rate of 4% in economic impact, the construction and operation of the Jackson Solar Facility would result in **a total economic impact of $229M, as well as 678 temporary and 28 permanent jobs**

Tax revenues & expenditures

	Construction (2021)	10 yr Total
City Tax Revenue	**$ 316,000**	**$ 513,000**
County Tax Revenue	**$ 775,000**	**$ 1,251,000**
State Tax Revenue	**$ 1,955,000**	**$ 3,190,000**
Federal Tax Revenue	**$ 7,732,000**	**$11,473,000**
Total taxes (Fed+S&L)	**$10,778,000**	**$16,426,000**

Study Background Sheet

IMPLAN® is nationally recognized as the leading standard for economic impact analysis software

- Developed by the University of Minnesota in 1978 and refined through the years
- Customers include a wide range of federal agencies & departments and academia
  - Departments of Defense, Agriculture, Commerce, Coast Guard, Forestry
  - University of Minnesota, Purdue, Arizona State, Clemson
- Data sets sourced from
  - Bureau of Labor Statistics
  - Bureau of Economic Analysis
  - Census Bureau
  - Department of Agriculture
- Impacts on 528 different business sectors are measured

Data set for this study is specific to Madison County (2018 – latest available federal data)

- Accounts for commuting patterns
- Uses Madison County-specific industries and labor base
- Madison County resident spending patterns

The following types of outputs are included

- Direct Effect – construction and operations
- Indirect Effect – Local business-business by goods or services vendors supporting the construction and operations (wholesalers, retailers, architects, realtors, accountants, etc). Only Madison County produced goods & services count towards the economic impact
- Induced Effect – Result of increased local wages, whether from Direct or Indirect Effects

Modeling assumptions

- Tax rates are based on FY20 rates
- Employment is measured in terms of full-time equivalents (FTEs)

Electronically Filed in TPUC Docket Room on May 24, 2021 at 11:51 a.m.

BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION
NASHVILLE, TENNESSEE

IN RE: THE APPLICATION OF JACKSON SUSTAINABILITY COOPERATIVE FOR A DETERMINATION OF EXEMPTION AND IN THE ALTERNATIVE, FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY	))))))	DOCKET NO. **21-00061**

DIRECT TESTIMONY OF DENNIS EMBERLING

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND TELEPHONE NUMBER.

A. Dennis Emberling
1100 Whitehall Street
Jackson, TN 38301
Phone: (731) 240-5001
Email: de@comdevent.com

Q. WHAT IS YOUR POSITION AND WHAT ARE YOUR RESPONSIBILITIES AT JACKSON SUSTAINABILITY COOPERATIVE ("JSC")?

A. President. I am responsible for overseeing and qualifying members to receive supplemental energy from renewable sources that JSC shares among its members. The members are a small group of manufacturers and commercial operators in an underserved area of Jackson, Tennessee. As the solar facility nears operation, I am responsible for making sure JSC has the administrative operations to run the cooperative.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I am an internationally-known, senior management consultant, with forty years of experience advising senior management of companies of all sizes, from startups to Fortune 100. My Bachelor's degree is in pure mathematics, from Reed College. For six years, I studied graduate-level and post-graduate-level classes in business, management theory and practice, organizational development, general systems theory, information theory, cybernetics, cognitive science, communication theory and practice, mediation and negotiation strategy, and finance. I was personally mentored for five years by Hugh MacLean, PhD., one of the country's leading pioneers in management science and related fields. My contributions to these fields have included over 4,000 pages of websites, articles, and teaching materials. This work is in use all over the world, including the

United Nations Development Program. I am also also an authority on distributed solar, having consulted for solar companies in California for seven years. I am a member of the California Intergovernmental Task Force on Consumer Protection and regularly advise the California Public Utility Commission. I have managed companies and have decades of experience in all aspects of business finance, tax, investing, and accounting.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony in this proceeding is to support JSC's Application for a determination of exemption under Tennessee law when constructing and operating a Solar Facility and Battery Storage in Madison County, Tennessee that offers supplemental energy from renewable sources to its members. If JSC is not exempt, then my testimony is to support a request for a Certificate of Public Convenience and Necessity to construct and operate this Solar Facility for shared supplemental energy.

Q. WERE YOU INVOLVED IN PREPARING JSC'S APPLICATION IN THIS DOCKET?

A. Yes.

Q. WHAT AUTHORITY IS JSC SEEKING FROM THE TRA?

A. JSC is requesting a prospective determination that it is exempt from regulation as a non-profit cooperative formed under the Electric G&T Cooperative Act. Alternatively, JSC is requesting approval to build and operate a solar facility and battery storage in Jackson, Tennessee.

Q. PLEASE DESCRIBE THE JACKSON SOLAR PROJECT.

A. As detailed in the JSC application, the Jackson Solar Project will make solar energy available in areas where it is presently uneconomical. The Jackson Solar Project has received an award from the U. S. Department of Energy's National Community Solar Partnership for innovation and contribution to making solar available in areas of the country where it is presently uneconomical. The Jackson Solar Project has strong support from the Jackson community and its businesses.

The Jackson Solar Project consists of solar panels mounted on fixed mounts (no movable trackers), inverters, batteries, system controller, and all associated electric equipment installed on 34.2 acres of land in Jackson, Tennessee, plus underground wiring to several commercial facilities within 3.5 miles of the solar site. The site is parcel IDs 057 065 10400 000 2020 (28.54 acres) and 057 065 10300 000 2020 (5.2 acres).

Approximately 33,347 SunPower A-450-COM solar panels rated for approximately 16 MW of power will supply approximately 25 GWh/yr. of electricity through SMA

Highpower string inverters, with Kore Power lithium battery storage of approximately 46 MWh. Northern Reliability, Inc., the nation's oldest developer of controller hardware and software (having built over 1,000 systems) is the prime contractor, and will design and build the controller hardware and software (including transformers and all supporting and safety electrical equipment on the site) for the Jackson Solar Project, install the system, and oversee, test, and commission the connections to the members of JSC. Smart electric meters will be installed at each customer's site. Energy from the Solar Facility will flow to these smart meters and to the electrical circuits in the buildings of the Members. The controller technology intelligently allocates power to and from the batteries and to members, taking all factors into account to optimize power delivery.

The smart meters will be completely isolated ("islanded") from the existing Jackson Electric Authority ("JEA") meters, which will remain in place and remain connected to JEA's grid. Members will draw power seamlessly from both JEA and JSC's controller, but no power will ever be able to backflow onto JEA's grid. When demand is average or below, members will primarily use electricity from JEA, as they do now. When demand rises, members will draw the extra electricity needed from the Solar Facility. When a JEA grid outage occurs, customers will draw all their electricity from the Solar Facility for short periods of time and/or for priority usage until grid power is restored.

The entire Solar Facility will be storm hardened and able to withstand severe storms without losing power. The solar panels are rated for high winds and will be mounted in racks rated to withstand hurricanes. The batteries will be housed in storm-hardened enclosures. All wiring on and off site will be underground. This ensures the capability of providing uninterruptible power during storms. (Jackson experiences these frequently, including two direct hits from tornadoes in 2020 alone.)

The Solar Facility is expected to cost approximately $67M. It will have at least a 30-year life, because it uses the highest quality equipment, run conservatively so as to extend lifespans. Operations and maintenance will be handled by Northern Reliability, Inc. All equipment, construction, and installation costs will be borne by Community Development Enterprises - Jackson I ("CDE"), who will lease the equipment to JSC. The members will have little expense. Members will pay a lower rate to JSCfor their peak demand usage than JEA's scheduled peak-demand charges.

All environmental approvals have either been received or have been applied for. All civil engineering designs and documents have been submitted to the Jackson Planning Department and have received staff recommendation for approval. The Solar Facility is exempt from regulation under PURPA from FERC, NERC, and SERC because it does not connect to the public utility grid.

The project is financed by CDE's private-equity investment because it is eligible for the Investment Tax Credit, New Markets Tax Credit, and accelerated MACRS depreciation.

Q. HOW DOES THE JACKSON SOLAR PROJECT FIT WITH THE COMPANY'S COMMITMENT AND THE COMMUNITY REDEVELOPMENT AGENCY IN THE CITY OF JACKSON?

A. The Community Redevelopment Agency ("CRA") works with communities in Jackson to address blight and to provide affordable housing. CRA works with business owners and other community stakeholders to determine community priorities and potential projects. The Jackson Solar Project is a community priority. The Jackson Solar Project is a collaborative energy innovation project for the Jackson area along Roosevelt Parkway. One goal of JSC is to partner with the local community and elected leaders to help transition Jackson to a cleaner, smarter and more reliable energy future. JSC is committed to this partnership to promote the efficient use of energy in Madison County, Tennessee. The Jackson Solar Project represents a deliberate investment in shared renewable energy resources, and increased access to new and existing demand-side management and energy efficiency programs in Jackson. The Jackson Solar Project meets a portion of this commitment. JSC is evaluating additional solar and storage sites in Tennessee and will make appropriate filings with the Commission for approval once it has made a decision on those projects. Along with furthering its commitment to site solar and storage technologies in West Tennessee, JSC intends for the Jackson Solar Project to support the goals and objectives of the CRA.

Q. PLEASE DISCUSS THE NEED FOR THE JACKSON SOLAR PROJECT.

A. Members of JSC need a Solar Facility for many reasons. First, for environmental benefits: to reduce carbon emissions and clean the air and water. Many companies have publicly announced goals and policies for moving to clean energy in the future. The Solar Facility helps members of JSC do just that, without incurring any capital costs. Further, it is likely that new regulations and penalties for carbon emissions are coming, so the Solar Facility will help companies avoid these penalties.

Second, to provide uninterruptible power during grid outages without resorting to individually-owned diesel backup generators, which pollute, are hazardous, and canot supply enough electricity to meet commercial needs during outages. Jackson is regularly hit with severe storms that cause outages, including two tornadoes in 2020 alone. Outages are very expensive for manufacturers. They can damage machinery and often force manufacturers to lose production and send workers home during the outage, only calling them back to execute an extended restart protocol when power is restored. The Solar Facility increases energy security and resilience for all its users.

Third, to lower peak-demand charges and thus overall electricity costs. Peak demand is very expensive for commercial customers, as well as for JEA and TVA. Even if demand spikes are brief, TVA must have massive reserve power generation on standby to meet it (with a 20% cushion on top of the peak). This is very expensive for TVA, who must pass

the cost on to JEA, who must pass the cost onto the customers in the form of peak demand charges. For the commercial customers JSC can serve, these demand charges represent approximately 44% to 66% of their annual electricity bills. By helping JEA meet these peak demands, the Solar Facility reduces costs to its customers and lowers JEA's charges from TVA. For example, JEA maintains a total capacity of 570 MW to meet a maximum demand in any one hour of 381 MW (354,549 in 2020). If the six heavy commercial users near JSC's site receive their peak power from the Solar Facility, that would reduce JEA's overall peak demand by 12.9% for 2020.

Fourth, meeting peak demand for power is also stressful on all utility equipment and power lines. Reducing this demand lengthens the life and reduces repair costs for the utilities. The Solar Facility also saves JEA the capital costs of installing backup batteries themselves, thereby allowing them to lower their rates.

Fifth, lower electricity costs will allow businesses in Jackson to expand. The availability of lower-cost, clean, solar energy will put Jackson on the map as a forward-looking city moving towards a cleaner environment, attracting new businesses to the area. Jackson is an economically distressed community that needs more job opportunities. This project will provide 511 full-time-equivalent jobs in 2020 and 22 permanent jobs, rising to 28 over the first ten years of operation.

Sixth, planning for unknown future electricity rate increases is difficult for businesses. JSC's rates will not rise in real dollars, which hopefully, will help members of JSC to better control their electricity costs over the next thirty years.

Seventh, the Solar Facility provides higher quality power than the utility grid, which regularly suffers from brownouts, voltage fluctuations, and unstable frequency of current. The electricity from the Solar Facility is tightly regulated, providing steady, high-quality power that improves the reliability and extends the life of machinery.

Eighth, it is very uneconomical for businesses to acquire their own renewable energy generation, because of the lack of state incentives, high cost for small systems and batteries, lack of attractive financing, inadequate roof or ground space at their site, costs of operation and maintenance, need to upgrade equipment from time to time, and lack of utility net-metering programs (which allow customers to sell back excess electricity generated during peak hours to the utility for a credit). As a result, there is little renewable energy in Jackson, and it is likely to remain that way without help. The Solar Facility solves many of those problems by taking advantage of lower costs due to economies of scale, tax incentives, and financing not available to most businesses.

Q. PLEASE DISCUSS THE ENVIRONMENTAL ATTRIBUTES OF THE PROJECT.

A. Operation of the Facility will have no emissions or pollutants, and the generation source

of the solar power will be 100% renewable. In addition, the Facility will be designed in accordance with State of Tennessee environmental requirements with regard to materials.

Q. TO YOUR KNOWLEDGE, HAS JSC FILED AND PROVIDED ALL INFORMATION AND OBTAINED ALL FEDERAL AND STATE LICENSES, PERMITS, AND EXEMPTIONS REQUIRED FOR CONSTRUCTION AND OPERATION OF THE PROPOSED GENERATION FACILITY?

A. Yes. I believe that the Application provides all information required under federal and state law and the Commission's rules. The Facility is expected to be fully permitted prior to construction. A complete list of all required federal, state and local approvals and their status is in the Application for Exemption.

Q. WHAT IS THE PROJECTED COST OF THE JACKSON SOLAR PROJECT?

A. The current engineering cost estimate for the Jackson Solar Project development is approximately $67M. The estimate includes Engineering Procurement & Construction ("EPC"), major equipment, labor, and associated permitting and development costs. Any tax credits and accelerated depreciation benefits will offset project costs for the benefit of the members of JSC.

Q. WHAT IS THE ESTIMATED CONSTRUCTION SCHEDULE FOR THE PROJECT?

A. If Commission approval were to be obtained, the notice to proceed is expected to be issued in May 2021, with site mobilization to begin as early as July 2021, with final commissioning by February of March of 2022.

Q. IN CONCLUSION, WHY IS JSC REQUESTING APPROVAL TO CONSTRUCT THE JACKSON SOLAR PROJECT?

A. The Jackson Solar Project is an innovative modernization solution for shared renewable energy. Moreover, it will enhance reliability to its members in the City of Jackson. The existing JEA grid incurs long duration outage events due to its location and is expected to require high-cost equipment upgrades in the future. Investing approximately $67M in the Facility, as an alternative to traditional utility upgrades to meet capacity requirements for peak demand, JSC will leverage local renewable generation and storage, improving reliability of service to its members who are primarily served by JEA. The project is also one of many deployments and initiatives designed to meet the shared goals of the members of JSC to invest in smart, clean energy projects in Tennessee. Finally, this project presents a unique opportunity for JSC to collaborate with community stakeholders on an innovative solution and reflects the community commitment to proactively support their energy-related goals and objectives. We are pleased with the strong local support for the Jackson Solar Project and look forward to bringing it online

for the benefit of the members of JSC and the Jackson community.

Q. ARE ALL STATEMENTS IN JSC'S APPLICATION TRUE AND CORRECT TO THE BEST OF YOUR KNOWLEDGE, INFORMATION, AND BELIEF?

A. Yes.

Q. DOES JSC HAVE ADEQUATE ACCESS TO THE CAPITAL NECESSARY TO PROVIDE SERVICE IN TENNESSEE?

A. Yes, JSC will lease the equipment and obtain start up capital from CDE. CDE has access to the financing necessary to fulfill any obligations it may undertake with respect to the operation and maintenance of the services specified in the Application.

Q. IF AUTHORIZED TO PROVIDE SUPPLEMENTAL ELECTRIC POWER SERVICES, WILL JSC ABIDE BY THE RULES, STATUTES, REGULATIONS, POLICIES, AND ORDERS OF THE COMMISSION, AND THE LAWS OF TENNESSEE, IN ITS PROVISION OF SERVICES, INCLUDING THOSE FOR DISCONNECTION AND RECONNECTION OF SERVICE?

A. Yes.

Q. PLEASE DESCRIBE THE PUBLIC INTEREST BENEFITS ASSOCIATED WITH JSC'S PROPOSED OFFERING OF SUPPLEMENTAL ELECTRIC POWER SERVICES IN JACKSON TENNESSEE?

A. Many environmental benefits, including reducing carbon emissions from power production, replacing fossil-fuel backup generators, and encouraging additional development of renewable energy projects. Many developmental benefit to Jackson for its economic redevelopment, including developing its reputation as a leader in green energy, a home for companies that have green-energy goals they must meet, $212M in economic impact over ten years, $14M in new tax receipts, 511 additional full-time-equivalent jobs in 2021, many additional jobs in the future, spurring expansion of existing businesses in Jackson, and attracting additional new businesses to Jackson. JSC will provide training, internships, and educational programs in the renewable energy field to Jackson's high school and colleges at its own cost. JSC will contribute to the improvement and redevelopment of Jackson's infrastructure. JSC's partners and members will contribute various programs to Jackson's community in the areas of job training and community building. The increasing availability of uninterruptible power will benefit first responders and improve safety in Jackson. Members who share supplemental energy from the Solar Facility will be able to afford to switch a major portion of their electricity usage to renewables without incurring any capital costs, while reducing their total electricity costs. They will be assured of future stable electricity pricing, enabling them to

plan with confidence and expand their businesses.

Q. HAS ANY STATE EVER DENIED OR REVOKED THE CERTIFICATION OF JSC OR ONE OF ITS AFFILIATES?

A. No.

Q. HAS JSC OR ONE OF ITS AFFILIATES EVER BEEN INVESTIGATED OR SANCTION BY ANY REGULATORY AUTHORITY FOR SERVICE OR BILLING IRREGULARITIES?

A. No.

Q. WHO IS KNOWLEDGEABLE ABOUT JSC'S OPERATIONS AND WILL SERVE AS JSC'S REGULATORY AND CUSTOMER SERVICE CONTACT?

A. Mr. Dennis Emberling is knowledgeable about its operations and will serve as CDE'S Regulatory and customer service contact.

Q. PLEASE EXPLAIN IN DETAIL JSC'S PROPOSED PROCEDURES FOR RESPONDING TO INFORMATION REQUESTS FROM THE TRA AND ITS STAFF.

A. All requests should be routed to Dennis Emberling, via email or telephone with a copy to counsel.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

I swear that the foregoing testimony is true and correct to the best of my knowledge.

Dennis Emberling

Dennis Emberling, President

Respectfully submitted this 18th day of May, 2021.

STATE OF TENNESSEE)
)
COUNTY OF DAVIDSON)

Subscribed and sworn to me a Notary Public, in his capacity as President of JSC this this 18th of May, 2021.

Brandee Perrin
Notary Public

BRANDEE PERRIN
STATE OF TENNESSEE NOTARY PUBLIC
DAVIDSON COUNTY

Commission Expires: 9th July 2024

RECEIVED
JUL 13 2021
TN PUBLIC UTILITY COMMISSION
DOCKET OFFICE

BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION
NASHVILLE, TENNESSEE

IN RE: THE APPLICATION OF JACKSON SUSTAINABILITY COOPERATIVE FOR A DETERMINATION OF EXEMPTION AND IN THE ALTERNATIVE, FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY	))))))	**DOCKET NO. 21-00061**

RESPONSE BY JACKSON SUSTAINABILITY COOPERATIVE TO THE FILED STATEMENTS

COMES NOW, Jackson Sustainability Cooperative ("Jackson Sustainability Cooperative" or "Applicant"), and responds to the Statement of Jackson Energy Authority ("JEA") and the Statement of Tennessee Valley Authority ("TVA") filed in response to the Petition filed by Jackson Sustainability Cooperative in support of its request to the Tennessee Utility Commission (the "Commission") to declare the legal rights, duties, or privileges of Jackson Sustainability Cooperative to operate a solar facility with battery-energy storage and shared interconnection (the "Solar Facility") so that a small group of local manufacturing and commercial users, its members, can acquire clean, renewable, stable, supplemental electricity. Even though JEA and TVA will remain the primary source of electric energy to this small group of local users, JEA and TVA oppose the Applicant and the Solar Facility. This response will address the issues JEA and TVA presented and summarize the issues for resolution in a contested case hearing.

I. JACKSON SUSTAINABILITY COOPERATIVE HAS STANDING TO REQUEST EXEMPTION FROM REGULATION AS A PUBLIC UTILITY UNDER T.C.A. 65-4-101(6)(A)(v).

Under Tennessee law, any person may petition the Tennessee Public Utility Commission

for a declaratory ruling on the applicability of any statement of facts that are within the jurisdiction of the Commission to hear utility related issues. (T.C.A. §65-2-104; 1220-01-02-.05(1) and (2)) TVA seeks to limit the jurisdiction of the Commission by asserting that Jackson Sustainability Cooperative lacks standing to seek a declaratory ruling. Specifically, TVA asserts that Jackson Sustainability Cooperative does not have a legal interest that can be determined under T.C.A. 4-5-223(a). (TVA Stmt., p. 2) The statute for declaratory rulings is very broad. It provides that "[a]ny affected person may petition ... for a declaratory order as to the validity or applicability of a statute." T.C.A. 4-5-223. The requested ruling is for a declaration that the Applicant's project is not a public utility. If not a public utility, the Commission may not have jurisdiction over the ongoing operation and rate structure of the Solar Facility which provides supplemental renewable energy.

Jackson Sustainability Cooperative requested that the Commission look at its proposed Solar Facility under T.C.A. 65-4-101(6)(A)(v)[1] and determine that it is not a public utility subject to regulation. (Pet. p.1) The statute the Applicant seeks to construe is stated as follows:

> "Public utility" means every ... [enterprise] ... that own, operate, manage or control, within the state, any ... power ... services, or any other like system, plant or equipment, affected by and dedicated to the public use, under privileges, franchises, licenses, or agreements, granted by the state or by any political subdivision thereof.
> T.C.A. 65-4-101(6)(A)

> "Public utility" as defined in this section shall not be construed to include ... [a]ny ... cooperative corporation not organized or doing business for profit. For purposes of this subdivision (6)(A)(v), "cooperative" shall mean only those nonprofit cooperative entities organized under or otherwise subject to the Rural Electric and Community Services Cooperative Act, compiled in chapter 25, part 2 of this title [65].
> T.C.A. 65-4-101(6)(A)(v)

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[1] The Petition incorrectly cites the statute as T.C.A. 65-4-101(6)(E) when the correct citation is T.C.A. 65-4-101(6)(A)(v).

In short, Jackson Sustainability Cooperative requests a declaratory ruling that it is not a "public utility" because it is a non-profit cooperative. This statutory exception in the definition Section of Title 65 is affirmed by T.C.A. §65-25-123, which provides as follows:

> Cooperatives ... transacting business in this state pursuant to this chapter shall be deemed to be not-for-profit cooperatives and nonutilities, and, except as provided in § 65-25-122, **exempt in all respects from the jurisdiction and control of the Tennessee public utility commission.**
> T.C.A. §65-25-123(emphasis added)

TVA argues that this statute removes jurisdiction from the Commission preventing it from making a finding that the Applicant's proposed solar facility is not a public utility. (TVA Stmt., p. 2,3) The Commission has jurisdiction over utility related issues. TVA confuses the judicial principles of standing and jurisdiction. TVA seeks to limit the jurisdiction of the Commission by not allowing a solar facility owner to seek a declaratory ruling that it is not a "public utility."

In support of its position TVA cites the case of Calfee v. TDOT, No. M2016-01902-COA-R3-CV, 2017 WL 2954687 (Tenn. App. 2017). In Calfee, on its second request, the Tennessee Department of Transportation gave the local Industrial Development Board permission to run two water lines along the highway to the Nolichucky River for the private benefit of US Nitrogen, a local chemical producer. TDOT originally denied the request because the proposed pipelines did not benefit the community. Several farmers who adjoined the highway filed an intervening petition with TDOT. It was deemed denied because it was not set for hearing in 60 days. The land owners filed in Chancery Court as affected persons seeking a declaratory ruling. TDOT sought to dismiss the complaint in Chancery Court on the basis the farmers did not have standing. The Court of Appeals denied TDOT's motion because the land owners had a stake in the outcome, stating as follows:

> Standing is a judge-made doctrine that is used to refuse to determine the merits of a legal controversy irrespective of its correctness where the party advancing it is not properly situated to prosecute the action. Knierim v. Leatherwood, 542 S.W.2d 806, 808 (Tenn. 1976). It requires us to determine "`whether a party has a sufficiently personal stake in a matter'" to warrant judicial resolution of the dispute. Metro. Gov't of Nashville v. Bd. of Zoning Appeals of Nashville, 477 S.W.3d 750, 755 (Tenn. 2015)(Id. at *18)

The Court of Appeals found that the six land owners had standing to challenge TDOT issuing the permit for the water lines. The land owners had "alleged distinct and palpable injuries fairly traceable to the permit" for water lines for which there was a likely remedy. (Id. at *36) The Court of Appeals further explained that the land owners are "affected persons within the meaning of the Uniform Administrative Procedures Act" and have standing to pursue this action for a declaratory ruling. (Id. at *36)

In the case at hand, Jackson Sustainability Cooperative is properly situated to prosecute its Petition because it is advancing the construction of a solar facility that will be shared among a small group of members who desire to use supplemental energy from renewable sources for their business. The Commission, as a regulator, has jurisdiction over utilities, and if the applicant is exempt, as in this case, will decline jurisdiction over future operation of the Solar Facility. On the other hand, since JEA is not a member of Jackson Sustainability Cooperative, it lacks standing to challenge the validity of the Applicant's board members and purposes clauses under its bylaws.

II. TVA AND JEA HAVE SELECTIVELY QUOTED PORTIONS OF THE G&T COOPERATIVE ACT, WHICH IS NOT THE STATUTE UNDER WHICH THE APPLICANT SEEKS A DECLARATORY RULING.

Jackson Sustainability Cooperative seeks a ruling that it is not a regulated "public utility" under the statutory scheme. The Petition requesting a declaratory ruling is further supported by

those supplemental Exhibits described as follows:

Exhibit 15	Charter Amendment
Exhibit 16	Amendment to Bylaws of Jackson Sustainability Cooperative
Exhibit 17	State of Tennessee Office of the Attorney General, April 10, 2017, Opinion No. 17-25, Sale of Electricity by a Solar Electricity Generating Facility

JEA argues that the Applicant's proposed Solar Facility is expressly prohibited by statute. JEA and TVA selectively cite part of the restriction under Section 118 of the Electric G&T Cooperative Act without mentioning the exception. (Electric G&T Cooperative Act is T.C.A. 48-69-101 et seq.) JEA and TVA rely on the retail restriction under Section 118(a) of the G&T Act. However, they fail to look at the exception that applies to Jackson Sustainability Cooperative, as follows:

> (b) No G&T cooperative shall provide telephony, cable television, video programming, Internet access or other telecommunications services to retail customers in the TVA area; **provided, however, that nothing *in this section* shall preclude or prevent a G&T cooperative from owning, leasing, operating and maintaining equipment or facilities for its own purposes or for the purpose of enabling one (1) or more members to provide or utilize advance metering infrastructure, load control, appliance monitoring, power exchange, billing, electric services or functions or any other similar or component service now or hereafter developed in connection with the provision of electricity to end-use customers.**

Tenn. Code Ann. § 48-69-118(b)(emphasis added)

The proposed Solar Facility provides supplemental electric service to its members through advanced metering, load control, and equipment monitoring, as part of the components of providing efficient, quality, supplemental electric service. The municipal provider is not replaced. The exception offered under 118(b) states that nothing "in this section" prevents these component services. Jackson Sustainability Cooperative avers that quality supplemental solar energy is a "component service" that is consistent with the legislative purpose of developing renewable, clean

generation sources of electricity. (see T.C.A. § 48-69-102(a))

There is no dispute that the Applicant considered pursuing a request for exemption under T.C.A. § 48-69-119 (exemption from the jurisdiction of the Commission). After careful consideration, the Applicant requested that the Commission issue a declaratory ruling that its proposed Solar Facility is not a public utility subject to regulation because the Applicant is a nonprofit cooperative entity subject to the Rural Electric and Community Services Cooperative Act found in title 65, chapter 25. (Pet. p. 1) No paragraph or section in the actual Petition before the Commission seeks a ruling under T.C.A. § 48-69-119.[2]

The Charter (Exhibit 1) and the Bylaws (Exhibit 2) referenced the Electric G&T Cooperative Act. The Charter and Bylaws were amended so that they are consistent with the request in the Petition. (Exhibits 15 and 16, attached)

III. BY PROVIDING SUPPLEMENTAL RENEWABLE POWER TO A FEW MANUFACTURERS, JACKSON SUSTAINABILITY COOPERATIVE DOES NOT INFRINGE ON THE STATUTORY TERRITORY OF JEA.

The Applicant's Solar Facility project proposes to directly connect nearby members who are end-users to the solar power generation with control systems that prevent any power from the project from entering the municipal distribution by JEA or the wholesale distribution transmission systems from TVA. In Tennessee, almost all electric power in the state is generated and supplied by TVA to municipal utilities like JEA who have contracts with TVA. Municipal utilities who want to increase the amount of renewable energy in their electric power supply are often

[2] Note that the cover letter does reference Section 119, but not the body of the Petition as filed with the Commission.

contractually prohibited from doing so by TVA. TVA operates only a limited amount of wind and solar generation, mostly through power purchase agreements with independent power producers. TVA currently has no programs to support distributed renewable generation.

The Applicant's solar project under consideration operates within a complex set of federal and state statutes defining the powers of municipal utilities and TVA. One of these laws is the Tennessee Geographic Territories Law ("GTL")(T.C.A. §65-34-101 et seq.) The GTL fixes the boundaries of municipal utility service territories and limits the ability of other parties to sell electric power in those service territories. The GTL statute was adopted in 1968 out of concern by the legislature that "duplication of electric system facilities lead to excessive consumer costs and adverse environmental and aesthetic impacts." (T.C.A. §65-34-101(1) Under the GTL, the legislature further declares that:

> (4) Maintenance of ... geographic territories ... [is] in the public interest and promotes the public health, safety and welfare;
> ...
>
> (6) It would be contrary to the public interest to permit utilities that are not consumer owned to expand service into areas already served by consumer owned municipal and cooperative electric systems, as such expansion would result in a duplication of service facilities and the loss of consumer investment in displaced facilities.

T.C.A. 65-34-101(4) and (6)

There are other statutory restrictions under the GTL for non-consumer owned electric systems. Specifically, "[n]o non-consumer owned electric system may construct, acquire, or maintain facilities, ... or other equipment used or useful for the distribution or sale of electricity outside its current geographic territory, nor may any non-consumer owned electric system provide, by sale or otherwise, electricity to any parcel of land located outside its current geographic territory. T.C.A.

§65-34-103 Another restriction gives the municipal utility "power to remove electric systems that located on land outside the non-consumer owned system's territory." T.C.A. §6-43-104

A full understanding the GTL is based on two key statutory definitions.

> (4) Non-consumer owned electric system means any public electric system **other than electric and community service cooperatives** and municipal electric systems; and
>
> (5) Public electric system includes electric and community service cooperatives, municipal electric systems, and every individual, co-partnership, association, corporation or joint stock company, their lessees, trustees or receivers, appointed by any court whatsoever, that own, operate, manage, or control any electric power system, plant, or equipment within Tennessee **affected by and dedicated to public use**.
>
> T.C.A. 65-34-102(4) and (5)(emphasis added)

The Applicant seeks a declaratory ruling that under the analysis provided by the Tennessee Attorney General under its interpretation of the application of the GTL to solar facilities that the operation of an independent renewable energy generation facility for supplemental energy that is not "dedicated to public use" does not violate the restrictions found in the GSL. (State of Tennessee Office of the Attorney General, April 10, 2017, Opinion No. 17-25, Sale of Electricity by a Solar Electricity Generating Facility)(Exhibit 17, attached)

The 2017 opinion of the Tennessee State Attorney General's office describes this situation as it applies to solar facilities as follows:

> In 1968 the Tennessee Legislature enacted a statutory scheme entitled the "Geographic Territories of Electric Utility Systems." Tenn. Code Ann. §§ 65-34-101 through 108. That legislation was designed to prevent duplication of electric system facilities because the Legislature found that such duplication results in excessive consumer costs and environmental and aesthetic problems. Tenn. Code Ann. § 65-34-101. To avoid duplication of electric system facilities and to protect consumer investment in those facilities, the Legislature deemed it in the public interest to keep in place geographic territories it had established in 1968 for electric utilities and to limit "utilities that are not consumer owned" from expanding "service into areas already served by consumer-owned municipal and cooperative electric system." Tenn. Code Ann. § 65-34-101.

To that end, the "Geographic Territories of Electric Utility Systems" statutory scheme prohibits a "non-consumer owned electric system" from constructing, acquiring, and maintaining facilities and equipment for the "distribution or sale of electricity outside its current geographic territory," and from providing, "by sale or otherwise, electricity to any parcel of land located outside its current geographic territory." Tenn. Code Ann. § 65-34-103.

If a solar electricity generating facility is a "non-consumer owned electric system" these statutory prohibitions would apply to it.

A "non-consumer owned electric system" is a "public electric system" (other than a municipal electric system or a community service cooperative). Tenn. Code Ann. § 65-34-102(4). A "public electric system" is any entity or individual that owns, operates, manages, or controls any electric power system, plant, or equipment in Tennessee "affected by and dedicated to public use." Tenn. Code Ann. § 65-34-102(5).

Question 1 assumes that a solar generating facility meets all the definitional elements of a "public electric system" save only the element that its property be "affected by and dedicated to public use." The phrase "affected by and dedicated to public use" is legal shorthand for the concept that "[a] distinguishing characteristic of a public utility is a devotion of private property by the owner to service useful to the public, which has a right to demand such service so long as it is continued with reasonable efficiency under proper charges." 73B C.J.S. Public Utilities § 1 (2016).

Whether an entity should be deemed to have dedicated its property to public use is a question that turns on the specific facts of each particular case. Just because its services are available to the public does not necessarily make the service provider a public utility. Similarly, an entity that sells all its product or services under contract to public utilities (which in turn sell that product to consumers) is not by that fact alone a public utility. On the other hand, the number of customers is not controlling; a facility is not rendered nonpublic just because a limited number of customers may have occasion to buy its services. ... See cases cited in 73B C.J.S. Public Utilities § 2 (2016).

The ultimate question is whether the utility conducts its business in a way that makes it a public concern. Put in a more concrete way, the question is whether the utility holds itself out (expressly or implicitly) as engaged in supplying its product or services to the public in general or to a limited portion of the public, as opposed to holding itself out as serving or prepared to serve only particular individuals. To answer this question, courts will consider the totality of the particular circumstances, including how the company actually conducts business, what the company's articles of incorporation and bylaws provide for, what its stated purpose is, whether it is providing a good or service in which the general public has an interest, whether it accepts substantially all requests for its services, how its service contracts are structured, and whether it is in actual or potential competition with other

entities that are public utilities. See cases cited in 73B C.J.S. Public Utilities § 2 (2016). See also Memphis Natural Gas Co. v. McCanless, 194 S.W.2d 476, 480 (1946) (charter conclusively authorized gas company to do business as a public utility).

***

A solar electricity generating facility that comes within the statutory definition of "public electric system" is prohibited from selling power in certain geographical territories. Tenn. Code Ann. § 65-34-102(4), § 65-34-102(5), and § 65-34-103. The question assumes that a solar generating facility meets all of the Tenn. Code Ann. § 65-34-102(5) definitional elements of a "public electric system" save only the element that its property be "affected by and dedicated to public use." Whether its property is "affected by and dedicated to public use" will depend on a variety of factors, specific to each case. The fact that it provides power "directly and exclusively to owners and/or tenants located on the same or adjacent premises" is just one of many factors to be considered but is not alone determinative of whether or not its property is affected by and dedicated to public use.

If the owner of a solar electricity generating facility is a public electric system as defined in Tenn. Code Ann. § 65-34-102(5), it would likewise be a public utility as defined in Tenn. Code Ann. § 65-4-101(6)(A) unless it were to come within one of the many statutory exceptions detailed in Tenn. Code Ann. § 65-4-101(6)(A)(i) through (B)(ii). (6)(A)

The issues stated by JEA under the GTL require a contested case hearing to resolve.(JEA Stmt., p.2, and f.n. 2) JEA states that it will attempt to use the GTL to prevent the construction or operation of a Solar Facility that is directly connected to users and selling power which does not interact with its municipal delivery system. JEA and TVA appear concerned over any project that has the potential to reduce retail and wholesale electricity demand in the JEA service territory. The evidence will show that JEA and TVA are not able to deliver quality, stable power during peak demand, and have frequent outages that result in sending employees home and lengthy restart protocols.

The Applicant's Solar Facility project falls within an exception to the prohibitions of the GTL. Jackson Sustainability Cooperative does not hold itself out to the general public. It offers

complementary services with supplemental energy from renewable sources to a small group of manufacturers and commercial users who have a demonstrated need for consistent, controlled power during peak demand. They also have a demonstrated need to minimize downtime related to weather and other failures of the grid that result in power outages.

While there is no statutory requirement that the Applicant receive any formal approval from JEA or TVA, the Applicant seeks a determination from the Commission that the project does not violate the terms of GTL. The Applicant hopes to work with JEA and TVA. For purposes of this state administrative hearing, the Applicant anticipates that JEA and TVA will argue that they have standing to enforce the GTL because they may lose revenue, and that Jackson Sustainability Cooperative is a public utility. JEA and TVA will likely advocate that the definition of the term "public utility" in the statute is broad and applies to anyone offering electric power services. However, that is only the first step in a fact intensive analysis assessing whether the statute prohibits an independent Solar Facility project from making sales of supplemental power to manufacturing and commercial users in Tennessee who remain customer of JEA. JEA and TVA will also likely aver that the statute discourages a solar project involving construction of distribution lines between the project and its end use customers because such lines duplicate the existing municipal distribution system, who will lose sales that support the capital and operational costs of the distribution system. In this case, the short and limited number of underground power lines from the Applicant's Solar Facility project do not "duplicate" the local distribution system except in a very minor way. In fact, the Applicant hopes to persuade JEA and TVA that a project of this nature positively supports and lowers costs of the local distribution system by deferring capital costs associated with demand growth, lengthening service life of system components and

reducing costs associated with meeting peak system demands. In this regard the impact of the Solar Facility project is more like that of a company that offers energy efficiency services to customers on the distribution system, than it is a competing utility stringing parallel wires to serve a wide range or large number of electric power customers. The Applicant's argument that the legislature did not intend to prevent this kind of Solar Facility project is supported by language in the GTL that creates exceptions to the general idea that duplicate distribution lines are prohibited. The prohibitions in the GTL are limited to service and equipment that, "is affected by and dedicated to the public use." The supplemental output of the Applicant's project will not be offered indiscriminately to the public. It has limited capacity, and its sales will be limited to a few off-takers with specific energy profiles. The Applicant asserts that the Commission can find the Solar Facility project is not "dedicated to the public use." As the state Attorney General's office opinion states:

> Whether its property is "affected by and dedicated to public use" will depend on a variety of factors, specific to each case. The fact that it provides power "directly and exclusively to owners and/or tenants located on the same or adjacent premises" is just one of many factors to be considered but is not alone determinative of whether or not its property is affected by and dedicated to public use. (Id.)

The application of the GTL to distributed solar generation projects is a matter of first impression in Tennessee. Currently, there are no cases in Tennessee where a municipal utility uses the GTL to suppress a solar project. In this case the Solar Facility provides a zero-carbon solar project that benefits employers in a minority community. The Applicant would like to see JEA and TVA agree that a community solar project does not violate their supply agreement so that JEA is free to adopt a community solar policy, a policy similar to statutes adopted by many other states.

CONCLUSION

The Petition, intervening Petitions, and Statements of JEA and TVA have placed the following issues before the Commission:

1. Whether Jackson Sustainability Cooperative has standing because it has a personal stake in obtaining a declaratory ruling from the Commission.

2. Whether Jackson Sustainability Cooperative's Solar Facility project is a "public utility."

3. Whether Jackson Sustainability Cooperative has sufficiently limited the scope and services of its Solar Facility so that it is not "dedicated to public use."

4. Whether the Commission has jurisdiction over the continued operation of the proposed Solar Facility which provides supplemental renewable energy to a few manufacturing and commercial members in the form of a non-profit cooperative.

5. Whether the operation of an independent renewable energy generation facility for supplemental energy violates the restrictions found in the Geographic Territories of Electric Utility Systems statutes, Tenn. Code Ann. §§ 65-34-101 through 108.

Jackson Sustainability Cooperative respectfully requests the Commission to hear these issues.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing has been served via U.S. Mail, postage prepaid, and by email to the following this 13th day of July, 2021.

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John A. Beam, III

EXHIBIT 15

ARTICLES OF AMENDMENT TO THE CHARTER

OF

JACKSON SUSTAINABILITY COOPERATIVE

Pursuant to the provisions of T.C.A. § 48-60-101, JACKSON SUSTAINABILITY COOPERATIVE hereby amends it s charter to delete a provision not required in the charter and to add a provision that is permitted in the charter. The Board of Directors of the corporation adopted the following articles of amendment to its charter as permitted under T.C.A. §48-60-102 and in compliance with T.C.A. §48-60-105:

1. The name of the corporation is JACKSON SUSTAINABILITY COOPERATIVE.

2. Section 2, subparagraph (m) of the Charter of Jackson Sustainability Cooperative dated May 14, 2021 is hereby deleted in its entirety and the following inserted in lieu thereof:

2.(m) To do and perform, either for itself or its members, any and all acts and things, and to have and exercise any and all of the foregoing purposes or as may be permitted by the Acts under which the Corporation is formed, for any lawful act or activity necessary or convenient to effect the foregoing purposes, including, but not limited to, the exercise of all powers granted to community non-profit cooperatives under the Rural Electric and Community Services Cooperative Act and by T.C.A. Section 65-25-101 *et seq.*, as amended from time to time.

3. Section 3, subparagraph (a) of the Charter of Jackson Sustainability Cooperative dated May 14, 2021 is hereby deleted in its entirety and the following inserted in lieu thereof:

3.(a) The Corporation is a not for profit corporation organized for the benefit of its members.

4. The corporation is a not-for-profit corporation.

5. The amendment was duly adopted on the 8th day of July, 2021 by the Board of Directors in compliance with the Bylaws and under T.C.A. §48-60-102 which does not require a

vote of the members. Approval of the amendment by persons other than the Board of Directors is not required.

6. In all other respected the Charter of Jackson Sustainability Cooperative dated May 14, 2021 is hereby ratified and confirmed.

JACKSON SUSTAINABILITY COOPERATIVE

Date: July 8, 2021

By: Dennis Emberling
Dennis Emberling, President

EXHIBIT 16

AMENDMENT TO THE BYLAWS
OF THE
JACKSON SUSTAINABILITY COOPERATIVE

This AMENDMENT TO BYLAWS of the Jackson Sustainability Cooperative (this "Amendment") is effective for all purposes as of the 8th day of July, 2021. The Jackson Sustainability Cooperative is a nonprofit corporation organized and operated under the laws of the State of Tennessee (the "Corporation"). Pursuant to Article XV and Article XVI of the Bylaws, the Bylaws may be amended by a vote of the members of the Board of Directors of the Corporation (the "Board") for any reason consistent with the purposes of the Corporation. The Board unanimously approved the amendment as evidenced by their signatures below.

NOW, THEREFORE, the Bylaws are hereby amended as follows:

1. All references to the Tennessee Electric G&T Cooperative Act of 2009 and to T.C.A. § 48-69-101 *et seq* currently in Article I, Section 1.1 shall be deleted in their entirety and following new first sentence inserted into Article I, Section 1.1 in lieu of the current first sentence:

Section 1.1. Purposes and Aims of Corporation. This Corporation was formed and exists to do and perform, either for itself or its Members, any and all acts and things, and to have and exercise any and all of the powers granted to community non-profit membership cooperatives as permitted under Tennessee law, including the Rural Electric and Community Services Cooperative Act and by T.C.A. Section 65-25-101 *et seq*., as amended from time to time, for any lawful act or activity, including, but not limited to, the following:

APPROVED by the Board of Directors effective this 8th day of July, 2021.

David Shimon

Dennis Emberling

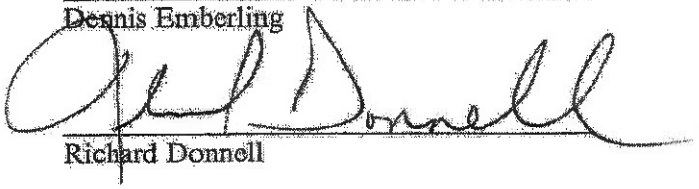
Dennis Emberling

Richard Donnell

Robert Starr

Jeff Frieling

Dennis Emberling



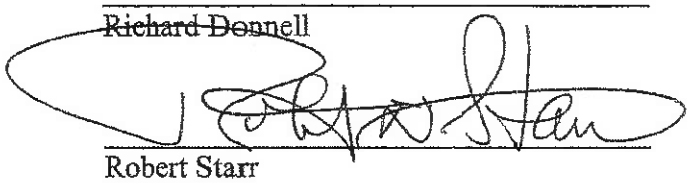
Richard Donnell

Robert Starr

Jeff Frieling

Dennis Emberling

~~Richard Donnell~~



Robert Starr

Jeff Frieling

Dennis Emberling

Richard Donnell

Robert Starr

Jeff Friedling

EXHIBIT 17

STATE OF TENNESSEE
OFFICE OF THE ATTORNEY GENERAL

April 10, 2017

Opinion No. 17-25

Sale of Electricity by a Solar Electricity Generating Facility

Question 1

Is a solar electricity generating facility that provides power directly and exclusively to owners and/or tenants located on the same or adjacent premises "affected by and dedicated to the public use," such that the facility would be prohibited from selling the power to those owners and/or tenants under Tenn. Code Ann. § 65-34-103?

Opinion 1

A solar electricity generating facility that comes within the statutory definition of "public electric system" is prohibited from selling power in certain geographical territories. Tenn. Code Ann. § 65-34-102(4), § 65-34-102(5), and § 65-34-103. The question assumes that a solar generating facility meets all of the Tenn. Code Ann. § 65-34-102(5) definitional elements of a "public electric system" save only the element that its property be "affected by and dedicated to public use." Whether its property is "affected by and dedicated to public use" will depend on a variety of factors, specific to each case. The fact that it provides power "directly and exclusively to owners and/or tenants located on the same or adjacent premises" is just one of many factors to be considered but is not alone determinative of whether or not its property is affected by and dedicated to public use.

Question 2

Is the owner of the solar facility described in the previous question a "public utility" as defined in Tenn. Code Ann. § 65-4-101(6)?

Opinion 2

If the owner of a solar electricity generating facility is a public electric system as defined in Tenn. Code Ann. § 65-34-102(5), it would likewise be a public utility as defined in Tenn. Code Ann. § 65-4-101(6)(A) unless it were to come within one of the many statutory exceptions detailed in Tenn. Code Ann. § 65-4-101(6)(A)(i) through (B)(ii).

ANALYSIS

In 1989 the Tennessee Legislature enacted a statutory scheme[1] entitled the "Geographic Territories of Electric Utility Systems." Tenn. Code Ann. §§ 65-34-101 through 108. That legislation was designed to prevent duplication of electric system facilities because the Legislature found that such duplication results in excessive consumer costs and environmental and aesthetic problems. Tenn. Code Ann. § 65-34-101. To avoid duplication of electric system facilities and to protect consumer investment in those facilities, the Legislature deemed it in the public interest to keep in place geographic territories it had established in 1968 for electric utilities and to limit "utilities that are not consumer owned" from expanding "service into areas already served by consumer-owned municipal and cooperative electric system." Tenn. Code Ann. § 65-34-101.

To that end, the "Geographic Territories of Electric Utility Systems" statutory scheme prohibits a "non-consumer owned electric system" from constructing, acquiring, and maintaining facilities and equipment for the "distribution or sale of electricity outside its current geographic territory," and from providing, "by sale or otherwise, electricity to any parcel of land located outside its current geographic territory." Tenn. Code Ann. § 65-34-103. It also prohibits municipalities from expanding the territories of non-consumer owned electric systems. Tenn. Code Ann. § 65-34-107(b).

If a solar electricity generating facility is a "non-consumer owned electric system" these statutory prohibitions would apply to it. But even if it does meet the definition of a non-consumer owned electric system (i.e., even if it is a public electric system), it may still enter into an agreement with another public electric system serving an adjacent geographic territory to modify the territories and transfer the right to provide service from one to another. Tenn. Code Ann. § 65-34-108.

A "non-consumer owned electric system" is a "public electric system" (other than a municipal electric system or a community service cooperative). Tenn. Code Ann. § 65-34-102(4). A "public electric system" is any entity or individual that owns, operates, manages, or controls any electric power system, plant, or equipment in Tennessee "affected by and dedicated to public use." Tenn. Code Ann. § 65-34-102(5).

Question 1 assumes that a solar generating facility meets all the definitional elements of a "public electric system" save only the element that its property be "affected by and dedicated to public use."[2] The phrase "affected by and dedicated to public use" is legal shorthand for the concept that "[a] distinguishing characteristic of a public utility is a devotion of private property by the owner to service useful to the public, which has a right to demand such service so long as it is continued with reasonable efficiency under proper charges." 73B C.J.S. *Public Utilities* § 1 (2016).

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[1] The Tennessee Court of Appeals has referred to this statutory scheme as a "labyrinth," and one that "leave[s] a large void" in some respects. *Electric Power Bd. v. Middle Tennessee Electric Membership Corp.*, 841 S.W.2d 321, 323, 324 (Tenn. Ct. App. 1992).

[2] We assume that the solar electricity generating facility at issue is not a community service cooperative (as defined in Tenn. Code Ann. § 65-25-102(4)) or a municipal electric system within the meaning of Tenn. Code Ann. § 65-34-102(3).

Whether an entity should be deemed to have dedicated its property to public use is a question that turns on the specific facts of each particular case. Just because its services are available to the public does not necessarily make the service provider a public utility. Similarly, an entity that sells all its product or services under contract to public utilities (which in turn sell that product to consumers) is not by that fact alone a public utility. On the other hand, the number of customers is not controlling; a facility is not rendered non-public just because a limited number of customers may have occasion to buy its services. And an entity that does other business in addition to providing a public service may nevertheless be a public utility subject to regulations. *See* cases cited in 73B C.J.S. Public Utilities § 2 (2016).

The ultimate question is whether the utility conducts its business in a way that makes it a public concern. Put in a more concrete way, the question is whether the utility holds itself out (expressly or implicitly) as engaged in supplying its product or services to the public in general or to a limited portion of the public, as opposed to holding itself out as serving or prepared to serve only particular individuals. To answer this question, courts will consider the totality of the particular circumstances, including how the company actually conducts business, what the company's articles of incorporation and bylaws provide for, what its stated purpose is, whether it is providing a good or service in which the general public has an interest, whether it accepts substantially all requests for its services, how its service contracts are structured, and whether it is in actual or potential competition with other entities that are public utilities. *See* cases cited in 73B C.J.S. Public Utilities § 2 (2016). *See also Memphis Natural Gas Co. v. McCanless*, 194 S.W.2d 476, 480 (1946) (charter conclusively authorized gas company to do business as a public utility).

In sum, whether the property of any particular solar electricity generating facility is "affected by and dedicated to public use" will depend on a variety of factors, specific to each case. The fact that it provides power "directly and exclusively to owners and/or tenants located on the same or adjacent premises" is just one of many factors to be considered but is not alone determinative of whether or not its property is affected by and dedicated to public use.

The "public use" element in the statutory definition of "public electric system" in Tenn. Code Ann. §§ 65-34-102(5) is common in—indeed integral to—most statutory definitions of "public utility."[3] Not surprisingly, "public use" appears as a key element in the statutory definition of "public utility" in Tenn. Code Ann. § 65-4-101(6)(A). The §101(6)(A) definition of "public utility" encompasses providers of other services in addition to providers of electric services, but is otherwise essentially the same as the definition of "public electric system" in Tenn. Code Ann. § 65-34-102(5). A "public utility" includes all individuals and entities that

> own, operate, manage or control, within the state, any interurban electric railway, traction company, all other common carriers, express, gas, electric light, heat, power, water, telephone, telegraph, telecommunications services, or any other like system, plant or equipment, *affected by and dedicated to the public use* . . . .

Tenn. Code Ann. § 65-4-101(6)(A) (emphasis added).

[3] In fact, the Tennessee Supreme Court has found it "abundantly clear" that "the terms *'public use'* and *'public utility'* are synonyms." *Memphis Natural Gas Co. v. McCanless*, 194 S.W.2d 476, 479-80 (Tenn. 1946)(emphasis in original).

Thus, if the owner of a solar electricity generating facility is a public electric system as defined in Tenn. Code Ann. § 65-34-102(5), it would likewise be a public utility as defined in Tenn. Code Ann. § 65-4-101(6)(A) unless it were to come within one of the many statutory exceptions detailed in Tenn. Code Ann. § 65-4-101(6)(A)(i) through (B)(ii).

HERBERT H. SLATERY III
Attorney General and Reporter

ANDRÉE SOPHIA BLUMSTEIN
Solicitor General

Requested by:

The Honorable Gerald McCormick
State Representative
206A War Memorial Building
Nashville, Tennessee 37243

NON-CIRCUMVENTION/NON-DISCLOSURE AGREEMENT

Between:

COMMUNITY DEVELOPMENT ENTERPRISES - JACKSON I ("Disclosing Party")

and

("Receiving Party")

_____
Name

_____
Street Address

_____
City, State, Zip

NON-CIRCUMVENTION/NON-DISCLOSURE AGREEMENT made as of the _____ day of _____, 2020 between Disclosing Party and Receiving Party.

WHEREAS, Disclosing Party desires to disclose to the Receiving Party certain information related to the development, engineering, and/or construction of a shared solar facility located in Jackson, Tennessee, including development activities relating to the processes involved in the establishment of a microgrid that delivers solar electricity to local commercial, government, and nonprofit users, and associated project data and information in connection therewith (collectively, the "Information") for the purpose of allowing the Receiving Party to evaluate a potential role in the process, and any other purpose related to the proposed solar facility, designed and developed by the Disclosing Party, and that is potentially benefited by obtaining the financial, management, or engineering assistance of the Receiving Party; and

WHEREAS, the Information to be disclosed by the Disclosing Party constitutes valuable proprietary, trade secret and/or confidential information to it; and

WHEREAS, the parties desire that all disclosures hereunder be subject to the terms and conditions of this Non-disclosure Agreement;

NOW, THEREFORE, the Disclosing Party and the Receiving Party hereby agree as follows:

1. The Receiving Party receiving Information under this Agreement from the Disclosing Party shall use such Information solely for the purpose stated above and shall not use it for any other purpose.

2. The Receiving Party and its employees will hold in strict trust and confidence all Information that the Disclosing Party furnishes and disclosed or otherwise makes available to the Receiving Party hereunder.

3. Neither the Receiving Party nor its employees or sub-contractors shall copy, reproduce, sell, lease, transfer, assign, reveal or otherwise disclose or make available any Information received by the Receiving Party hereunder to any persons or parties other than the Receiving Party's employees who reasonably have a need to possess knowledge of such Information for the purpose stated above and who have signed a secrecy agreement with terms at least as strict as those herein.

4. Upon the conclusion of the evaluation described above, the Receiving Party shall return to the Disclosing Party all Information received by it hereunder.

5. The Receiving Party shall not be subject to the restrictions imposed herein with respect to any Information obtained by it from the Disclosing Party pursuant to this Agreement if:

   (a) the Receiving Party can show by written documentation that the Information was known to it at the time of the receipt from the Disclosing Party;

   (b) the Information was at the time of disclosure by the Disclosing Party to the Receiving Party or thereafter becomes a matter of public knowledge through no violation of this Agreement by the Receiving Party; or

   (c) the Information was or hereafter is obtained properly by the Receiving Party from another source without any restrictions of confidentiality or use.

6. This Agreement shall be governed by the laws of the State of Tennessee.

7. The obligations contained in this Agreement with respect to any Information shall remain in effect for five (5) years from date of disclosure of such Information.

8. This Agreement constitutes the entire agreement between the parties with respect to the subject matter hereof, and it supersedes all prior or contemporaneous agreements, negotiations or understandings with respect to said subject matter. This Agreement may be amended or waived only by a written instrument duly signed by both parties.

IN WITNESS HEREOF, the parties have caused this Non-disclosure Agreement to be executed on their respective behalf as of the date first hereinabove set forth.

DISCLOSING PARTY:
COMMUNITY DEVELOPMENT ENTERPRISES - JACKSON I
E A Solar, LLC, Manager

By: _____
Dennis Emberling, CEO

Date:_____

RECEIVING PARTY:

Name:_____

Title:_____

Date:_____

How the Jackson Sustainability Cooperative Works

March 25, 2021, Version 4

1. Potentially eligible companies near our facility can join as conditional Members without cost or obligation
2. Each member company must designate a representative to the co-op
3. After companies give JSC their hourly electrical-usage information from JEA, JSC will determine their eligibility to become full Members (those that will receive electricity from the facility)
4. The Co-op has many aims beneficial to its Members and to the Jackson community, but it not obligated to do anything
5. Co-op leases all CDE's equipment, up through and including the smart meters in Members' buildings. CDE installs.
6. The Co-op pays CDE a monthly lease fee.
7. The Members pay the Co-op for electricity, plus a bit more to cover its administrative expenses
8. Monthly charges will be specified in the lease and in Member Agreements.
9. Governance and operations
    a. Board of directors are responsible for management and operation of the co-op
        i. At first, these will be 3 prominent Jackson citizens
        ii. Once the co-op has permanent members, they will elect the board
    b. Officers elected by the board
    c. Operated by employees it hires
    d. Bills members
10. The Co-op is limited as follows
    a. The lease of equipment from CDE obliges JSC to purchase all electricity it receives
    b. 30 years
    c. Rates or charges specified in the lease
11. Member Agreements
    a. Protect Members against paying more in total for monthly electricity than if they had not joined the Co-op
    b. Require 30 year membership
    c. Specify obligations of the co-op to each Member, including charges
12. What happens if Member drops out? Who pays during period of recruiting new customer?
    a. Co-op will maintain a Reserve Fund, capped at ~$2M, accrued over 3 years, for this contingency
13. Patrons of the Co-op
    a. CDE (founding Patron), because it contributes start-up capital to the co-op
    b. CDE's capital account is prioritized for payback
    c. Members become Patrons if they contribute capital to JSC
    d. Contributed capital is not eligible for tax benefits as contributions to a nonprofit

Aims of the Co-op

March 25, 2021, version 3

1. Who It's For
   a. A small, select group of manufacturers with facilities in the Roosevelt Parkway neighborhood of Jackson, Tennessee
   b. Who regularly experience high peak-demand charges for electricity
   c. Who want to move to renewable energy, expand, and contribute to Jackson's redevelopment and community
   d. But who cannot economically justify building their own renewable-energy generation facilities

2. What It Does
   a. Develop a solar + storage facility to provide supplementary electricity to meet most or all of their peak-demand needs
   b. Connected directly to their facilities through underground wiring
   c. With smart meters in their buildings that enable precise monitoring by circuit, leading to conservation
   d. Constructed to withstand severe storms and other events that cause grid failure

3. Contributes to Sustainability
   a. Improves environmental quality inside and outside Jackson, Tennessee
   b. Promotes and develops energy conservation through research

4. Improves Members' Businesses
   a. Lowers energy costs without any member capital-outlay, maintenance expense, or use of members' rooftops or land
   b. Improves energy efficiency by giving members the ability to monitor electricity usage by individual circuit
   c. Increases machinery life and reduces repair expenses by improving power quality and stability
   d. Avoids costs caused by power outages, without having to resort to fossil-fuel backup generators

5. Contributes to the Jackson Community
   a. Has major economic impact on Jackson, including increasing job opportunities and improving infrastructure
   b. Enables members' manufacturing businesses to expand by reducing their energy costs with renewable energy
   c. Availability of renewable energy will attract new businesses to Jackson
   d. Promotes Jackson's redevelopment and infrastructure
   e. Contributes to charities and philanthropic projects in the city of Jackson

6. Improves Jackson's Electrical System
   a. Reduces stress on transmission and distribution systems by relieving peak demand, without capital cost to Jackson
   b. Increases the system's resiliency and redundancy by providing supplementary sources of energy

7. Expands Jackson's Skilled-Labor Pool
   a. Internships and training in the renewable-energy field to Jackson's colleges
   b. Programs in renewable energy to Jackson's high schools
   c. Other skilled-labor training
   d. Increases the skilled workforce needed for members' businesses to expand

Power Quality

The power generated by an electric utility starts out as a “clean” 60 Hz sine wave (Fig. 1), but both utility and customer equipment can affect the pureness (quality) of the power delivered to the user. Load and generation changes, equipment switching, and electronically controlled loads can all cause significant disturbances to the electrical waveform. Poor power quality can be merely annoying or it can adversely affect or damage sensitive loads such as computers, adjustable-speed drives, and motors, disrupting important facility processes.

Symptoms of poor PQ include the following:

Voltage sags and swells — the voltage is too high or too low for a period of several cycles to several minutes (Fig.2).

Voltage spikes — sharp, randomly occurring pulses in the voltage (Fig. 3).

Momentary outage — complete interruption of power for up to 5 minutes (Fig. 4).

Harmonic distortion — variation from a pure sine wave due to harmonic frequencies (Fig. 5).

Other signs of poor PQ are variations in the frequency from a constant 60 Hz, noise (low-level random voltage variations), and unbalanced voltages and currents between the three phases of the electric system.

How do you know if you've got PQ problems? You may see lights flicker or go dim or bright. Motors can vibrate, make noise, overheat, or stall. Outages are easy: everything goes black. Some symptoms are hard to detect, so you might want to ask your local utility or a consultant to monitor your power and do a PQ analysis for you.

If your facility has experienced any of these symptoms, first ask your local utility or vendors about the solutions they could provide. In many cases, improper grounding or problems inside your facility may be to blame; sometimes nearby customers are the source of the problem. Because many utilities make no warranties concerning power quality, you may need to consider installing PQ mitigation technologies. These include UPS, battery systems, storage technologies, motor-generator sets, isolation transformers, voltage regulators, line conditioners, filters, shielding and grounding techniques, and surge
suppressors.

Figure 1: Normal Power Waveform

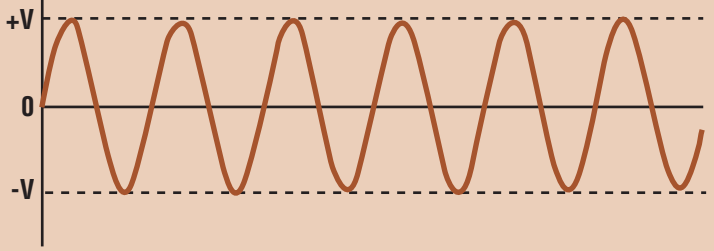


Figure 2. Voltage Sags and Swells

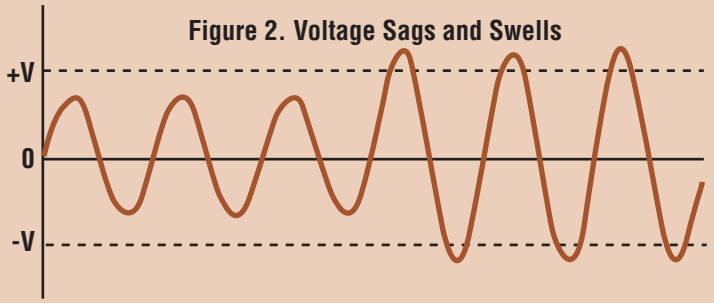


Figure 3. Voltage Spikes

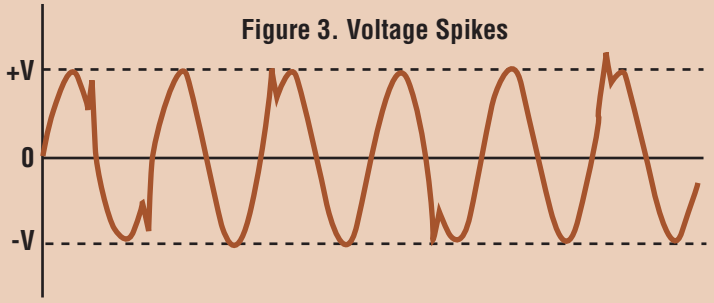


Figure 4. Momentary Outage

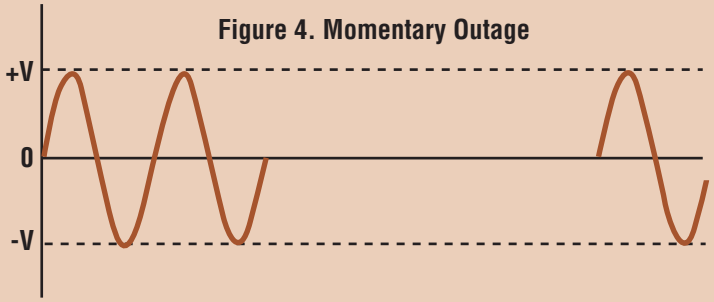
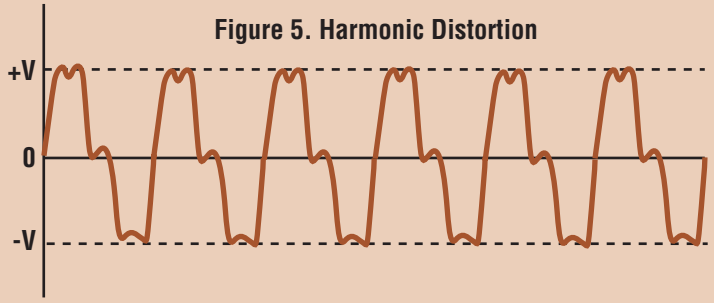


Figure 5. Harmonic Distortion



POWER OUTAGE

This policy is intended to deal with unexpected power outages, usually of uncertain duration. The main purposes of the policy are to provide:

- Safety of employees and any visitors
- Protection of electronic equipment and data
- Protection of manufacturing equipment and facility resources

Power outage falls into 2 categories, localized occurring only to the Company facilities or city/town wide

Responsibility

In the event of power failure, the Plant Manager is in charge of emergency arrangements. In his absence, the next senior employee, Supervisors or evening shift Charge hand should deal with the situation.

Unless there is evidence that the power outage will be of short duration, the plants should begin equipment shutdown procedures, 5 minutes after the outage occurs. If the outage occurs during hours of darkness, shutdown procedures should begin immediately.

Supervisors in each department should account for their employees and know where to find an emergency flashlight when needed.

Procedures When Power Outage Occurs

The fire exit signs will illuminate and battery operated lights turn on to allow employees to move to the doorways. Contact Maintenance, determine if the outage is plant-wide, and if there is any word of power outage duration from the Hydro Company.

Each employee is responsible for the equipment they are working with, and must ensure that where the equipment requires an automatic restart, the equipment is allowed to come back on line within the time allowed i.e. Laser. Equipment that does not have a low voltage release system that will restart when the power is restored must be switched off at the equipment switch i.e. belt floor sander/drill press.

Administrative employees using a computer that is on battery back up should save the file they are using and close down their computers.

Each Supervisor/Chargehand is responsible to account for all their employees and report to the plant manager any unaccounted for. Additionally if it is expected that the power outage is going to be significant employees should move to the nearest exits for the light.

If during the evening shift and a significant power outage occurs the evening shift Chargehand should contact the Plant Manager (Phone #) or (Phone #) and seek guidance on the course of action necessary.

When the power outage is over the equipment should be restarted in the following order:

	Main	R&D	West Plant
Compressors	Compressors	Compressor	Compressor
Make up units and ventilation	Make up units and ventilation	Heating and Ventilation	Make up units and ventilation
Laser	Laser	Other equipment	Paint line
Paint line	Paint line		Other equipment
Other equipment	Other equipment		

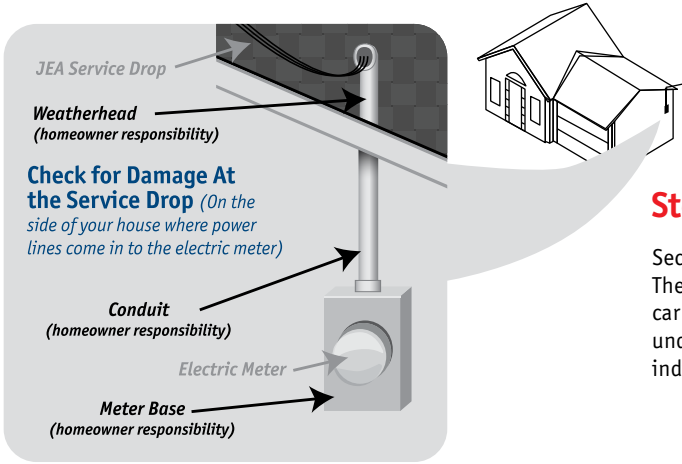
Steps to Restoring Power Following a Major Outage

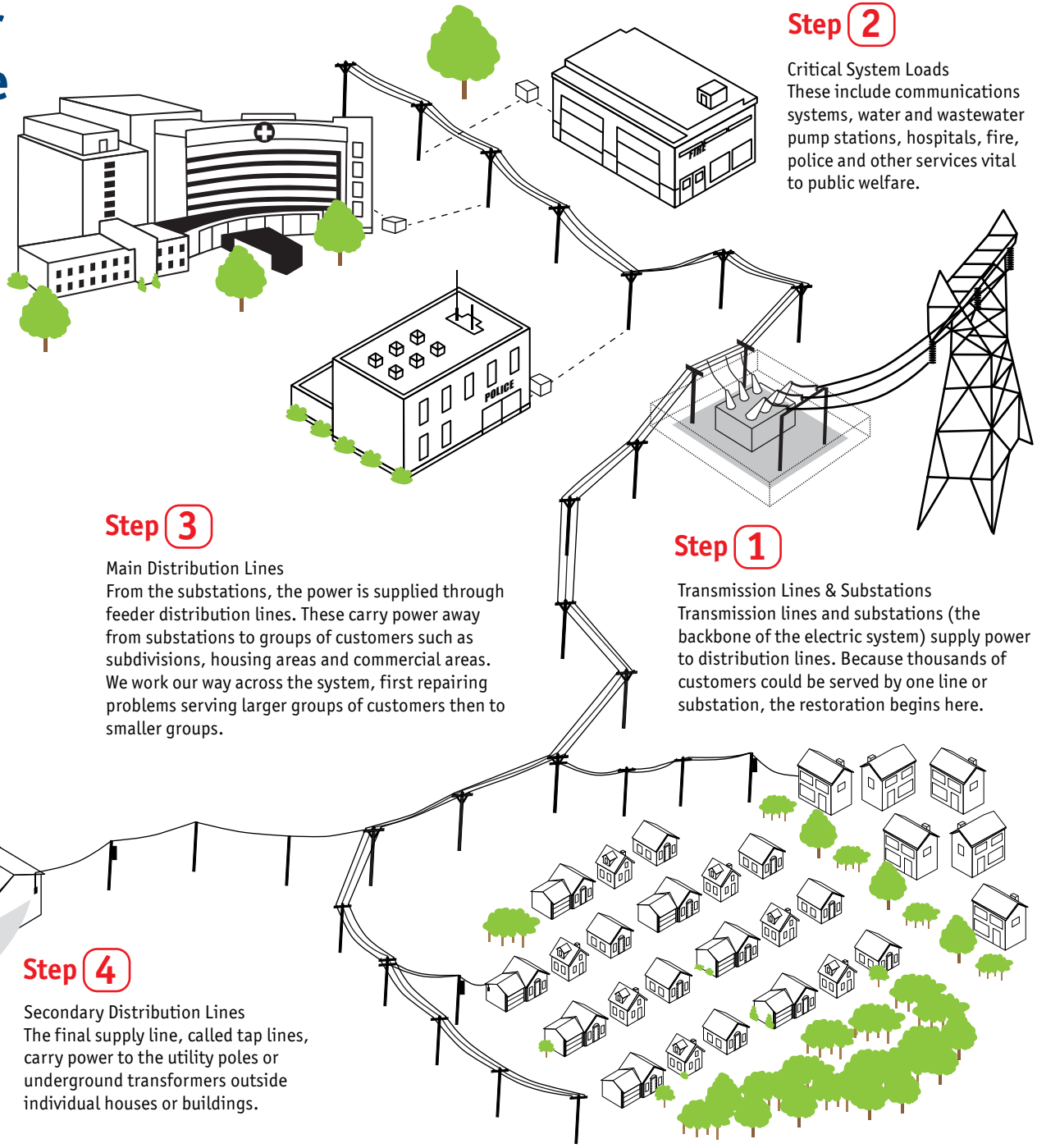
Powerful storms often pass through our area, leaving damage to our utility services. In many instances, we can diagnose and often repair problems with minimal impact on our customers. Unfortunately, there are those storms that create major systemwide damage, leaving customers without power for an extended period of time. Restoring power after a major storm is a complex process that can affect each customer differently.

In the event of a widespread outage, JEA's outage restoration plan is put into place immediately. The steps in this plan are designed to restore power as safe as possible to the greatest number of customers in the shortest amount of time. In general, restoration begins at the power source and ends at your house.

SAFETY FIRST

When our system is damaged by a major storm, before any restoration begins our top priority is safety. Our employees assess the situation to make sure there are no life-threatening conditions such as live downed lines.





Step 2

Critical System Loads
These include communications systems, water and wastewater pump stations, hospitals, fire, police and other services vital to public welfare.

Step 3

Main Distribution Lines
From the substations, the power is supplied through feeder distribution lines. These carry power away from substations to groups of customers such as subdivisions, housing areas and commercial areas. We work our way across the system, first repairing problems serving larger groups of customers then to smaller groups.

Step 1

Transmission Lines & Substations
Transmission lines and substations (the backbone of the electric system) supply power to distribution lines. Because thousands of customers could be served by one line or substation, the restoration begins here.

Step 4

Secondary Distribution Lines
The final supply line, called tap lines, carry power to the utility poles or underground transformers outside individual houses or buildings.

Jackson Energy Authority
One thing you can count on.

JSC - 000420

Neighborly Notification

#

Community Development Enterprises will be constructing and operating a solar + battery farm near you in the vacant lot, Parcel #104, just north of the homes at 107 to 137 Roosevelt Parkway and 5 & 6 Stone Ridge Dr., and just east of the homes at 44 Bronzewood Cove and 83 Carver Avenue.

Privately Owned, leased by the Jackson Sustainability Cooperative

- Private Entrance
- 8 Foot Privacy Fencing and Decorative Planted based Barrier
- Panels mounted low to the ground, nearly flat, so not visible from homes or street
- Little Traffic or Activities
- Absolutely no Noise or Sound generated
- Absolutely no Smell or Odor
- No Large Trucks after construction is completed
- Adds $16,400,000 new tax revenue for city & county, & most importantly our schools
- Total economic impact to Jackson will be $229,000,000 over the next ten years
- Creates 678 new jobs in Jackson during construction, and 28 permanent jobs
- Provides uninterruptible power to some local businesses during power outages
- Helps local businesses reach their sustainability goals
- Gives Jackson a competitive advantage in recruiting new businesses
- Encourages expansion of current businesses
- Reduces pollution and global warming by shifting away from fossil-fuel electricity
- Green energy: saving our planet and creating the jobs of tomorrow

Any questions or concerns please contact:

David Hunt
Partner,
CDE
VP, Development /Construction
731-423-1208
Dhunt@huntservicestn.com

Renewable-Energy Expertise & Experience

Dennis Emberling

August 14, 2021

I. Renewable-energy generation projects: development, procurement, contracting, due diligence
   - A. Feasibility Studies
   - B. Environmental regulations
   - C. Federal regulations: PURPA, FERC, NERC, & SERC
   - D. Utility interconnection, rates, restrictions
   - E. Off-taker demand and usage profiles
   - F. Solar design: rooftop residential, rooftop commercial, ground-mount utility-scale
   - G. Evaluation and choice of solar equipment
   - H. Qualifying and selecting EPCs and other contractors for renewable-energy projects
   - I. Collaborating with civil engineers on site research and design
   - J. Insurance for renewable-energy generation facilities
   - K. Funding of renewable-energy generation facilities: tax-equity investment strategies, U. S. government programs

II. Research: thousands of hours over 7 years into all aspects of solar including technical, financial, environmental, demographic, and regulatory. Published over 40 articles, guides, and reports
   - A. Savings squandered by average California homeowner
   - B. Total savings squandered so far by California solar homeowners
   - C. Total savings to be squandered by California solar homeowners if pattern continues
   - D. Calibrated PVSyst, PV Watts, SAM for best, average, and low-quality equipment
   - E. Analyzed performance, reliability, and warranties of 496 models of 14 best-selling brands of panels for 2018 in California - 95% of all residential sales
   - F. Analyzed and scrubbed DG (Distributed Generation) Stats database for 2016, 2017, and 2018
   - G. Accurately compared true pricing for systems of different qualities, adjusted to same annual production
   - H. Wrote 4 Buying Guides for solar shoppers
   - I. Website for solar shoppers and owners, www.SolarConsumerAdvisor.com, took over 2,000 of research and design
   - J. Calculated costs of degradation and lifespan for best, average, and low-quality panels
   - K. Calculated production of best, average, and low-quality panels with same output specs
   - L. Invented algorithms and tools to calculate system size needed to eliminate utility energy charges
   - M. Invented algorithms and tools to calculate true costs and savings of residential solar systems, all factors into acct.
   - N. Performed comparisons of all ways of financing solar
   - O. Studied added-value of solar to home values: analysis, article
   - P. Researched & calculated environment value of residential solar to California
   - Q. Calculated effect of shift in SCE TOU-D rate schedule from 2-8 to 4-9: 41% increase in size needed
   - R. Solar law in California
   - S. Real estate law, problems with titles, lenders, solving realtors' problems
   - T. Contracts: sale, lease, loan, PPA
   - U. Warranties

V. California regulatory agencies: their authority over solar, enforcement actions
W. Evaluated accuracy and usefulness of information available on over 60 solar websites
X. Quantified and prioritized risks to solar shoppers
Y. Utilities: rate schedules, NEM practices, tariffs

III. Consulting
  A. To solar industry
    1. Learned how dealers and installers operate
    2. Trained salespeople
    3. Improved dealer/installer business models and practices
  B. Consultant to shoppers on how to acquire solar well
  C. To realtors
    1. Gave workshops on solar to thousands of realtors
    2. Assisted realtors and their clients in problems they had with sales of home with existing solar
    3. Performed Solar Evaluation Service for many realtors and their clients
  D. Ombudsman to California consumers duped by solar companies

IV. Consumer advocate
  A. Appointed to the California Intergovernmental Task Force on Solar
    1. Gave presentations
    2. Collaborated with and advised member agencies on solar issues
  B. Active participant in CPUC proceedings
    1. NEM-2: Succeeded in preventing higher costs for homeowners
    2. Info Packet
    3. Calculator
    4. All work CPUC has done and is doing on solar-consumer protection
    5. Advised CPUC staff on solar-consumer protection
  C. Wrote the Solar Disclosure form for the California Contractors State License Board (CSLB)
  D. Founded nonprofit Solar Consumer Advisor to help consumers and deter fraud in solar
    1. Wrote and published website, www.solarconsumeradvisor.com: 41 pages of free help
    2. Over 2,000 visits per month
    3. More than 600 Buying Guides downloaded
    4. Hailed as the most helpful and honest website on solar available
  E. Identified data needed to be gathered via surveys and from IOU data
  F. Collaborated with many solar advocacy groups

  G. Performed stakeholder analysis of residential-solar field
    1. Picked out the key stakeholder groups
    2. Identified their main problems
    3. Found ways they can help each other solve these problems
    4. Discovered factors unique to the solar field that make these solutions easier

V. Shopped for, purchased, and owned solar system: monitored & studied carefully for 4 years

VI. Other professional experience: practiced, taught, and wrote articles and guides

A. Finance: banking, investing, stock market, bonds, returns on investment, inflation, consumer price index, analysis
B. Tax: federal and state income tax preparation, payroll taxes, other state taxes
C. Nonprofits: setting up, qualifying for IRS 501(c)(3) tax treatment, federal and state laws and regulations, operations
D. Accounting: setting up accounting systems, auditing, interpreting reports
E. Mathematics: degree in advanced mathematics; quantitative analysis, decision analysis, cumulative probability, many others
F. Management and organizational consulting

VII. Education in renewable energy
A. Mentored by experts for years
1. Michael Kahn, Kahn Solar, California: residential and commercial solar and storage
2. Rick Brown and Kevin Ross, Terraverde Energy, California: large-scale solar and storage development
3. Gregg Noble, Northern Reliability, Vermont: microgrid and storage development
B. Collaborated with many renewable-energy companies and technical experts for years
C. Extensive research into all aspects of solar

VIII. Major published reports
A. Protecting California's Solar Consumers
B. Analysis of the Residential Solar Field

IX. Degree in pure mathematics from Reed College

X. Original mathematical work (also implemented, taught, and written)
A. Thesis discovered a new, shortest proof for the Fundamental Theorem of Algebra. Published. Used for classes in calculus of complex variables.
B. CDAT (Closure Decision-Analysis Tool): software tool to permit science and regulatory teams to decide how to remediate a polluted area, based on lab-test results and regulations

David Shimon Bio Material

October 23, 2020

1. From CDE Website About Us page
   a. David Shimon is a founder and former owner of a commercial bank in Maryland, serving on its loan committee and board of directors. He also founded a $60 M technical company and served as its board chairman. He has had many years of experience in guiding young companies to success. In recent years, he has owned and operated a Florida solar company. David is very active in and a regular speaker for many community groups that feed the elderly and provide services in under-developed empowerment zones in Florida.

2. From Early Bio
   a. Information Officer for Israeli Embassy in Washington, D.C.
   b. MBA, Central Michigan University
   c. B.S. in Business Administration and Marketing, University of Maryland
   d. Founder, owner, manager of many businesses, including
      1) Maryland Permanent Bank
      2) We Show Talent, LLC: global, talent-search firm online and on global TV
      3) Davish Realty and Metzbrook, LLC
      4) Davish Enterprises Baltimore Maryland: marketing, TV infomercials
      5) Response Security, Inc.: commercial and residential alarm services
      6) Integrity Relief, LLC: advising and assisting consumers in real estate
   e. Consultant for Coleco, Inc.
      1) Client: Innovative Products
         a) Helped them expand retail in U. S. to large scale
         b) Developed new manufacturing facility in China
         c) Developed new products for American markets
      2) Formed consortium including University of Maryland Marin Biology Institute, Corbit Rockwell, and Coleco
   f.
   g. Banking: board member, chair of Marketing Committee, member of loan committee
   h. Digital Global Internet, LLC

BEFORE THE TENNESSEE PUBLIC UTILITY COMMISSION

IN RE: THE APPLICATION OF JACKSON SUSTAINABILITY COOPERATIVE FOR A DETERMINATION OF EXEMPTION AND IN THE ALTERNATIVE, FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY	))))))	**DOCKET NO. 21-00061**

DIRECT TESTIMONY OF DENNIS EMBERLING, PART II

Part I of the direct testimony of Dennis Emberling was filed with the Petition. This is a continuation of Mr. Emberling's direct testimony.

Q. How was Jackson, Tennessee selected for the Solar Project?

A. In late 2019, two people from Jackson came up with an idea for a way to help the city redevelop and improve the lives of its citizens. One, a retired, disabled Army Lieutenant Colonel, West Point graduate, and professor of mathematics, has been working for some time on building affordable housing in East Jackson for other veterans and seniors. The other is the owner of several small businesses in Jackson who knows the area's problems first hand.

Both these Jacksonians were particularly focused on the plight of East Jackson. Although it is home to many businesses that employ thousands of people, the area is in the worst shape of any of Jackson's redevelopment districts. It is the only one classified as "deteriorated." The population is 88% black, and the median household income in 2019 was under $19,000 per year. It is the 24th poorest census tract in Tennessee. Its housing and infrastructure are extremely poor.

Q. Is Jackson, Tennessee at risk of losing national manufacturers? Why?

A. Many national companies have manufacturing facilities in East Jackson. Most of these national companies either already have or will soon have mandatory sustainability goals that require them to switch all or in large part to renewable energy by a date certain. These corporate goals represent corporate responsibility to change the impact on the environment and play a significant role in diverting an obvious future environmental crisis, and lead federal and state government into recognizing the need for legislative action to create supporting policies for the inevitable move to renewable energy sources.

These sustainability policies prevent national companies from expanding in cities where renewable energy is not available. They could eventually force companies to leave such cities altogether, taking advantage of offers from cities where renewable energy is available. Other companies looking for locations to build facilities are unlikely to consider cities without renewable energy. All this bodes ill for Jackson.

Q. Other than accomplishing corporate sustainability goals, do manufacturers in Jackson, TN have other reasons they need solar energy?

A. We are told by electrical contractors who service the heavy machinery of these manufacturers in Jackson that they suffer from poor power quality from the grid. Fluctuations in frequency and voltage, which are especially common when demand surges, increase maintenance and repair costs and shorten the life of expensive machinery. See "Using Distributed Energy Resources," by the Federal Energy Management Program of the U. S. Department of Energy's Office of Energy Efficiency and Renewable Energy, page 8, for the causes and effects of poor power quality, https://www.nrel.gov/docs/fy02osti/31570.pdf. When the grid fails, manufacturers must send workers home, wait for the grid to be restored, then go through lengthy restart protocols and recall workers. This is very expensive for such businesses. Naturally, having reliable, uninterruptible power is very important to them, but presently unavailable. See "Seven Steps for a Successful Shutdown," www.plantengineering.com/articles/seven-steps-for-a-successful-shutdown.

Right now, Jackson has little to offer manufacturers to cope with these problems. As of July 15, 2021, only 16% of TVA's electricity generation came from renewables (EIA). For Jackson manufacturers, installing their own renewable generation, such as solar, is impractical and uneconomical for many reasons: lack of incentives from TVA or the state of Tennessee (not even net metering), inadequate suitable land or roof space, sub-optimal weather, capital costs, inability to take advantage of tax benefits, and lack of experience with acquiring, operating, and maintaining solar and storage facilities. That's why there is so little individually-owned commercial solar in Tennessee. And manufacturers have no good solution to the problems of frequency and voltage fluctuations or grid failures.

This is partly why Jackson, which desperately needs more good-paying jobs, decent housing, and infrastructure improvements, isn't growing, isn't attracting new businesses, and isn't seeing present businesses expand. Worse, it means Jackson is in danger of losing some of the businesses it has if it can't help major employers meet their corporate sustainability goals and offer reliable, high-quality, uninterruptible power. Other cities will be glad to offer these companies large incentives to relocate, bringing thousands of jobs with them.

Q. How is the local municipal service provider limited in its ability to respond to these issues?

A. The City of Jackson is an economically distressed community. It cannot afford to pay for building renewable energy generation facilities for its municipally-owned utility, Jackson Energy Authority ("JEA"). Additionally, TVA's contracts with its resellers such as JEA forbid resellers from buying electricity from anyone besides TVA or using their distribution systems to conduct non-TVA electricity to customers. This means JEA cannot buy significant amounts of renewable energy from anyone else either. That's a major reason why some of TVA's resellers, including JEA, are refusing to sign TVA's new long-term agreements and considering not renewing their current TVA contracts - so that they can look elsewhere for renewables.

Like all utilities, JEA's electric service to its customers suffers from frequent voltage sags,

swells, and spikes, as well as frequency variations, momentary outages, harmonic distortion, and unbalanced voltages and currents between the three phases of the system. These are unavoidable for a large power utility, for well-known reasons within the energy industry, such as changes in load, changes in generation source (e.g., from suddenly bringing a new fossil-fuel generator on line to meet higher demand, equipment switching, and electronically-controlled loads.

These power-quality events make motors vibrate, overheat, or stall. They occur without warning. Power quality is not commonly warrantied by utilities to their customers. Customers have to install uninterruptible power systems, battery systems, other storage technologies, motor-generator sets, isolation transformers, voltage regulators, line conditioners, filters, shielding and grounding techniques, and surge suppressors to forestall and cope with these power-quality problems. All these are expensive to the customer. Because they do not address the power-quality issues at their source (the input of electricity to the building), they cannot fully prevent excess wear and tear on expensive machinery or shortening its lifespan.

Nor can JEA provide uninterruptible power to all its customers. It would be cost prohibitive. Thus, it is economically impossible under current contracts for JEA to offer significant percentages of renewable energy to its customers, provide consistently high-quality power, or avoid power outages. To a manufacturer, this means Jackson is not a very desirable place to locate or expand, especially as corporate sustainability goals take effect.

Q. What steps did the concerned citizens take to bring solar energy to manufacturers in Jackson, Tennessee?

A. For all these reasons, the two Jacksonians came up with the idea of bringing solar to Jackson. They asked my partner, David Shimon, a solar dealer in Florida they knew through mutual acquaintances, to investigate Jackson's potential for solar. He brought in several large solar developers to research feasibility, and they concluded it was economically impossible because of the opposition of TVA and JEA and the lack of incentive programs.

He then asked me to look into it, and, with help from my friends and colleagues in the solar industry, I discovered a way to make it work, with no interconnection to JEA's grid, no violation of Tennessee law, and no capital cost to the city of Jackson, the manufacturers who would use the renewable energy, JEA or TVA. So David and I set up a joint venture partnership with our Jackson friends called Community Development Enterprises - Jackson I to develop the project on vacant land located close to several manufacturers in East Jackson.

Q. How does benefitting manufacturing citizens help all citizens in Jackson?

A. My talks with people in the solar and storage industries led to discussions with foundations eager to help in Jackson. Some offered to bring free educational programs in the renewable energy field to Jackson's high schools and its four colleges, along with internships to prepare students for careers in the industry. Others offered to bring job training and other services to the Jackson community. We and our partners committed to contribute a share of the project's revenue to help redevelop East Jackson, upgrade its housing, and improve its dilapidated infrastructure.

We commissioned a professional Economic Impact Study from SynEnergy, Inc. which showed the project having a total impact of $231M on the area, with 678 temporary full-time equivalent jobs and 28 permanent full-time-equivalent jobs.

This is why so many companies, organizations, individuals, advocacy groups, and governmental agencies have been so eager to help with this project, and why the people and businesses of Jackson are so enthusiastic: because it is so worthwhile for everyone. It makes solar possible in East Jackson where it is presently unobtainable. It offers tremendous benefits to manufacturers and the local community. And its is privately financed, with no out of pocket cost to the city.

Q. Were the Tennessee Valley Authority ("TVA") and Jackson Energy Authority ("JEA") willing to work with you?

A. We reached out to TVA and JEA when first researching the project. We offered to collaborate with them, help them move into solar in the future, help them meet their difficult peak demand needs, and work cooperatively with them in many ways, all without cost to them. They totally refused.

In fact, the project's only opponents are TVA and its affiliates. They seem to think the project competes with them and diminishes their profits. In this, they are totally wrong. It does exactly the opposite.

H. We discussed benefits to manufacturers, are there ways JSC benefits JEA and TVA?

First, meeting peak demand for electricity is very costly for utilities. As the generator of electricity for JEA, TVA must maintain expensive stand-by reserves to kick in quickly when demand spikes. The rest of the time, that generation capacity sits idle. If peak demand from its retailers rises, TVA must build additional power facilities, as it is doing now, to be able to meet this demand, plus satisfy legal reserve requirements. The higher the peak demand, the more ancillary and transmission equipment TVA needs, and the higher its fixed costs for this equipment.

TVA tries to cover these costs by charging its retailers, like JEA, a heavy surcharge for peak demand. But whether these surcharges fully cover the costs to TVA of higher peak demand is uncertain. It is a complicated calculation. It is likely that only TVA knows the answer. We have demanded from TVA its actual profit margin on demand charges.

In turn, the higher the peak demand from its customers, the higher JEA's monthly peak demand is from TVA, so the higher TVA's surcharges to JEA for that month's peak demand. These are heavy costs to JEA each month. If JEA's monthly demand peak is lowered, so are these costs it must pay TVA. JEA tries to recover these costs by charging its customers a heavy surcharge for their peak demand each month. Whether these surcharges fully cover the costs it must pay TVA for this peak demand is something only JEA knows. We have demanded from JEA its actual profit margin on demand charges.

But at the very least, lowering the monthly peak demand of a few of JEA's manufacturing

customers will lower JEA's total monthly peak demand, and therefore lower its peak demand surcharges from TVA. Whether that alone will increase or decrease JEA's net profits is to be determined, but it is clear that the effect cannot be large. We have the potential to help JEA meet its other peak demand as well. See https://www.enertiv.com/resources/faq/what-is-peak-demand; https://www.forbes.com/sites/baininsights/2017/05/01/can-utilities-profit-from-distributed-energy-resources/?sh=31263f6f1dbf; https://www.seia.org/initiatives/utility-rate-design-complementary-policies

Second, demand surges are very hard on transmission and distribution equipment. TVA and JEA both incur significant expenses for maintenance and repair of their systems. JEA alone spent over $3.2M last year on maintenance expenses. These peak demands and surges will be reduced by the new solar facility, thereby reducing losses on peak demand and lessening their repair, maintenance, and replacement costs for power lines and equipment. Overall, JEA's and TVA's revenue will decrease slightly, but their expenses decrease by even more, improving their profitability.

Third, the manufacturers who belong to the co-op remain customers of JEA/TVA, not just for electricity but for all other utility services. If solar encourages them not to leave Jackson, that prevents a reduction of profits for JEA/TVA. If solar encourages them to expand, JEA/TVA's profits go up. If solar encourages new businesses to locate in Jackson, they will become new JEA/TVA customers as well.

Taking all these benefits to JEA/TVA into account, it is clear that our supplementing electricity to members for their mutual benefit, is a net benefit to JEA/TVA, and far from a drag on their profits. Any perceived negative effects are short-sighted, and fail to put the benefits in context.

Q. How can a manufacturer participate in the benefits of renewable energy?

A. The only way right now for businesses that need a lot of electricity to get uninterruptible, high-quality, renewable energy is to share a facility with other similar companies. This solves the problem of optimal siting and brings the costs way down through economies of scale and making many more tax benefits available.

The most natural way in Tennessee for organizations to collaborate is through cooperatives, because they are offered many advantages in Tennessee law. Exemption from Public Utilities Commission regulation and monopolistic utility restrictions are only some of them. Therefore, it makes sense for manufacturers who want to share the renewable, uninterruptible power from a solar facility to form a nonprofit co-operative corporation for this purpose.

Such a co-operative also serves its members as a useful nonprofit vehicle to contribute in many ways to the redevelopment and economic improvement of their community, which in turn benefits the member companies. As the labor pool expands and gains more skills, they can expand their businesses, knowing they can find the workers they need. As the quality of the community improves, their working environment and amenities improve, all to the benefit of the companies as well.

Since all these goals fit perfectly with what we and our partners want to do for Jackson, we launched the co-operative, to be controlled by its members. It will lease the entire solar facility, on-site and off-site, from the developer, Community Development Enterprises. It will distribute the electricity generated to its members through a smart controller that directs the flow to members according to their immediate demand, as well as to and from battery storage.

Q. How will the Co-op's system exist with JEA's grid?

A. Because Jackson is subject to severe storms, the entire facility will be storm-hardened, with all wiring underground. In this way, it will be able to continue to supply power when the grid fails. Its electricity is tightly regulated for frequency and voltage, so the members will no longer experience surges, spikes, or dips that damage their equipment. The power will supplement electricity they continue to receive from JEA's grid, coming on only when their demand rises. They will pay the co-operative for the electricity they use at rates guaranteed always to be lower than what they would have paid JEA had the solar not been available.

They will receive new smart meters and electrical panels that allow them to monitor their usage by individual circuit, enabling them to make improvements in energy efficiency. They can also prioritize their circuits to make sure the most important ones get power first in case the grid fails and there isn't sufficient sunlight or battery capacity to power all their circuits. All this without any capital expense to the manufacturers.

The electricity from the solar facility will be completely isolated from JEA's grid, so it can never backflow onto their grid when it is down. Nor can any power from JEA's grid ever flow onto the solar facilities system. It will come on and off seamlessly to the users just when they need it.

Q. Is membership in Jackson Sustainability Cooperative limited?

Because their site can only support so much solar power, the coop is limited allowing only a few manufacturers to participate in the project. Because the power must be distributed among the manufacturers according to their demand, the weather, the time of day, and the limits of our battery storage, we can only serve manufacturers whose electrical usage profiles fit effectively with each other and fall within the limits of what we can supply.

Therefore, our engineers must carefully consider all the circumstances that affect each manufacturer's electrical usage and select from the candidates just those few that form a workable set of users that fit our facility's capability. That is why co-op membership is not open to the public, or even to all nearby companies. The requirements for membership in the co-op are very severe, and only our engineers can choose the group of companies that we can serve.

Q: How does Jackson Sustainability Cooperative determine whether an entity is eligible to participate as a member of the cooperative?

A. When initial research by Jackson Sustainability Cooperative indicates that a commercial

entity's characteristics may be a suitable fit with those of other potential members, Jackson Sustainability Cooperative initiates a discussion with that entity. If the entity indicates a desire to become a member, it is given a Conditional Member Agreement to sign and required to provide Jackson Sustainability Cooperative with all the electricity usage information needed to evaluate its suitability for membership. This Conditional Member Agreement is non-binding, and provides for confidentiality of the electrical information supplied.

Q: When you review a conditional member's electric bills and energy profile, what elements are essential to allow discussions to continue on possible membership?

A. As stated in the Jackson Sustainability Cooperative Bylaws, Article II, Section 2.1, "An Entity becomes a conditional member of the Cooperative if it signs a Conditional Member Agreement. The Cooperative will analyze the energy profile and energy demands of the conditional Member to see if the conditional Member's electricity needs are a suitable fit with the other members and the Solar project. Qualifying conditional Members may be invited to become full Members who receive supplemental energy after they sign a Full Member Agreement (such person being a "Member" and the Member being in a "Membership"). An applicant may be eligible for conditional Membership if its plant and facility (1) annually requires or is expected to annually require at least 100,000 kilowatt-hours (kWh) of electric energy; and, (2) uses electric energy on a demand curve consistent with the Cooperative's requirements."

No entity is entitled to become a member of Jackson Sustainability Cooperative. Membership is by invitation from Jackson Sustainability Cooperative. There is no such thing as "qualifying" for membership. Jackson Sustainability Cooperative's shared services are not offered to the general public or to any categories of users. No public or private entity can demand service from Jackson Sustainability Cooperative. The cooperative service is of no use to the public in general, but only to those few manufacturers that Jackson Sustainability Cooperative specifically invites to participate in sharing supplemental solar energy under the Bylaws and Full Member Agreement with Jackson Sustainability Cooperative.

Jackson Sustainability Cooperative represents its members when holding itself out as facilitating supplemental electricity to members who share the common objective of using energy from renewable sources. Jackson Sustainability Cooperative does not hold itself out to the public in general or any limited portion of the public in general. It represents a collaborative effort of neighboring commercial and industrial concerns with a strong desire to increase their use of energy from renewable sources. Its offers of membership are made directly to selected neighboring manufacturers. The general public has no interest in Jackson Sustainability Cooperative, since the public is not and cannot connect to the solar facility. Even if entities strongly prefer solar energy, there is no way of receiving supplemental energy from Jackson Sustainability Cooperative. Jackson Sustainability Cooperative can only facilitate a few of the requests for membership, and only from neighboring manufacturers who are approved.

The membership factors Jackson Sustainability Cooperative considers include, but are not limited to, the location, number of buildings, number of meters, site wiring, building wiring,

historical and projected electrical consumption profile, historical and projected peak electrical demand profile, maintenance and repair costs for machinery caused by voltage or frequency surges or dips, historical costs associated with power outages, shut down processes, sending workers home, lost productivity, and restart protocols, publically stated corporate goals for use of energy from renewable sources, and time lines for sustainability, reduction of emissions, and shifting to renewable energy, acceptance of mutually agreeable terms of full membership, credit worthiness, and a willingness to participate in and contribute to the charitable and public works of Jackson Sustainability Cooperative for the benefit of the Jackson community and the East Jackson development district. In addition, from the group of interested members, Jackson Sustainability Cooperative will invite only a small subgroup whose electrical profiles fit well together in terms of consumption and peak demand, so as to maximize the ability of the solar facility to serve the mutual benefit of members economically and to their satisfaction.

This restriction to a few members chosen by Jackson Sustainability Cooperative according to practical considerations demonstrates that Jackson Sustainability Cooperative is not in actual or potential competition with public utilities. Its sole service is to supplement the electricity provided by JEA to a few manufacturers. A competitor would be an alternative to JEA, not a supplement to it. When the grid fails and Jackson Sustainability Cooperative continues to provide power, it is not competing with JEA, it is helping JEA with its mission of providing energy to local employers.

Although it will reduce JEA's revenue in peak demand charges from those manufacturers, it will also reduce JEA's acquisition costs for that peak demand electricity from TVA. JEA's cost of assuring it meets peak demand is both in the form of payments to TVA for the capacity to deliver peak demand electricity and for the wear and tear on JEA's transmission system that peak demand imposes. The net result will likely be an increase in JEA's profit from those manufacturers. In addition, expansion of existing Jackson businesses and attraction of additional businesses to Jackson as a result of Jackson Sustainability Cooperative's contributions to Jackson will increase the number of customers of JEA and their increase total consumption, thereby increasing JEA's revenue and profits. There is no competitive loss or disadvantage to JEA from Jackson Sustainability Cooperative's collaborative efforts to provide supplemental services.

Q: Describe the process by which a Conditional Member becomes a Full Member of the Cooperative?

A. Once Northern Reliability informs Jackson Sustainability Cooperative that sufficient electrical usage information from a sufficient number of Conditional Members has been received, Northern Reliability begins to analyze all relevant information submitted by all Conditional Members. Northern Reliability then selects a set of Conditional Members whose electrical usage patterns form a good fit for the capabilities of the solar facility. Jackson Sustainability Cooperative then offers these selected Conditional Members the opportunity to sign Full Member Agreements. If all sign, they become the only Full Members. If one or more do not sign, Northern Reliability selects replacements for them from the set of Conditional Members, and these newly selected Conditional Members are then offered Full Membership. Once a complete set of Full Members, according to Northern Reliability's analysis of the fit between

members' usage and the facility's production, is achieved, membership is complete.

Q: Mr. Emberling, you have described two member agreements, why are there two steps before an entity becomes a member eligible for supplemental renewable solar energy?

A. The process of choosing the set of members is a type of problem in mathematics called "optimizing a set of interdependent variables." It proceeds recursively. One must start with a trial set, analyze it, change it, re-analyze it, and continue until the set reaches optimum in value. Therefore, potential members must first be identified, then evaluated, then formed into a well-fitting, optimized set. This requires securing their electrical usage profiles and other relevant information before membership can be offered, because which candidates fit best together cannot be determined until after evaluation and recursive attempts at fitting. Only when the set is optimized can membership be offered and the second membership step completed.

Q: Who regulates the proposed Jackson Solar Facility?

A. Electric utilities that deliver all the requirements for retail electric service to consumers are, in most states, regulated by state, federal, and local agencies. These agencies primarily govern the prices utilities charge, the terms of their service to consumers, their budgets and their construction plans. Two broad, fundamental principles justify governmental oversight of these utilities. First, because a utility provides essential services for the well being of society, the public interest is best supported by having one large provider charged with meeting the overall demand of the community. Second, the theory is that this can be accomplished more cheaply through a monopoly given to a single provider rather than having a competition among smaller providers. Small providers cannot thrive under these conditions, so eventually all firms but one will exit the market or fail. The survivor is a natural monopoly.

Given these two conditions, economic regulation is explicit governmental intervention into a market. It is necessary to achieve public benefits that the market fails to achieve on its own. In recent years, we have seen telephone services, cable services, and other services give way to competitive pressure. In Tennessee, other than filing a financial report, a municipal electric energy acquisition utility is excluded from economic regulation by the Public Utility Commission. For example, Jackson Electric Authority is not required to submit its rates or its building projects to the Tennessee Public Utility Commission for approval. Local Commissioners regulate Jackson Electric Authority. The theory is that the public who benefits locally can elect Commissioners to direct the municipal service provider.

By contrast, Jackson Sustainability Cooperative provides supplemental electric energy for the mutual benefit of its members. Jackson Sustainability Cooperative does not replace the municipal provider. Jackson Sustainability Cooperative is not open to the public. However, it is locally owned and will ultimately be controlled by its members who are manufacturers who benefit from its supplemental solar energy. Much like the municipal provider and the consumer with its own equipment, in Tennessee the government does not regulate cooperative providers to its consumer-members. Cooperative providers are accountable to their members and must comply with the local electrical codes.

The proposed Jackson Solar Project is currently exempt from regulation under federal laws because it does not interconnect to the public utility grid.

Q: How will Jackson Sustainability Cooperative deliver supplemental energy without affecting the existing connection with JEA?

A: Smart electric meters will be installed at each member's facility. Energy from the Solar Facility will flow to these smart meters. The controller technology intelligently allocates power to and from the batteries and to members, taking all factors into account to optimize power delivery. Members will draw power seamlessly from both JEA and JSC's controller, but no power will ever be able to backflow onto JEA's grid. The controller is designed to deliver supplemental energy when demand is high and the energy is most needed. When a JEA or TVA grid outage occurs, members will draw all their electricity from the Solar Facility for short periods of time and/or for priority usage until grid power is restored.

Q: Has the Jackson Sustainability Cooperative solar energy facility received any national recognition?

A. The Jackson Solar Project received an award from the U. S. Department of Energy's National Community Solar Partnership for innovation and contribution to making solar available in areas of the country where it is presently uneconomical.

Q. How will Jackson Sustainability Cooperative finance the Jackson Solar Project?

A. Jackson Sustainability Cooperative will lease all equipment necessary for the production of solar energy for its members. The Lessor is Community Development Enterprises - Jackson I, who is the on site developer. Jackson Sustainability Cooperative has a purchase option. Therefore , if the members of Jackson Sustainability Cooperative can find more favorable finance terms, they can acquire the leased equipment.

Q. Who will maintain the operation of the solar facility for Jackson Sustainability Cooperative?

A. Maintenance of the facility will initially be handled by Northern Reliability, Inc.

Q. In summary, what steps has JSC accomplished to date?

Since beginning work on this project a year and a half ago, we have completed the following:

- Site research, survey, and acquisition
- Feasibility study
- Due diligence: environmental, regulatory, permitting, and utility
- Received all 6 environmental approvals needed
- Preliminary design of the facility
- Selecting equipment needed

- Selecting and contracting with companies to design, engineer, and construct the project
- Selecting local contractors for construction and electrical work, preferring local labor

- All civil engineering site work
- Approval of the site plan design by the Jackson Planning Commission
- Held neighborhood meetings to explain the project to people living nearby, receiving near-unanimous approval

- Arranging for insurance during and after construction
- Beginning funding negotiations with select tax-equity investment banks and investors

Once we are assured that we are in compliance with the law, we will be ready to complete our financing, obtain a building permit, and begin construction of the Jackson Solar Project.

I swear that the foregoing testimony is true and correct to the best of my knowledge.

Dennis Emberling

Dennis Emberling, President

Respectfully submitted this 21 day of September, 2021.

STATE OF TENNESSEE)
)
COUNTY OF DAVIDSON)

Subscribed and sworn to me a Notary Public, in his capacity as President of JSC this this 21 of September, 2021.

Ambra Barnes

Notary Public

Commission Expires: 3/23/2025

AMBRA BARNES
STATE OF TENNESSEE
NOTARY PUBLIC
RUTHERFORD COUNTY

Northern Reliability

Prepared For:	**Dennis Emberling, CEO** **COMMUNITY DEVELOPMENT ENTERPRISES – JACKSON I**
Agreement For:	Design and EPC Services for Solar Microgrid with MV Distribution Network comprised of **(1) 20MWAC / 46MWhDC Lithium Ion Battery Energy Storage System, ~19.7MW AC-Coupled Solar Array, ~1.25 Mile MV Distribution network, and a Microgrid Control System for East Jackson, Tennessee, Microgrid Project #1**
Contact:	**Gregg R Noble – Vice President of Sales & Development**
Office:	**802.496.2932**
Email:	Gnoble@northernreliability.com

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PRODUCT SALES & EPC AGREEMENT

This Product Sales & EPC (Engineer/Procure/Construct) Agreement ("Agreement") is made as of the 15th day of December 2020, by and between Northern Reliability, Inc., a Vermont corporation having its principal place of business at 81 Demeritt Place, Waterbury, VT 05676 ("NRI"), and Community Development Enterprises – Jackson I, a Tennessee General Partnership, having its principal place of business at 1104 Whitehall Street Jackson, TN 38301 ("CDE"). NRI and CDE are, together, referred to herein as the "Parties."

Whereas, NRI designs, develops, engineers, manufactures, distributes, installs and commissions, operates, and maintains energy and energy storage related products and microgrid power plant systems including but not limited to power conditioning equipment, power system controllers, energy storage systems, solar arrays, and microgrid supervisory controllers; and

Whereas, CDE is an energy project developer who wishes to procure from NRI a solar array of approximately 19.7MW plus a 20MWAC-46MWhDC lithium ion energy storage & microgrid system to supply industrial users in Jackson, TN ("the Plant"); and

Whereas, CDE is purchasing the aforementioned products and/or services from NRI either (i) for its own use or (ii) for re-sale to a designated customer or end-user (an "End-User"); and

Now, therefore, in consideration of the mutual agreements and covenants set forth herein, NRI and CDE hereby agree as follows:

1. SALE OF GOODS.

1.1 NRI shall sell to CDE, and CDE shall purchase from NRI, the products ("Products") and

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/ or services ("Services") described in Exhibit A, attached hereto, and incorporated herein by this reference, upon the terms and conditions of this Agreement (including, without limitation, strict compliance with the payment terms set forth in Exhibit B attached hereto and incorporated herein by this reference).

2. DELIVERY OF SYSTEM COMPONENTS, RISK OF LOSS, ADDITIONS TO PROJECT

2.1 NRI shall deliver and install system components to CDE in accordance with the "Delivery Date" set forth on Exhibit A, subject to CDE strict compliance with the terms and conditions of this Agreement, including, without limitation, the payment terms set forth in Exhibit B. NRI shall provide CDE with reasonable advance notice of the actual Delivery Date and any adjustments to this date as the project progresses. CDE acknowledges that NRI shall have no obligation to deliver the Products to CDE unless and until CDE is in compliance with the terms of Exhibit B. NRI's Delivery Date shall represent the time at which the Plant has all system components in place with successfully completed the On-Site Acceptance Testing (OSAT) process which shall be mutually agreed upon in advance of the construction phase of the project by all Parties.

2.2 NRI will deliver and install some system components At Place (DAP), as applicable as specified on Exhibit A. Security of the CDE site or an alternative designated climate controlled CDE storage location, and thereby the security of the components, during the installation and commissioning process, once delivered, is the responsibility of CDE. NRI shall remain owner and risk of loss of any components until title is passed to CDE. NRI shall follow the security protocols provided by CDE at the end of each business day to ensure site is secure prior to NRI personnel's departure. For clarification purposes, CDE (or its general contractor) is responsible for the site, civil site improvements, site maintenance and security, and the supply of local electrical service and restroom accommodations at the site during the time of construction. NRI is responsible for all Plant related components and their integration into the NRI-generated and CDE-approved design, all Plant construction and commissioning, operation and maintenance plans.

2.3 **Solar Array Addition** - NRI acknowledges that this overall system is designed to include a

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solar array at the project site whose design and implementation does fall under the NRI project scope. NRI will collaborate with CDE and select a subordinate solar array vendor approved by CDE who will function as a subcontractor to NRI. Regarding any planned interconnection to the energy storage system or microgrid medium voltage network, system grounding schema, and other site-specific requirements NRI shall function as the lead technical representative for CDE in all matters relating to the solar array construction.

NRI's responsibility within this project shall be that of the technical lead and prime contractor for all electrical components including the solar array, the energy storage system, the microgrid controller and subservient customer-related microgrid panels, and the medium voltage distribution network. CDE, or CDE's general contractor, shall be responsible for all civil site work, civil engineering services, permitting and regulatory filings and compliance, and local electrical licensed activities such as station service wiring and/or customer load-panel wiring. NRI shall provide supportive engineering service to CDE throughout their permitting activities whenever possible avoiding all unnecessary additional expenses. NRI shall direct all as-yet undetermined subcontractors reporting to NRI to supply and deliver their materials in accordance with Shipping Terms and Delivery Conditions NRI and CDE have agreed upon.

NRI will work with CDE to select a qualified and experienced solar subcontractor to NRI who shall construct a solar array at the project site of approximately 19.7MWDC in size as described and provided in budgetary layouts by Mr. Dennis Emberling. Adjustments to the MW scale of the solar array, if required, shall be made with CDE approval after further technical discussions with NRI. The price per installed Watt ($/Watt) of this array shall be set after review and approval by NRI and CDE of vendor proposals. Once the array design and price have been established, CDE shall execute a Change Order or Addendum to this Agreement to add the solar array. The solar array's Change Order or Addendum shall be issued with its own set of payment terms unique to the array's construction.

2.4 **Medium Voltage (MV) Distribution Network Addition** - NRI acknowledges that this overall system is designed to include a medium voltage, underground, direct-to-customer, cable network

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at the project site whose implementation does fall under the NRI project scope. This medium voltage network shall be designed to connect the solar array facilities, with the energy storage units, and customers located across the project area. NRI will serve as the lead designer for this medium voltage network and shall be responsible for the design, procurement, installation, and commissioning of the network. NRI will collaborate with CDE and CDE's general contractor responsible for civil work (which shall include trenching) and shall terminate the distribution network at the designated customer facility as directed by CDE. The price of this installed distribution network shall be set after review and approval by NRI and CDE of our medium voltage engineer's proposal. Once the network design and price have been established, CDE shall execute a Change Order or Addendum to this Agreement to add the distribution network. The distribution network's Change Order or Addendum shall be issued with its own set of payment terms unique to the network's construction.

2.5 **Establishment of Demarcation points** - CDE Acknowledges that it is solely responsible for managing and overseeing all aspects of this project beyond the points of electrical and communications demarcation. Electrical demarcation shall be the designated as the customer transfer switch(es) which shall interconnect the Microgrid system and the public utility electrical system. Communications demarcation shall be the public WAN ports of any communication devices associated with the microgrid controls. CDE is responsible to maintain on an ongoing basis adequate and secure internet connectivity for the microgrid at and after the time of system commissioning throughout the 10-year warranty period included within this agreement. Such connectivity is critical to the ongoing operation of the Microgrid system. CDE and NRI may agree outside of this Agreement to have NRI maintain internet services, for a monthly fee, in a subsequent document.

3. PAYMENT.

3.1 The prices for Products and Services are set forth in Exhibit B (Pricing & Payment Terms) and

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any adjustments shall be billed in accordance with Exhibit F (NRI Engineering Rate Schedule).

3.2 All prices in Exhibit B are in U.S. Dollars (USD). Prices do not include any applicable taxes (including but not limited to sales and use), wherever imposed, which are payable by CDE. CDE shall pay any and all applicable sales taxes and charges or provide NRI acceptable exemption certificates. Pricing **DOES** include any applicable import tariff on lithium modules.

3.3 CDE shall make payments to NRI in strict accordance with the terms of Exhibit B. CDE shall make all payments, in U.S. currency by bank wire transfer to NRI's designated bank pursuant to the wire instructions set forth in Exhibit B (which may be changed by NRI upon written notice to and acceptance by CDE).

3.4 CDE hereby grants to NRI a purchase money security interest in all Products sold to CDE as security for the due and punctual performance by CDE of its obligations under this Agreement. CDE shall not encumber or otherwise permit any lien to exist on the Products unless and until NRI has been paid in full hereunder. NRI's security interest in the Plant shall cease upon completion of the last payment defined in Exhibit B.

3.5 CDE represents and warrants that it has or will obtain prior to design approval the financial ability to fully perform its obligations under this Agreement. CDE has obtained or will obtain prior to design approval any commitments, consents or approvals, easements or other legally required access or rights, from authorized third parties necessary for CDE to perform hereunder, and such commitments, consents or approvals are binding and non-discretionary. CDE's performance of its obligations hereunder will not violate any agreement or instrument to which CDE is a party or by which its properties are bound.

3.6 CDE shall make all payments due to NRI hereunder without deduction, set-off or counterclaim. CDE understands that deduction, set-offs and counterclaims are not in accordance with the payment terms of Exhibit B. NRI and CDE agree that both parties will resolve any and all disagreements regarding system installation and acceptance through a mutually agreeable dispute

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resolution process which shall allow for the increase or decrease of overall project costs and the issuance of change orders as are needed to successfully complete the project and commission the system for CDE's use.

3.7 CDE understands that a failure to make payments as detailed in Exhibit B will result in change to the Delivery Date as set forth in Exhibit A and agrees to hold harmless NRI for any change in Delivery Date resulting from a failure to make payments.

4. SPECIFICATIONS; WARRANTY; PERFORMANCE GUARANTEE; SPARE PARTS

4.1 The specifications for the goods listed in Exhibit A (the "Products") are set forth in Exhibit C attached hereto and incorporated herein by this reference (the "Specifications"). CDE acknowledges receipt of, and has reviewed, the Specifications.

4.2 In addition to passing manufacturer warranties directly to CDE, NRI provides a Standard 10 Year Wrap Warranty on all systems. 10 Year Warranty is detailed in Section 4.3 of this document. NRI shall perform the first year's annual service visit to CDE at no charge (except system consumables). Subsequent service years and/or ongoing operational services may be purchased throughout the Term of the 10 Year Warranty. Service either by NRI or an NRI-authorized and certified party is required in order to maintain system warranty beyond the factory default 2-year warranty.

4.3 The Optional 10 Year Extended Warranty for the Plant (included in pricing) and corresponding Service requirements and the System Performance Guarantee are set forth in Exhibits D, E, and F attached hereto and incorporated herein by this reference (Exhibit D - "**NRI 10 Year Warranty & System Maintenance Requirements**"), THE LIMITED WARRANTY PROVIDED HEREUNDER AND THE RIGHTS AND REMEDIES OF THE CDE HEREUNDER ARE IN LIEU OF, AND CDE EXPRESSLY WAIVES, ALL OTHER WARRANTIES, GUARANTEES, OBLIGATIONS, LIABILITIES, OR REMEDIES, EXPRESSED OR IMPLIED, ARISING BY LAW OR OTHERWISE, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY AND NON- INFRINGEMENT, IMPLIED

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WARRANTIES ARISING FROM THE COURSE OF DEALING OR USAGE OF TRADE AND IMPLIED WARRANTIES OF SUITABILITY OR FITNESS FOR A PARTICULAR PURPOSE. WARRANTY AND/OR PERFORMANCE GUARANTEES REQUIRE THAT CDE'S FACILITIES ARE CONSTRUCTED, AND MAINTAINTED, TO A SPECIFICATION DETAILED BY NRI IN THE PROJECT'S ENGINEERING PHASE. NRI 10 YEAR SYSTEM WARRANTY IS PROVIDED AS AN OPTION UNDER EXHIBIT B's PRICING TABLE.

4.4 Except as provided in Exhibit D, NRI makes no representations or warranties whatsoever with regard to any Product other than the manufacturer's warranties aforementioned in Exhibit D. NRI will transfer and assign to CDE all warranties received by NRI from third party manufacturers of system components other than the NRI SC-200 and SC-1000 controllers. While CDE is contracted with NRI for the ongoing maintenance of the Plant, NRI shall be responsible for the administration and processing of all Warranty related issues on CDE's behalf and shall represent CDE as the Owner's Engineer for the purposes of defending them against component manufacturers in Warranty related matters. The cost of hardware required to record system operating information for warranty purposes is the responsibility of CDE, however NRI will provide you with recommended specifications for the small server that is required (estimated at less than $5,000).

4.5 CDE may, at the time of purchase elect to procure the KORE System Performance Guarantee for the battery modules used in this project. The KORE System Performance Guarantee is available directly through KORE at an additional cost of 1% of the total battery cost. This Guarantee requires that both a 10 Year Extended Warranty is purchased in order to support the system requirements and that a defined use profile has been submitted by the customer to KORE. If elected, the System Performance Guarantee will provide a guarantee to the degradation curve of the batteries provided they are operated within the defined use profile.

4.6 NRI shall provide CDE a list of recommended spare parts for the energy storage system and microgrid controllers and NRI and CDE shall designate a local site in which Microgrid system spares shall be kept and inventoried on an annual basis during the standard service interval. As additional portions of the project are added (See Sections 2.3 and 2.4) the list of spare parts shall be updated to CDE. Spare parts shall be used in support of Warranty activities and shall be replaced by either

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CDE or NRI, depending upon each Warranty claim's resolution. Both parties agree that on-site spare parts serve the primary purposes of maintaining the highest level of up-time for the microgrid network and its customers.

5. MODIFICATIONS/CHANGES. The terms and conditions of this Agreement are expressly amended and modified pursuant to the provisions set forth in Exhibit E attached hereto and incorporated herein by this reference (the "Supplemental Terms and Conditions"). Except for the Supplemental Terms and Conditions set forth in Exhibit E. If there are no Supplemental Terms or Conditions for inclusion in Exhibit E, the Parties shall so indicate on Exhibit E by marking "None."

6. TITLE TO ENERGY STORAGE SYSTEM. NRI represents and warrants to CDE that, at the time of Commissioning of the Microgrid System to CDE, NRI will have good and marketable title to the Energy Storage System (including all intellectual property used to engineer and design the system), the Solar Photovoltaic Array, the Medium Voltage Distribution Network, and the Microgrid controller, free and clear of all liens and encumbrances. Title for the balance of Plant not included in the list of Long Lead items shall transfer from NRI to CDE after the system has been commissioned, and after the last payment in Exhibit B has been remitted to NRI.

7. FORCE MAJEURE. NRI shall not be liable for any delay in performance, nonperformance, or any other deviation in performance of NRI's obligations, nor for any loss or damage to the goods supplied hereunder, when occasioned directly or indirectly by any cause beyond the reasonable control of NRI, its subcontractors or suppliers, including acts of God, acts of criminals or public enemy, war, terrorism, pandemic, riot, official or unofficial acts, orders, regulations or restrictions of any foreign or domestic government or agency thereof, acts of CDE or its employees or representatives; strikes or labor difficulties involving employees of CDE or any other party. NRI shall have a reasonable, and mutually agreed upon extension of the time for performance when delayed by any such cause, which extension may result in a delay of the "Delivery Date" set forth on Exhibit A.

8. TERMINATION. If CDE fails to perform or observe any material term or condition of this

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Agreement within sixty (60) days after receipt of written notice from NRI of such failure, CDE shall be in default and NRI may terminate this Agreement. If CDE fails to make payments required under this Agreement within thirty (30) days after receipt of written notice from NRI of such failure, CDE shall be in default and NRI may terminate this Agreement. In the event of any such termination, CDE shall pay to NRI (i) all amounts due and payable hereunder for any components delivered by NRI as of the termination date; (ii) all costs incurred and legally committed to by NRI through the effective date of termination and all costs associated with terminating subcontracts, less credit, if any, for returned purchases; (iii) any outstanding balance of engineering hours invested into the project as calculated under Exhibit F. If CDE is unable to fully fund the development and construction of the Plant or to obtain all governmental and third-party approvals necessary to develop and construct the Plant, then CDE may terminate this Agreement and will pay NRI for its time and materials up to the date of such termination.

9. SITE DELIVERY NOTIFICATION. NRI will inform CDE in advance of the delivery times of all major system components (Batteries / Inverters / Controllers / Panels / Transformers / Racking) to ensure that CDE is able to adequately prepared for the security at the site (or designated storage facility) in order to avoid any Risk of Loss (See Section 2.2).

10. COMMISSIONING AND ACCEPTANCE. NRI will schedule system commissioning in coordination with battery and inverter system's engineering representatives, representatives of the solar array subcontractor, and CDE representatives to ensure the completed system is performing at the agreed upon levels. A subsequent commissioning exercise shall occur at each microgrid offtaker where microgrid controls and controller load panels and connections shall be reviewed and tested in accordance with the testing plan which shall be mutually developed by NRI and its medium voltage engineering team. Once the facility OSAT, and end user commissioning processes have been completed and any applicable Warranty has been issued for the completed system, CDE will accept delivery of the completed system, and all agreed upon Warranty periods and maintenance schedules shall commence.

11. INSURANCE.

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11.1 In connection with NRI's performance of its obligations under this Agreement NRI will procure and maintain, the following types and minimum amounts of insurance

Commercial General Liability Insurance including Product Liability, Completed Operations and Contractual Liability coverage for losses including but not limited to bodily injury, death or property damage, with limits of not less than $10,000,000 per occurrence and $10,000,000 in the aggregate; and

Automobile Liability Insurance coverage for all vehicles owned, non-owned, leased, hired or otherwise used by NRI with limits of not less than $1,000,000 combined single limit; and

Worker's Compensation Insurance coverage with Part A Statutory limits and Part B Employers' Liability limits not less than $1,000,000 including waiver of subrogation in favor of CDE and its subsidiaries and affiliates.

11.2 In connection with NRI's performance of its obligations under this Agreement NRI will ensure that all subcontractors working on the solar array and medium voltage networks maintain the following types and minimum amounts of insurance:

Commercial General Liability Insurance including Product Liability, Completed Operations and Contractual Liability coverage for losses including but not limited to bodily injury, death or property damage, with limits of not less than $10,000,000 per occurrence and $10,000,000 in the aggregate; and

Automobile Liability Insurance coverage for all vehicles owned, non-owned, leased, hired or otherwise used by NRI with limits of not less than $1,000,000 combined single limit; and

Worker's Compensation Insurance coverage with Part A Statutory limits and Part B Employers' Liability limits not less than $1,000,000 including waiver of subrogation in favor of CDE and its subsidiaries and affiliates.**12. CONFIDENTIALITY; INTELLECTUAL PROPERTY**

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12.1 CDE and NRI have executed a Mutual Non-Disclosure Agreement which shall remain in force under a separate cover which shall cover all CDE projects.

12.2 REMOVED – NON APPLICABLE DISTRIBUTOR SECTION

12.3 Subject to the terms of this Non-Disclosure Agreement, NRI hereby grants CDE a non-transferable and copyright license to use the software associated with the NRI SC-1000 System Controller, solely for CDE's internal business purposes and in connection with the operation of the System detailed in Exhibit A. The cost of this license is included within the price of the System O&M Annual Maintenance Plan. NRI shall provide CDE with software support or updates regarding the System at no charge so long as CDE is contracted with NRI for ongoing maintenance of the Plant.

12.4 Except as otherwise provided in this Section, this Agreement does not grant to CDE any right, title, or interest in or to NRI's intellectual property, other proprietary rights or other information, including, but not limited to, NRI's name, trademarks, trade names, trade dress, trade symbols, copyrights, patents, patent applications, inventions, trade secrets, customer lists, product names or designations, processes, designs, or formulas.

12.5 Except for the NRI licensed software and standard project modifications to the NRI proprietary supervisory controller and balance of plant systems, NRI acknowledges that work within the scope of the Services to be performed regarding the Microgrid system or operating model are part of NRI's duties and responsibilities that are performed in collaboration with CDE under the scope of this Agreement. NRI is not acquiring, as a result of performing the Services, any rights to or ownership of CDE's trademarks, copyrights, or other forms of intellectual property. Likewise, CDE is not acquiring, as a result hiring NRI any rights to or ownership of NRI's trademarks, copyrights, or other forms of intellectual property. NRI and CDE mutually agree that any invention within the Microgrid scope of this project (everything except the solar equipment, solar inverters, battery storage, storage inverters, and storage controls) which may result from these collaborative efforts

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shall be shared equally between the Parties.

12.6 Per Section 12.5, NRI shall disclose promptly to CDE, and only to CDE, any invention which NRI believes the Parties have developed, conceived, or made during the term of this Agreement or within six months of the termination of this Agreement that directly results from NRI's work with CDE. NRI assigns to CDE 50% of any such invention or idea in any way connected with the provision of Microgrid Services or related to CDE's Microgrid Business, its research or development, or demonstrably anticipated research or development, and will cooperate with CDE and sign all papers deemed necessary by CDE to enable it to obtain, maintain, protect, and defend patents covering such inventions and ideas, and to confirm CDE's 50% ownership of all rights in such inventions, ideas and patents, and irrevocably appoints CDE as its agent to execute and deliver any assignments or documents NRI fails or refuses to execute and deliver promptly, this power and agency being coupled with an interest and being irrevocable. This constitutes written notification that this assignment does not apply to an invention by NRI for which no equipment, supplies, facility or trade secret information of CDE was used, and which was developed entirely on NRI's own time, unless (a) the invention relates (i) directly to CDE's Business, or (ii) to CDE's actual or demonstrably anticipated research or development, or (b) the invention results from any work performed by NRI in collaboration with CDE.

Section 12 shall survive the termination of this Agreement.

13. ON-SITE ACTIVITY.

13.1 If Exhibit A calls for any on-site Services by NRI, including but not limited to inspection, start-up/commissioning, technical representation, erection, installation, construction, or other services the following conditions shall apply:

13.1.1 If NRI is unable to perform through no fault of its own or as a result of CDE's failure to cooperate or provide assistance or access to the site, NRI shall be excused from

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performance. In such event, NRI may, at its option, terminate this Agreement or continue to perform to the extent possible, and shall be entitled to an equitable adjustment in purchase price and/or schedule. The amount of such equitable adjustment shall be mutually agreed upon by both parties, or through the arbitration process. CDE assistance shall be free of charge to NRI and shall include but not be limited to:

13.1.2 CDE shall provide reasonable security and protection for all persons, property and equipment employed or used by NRI while at the site.

13.1.3 CDE shall make available to NRI the use of any required utilities, including rest room facilities and electrical power at site.

13.1.4 CDE shall assist NRI to obtain access to all necessary roads, railways, pumping stations, power lines, pipelines, canals, rights-of-way, easements, and the like which may be required to integrate the system.

13.1.5 CDE shall obtain any permits, licenses, easements, property rights, or other authorizations necessary to perform this Agreement. NRI will assist CDE in the application processes as they may require, however CDE (or CDE's general contractor) as owner of the facilities shall be the permit applicant for the purposes of obtaining all interconnection, environmental, zoning, construction, and electrical permits. NRI will provide engineering support throughout these processes to CDE.

13.1.6 CDE shall provide access for NRI personnel to facilities if facilities are located behind an CDE or 3rd Party secure barrier as is necessary to perform required scheduled or emergency maintenance of equipment.

13.2 If NRI, in the course of performing this Agreement discovers (i) subsurface or latent

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physical conditions at the site differing materially from those indicated in Exhibit A herein, or (ii) unknown physical conditions at the site, differing materially from those ordinarily encountered in the work as provided for in this Agreement. If the conditions differ and cause a substantial increase in NRI's cost of, or time for, performance of any part of the work, whether or not changed as a result of such conditions, the parties may mutually agree to make an equitable adjustment in the purchase price and/or schedule.

13.3 NRI is an independent contractor and not an employee or agent of CDE. CDE employees, agents or subcontractors assigned to assist NRI may receive temporary instructions, directions, safety instructions, or control from NRI but shall, at all times, be considered the employees, agents or subcontractors of CDE and not of NRI.

14. RESPONSIBILITY FOR SITING, ENGINEERING, CONSTRUCTION, AND OPERATION.

14.1 CDE as the Plant owner is fully responsible for the compliance with all Federal, State, local and municipal rules and regulations, including without limitation zoning and land use. CDE further acknowledges that it has relied, or will be relying, solely upon its own independent investigation, review and analysis in reaching such determination and understands that NRI makes no representation or warranty regarding the suitability of the location(s) chosen by CDE.

NRI has not made, nor will it make, any independent investigation or verification of CDE's siting decision for the Plant nor its attachment to specific solar array components. NRI will attempt to identify through the initial site survey, and its conferences with CDE or CDE's Civil engineering representative and/or end-user staff any potential obstacles which may delay the system deployment, but NRI does not guarantee that unforeseen site obstacles may still exist.

14.2 NRI recognizes that outside of civil and site concerns, the responsibility for the engineering analysis to ensure the proper design, delivery, and construction of the Plant resides with NRI. NRI

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has defined both a point of electrical and communications demarcation within this document (See Section 2.5). All equipment and work beyond the points of demarcation is the responsibility of CDE or its subcontractors, or the system off-takers. All equipment and work inside the point of demarcation is the responsibility of NRI with the specific exception of the concrete pads and conduits which shall be CDE's responsibility, but which NRI shall supply schematics for. In the event that CDE, or its designee, operating the system outside of specific performance metrics agreed upon by both parties and as detailed in the system Operator's Manual provided at the time of commissioning, the warranty may be subject to cancellation.

14.2A – Pads & Conduits shall be installed per a specification provided to CDE by NRI. It is NRI's responsibility to spec the pads and conduit, and CDE's (or CDE's General contractor's) responsibility to install these items. NRI shall work with whichever contractor CDE selects directly upon request.

14.2B – All conduits shall be installed with pull string and shall be fashioned and sealed with a weatherized cap at both ends to help prevent the invasion of water into system elements.

14.3 CDE recognizes that after the OSAT/commissioning has occurred and CDE has accepted the performance requirements, CDE is responsible for the continuous safe operation of the Microgrid System through its Operator. NRI shall not be liable to CDE for operation of the Energy Storage System if the system is used outside of its designed technical parameters which shall be detailed Operator's Manual provided to CDE at the Delivery Date. CDE may contract under a separate Agreement for NRI to become the ongoing operator of the system.

14.3.A – In order to clearly define when the system commissioning has been completed, the system shall not be operated for CDE or end-user commercial purposes until OSAT/Commissioning has been completed by NRI. Until the system has been commissioned it is the responsibility of NRI to organize and schedule OSAT and commissioning activities with the end-user utility on behalf of CDE. NRI shall notify CDE of all commissioning activities and CDE shall have the right to have a representative or owner's engineer present for commissioning activities. Until commissioning is completed NRI and CDE may mutually agree to have local CDE personnel assist with some testing activities. After the system has been commissioned, control and access to the system shall be exclusively determined by

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CDE. Following commissioning, NRI will continue to monitor the system under all applicable NRI warranties throughout their duration. The System may be operated for commercial purposes after commissioning and before a final punch-list has been completed.

15. LIMITATION OF LIABILITY.

15.1 NRI shall not be liable to CDE, or any third party, for any damage, injury, loss of life, or network-related issues resulting from the improper use of the Plant (Uses not specified within the System Operations Manual), nor shall NRI be liable for any indirect damages including but not limited to the loss of profits, loss of revenue, loss of production, or business interruption associated with the use of the Plant. NRI's sole liability for the use of the energy storage systems is detailed in the product's Warranty and this Agreement.

16. REGULATORY COMPLIANCE/SAFETY.

16.1 CDE and NRI shall comply with all applicable laws and regulations related to the purchase of the products and services under this Agreement including but not limited to, environmental regulations, technical standards, and AHJ (Authority Having Jurisdiction) determinations. NRI will assist CDE in supplying of information required in all permitting application processes. NRI assistance does not include Tennessee state stamped engineering documentation.

16.2 CDE and NRI's use of the Products shall comply with (i) all applicable health and safety laws and regulations, and (ii) NRI's Operations and Maintenance Manuals. CDE acknowledges that any failure to comply with such requirements may lead to bodily injury, death or damage to property. CDE acknowledges that it is CDE's sole responsibility to ensure the safe operation of the completed system in accordance with the Operating Manual and Technical Documentation.

17. DISPUTE RESOLUTION

17.1 Any controversy, dispute or claim between the Parties not settled by mutual agreement

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(a "Dispute") will be resolved by final and binding arbitration in East Jackson, Tennessee USA. Upon mutual agreement of both parties due to geographic distances, arbitration may occur over telephone conference utilizing an arbitrator based in East Jackson, Tennessee USA.

17.2 The arbitration will be conducted in accordance with such rules as may be agreed upon by the Parties, or failing agreement within thirty (30) days after arbitration is demanded, in accordance with the Commercial Arbitration Rules of the American Arbitration Association ("AAA").

17.3 The Dispute will be determined by one arbitrator appointed by mutual agreement of the Parties (or by the AAA, if the parties cannot mutually agree), unless the Dispute involves an amount in excess of $1 million, exclusive of interest and costs, in which case three (3) arbitrators will be appointed. Persons eligible to serve as arbitrators need not be members of the AAA, but they must have professional credentials demonstrating the ability to handle a matter of the scope and complexity of the Dispute.

17.4 The Parties agree to meet and discuss the scope and extent of discovery. If the Parties cannot agree, they will submit their discovery issues to the arbitrator. The arbitrator(s) will resolve any discovery disputes and issue a discovery schedule for the Dispute. THE PARTIES KNOWINGLY AND VOLUNTARILY WAIVE THEIR RIGHTS TO HAVE ANY DISPUTE TRIED AND ADJUDICATED BY A JUDGE OR A JURY.

17.5 The arbitration will be governed by the substantive laws of the State of Tennessee USA, without regard to conflicts-of-law rules, and by the arbitration law of the United States Federal Arbitration Act (Title 9, U.S. Code). Judgment upon the award rendered may be entered in any court having jurisdiction. The award must be in writing and include the findings of fact and conclusions of law upon which it is based.

17.6 The prevailing party in any such arbitration action will be entitled to recover all costs, including reasonable attorneys' fees. However, regardless of the outcome, the fees of the arbitrator(s) and the AAA shall be borne equally between NRI and CDE.

17.7 The request for arbitration shall be made within a reasonable time after the dispute or claim arises, and in no event after it would be barred by any applicable statute of limitations.

18. END-USER ACKNOWLEGDMENT. This Agreement is made for the sole benefit of NRI and CDE, and no other person shall have any right or remedy or other legal interest of any kind. CDE shall have any and all rights to transfer, assign or sell its interest in this project in order to obtain financing or maximize related tax incentives. CDE shall have any and all rights to transfer, assign, or sell the project, including all licenses granted herein which shall remain affixed to this project. Such transfers shall not be effective until NRI has been paid in full or has granted approval to CDE.

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19. MISCELLANEOUS.

19.1 Other than rights acknowledged in Section 18, neither party may assign its rights and obligations hereunder without the prior written consent of the other party. The rights and obligations under this Agreement will inure to the benefit of, and be binding upon, the parties hereto and their respective heirs, administrators, executors, personal representatives, successors and permitted assigns.

19.2 No action, failure of action or delay by either party will constitute a waiver of any of its rights or remedies under this Agreement. The waiver of a breach of any provision does not constitute a waiver of a subsequent breach of the same or different provision.

19.3 NRI is an independent contractor. CDE (and End-User, as applicable) and NRI are not, and will not be, joint venture's, partners, agents, servants, or employees or fiduciaries of the other. NRI and CDE do not have the power to legally bind or obligate the other to any third party.

19.4 The rights and liabilities of the parties under this Agreement are governed in all respects by the laws of the State of Vermont, without reference to or application of its conflicts of law provisions.

19.5 This Agreement, together with Exhibits A, B, C, D, E, and F represent the entire understanding of the parties with respect to the subject matter herein and supersede all prior negotiations, representations or agreements, written or oral. This Agreement replaces and supersedes all previous agreements, term sheets, proposals, or letters of intent, whether written or oral, between the Parties relating to the supply of the Products from NRI to the CDE. The stating of additional or different terms of sale by the CDE or the furnishing by CDE of additional documents, written or electronic (including any purchase order), shall not modify this Agreement, nor be binding upon NRI.19.6 This Agreement may not be amended, modified or altered except in writing signed by both Parties.

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19.7 Any notice provided pursuant to this Agreement shall be in writing and shall be deemed given:

(i) if by hand delivery, upon receipt thereof; (ii) if mailed with 5 days of certified mail return receipt requested, (iii) if sent via overnight courier by a nationally recognized service, upon receipt; or (iv) if sent via facsimile, upon confirmed receipt. All notices to NRI shall be addressed to it at the addresses indicated below and notices to CDE shall be addressed to it at the address on the signature page hereof (or to such other address as either party may provide written notice of to the other in the manner provided for herein):

If to NRI:

Jay Bellows, CEO
Northern Reliability, Inc.
81 Demeritt Place
Waterbury, VT 05676

If to CDE:

Dennis Emberling, CEO
Community Development Enterprises – Jackson I
[redacted]

19.8 This Agreement may be executed by the parties in counterparts, including counterparts executed and delivered via electronic transmission including e-mail or facsimile, each of which shall be deemed an original and all of which together shall constitute one and the same instrument.

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[Signature Page Follows]

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IN WITNESS WHEREOF, the Parties have caused this Sales & EPC Agreement to be executed by their duly authorized representatives as of the date first written above. In signing this Agreement, both parties agree and understand that this Agreement shall not become valid until CDE executes a separate Agreement between CDE and Community Development Enterprises for energy storage services.

Northern Reliability, Inc.

By: Jay Bellows (Dec 14, 2020 13:53 EST)

Jay Bellows

President & CEO

Date: 12/14/2020

Community Development Enterprises – Jackson I

By: Dennis Emberling (Dec 14, 2020 10:56 CST)

Name: Dennis Emberling

Chief Executive Officer

Date: Dec. 14, 2020

List of Exhibits:

Exhibit A --- Products and Services

Exhibit B --- Pricing & Payment Terms

Exhibit C --- Product Specifications

Exhibit D --- NRI Warranty Information

Exhibit E --- Supplemental Terms and Conditions

Exhibit F – NRI Engineering Rate Schedule

Exhibit G – Ongoing Maintenance and Operation Services

Exhibit A – Products and Services

NRI shall design, engineer, procure, construct, install, and commission one microgrid **Plant** which shall include:

(1) A Lithium Ion Battery Energy Storage System (BESS) which shall be comprised of (4) [redacted] designed to sustain tornado rated winds to be sited in East Jackson, Tennessee at the Roosevelt Parkway property location whose price is included in this Agreement.

(2) A Microgrid Controller and controller network which will integrate in the solar array's production, operation of the energy storage asset, and load requirements of the end-user facilities whose price is included in this Agreement.

(3) A 19.7MW Photovoltaic Array with PV Inverters and MV Step-up transformers as required by Microgrid system design whose price and final design shall be added to this Agreement by Change order or Addendum prior to the end of the Design Phase [redacted].

(4) A Medium Voltage (MV) distribution network between the Roosevelt Parkway property site and one or more end-user customer locations within approximately 1.5 miles along easements to be obtained by CDE whose price and final design shall be added to this Agreement by Change order or Addendum prior to the end of the Design Phase [redacted].

The contract's base price, which will be adjusted based upon the Terms and Conditions listed in Exhibit E and the scheduled project additions listed in Sections 2.3 and 2.4 is:

Complete ESS System and Microgrid Controller..... [redacted]

TOTAL CONTRACT VALUE BEFORE ADDENDUMS..... [redacted]

Planned Addendums:

Addendum 1 Solar (Section 2.3)..... [redacted]

Addendum 2 Medium Voltage Distribution Network (Section 2.4).. [redacted]

NRI's pricing within this Agreement is based upon the design and construction of four storm proof, hardened, BESS enclosure(s) on NRI pre-specified concrete pad(s) at each site (which are poured by CDE's general contractor), and a Microgrid Controller which shall integrate the and all system engineering, component procurement, system construction up to the points of demarcation.

Each BESS shall be charged through its connection with a local distribution feeder and the associated solar plant.

The BESS shall be comprised of the following components by NRI:

- System:
  - [redacted] Lithium Ion BESS shall contain the following components:
  - A total of 46MWh DC of [redacted] Lithium batteries (DAP per Section 2.2) – NRI to install
  - [redacted] Battery Management System (BMS) (DAP per Section 2.2) – NRI to install and configure
  - Twenty [redacted] Inverters capable of providing 1.00MWAC combined output power with an EPC Inverter Controller. (DAP per Section 2.2). – NRI to install and configure
  - Twenty [redacted] Controllers integrated with NRI Northview Software and Monitoring System with Onsite HMI – NRI to install
  - One (1) [redacted] Supervisory Controller integrated with NRI Northview Software and Monitoring System with Onsite HMI – NRI to install
  - NRI Battery Racking System – NRI to install
  - NRI Microgrid Controller Interface

- NRI Remote Monitoring, Security, & Communications Package – NRI to install
- Weatherized, Climate Controlled Enclosure(s) per Final System Design – NRI to install
- HVAC and air handling system – NRI to install
- Fire Suppression System – NRI to install
- 10 Year Wrap System Warranty

The Design Phase of this Agreement shall have the following deliverables provided to CDE for each system:

Phase One: **Electrical Engineering Design Phase**
(Work Scheduled to be performed [redacted])

- Electrical engineering design of Power System; Phase One deliverables to include (document titles included in parentheses):
  - Single Line Electrical Diagram (INST0720-J01)
  - Schedule & Work Breakdown Structure (INST0720-PM07)
  - Documentation Schedule & Register (INST0720-PM10)
  - Product Specification (*document containing information regarding the features and benefits of the System, and stating design and Project assumptions, clarifications, and exclusions; includes logic and parameters used to determine battery SOC, monitored parameters extended for remote observation and generator room, control functions available at remote location, description of inverter configuration and operation (phase control, alarms, shutdown parameters), and interface requirements for extended controls and alarms*) (INST0720-A01) (Contains legacy H02 Document).
  - General Arrangement *(drawings providing identification and layout of all major equipment showing equipment sizes, distances from other pieces of equipment, existing structures, and site boundaries; access, withdrawal, and lay down requirements for maintenance, including door openings and equipment removal areas; overall weights and maintenance weights for major components; and indication of interconnection points)* (INST0720-B02)

- Wiring Schematic Diagram (INST0720-H06)
- AC/DC Schematic 2-Line Drawing (INST0720-J06) (Contains Legacy J07 Document)
- Equipment Schedule *(Bill of Materials with manufacturer part numbers of major components, including part numbers identifying options)* (INST0720-J04)
- Electrical Data Sheet(s) (*collection of data sheets for all major electrical components purchased for use in the Project*) (INST0720-R02)
- System Programming Code, subject to change in Phase Two *(to include preliminary logic and parameters used for controller operation)* (INST0720-H19)
- Telemetry Schedule, subject to change in Phase Two (including parameters to be monitored and associated alarms) (INST0720-H14)
- Site Pad Specifications Design Sketch

Phase Two: **Project Implementation Phase**
(Work Scheduled to be performed [redacted])

- Installation of Solar array racking system (To be added, priced, and scheduled by Addendum)
- Installation of Solar array panels and inverters (To be added, priced, and scheduled by Addendum)
- Connection of Solar array to MV point of interconnection (To be added, priced, and scheduled by Addendum)
- Engineering/design of environmental components for Battery & Equipment Shelter (Estimated [redacted])
- Thermal Calculations for Battery & Equipment Shelter (Estimated – [redacted])
- Engineering/design for general arrangement of equipment (Estimated – [redacted])
- Programming/software development of all required controls systems in coordination with local utility representative or CDE representative (Ongoing process [redacted])
- Procurement of all Equipment and materials indicated in Northern Reliability's Bill of Materials (Estimated Long lead procurement – [redacted] | Estimated Balance of Plant procurement – [redacted])
- Installation of Battery & Equipment Shelter ([redacted])
- Production of System Controller – (Estimated [redacted])
- Installation FAT of system controllers – ([redacted])

- Installation of Primary Microgrid Controller (MGC) – ([redacted])
- Testing and OSAT of MGC ([redacted])
- Factory Acceptance Testing (FAT) Procedure and Metrics ([redacted])
- Delivery of Northern Reliability procured equipment and materials to CDE
- On-Site Acceptance Testing (OSAT) Procedure and Metrics for Roosevelt Parkway facilities [redacted]
- Installation of Medium Voltage (MV) wire runs, protection, and switchgear (To be added, priced, and scheduled by Addendum) – Estimated Construction [redacted]
- Installation and Testing of End-user Microgrid Controls and Load panels (To be added, priced, and scheduled by Addendum) – Estimated Construction [redacted]
- Commissioning of End-user Microgrid System and OSAT with primary MGC. (To be added, priced, and scheduled by Addendum) – Estimated Construction [redacted]

NRI's BASE PRICE includes the following services:

- NRI Engineering Field Services Team for Design, Component procurement, Controller assembly, system installation, and Factory Acceptance Testing (FAT)
- Battery System Engineering Field Commissioning
- NRI Field Services and Engineering On-Site Acceptance Testing (OSAT) Team
- NRI Engineering Team Field Commissioning
- Ten Year Complete System Warranty (Battery and Inverter provider has its own warranty which shall be passed directly to CDE)
- Ten Year KORE Battery Warranty
- Installation equipment and resources for installing system
- Storage facilities for materials arriving prior to receiving date

NRI's BASE PRICE does not include:

- NRI Annual Maintenance (priced separately as Exhibit G to this Agreement)

DELIVERY DATE:

Providing this Agreement is executed on or before December 18th, 2020 NRI to have the facility installed, operational, and commissioned by January 1st, 2022. This date is designated as the DELIVERY DATE until altered by mutual agreement of both Parties as the project develops.

Exhibit B – Pricing & Payment Terms

PRICING

The total unadjusted purchase price and total contract value is ("BASE PRICE") $22,359,188

This includes the ten-year extended BESS wrap warranty from NRI covering all equipment, the 10 Year Manufacturer Warranty from Kore Power, the EPC Power manufacturer Warranty for the inverters.

PAYMENT TERMS

(Advance Engineering & Development Services, Energy Storage System, Microgrid Controller)

- A $1,000 Deposit upon execution of Agreement
- 05% of the total project value upon securing the project's funding pool ([redacted])
- 10% of the total project value upon finalization of the electrical design ([redacted])
- 35% of total contract value upon placement of long lead equipment (batteries/inverters /racking) ([redacted])
- 5% of total contract value upon receipt of long lead equipment
- 5% of total contract value upon completion of factory acceptance test for battery system controllers
- 5% of the total contract value upon completion of the (4) Tornado Proof ESS enclosures
- 5% of the total contract value upon completion of the medium voltage electrical runs between ESS facilities and end-user location
- 5% of the total contract value upon successful completion of the PV array to the point of MV interconnection
- 5% of the total contract value upon successful commissioning of the ESS system
- 5% of the total contract value upon successful commissioning of the Microgrid Controller and End user microgrid controls
- Balance of the total contract value due upon completion of project punch down list
- All payments are due Net 30 and to be made in U.S. Dollars via electronic payment or money order.

PAYMENT TERMS – Solar Array

- **To be determined per Section 2.3**

PAYMENT TERMS – Medium Voltage Distribution Network

- **To be determined per Section 2.4**

Additional Terms, Conditions, and Considerations

For the purposes of payment terms, long lead equipment is defined as the Kore Mark 1 Modules and racking, and EPC Power Inverters)

NRI shall be required to maintain insurance coverage itself or through the component manufacturers of all purchased components until commissioning has been completed and title has been passed to CDE.

Pricing is based upon the products and services listed in Exhibit A above and upon the scope of work outlined therein.

All prices and any applicable change orders are based on 2020 commercial field rate sheet and are valid for the duration of this project. Field engineer rates are blended comprising field service lead and crew.

Additional Expenses, if authorized by CDE, will be added to the appropriate milestone.

In order to expedite the project as much as possible payment terms of Net 30 from date of invoice for completed services are requested. NRI reserves the right to charge a late fee of up to 1.5% per month on unpaid invoices after 45 days compliant with Vermont State law. NRI shall be informed of any invoice disputes before the due date of the subject invoice, and payment shall be 45 days or less after agreement on the invoice is reached by both parties.

Optional NRI System Maintenance Agreement to supply annual physical maintenance and provide ongoing monitoring (dependent upon utility communications connection) is available at a rate of $35,000.00 per year plus a 2% annual escalator plus consumables as detailed in the Operations Manual. The first year of maintenance labor is included at no charge with this agreement; consumables are not included for the first year. Maintenance scope may be found in the System Operations Manual.

Payment of Change Orders – Unless otherwise agreed upon and excluding items noted in Section 2.3 and Section 2.4 of this Agreement, any authorized change order with a value greater than $10,000.00, will generate a separate invoice payable in Net 30. Change orders may be held until their cumulative value exceeds $10,000.00 at which time an invoice will be generated. After the unit has been commissioned, all remaining unpaid Change orders will be invoiced. Labor for change orders shall be billed according

to the rate schedule accompanying this agreement.

Exhibit C --- Product Specifications

NRI shall engineer, design, procure, install, and commission a Lithium Ion Battery Energy Storage System and Microgrid Master Controller at an CDE property located in East Jackson, Tennessee. The system shall be a 20MWAC/46MWhDC Lithium Ion BESS. Final system diagrams shall be provided to CDE during the preliminary design review stage of the Agreement after the initial site visit by NRI has occurred.

PRIMARY FUNCTION AND USE CASE: The storage system shall be capable of delivering a maximum sustained, continuous, and uninterrupted 20MWAC discharge for a period of 2 hours at the design's beginning of life or variable sustained power as required by the microgrid controller in support of microgrid operations and customer load demands.

The storage system shall include a read-only interface for CDE personnel accessible through a secure online portal (requires CDE or end-user utility maintains adequate internet connectivity at all times).

Further product specification for the energy storage system will be defined in the design and engineering critical and final review phases and will be detailed in the forthcoming A01 Design document from NRI to CDE.

Further product specification for the 19.7MW solar array will be defined in the Addendum to be produced under Section 2.3 of this Agreement.

Further product specification for the Medium Voltage Distribution Network will be defined in the Addendum to be produced under Section 2.4 of this Agreement.

Equipment Lease Agreement

This Lease Agreement (this "Agreement") is entered into by and between Jackson Sustainability Cooperative (the "Lessee") and Community Development Enterprises - Jackson I (the "Lessor").

RECITALS

WHEREAS, Jackson Sustainability Cooperative is committed to efficiently supporting the community to enable the greatest mutual benefit among its Members from the acquisition of the technology and equipment necessary to accomplish its mission of allowing its Members to share in supplemental energy from renewable solar sources;

WHEREAS, the Members of Jackson Sustainability Cooperative are significant peak demand consumers of electric power who have corporate goals to increase their overall energy consumption from renewable sources;

WHEREAS, the Members of Jackson Sustainability Cooperative are committed to expanding the use of renewable energy within their facilities by implementing this shared renewable supplemental energy project and by leasing equipment used in the production of electricity from renewable solar energy sources that reduce emissions contributing to air pollution;

WHEREAS, Community Development Enterprises - Jackson I is financing the development of a 16.5 MW solar facility ("Solar Facility");

WHEREAS, the Parties have agreed to enter into this Lease for the use of the Equipment defined in Section 1 below, in accordance with the terms and conditions set forth herein, for the purpose of developing and operating a Solar Facility to generate renewable energy for the benefit of the Members of Jackson Sustainability Cooperative who desire to share supplemental energy.

NOW, THEREFORE, the parties enter into this Agreement upon the following terms and conditions:

1. **Equipment Leased.**

(a) The Equipment. Subject to the terms and conditions set forth below, the Lessor leases to the Lessee, and the Lessee hires the use of the following described equipment to operate a ground mounted solar facility capable of generating up to 26.2 Gwh/yr of energy (the "Equipment"):

Solar Modules:
35,098 [redacted], 16.5 MW STC rated DC power, degrading at the rate of .25% per year thereafter, with an expected life of at least 40 years

Solar Inverters:
115 [redacted] 150-US (600V), 150W AC each, with an expected life of 20 years before needing to be replaced.

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Battery Energy Storage System:
[redacted] Energy Storage Modules, 15 MW AC, 46 MWh DC, with an expected life of 20 years.
Other miscellaneous equipment used to connect and transfer energy to the end user.

(b) Delivery and Installation of the Equipment.

(1) The Lessor shall cause the manufacturer and contractors to deliver and install the Equipment so that it shall be commissioned and ready for acceptance by the Lessee no later than June 30, 2022. This date may be extended only by the mutual written consent of the parties.

(2) The Equipment shall be delivered to and installed at the Roosevelt Parkway site and connected to each participating Member of Lessee who shares supplemental energy, with termination of the Equipment inside the plant as designated by Lessee (the "Delivery Point"). The Lessor shall pay shipping and delivery costs.

(3) The Lessor agrees to have the site prepared for installation of the Equipment.

(4) Installation shall be performed in a professional and workmanlike manner in conformance with all recommendations of the manufacturer, and in compliance with good construction and engineering practices.

(5) The Lessor shall schedule and coordinate the installation with the Lessee and its Members to minimize interference with the Member activities in and around the facilities where the Equipment is to be located. Installation work at the Member plant shall be performed during the Member's normal working hours, unless the Member and/or Lessee directs otherwise in writing prior to the commencement of installation.

(c) Acceptance of the Equipment

(1) Following the delivery and installation of the Equipment, the Lessor shall certify that the Equipment has been successfully installed and commissioned and is ready for use. The Lessee shall promptly inspect the Equipment and shall provide its written acceptance to Lessor. The Lessor may, upon the failure of the Lessee to issue a written acceptance within ten (10) business days, demand a written acceptance, and the Lessee will be deemed to have accepted the Equipment if it has not accepted or rejected the Equipment within ten (10) days after receipt of the Lessor's written demand for acceptance.

(2) If the Equipment fails to conform to the requirements of this Agreement, the Equipment may be rejected by the Lessee.

(3) The Lessor shall provide adequate instructional services in the operation of the Equipment that may be required by Lessee and/or its Members and vendors.

(d) Use of Equipment

(1) Subject to the terms hereof, Lessee shall be entitled to use the Equipment in compliance with all laws, rules, and regulations of the jurisdiction wherein the Equipment is located and will pay all cost, claims, damages, fees and charges arising out of its possession, use or maintenance. Lessee agrees to solely use the Equipment in the conduct of Lessee's business. Lessee shall not use or permit the use of the Equipment for any purpose for which, according to the specification of the manufacturer, the Equipment is not designed or reasonably suited.

(2) Lessee, at its expense, shall take good and proper care of the Equipment and make all repairs and replacements necessary to maintain and preserve the Equipment and keep it in good order and condition (reasonable wear and tear excepted). Unless Lessor shall otherwise consent in writing, Lessee shall, at its own expense, enter into and maintain in force a maintenance agreement covering the Equipment and its components and accessories. Lessee shall furnish Lessor with a copy of such agreement, upon request. Lessee shall not make any alterations, additions, or improvements, or add attachments not included in this agreement to the Equipment without the prior written consent of Lessor, except for additions or attachments to the Equipment purchased by Lessee from the manufacturer of the Equipment (or an authorized distributor of the manufacturer) or any other person approved by Lessor. Lessee shall affix on a prominent place on each item of Equipment any tags, decals or labels supplied by Lessor to Lessee which describe the ownership of the Equipment.

(e) Liens

Lessee shall keep the Equipment free and clear of all levies, liens and encumbrances, and shall give Lessor immediate notice of any attachment or other judicial process affecting any item of Equipment.

(f) Possession and Enjoyment

The Lessor hereby covenants to provide the Lessee during the term of this Agreement with the quiet use and enjoyment of the Equipment, and the Lessee shall, during the term of this Agreement, peacefully and quietly have and hold and enjoy the Equipment, without suit, trouble or hindrance, except as expressly set forth in this Agreement.

2. **Maintenance of Equipment**

(a) The Lessor shall keep the Equipment in good operating condition and shall periodically advise the Lessee of the status of the preventative maintenance schedule.

(b) All repairs or remedial maintenance will be performed promptly.

(c) There will be no charge for travel expenses associated with maintenance service under this Agreement.

(d) The Lessor shall pay all charges for parts and maintenance and other service activities related to the Equipment.

3. **Consideration**. Lessee agrees to use all the energy generated by the Solar Facility. Unless adjusted by agreement of the parties following the commissioning of the Solar Facility during a reasonable ramp up period, the rent of the Equipment is determined as follows:

(a) Market Value of Land. Lessee and Lessor agree that the Fair Market Value ("FMV") of the property is [redacted]. Accordingly, the Parties agree that, commencing on January 1, 2023, the Fair Market Lease Value of the Leased real property is [redacted] per year, payable as [redacted] per month, which value shall be escalated at 2.5% per annum plus the annual change in the Consumer Price Index, for the remaining term of the Lease. The FMV of the property shall further be adjusted to equal the greater of these adjustments or its actual market rate once every ten (10) years. The result of all these adjustments for a particular year is called the "Adjusted Market Value of Land" for that calendar year.

(b) Market Value of Equipment. Lessor shall submit to Lessee the estimated cost of the Equipment used in the Solar Facility, to include all costs associated with the design, acquisition, construction and installation of the Equipment. The anticipated reasonable lifespan for the Equipment is thirty years. The current anticipated installed capital cost for the design and construction of the Equipment is [redacted]. Replacement cost of batteries, inverters, and other electrical items expected in the twenty-first year of operation is reasonably estimated at [redacted] whose present value at an expected discount rate of 6% is $9,915,350. Replacement of solar panels is expected to begin when their warranties expire in the twenty-sixth year of operation. For purposes of this Lease, the cost of replacement panels is estimated at $1,200,000.00, whose present value using a discount rate of 6% is $234,756.00. Therefore, the total present value of the capital cost of the Equipment comprising the entire Solar Facility is [redacted] for the purposes of this Lease. For the first year of the thirty-year lifespan expected, this capital cost is [redacted]. Accordingly, the Parties agree that for the first year of operation, the Market Lease Value of the Equipment is [redacted] per year, payable at the rate of [redacted] per month. Commencing on January 1, 2021 and repeating on January 1 of each succeeding year of the lease, this value shall be escalated at 2.5% per annum plus the annual change in the Consumer Price Index. The parties may adjust this amount to start replacing aging equipment, and may build an equipment replacement fund held by Lessor to be ready to replace equipment that has lost a significant portion of its capacity for its intended purpose. The result of all these adjustments for a particular year is called the "Adjusted Market Value of Equipment" for that calendar year.

(c) Expenses. By March 1st of each year of the term, Lessor shall provide to Lessee an annual accounting of operations and maintenance costs incurred during the preceding

calendar year. The cost to operate and maintain the Solar Facility, to include scheduled replacement costs, as well as the costs of operation, maintenance, repairs, and replacements that are typical for a solar power generation facility with battery storage and its associated equipment, shall be no less than [redacted] per year over the thirty (30) year term, for a monthly amount of [redacted]. Commencing on January 1, 2021 and repeating on January 1 of each succeeding year of the lease, this value shall be escalated at 2.5% per annum plus the annual change in the Consumer Price Index. The Expenses shall further be adjusted at this time to equal the greater of these adjustments or the actual expenses for the prior year. The result of all these adjustments for a particular year is called "Adjusted Expenses" for that calendar year.

(d) Cash Consideration. Subject to the adjustments in subparagraphs (d) and (e) below, Lessee shall pay Rent to Lessor for the Equipment over the term based on the components of subparagraph (a), (b), and (c) above in the initial amount of [redacted] per month ([redacted]). For each subsequent year beginning January 1, 2023, Rent shall equal the sum of that year's Adjusted Market Value of Land plus Adjusted Value of Equipment plus Adjusted Expenses. This value is called "Adjusted Rent" for that year. Payments under this Agreement shall be made in arrears, with the first payment due within 30 days after the first month of operation.

(e) Monthly Rent. For all years, Rent for the month just ended (the Billing Month) shall also be adjusted monthly according to the following formula ("Monthly Rent"), where

R = annual Adjusted Rent for the current calendar year

M = sum of energy delivered to Lessee at all Delivery Points for the Billing Month

A = sum of energy delivered to Lessee at all Delivery Points for twelve months prior to the Billing Month

$$\frac{12 \times R \times M}{A}$$

For the first year of operation, A shall be assumed to = 23.0GWh.

However, in no event shall the Rent exceed ninety-five percent (95%) an amount equal to the difference between what the municipal utility would have charged JSC's members without JSC's supplemental green energy and what the municipal utility actually did charge JSC's members for that month.

(f) Solar Renewable Energy Credits (SRECs). Lessor agrees to assign to Lessee (or its Members) the Solar Renewable Energy Credits generated by the Solar Facility in its first twelve months of operation. Thereafter, all Solar Renewable Energy Credits remain the property of the Lessor.

(g) Reward for Energy Conservation. Lessor agrees to discount the Rent to Lessee by an amount agreed upon between Lessor and Lessee from time to time as an incentive for all or certain of Lessee's Members to conserve energy. This Rent discount is intended to incentivize Lessee's Members to replace old, inefficient equipment with new, more efficient equipment, as well as to replace inefficient lighting, HVAC, and other electrical devices with more efficient ones.

(h) Modification of Consideration for Technology Upgrades. In the event the parties desire to upgrade the Solar Facility to incorporate new technology that will increase electric power production and/or improve cost effectiveness, the parties may, by mutual agreement, modify the consideration due for any extension in the Lease term.

4. **Term**

(a) Term of Lease. The term of this Lease shall be for a period of thirty (30) years, commencing on the later of August 1, 2022 or the first day of the month following the completion of testing, commissioning and certification of the Solar Facility (the "Commencement Date") and, unless sooner terminated as hereinafter provided, expiring on July 31, 2052.

(b) Modification of Term of Lease for Expansion or Technology Upgrade.

(1) During the basic term of this Lease, the Parties may desire to upgrade the Solar Facility to incorporate new technology that will increase electric power production and/or improve cost effectiveness. Upon mutual agreement of the parties, the term of this Lease may be extended by up to twenty (20) years, with corresponding modification to consideration, to accommodate the installation and amortization of any such upgrade.

(2) In the event that Lessor is unable to use the leased Property due to any of the following: (i) Lessor is denied any permits necessary to construct and operate the Solar Facility; (ii) fire, natural disaster or other casualty; (iii) hostile acts, warfare, or major accidents; (iv) condemnation for a public or quasi-public use under any statute or by right of eminent domain or private purchase in lieu thereof by any competent authority; then Lessor shall have the right to terminate the Lease within thirty (30) days after providing Lessee with written notice. Lessor shall also have the right to terminate the Lease within thirty (30) days after providing Lessee with written notice in the event that there is a change in law or applicable regulation and action or inaction by any federal, state or local legislative, executive, administrative judicial agency or body which invalidates any government incentive that Lessor is to receive for operating a solar power generation facility with battery storage. Except for any obligations that specifically survive the termination of the Lease as set forth herein, both Lessor and Lessee shall be released of any and all liability and obligations specified in the Lease as of the termination date.

(c) Commissioning and Certification. Lessor shall deliver the energy from the Equipment for use by the Lessee once the Equipment is commissioned and certified. Once certified by the Lessor to the Lessee, Rent shall commence.

5. **Manufacturer Warranties**

Lessor has acquired or will acquire the Equipment in connection with this Agreement. Lessor shall not be liable for damages for any reason for any act or omission of the manufacturer of the Equipment. Except as provided in Section 18 ("Remedies") hereof, Lessee acknowledges that neither its dissatisfaction with the energy produced by the Equipment or any component part or accessory, nor the failure of the Equipment to remain in useful condition during the Term, nor the loss of possession nor the right of possession of the Equipment nor any part thereof by Lessee (unless due to Lessor's acts or omissions"), shall relieve Lessee from the obligations under this agreement during the Term. The Equipment shall remain the sole and exclusive personal property of Lessor. Lessor is the beneficiary of all manufacturer warranties. Lessor shall promptly notice the manufacturer of problems with the Equipment that are covered under warranty.

6. **Location of Equipment and Tax**

Lessor shall at all times keep the Equipment within its exclusive possession and control. Upon Lessor's prior written consent, which shall not be unreasonably withheld, Lessee may inspect the Equipment. Not later than January 31st of each calendar year, Lessor shall provide Lessee a written report detailing the current condition and efficiency of the Equipment as of the prior calendar year. Lessor shall make all tax filings and returns for property taxes due with respect to the Equipment, and Lessee agrees that it shall not make or file any property tax returns, including information returns, with respect to the Equipment. Lessee is not required to reimburse Lessor for the personal property taxes paid with respect to the Equipment.

7. **Risk of Loss**

Commencing on completion of construction and continuing throughout the Term, Lessor shall bear the entire risk of loss or damage in respect to the Equipment, whether partial or complete, from any cause whatsoever. In the event of loss, theft, destruction or damage of any kind to any item of Equipment, or if the Equipment is lost, stolen, or taken by governmental action for a stated period extending beyond the Term (an "Event of Loss"), Lessor shall promptly notify Lessee. Lessor shall, at its option: (a) immediately place the affected Equipment in good condition and working order, or (b) replace the affected Equipment with identical equipment of at least equal value, in good condition and repair, and transfer clear title thereto to Lessor. Lessor may, but is not required, to secure (i) business interruption insurance in the minimum amount to cover the average monthly expenditures based on an average of the prior three years operating expense experience, and (ii) equipment insurance to cover the replacement costs of all damaged equipment. Lessee shall be named as additional insured and receive credit for proceeds received by Lessor from this insurance to cover the monthly Rent from the business interruption insurance.

In the event of a governmental taking of Equipment for an indefinite period or for a stated period, which does not extend beyond the Term, all obligations of the parties with respect to the Equipment (including payment of Rent) shall continue. The parties shall work in good faith to divide or credit all sums received by Lessor from the government by reason of such taking.

8. **Access to Records and Billing**

(a) The Lessor shall maintain all books, documents, papers, maintenance records, accounting records, and other evidence pertaining to all costs incurred for the Equipment leased under this agreement. Lessor shall make such materials available at its office at all reasonable times during the lease term, and for three (3) years from the date of final payment under the lease, for inspection by the Lessee. Copies thereof shall be furnished at no cost to the Lessee if requested.

(b) Lessee is responsible for billing its Members based on their Member Agreement. Lessee will consult with Lessor when necessary to establish billing procedures for energy assessments to determine the amount charged to each Member. Lessee shall send written (or email) invoices to its Members monthly. Lessee shall take such action as is necessary to collect any invoice not paid within thirty (30) days after the due date. Upon the request of the Lessor, Lessee shall issue a statement setting forth the identity of Members who have not timely paid. For paid Members, the statement is conclusive evidence of such payment. Lessee shall establish guidelines and policies to the satisfaction of Lessor for all its officers having fiscal responsibilities. If a Member payment is more than ninety (90) days in arrears, upon request of Lessor, the Lessee shall assign the unpaid amount to Lessor for collection.

9. **Assignment**

The Lessee binds its successors and assignees to all the terms and conditions of this Equipment Lease Agreement. The Lessee shall not assign or subcontract the whole or any part of this agreement without the Lessor's prior written consent. The Lessee may assign its right to receive payments from its Members to the Lessor or to an agreed third party for collection. The assignment shall cover all unpaid amounts under this agreement and shall not be made to more than one party.

10. **Authority to Bind**

The signatory for the Lessee represents that he has been duly authorized to execute this agreement on behalf of the Lessee and has obtained all necessary or applicable approvals to make this agreement fully binding upon the Lessee when his signature is affixed, and certifies that this agreement is not subject to further acceptance by Lessee when accepted by the Lessee.

11. **Compliance with Laws.**

(a) Lessor and Lessee shall comply with all applicable federal, state and local laws, rules, regulations and ordinances, and all provisions required thereby to be included herein are

hereby incorporated by reference. The enactment of any state or federal statute or the promulgation of rules or regulations thereunder after execution of this agreement shall be reviewed by the Lessee and the Lessor to determine whether the provisions of this agreement require formal modification.

(b) Lessee certifies by entering into this agreement, that neither it nor its principal(s) is presently in arrears in payment of its taxes, permit fees or other statutory, regulatory or judicially required payments.

(c) Lessor certifies by entering into this agreement, that neither it nor its principal(s) is presently in arrears in payment of its taxes, permit fees or other statutory, regulatory or judicially required payments.

(d) Lessor warrants that the Lessor and its subcontractors, if any, shall obtain and maintain all required permits, licenses, and approvals, as well as comply with all health, safety, and environmental statutes, rules, or regulations in the performance of work activities related to the Equipment. Failure to do so may be deemed a material breach of and grounds for immediate termination of this agreement.

(e) The Lessee hereby affirms that it is properly registered and owes no outstanding reports with the Tennessee Secretary of State.

12. **Condition of Payment**

The operation of the Equipment provided by the Lessor under this agreement must be operated to the Lessee's reasonable satisfaction, and in accordance with all applicable federal, state, local laws, ordinances, rules, and regulations.

13. **Confidentiality of Data, Property Rights in Products, and Copyright Prohibition**

The parties acknowledge that this agreement may require or allow access to data, materials, and information containing confidential information maintained by the Lessee in its computer systems or other records. The Lessor covenants that data, material and information gathered, based upon or disclosed to the Lessor for the purpose of this agreement, will not be disclosed to or discussed with third parties without the prior written consent of the Lessee. Lessor agrees to maintain the same internal privacy/confidential information policy as maintained by Lessee. Lessor agrees to comply with such internal privacy/confidential information policy with regard to data, materials, and information disclosed or otherwise provided to Lessor by the Lessee under the terms of this agreement. The Lessor agrees that all information, data, findings, recommendations, proposals, etc. by whatever name described and in whatever form secured, developed, written or produced by the Lessee in furtherance of this agreement and in operation of the Equipment shall be the property of the Lessee. The Lessor shall take such action as is necessary under law to preserve such property rights in and of the Lessee while such Equipment is within the control and/or custody of the Lessee. The Lessor specifically waives and/or releases to the Lessee any cognizable property right of the Lessee to copyright, license, patent or otherwise use such information, data, findings, recommendations, proposals, etc.

14. **Option to Extend; Surrender of Equipment; Purchase Option**

(a) Unless Lessee notifies Lessor not less than ninety (90) days prior to the expiration of the initial thirty (30) year Term, the Lessee's renewal option to extend the lease for continued use of the Equipment for an additional twenty (20) year Term is automatic. The renewal Term is for twenty (20) years. The parties may by agreement engage in additional renewal Terms so long as the lease extension does not exceed seventy five percent (75%) of the remaining economic life of the Equipment. If Lessee desires not to exercise its option, it shall give Lessor irrevocable written notice of its intention not to exercise such option at least ninety (90) days (and not more than 180 days) before the expiration of the Term. If the Lessee does not renew the lease, then upon the end of the Term, Lessor will take sole possession of the Equipment in compliance with Section 14(b) below.

(b) Except as specified otherwise herein, upon the expiration, early termination as provided herein, or final termination of the Term, Lessee, at its cost and expense, shall promptly return all (not part) of its rights to the use of the Equipment (including, without limitation, all service records and user manuals). Additionally, Lessee, at its cost and expense, shall cause its Members to promptly allow Lessor to remove and return all (not part) of its rights to the Equipment located on the premises of the Members (including, without limitation, all service records and user manuals. If the Equipment is sold by the Lessor after the final termination, Lessor shall arrange and pay for the de-commissioning, de-installation and packing of the Equipment to be performed by manufacturer-certified technicians, approved by Lessor. Lessor shall supervise and direct the preparation of the Equipment for return from the Member's of the Lessee. IF, UPON TERMINATION OR EXPIRATION OF THE TERM FOR ANY REASON, LESSEE FAILS OR REFUSES FORTHWITH TO RETURN AND DELIVER THE EQUIPMENT TO LESSOR, LESSEE SHALL REMAIN LIABLE FOR ANY RENT PAYMENTS ACCRUED AND UNPAID WITH RESPECT TO THAT EQUIPMENT AND SHALL PAY RENT UP TO THE DATE THAT THE EQUIPMENT IS RETURNED TO THE ADDRESS SPECIFIED BY LESSOR. In such event Lessor shall also have the right, with reasonable notice, to enter Lessee's Members premises or any other premises where the Equipment may be found and to take possession of and to remove the Equipment, at Lessor's sole cost and expense, without legal process. Lessee understands that it may have a right under law to notice and a hearing prior to repossession of the Equipment. As an inducement to Lessor to enter into a transaction, but only to the extent that Lessee, if a state agency, has statutory authority to do so, Lessee hereby expressly waives all rights conferred by existing law to notice and a hearing prior to such repossession by Lessor or any officer authorized by law to effect repossession and hereby releases Lessor from all liability in connection with such repossession. To the extent authorized by the Constitution and laws of the State of Tennessee, Lessee's or the Lessee's Members' obligation to return Equipment may, at Lessor's option, be specifically enforced by Lessor.

(c) Lessor hereby grants and extends to Lessee, an option to purchase the Equipment. Lessee must exercise the option to purchase within ninety (90) days from December 31,

2032. The purchase price of the Equipment is [redacted] and No/100's Dollars ([redacted]). Lessor shall give Lessee a bill of sale and assign any remaining manufacturers warranty, if any, at closing. Title to the Equipment will pass to the Lessee upon notification to the Lessor of the Lessee's intent to exercise its purchase option, and the payment of the Purchase Price. Closing will occur within ninety (90) days of exercise of the option to purchase. The purchase option granted shall be exercised in writing and delivered or sent by first class mail, postage prepaid, to the Lessor, and must include all and not less than all of the Equipment. Upon giving the notice as provided, it is agreed that such shall constitute a binding contract for the sale and purchase of the Equipment described in the notice and enforceable by either party including the right to specific performance, if necessary. Lessee is responsible for payment of any transfer tax or tax on tangible personal property, if any, that occurs on or after closing. Each party will be responsible for and pay their respective costs and expenses relating to the transaction. This purchase option is personal to Lessee and may not be assigned to any person.

15. **Insurance**

At its expense, Lessor shall keep the Equipment insured against all risks of loss and damage with companies acceptable to Lessor for an amount equal to the original cost of the Equipment, with Lessor or its assign(s) named as a loss payee. Lessor shall also maintain comprehensive general liability insurance, with Lessee or its assign(s) named as an additional insured. Lessor shall be liable for any loss not covered by insurance. All said insurance shall be in form and amount reasonably satisfactory to Lessor. Lessor shall pay the premiums therefor and deliver to Lessee or its assign(s) the certificates of insurance or duplicates thereof or other evidence satisfactory to Lessee or Lessor's assigns of such insurance coverage. Evidence of such insurance coverage shall be furnished no later than the commencement date of the Term and from time to time as Lessor or its assigns may request. Each insurer shall agree by endorsement upon the policy or policies issued by it or by independent instrument furnished to Lessor that it will give Lessor's assigns thirty (30) days prior written notice of the effective date of any alteration or cancellation of such policy. Lessee hereby irrevocably appoints Lessor as Lessee's attorney-in-fact to make claim for, receive payment of, and execute and endorse all documents, checks or drafts received in payment for loss or damage under any said insurance policy.

Lessee shall procure and maintain liability insurance on it officer and directors. Lessee shall also maintain comprehensive general liability insurance, with Lessor or its assigns named as an additional insured.

16. **Disputes**

(a) Should any disputes arise with respect to this agreement, the Lessor and the Lessee agree to act immediately to resolve such disputes. Time is of the essence in the resolution of disputes.

(b) The Lessee agrees that, the existence of a dispute notwithstanding, it will continue without delay to carry out all its responsibilities under this agreement that are not

affected by the dispute. Should the Lessee fail to continue to perform its responsibilities regarding all non-disputed issues without delay, any additional costs incurred by the Lessor as a result of such failure to proceed shall be borne by the Lessee, and the Lessee shall make no claim against the Lessor for such costs. If the Lessee and the Lessor cannot resolve a dispute within ten (10) working days following notification in writing by either party of the existence of a dispute, then the following procedure shall apply:

(1) The parties agree to resolve such matters through submission of their dispute to the certified public accountant of the Lessor. The accountant shall reduce a decision to writing and furnish a copy to the Lessor and the Lessee within ten (10) working days after presentation of such dispute for action. The accountant's decision shall be final and conclusive unless either party mails or otherwise furnishes to the accountant, within ten (10) working days after receipt of the decision, a written protest. If a written protest is provided, the parties agree to submit the dispute to mediation for a determination. Mediation is non-binding unless the parties sign a settlement agreement at the conclusion of mediation. Otherwise, the dispute may be submitted to a Tennessee court of competent jurisdiction.

(2) The intentional and/or unintentional nonpayment by the Lessee to the Lessor of one or more payments not in dispute in accordance with the terms of this agreement will not be cause for Lessor to terminate this agreement, and the Lessor may bring suit to collect these amounts without following the disputes procedure contained herein.

17. **No Warranties by Lessor Regarding the Equipment**

LESSEE ACKNOWLEDGES THAT LESSOR IS NOT THE MANUFACTURER OR LICENSOR OF THE EQUIPMENT. LESSEE AGREES THAT LESSOR HAS NOT MADE AND MAKES NO REPRESENTATIONS OR WARRANTIES OF WHATSOEVER NATURE, DIRECTLY OR INDIRECTLY, EXPRESS OR IMPLIED, AS TO THE SUITABILITY, DURABILITY, FITNESS FOR USE, MERCHANTABILITY, CONDITION, OR QUALITY OF THE EQUIPMENT OR ANY PART THEREOF. LESSEE SPECIFICALLY WAIVES ALL RIGHT TO MAKE CLAIM AGAINST LESSOR FOR BREACH OF ANY EQUIPMENT WARRANTY OF ANY KIND WHATSOEVER; AND WITH RESPECT TO LESSOR, LESSEE LEASES EQUIPMENT "AS IS". LESSOR SHALL NOT BE LIABLE TO LESSEE FOR ANY LOSS, DAMAGE, OR EXPENSE OF ANY KIND OR NATURE CAUSED DIRECTLY OR INDIRECTLY BY ANY EQUIPMENT LEASED HEREUNDER, OR BY THE USE OR MAINTENANCE THEREOF, OR BY THE REPAIRS, SERVICE OR ADJUSTMENT THERETO OR ANY DELAY OR FAILURE TO PROVIDE SERVICE TO THE EQUIPMENT, OR BY ANY INTERRUPTION OF SERVICE OR LOSS OF USE THEROF, OR FOR ANY LOSS OF BUSINESS OR DAMAGE WHATESOEVER AND HOWSOEVER CAUSED.

18. **Remedies.**

(a) Lessor's Remedies.

i. Upon the occurrence of an "Event of Default" and at any time thereafter Lessor may, in its sole discretion, do any one or more of the following:

A. after giving thirty (30) days prior written notice to Lessee of default, during which time Lessee shall have the opportunity to cure such default, terminate this agreement executed by Lessor and the defaulting Lessee;

B. to the extent allowed by the laws of the State of Tennessee, Lessor may proceed by appropriate court action to enforce the performance of the terms of this agreement and/or recover damages, including all of Lessor's economic loss for the breach thereof;

C. whether or not this agreement is terminated, upon notice to Lessee, take possession of the Equipment wherever located, without demand, liability, court order or other process of law, and for such purposes Lessee, to the extent permitted by Tennessee law, hereby authorizes Lessor, its assigns or the agents of either to enter upon the premises where such Equipment is located or cause Lessee, and Lessee hereby agrees, to return such Equipment to Lessor in accordance with the requirements of Section 14(b) of this agreement;

D. by notice to Lessee, and to the extent permitted by law, declare immediately due and payable and recover from Lessee, as liquidated damages and not as a penalty, the sum of:

I. the present value of the Rent owed from the earlier of the date of payment by Lessee or the date Lessor obtains a judgment against Lessee until the end of the Term plus, if the Equipment is not returned to or repossessed by Lessor, the present value of the estimated in-place fair market value of the Equipment at the end of the Term as determined by Lessor;

II. all Rent and other amounts due and payable on or before the earlier of the date of payment by Lessee or the date Lessor obtains a judgment against Lessee;

III. to the extent allowed by the laws and Constitution of the State of Tennessee, costs, fees (including all attorneys' fees and court costs) and expenses associated with collecting said sums; and

IV. interest on (I) and (II) from the date of default at 1½% per month or portion thereof (or the highest rate allowable by law, if less) and, on (III) from the date Lessor incurs such fees, costs or expenses.

ii. Upon return or repossession of the Equipment, Lessor may, if it so decides in its sole discretion, upon notice to Lessee, use reasonable efforts to sell, re-lease or otherwise dispose of such Equipment, in such manner and upon such terms as Lessor may determine in its sole discretion, so long as such manner and terms are commercially reasonable. Upon disposition of the Equipment, Lessor shall credit the Net Proceeds (as defined below) to the damages paid or payable by Lessee. Proceeds upon sale of the Equipment shall be the sale price paid to Lessor less the Stipulated Loss Value in effect as of the date of default. Proceeds upon a re-lease of the Equipment shall be all rents to be received for a term not to exceed the remaining Schedule Term, discounted to present value as of the commencement date of the re-lease at Lessor's current applicable debt rate. To the extent allowed by the laws and Constitution of the State of Tennessee, "Net Proceeds" shall be the Proceeds of sale or re-lease as determined above, less all costs and expenses incurred by Lessor in the recovery, storage and repair of the Equipment, in the remarketing or disposition thereof, or otherwise as a result of Lessee's default, including any court costs and attorney's fees and interest on the foregoing at eighteen percent (18%) per annum or the highest rate allowable by law, if less, calculated from the dates such costs and expenses were incurred until received by Lessor. Lessee shall remain liable for the amount by which all sums, including liquidated damages, due from Lessee exceeds the Net Proceeds. Net Proceeds in excess thereof are the property of and shall be retained by Lessor.

iii. No termination, repossession or other act by Lessor in the exercise of its rights and remedies upon an Event or Default by Lessee shall relieve Lessee from any of its obligations hereunder. No remedy referred to in this Section is intended to be exclusive, but each shall be cumulative and in addition to any other remedy referred to above or otherwise available to Lessor at law or in equity.

(b) Lessee's Remedies. Anything herein to the contrary notwithstanding, Lessee shall have all rights provided under the Tennessee Uniform Commercial Code, including without limitation, the right to cancel this agreement and recover damages from Lessor in the event of nonperformance of or other default by Lessor hereunder.

(c) Each party agrees that any delay or failure by the other party to enforce that party's rights under this Agreement does not prevent that party from enforcing its rights at a later time.

19. **Force Majeure**

In the event that either party is unable to perform any of its obligations under this contract or to enjoy any of its benefits because of natural disaster or decrees of governmental bodies not the fault of the affected party (hereinafter referred to as a "Force Majeure Event"), the party who has been so affected shall immediately give notice to the other party and shall do everything possible to resume performance. Upon receipt of such notice, all obligations under this contract shall be immediately suspended. If the period of nonperformance exceeds thirty (30) days from the receipt of notice of the Force Majeure Event, the party whose ability to perform has not been so affected may, by giving written notice, terminate this contract.

20. **Governing Laws**

This Contract shall be construed in accordance with and governed by the laws of the State of Tennessee and suit, if any, must be brought in the State of Tennessee.

21. **Indemnification.**

(a) Lessor agrees to indemnify, defend, and hold harmless the Lessee, its agents, officers, and employees from all claims and suits including court costs, attorney's fees, and other expenses caused by any act or omission of Lessor and/or its subcontractors, if any, during the construction and installation phase of developing the Solar Facility.

(b) Lessee agrees to indemnify, defend, and hold harmless the Lessor, its agents, officers, and employees from all claims and suits including court costs, attorney's fees, and other expenses caused by any act or omission of Lessee and/or its subcontractors, if any, in the performance of this agreement.

22. **Independent Contractor**

Both parties hereto, in the performance of this contract, shall act in an individual capacity and not as agents, employees, partners, joint venturers or associates of one another. The employees or agents of one party shall not be deemed or construed to be the employees or agents of the other party for any purposes whatsoever. Neither party will assume liability for any injury (including death) to any persons, or damage to any property arising out of the acts or omissions of the agents, employees or subcontractors of the other party.

The Lessee shall be responsible for providing all necessary unemployment and workers' compensation insurance for the Lessee's employees and Members operating the electric cooperative.

23. **Default**

Lessee shall be in default upon the occurrence of any one or more of the following events (each an "Event of Default"): (a) nonpayment or incomplete payment by Lessee of Rent or any other sum payable on its due date; (b) failure by Lessee to perform or observe any other term,

covenant or condition of this Agreement, any Schedule, or any applicable software license agreement, which is not cured within ten (10) days after notice thereof from Lessor; (c) insolvency by Lessee; (d) Lessee's filing of any proceedings commencing bankruptcy or the filing of any involuntary petition against Lessee or the appointment of any receiver not dismissed within sixty (60) days from the date of said filing or appointment; (e) subjection of a substantial part of Lessee's property or any part of the Equipment to any levy, seizure, assignment or sale for or by any creditor or governmental agency; or (f) any representation or warranty made by Lessee in this Agreement, any Schedule or in any document furnished by Lessee to Lessor in connection therewith or with the acquisition or use of the Equipment being or becoming untrue in any material respect.

24. **Key Person(s)**

(a) If Lessor designates that certain individual(s) are essential to the Lessee's use and operation of the Equipment, the parties agree that should such individual(s) leave their employment during the term of this agreement for whatever reason, the Lessor shall have the right to approve the appointment of a successor. Lessee agrees to submit the name of a successor within thirty (30) days of the essential individual's last day of employment.

(b) The business and affairs of the Lessee are managed by its Board of Directors. After the commissioning and certification of the Solar Facility and operation of the system for six (6) months, the Lessee agrees to have equal representation on its Board of Directors from the Members of Lessee, the community in Jackson, Tennessee, and from the Lessor. The initial Board of Directors of Lessee will consist of five members. The Lessor shall provide the name of one or more persons to the Credentials and Elections Committee of the Lessee for approval to submit to the Members for election. The Lessor may request to the Credentials and Elections Committee the removal of any director the Lessor believes is not working cooperatively to maximize the use of the Solar Facility. Without prior approval of the Lessor, no director shall receive compensation for any service he or she may render to the Lessee. A Director may, however, be reimbursed for his or her actual expenses incurred in the performance of his or her duties that are approved in advance by the President of the Lessee.

25. **Material Incorporated or Referred to in Contract**

The Lessee acknowledges that it has received all written materials, documents, or user manuals related to the Equipment, and which do not alter the terms of this agreement.

26. **Merger and Modification**

This agreement constitutes the entire agreement between the parties. No understandings, agreements, or representations, oral or written, not specified within this agreement will be valid provisions of this agreement. This agreement may not be modified, supplemented or amended, in any manner, except by written agreement signed by all necessary parties.

27. **Nondiscrimination**

Pursuant to the Civil Rights Act of 1964, the Lessee and its subcontractors shall not discriminate against any employee or applicant for employment in the operation of the Equipment or the performance of this agreement. The Lessee shall not discriminate with respect to the hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment, because of race, color, religion, gender, disability, national origin or ancestry. Breach of this covenant may be regarded as a material breach of this agreement. The Lessee's execution of this agreement also signifies compliance with applicable federal laws, regulations, and executive orders prohibiting discrimination in the provision of services based on race, color, national origin, age, gender, disability or status as a veteran.

28. **Notices**

Whenever any notice, statement or other communication is to be sent to the Lessee or to the Lessor, it shall be sent to the following addresses unless otherwise specifically advised:

Notice to the Lessor shall be sent to:

Community Development Enterprises - Jackson I
1100 Whitehall Street
Jackson, TN 38301

Notice to the Lessee shall be sent to:

Jackson Sustainability Cooperative
1031 Greystone Square
Jackson, TN 38305

29. **Order of Precedence**

Any inconsistency or ambiguity in this agreement shall be resolved by giving precedence in the following order: (1) this agreement, (2) attachments prepared by the Lessee, and (3) attachments prepared by the Lessor. In the event of any conflict between the terms and conditions of this agreement and the provisions of any of the other documents identified in items (2) or (3) of the immediately preceding sentence, the terms and conditions of this agreement shall supersede and control.

30. **Ownership of Documents and Materials**

All documents, records, programs, data, film, tape, articles, memoranda, and other materials developed under this contract shall be considered "work for hire" and the Lessor transfers any ownership claim to the Lessee. Use of these materials, other than related to contract performance by the Lessee, without the prior written consent of the Lessee, is prohibited. During the term of this agreement, the Lessee shall be responsible for any loss of or damage to these materials developed for or supplied to the Lessee and used to develop or assist in the

operation of the Equipment provided herein while the materials are in the possession of the Lessee.

31. **Payments**

All payments shall be made by ACH transfer payable to Lessor to an account designated by Lessor. No payments will be made to Lessor in advance of receipt, installation and commissioning of the Equipment that is the subject of this agreement.

32. **Progress Reports**

The Lessee shall submit progress reports to the Lessor upon request. The report shall be oral, unless the Lessor, upon receipt of the oral report, should deem it necessary to have it in written form. The progress reports shall serve the purpose of assuring the Lessor that the Equipment is operating properly with all preventative service performed on time.

33. **Severability**

The invalidity of any section, subsection, clause or provision of this agreement shall not affect the validity of the remaining sections, subsections, clauses or provision of this agreement.

34. **Substantial Performance**

This contract shall be deemed to be substantially performed only when fully performed according to its terms and conditions and any modification thereof.

35. **Taxes**

The Lessee is responsible for any taxes levied on the Lessor as a result of this agreement.

36. **Termination for Convenience**

This contract may be terminated, in whole or in part, by the Lessor whenever, for any reason, the Lessor determines that such termination is in the best interest of the Lessor. Termination shall be effected by delivery to the Lessee of a Termination Notice at least one hundred twenty (120) days prior to the termination effective date, specifying the extent to which performance of services under such termination becomes effective.

37. **Termination for Default**

(a) With the provision of thirty (30) days notice to the Lessee, the Lessor may terminate this contract in whole or in part, if the Lessee **fails to**:

(1) Correct or cure any breach of this contract;
(2) Make progress so as to endanger performance of this contract; or
(3) Perform any of the other provisions of this contract.

(b) Failure to agree will be a dispute under the Disputes clause. The Lessor may withhold from these amounts any sum the Lessor determines to be necessary to protect the Lessor against loss because of outstanding liens or claims of former lien holders.

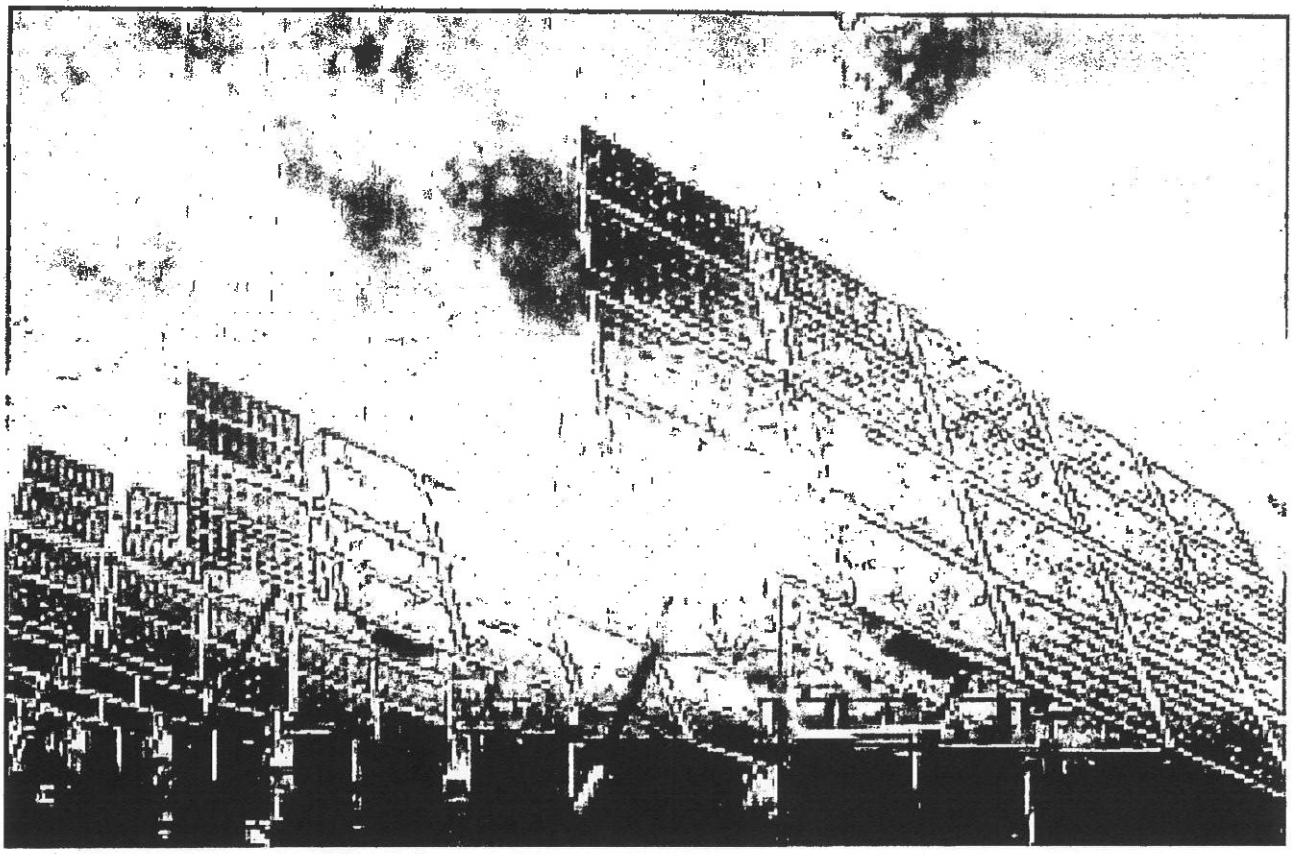
(c) The rights and remedies of the parties in this clause are in addition to any other rights and remedies provided by law or under this contract.

38. **Waiver of Rights**

No right conferred on either party under this contract shall be deemed waived and no breach of this contract excused, unless such waiver or excuse shall be in writing and signed by the party claimed to have waived such right.

IN WITNESS WHEREOF, Lessor and the Lessee have, through duly authorized representatives, entered into this agreement. The parties having read and understand the foregoing terms of this agreement and do by their respective signatures dated below hereby agree to the terms thereof.

Lessor:	**Lessee:**
Community Development Enterprises - Jackson I	Jackson Sustainability Cooperative
By: _____	By: _____
Title: _____	Title: _____
Date: _____	Date: _____



Informational Meeting

WANT TO KNOW MORE ABOUT THE

SOLAR FARM MICROGRID?

COME JOIN US!

MONDAY, MAY 17th

6:00 PM

1100 WHITEHALL

(formerly Americana Kitchen)

JSC Confidential - 500053

Solar Micro-Grid

Informational Meeting

Requested

By

Planning Committee

City of Jackson Tennessee

May 17,2021

6:00 PM

Sign In Sheet

Name	Address
1. Valrie Butler	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

38301

Solar Micro-Grid

Informational Meeting

Requested

By

Planning Committee

City of Jackson Tennessee

May 17,2021

6:00 PM

Sign In Sheet

Name	Address
1. Callessia Smith	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	38301
10	305

JSC Confidential - 500055

Name	Address
① Donzell Carthorne	Parkway
	204.
	77301

Feasibility Study

To Develop a Community Solar Microgrid
In East Jackson, Tennessee

By Dennis Emberling

Community Development Enterprises - Jackson I

July 24, 2020

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Introduction

Purpose of This Study

The purpose of this study is to determine the likelihood that Community Development Enterprises - Jackson I (CDE) will be able to build a 21 MW community solar microgrid on our 28.54 acre site in Jackson, Tennessee. CDE plans to own and operate the facility for its lifetime.

Specifically, the study includes all data collected to date about the site, its physical attributes, environment, entitlements, permitting requirements to develop the land and construct the improvements, requirements and interconnection to the local utility, regulatory requirements, and potential customers. This data has been used to formulate a distribution strategy and preliminary choices for technology and site layout. The final section lays out an economic analysis, including preferences among solar developers, financing arrangements, and estimates of all construction costs, revenues, and operating expenses, resulting in a substantial positive cash flow as soon as operations commence.

Due Diligence Completed

This study is the result of three months of research and due diligence by a team with expertise in solar, construction, planning, regulation, lending, tax, and legal issues. The team has consulted with and received information and advice from the city of Jackson's Planning Department, Engineering Department, Building Department; from the state of Tennessee's Wildlife Resources Agency, the Department of Environment and Conservation's

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Division of Natural Heritage, Division of Archaeology, and Jackson Field Office); and the U. S. Fish and Wildlife Service. [redacted] We are currently talking with other nearby heavy users of electricity. We have completed all regulatory and utility due diligence with FERC, NERC, SERC, TVA (Tennessee Valley Authority), JEA (Jackson Energy Authority), and the Tennessee Public Utilities Commission. We have lined up investors with sufficient tax appetites to use up all the tax benefits available. We have contacted many federal, regional, state, and local sources of grants and loans, and are eligible for many of them. We have consulted with a large insurance brokerage firm about needed coverage and premium estimates.

Community Solar Microgrids

Community Solar. Community (sometimes called "shared") solar is projected by NREL and others to experience a dramatic upsurge in the next few years. SEIA projects an additional 3.4 GW from 2020 to 2025. GreenTechMedia (GTM) details many community solar opportunities in its 2018 study. Forty-three states now have it, with Massachusetts and Minnesota leading the way. It has many benefits for everyone: lower electricity costs, environmental benefits, resiliency, economies of scale, optimal siting, making solar available to many homes and businesses that cannot economically acquire their own, and no user maintenance or entanglements. It can contribute to economic development and local job opportunities.

Microgrids. Similarly, renewable-energy microgrids are poised to take off in the U. S. Like a macrogrid operated by a utility, a microgrid is a discrete energy system consisting of distributed energy sources (with demand management, storage, and generation) and loads capable of operating in parallel with or independently from the main power grid.

Wood Mackenzie is tracking 2,430 operational microgrids across the U. S. as of January 2020, developed by 187 developers. Only 17 of these developers are not themselves the customers and have developed more than a single project. GTM predicts the microgrid market to accelerate in 2020.

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Microgrids provide energy resiliency to users by being able to disconnect from the macrogrid and provide backup energy in the event of a blackout. Manufacturers, in particular, risk significant costs from interruptions to production from blackouts. In our case, ensuring service when the grid is down to a fire station and colleges, the microgrid protects first responders, at-risk populations, and potential storm shelters.

Microgrids perform dynamic control over energy sources, enabling autonomous and automatic self-healing operations. By putting the energy generation facility close to the energy users, microgrids reduce transmission losses (up to 15%) and costs, thereby offering greater efficiency and lower cost to users. They can also improve power quality (better for your electrical equipment), power factor (more real usable power), and voltage profile (greater stability and less fluctuation, like brownouts). They also reduce stress on utilities' transmission and distribution systems.

Renewable-energy microgrids, like solar, offer additional environmental and economic benefits to users and their locales. They enable their users to become green and technology leaders, qualifying for various government incentives and programs.

The Need for a Community Solar Microgrid. Where a local utility forbids the transmission across its grid of electricity from distributed generation facilities to users, and where rates, policies, or weather make ownership of solar by residences and businesses uneconomical, a combination of the community solar model with the solar microgrid model is the only way to bring the benefits of solar energy into the community.

Such is the case in the territory served by the Tennessee Valley Authority (TVA), including Jackson, Tennessee. In our efforts to help hard-hit Jackson redevelop in many ways, we are undertaking this project is to develop a first community solar microgrid for some of its colleges and businesses.

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Challenges for Solar in Tennessee

TVA. There isn't much solar in the areas that Tennessee Valley Authority (TVA) services (parts of 8 states). This is partly because TVA, at least since the beginning of 2020, is one of the least solar-friendly utilities in the country. In addition, its retail rates are relatively low, making it difficult for individually owned solar to be economically feasible.

CleanEnergy.org's "Solar in the Southeast 2018 Annual Report" says of TVA, "They are a self-regulated monopoly, not subject to federal or state regulatory oversight. TVA was an early leader in small-scale, distributed solar. Recently, however, it is aggressively using a self-regulated rate design process to undercut solar penetration and dis-incentivize distributed solar throughout the Valley. Instead of 'net metering,' ... TVA implemented a 'dual meter' scheme, where it buys all the power owners generate on-site, and requires those same customers to buy all the power they consume from the local power company at retail rates. After decreasing the rate it pays for solar power produced by these customer-generators in 2018, TVA has since announced it will sunset this Green Power Providers program at the end of 2019 (which it did), with no current plans to replace it, further slowing solar development and planning ability."

Weather. Tennessee's weather is not terrific for solar. It rains an average of 3" - 4" per month all twelve months of the year! It does get enough sun the rest of the time for our project to be economically viable, but not enough for most residential or small-commercial solar to be economical.

State Policies and Incentives. Finally, the state of Tennessee (and most of the surrounding states that TVA serves) do not encourage solar through their policies or offer any incentives.

Taken together, these challenges explain why there is so little solar in TVA's service territory.

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A New Way to Overcome These Challenges. We have discovered, however, that there is one way to meet these challenges, although, to the best of our knowledge, nobody has taken advantage of it yet. That way is to build a community solar microgrid of substantial size and sell its production to a few, nearby, heavy commercial users of electricity wired directly behind their meters.

Further, because roughly 50% of heavy commercial users' TVA bill is demand charges, we can have the biggest impact on lowering their bills by providing storage that enables us to cut the peaks off their demand. Since the Tennessee average blended commercial rate is $.103 per kWh, there is plenty of room to pay us a decent rate for solar energy and still save substantially on electricity costs.

Of course, wiring up our commercial customers directly is somewhat costly, and we have included these costs in our financial projections. It also requires easements when the commercial customers are not adjacent to our site. However, we have the good will and great cooperation from the city of Jackson, and we have been assured that we are likely to obtain them.

Because our site is in an Opportunity Zone, our project is eligible for three major tax benefits: the federal Investment Tax Credit (ITC), New Market Tax Credit (NMTC), and accelerated first-year and five year MACRS depreciation. It is also eligible for many federal, regional, state, and local grants and loan programs, including Tax Incentive Financing (TIF). These programs greatly ease the challenges of financing the project.

Our New Model

Our model for community solar microgrids is a variant of NREL's Special Purpose Entity (SPE) model for solar facilities. As in the SPE model, a business entity, Community Development Enterprises - Jackson I (CDE), a Tennessee general partnership, will own or lease the microgrid's land, as well as operate and maintain it.

The way our model differs from NREL's SPE model is that, instead of distributing the solar energy produced via a utility's grid, we will wire our

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commercial customers behind their meters directly from the solar facility. By restricting ourselves to only a few commercial customers near the facility, including many along a single wiring path (total wiring of only 1.7 to 4.1 miles for all users combined), we can avoid excessive transmission costs and sell all of the electricity generated at near retail rates.

Our commercial customers will be able to draw electricity from the microgrid during the day as needed, up to the capacity of the microgrid, apportioned among the commercial customers in proportion to their agreed upon usage. Substantial battery storage will enable us to meet most of their needs on cloudy days, plus lighter and more occasional use at nights. This will shave the peaks off their demand, thereby greatly reducing their utility bills. They continue to connect to the utility's grid for additional electricity needed.

Our microgrid will **not** be connected to the utility grid, thereby avoiding all federal regulation and requirements from the utilities.

We are not aware of any other community solar microgrid using this model in the U. S. We are forced to it by TVA's refusal to allow us to transmit our energy to its commercial customers over its grid. However, by restricting our users to only a few, heavy-usage commercial customers close to the facility, our projections show this to be a very viable model.

Our Next Projects

We plan to install about four more microgrids in Jackson. We also plan to build affordable housing, support local colleges, and contribute to infrastructure improvements in Jackson, all of which are sorely needed in this hard-hit community.

After helping redevelop Jackson, we plan to go on to replicate these projects in a number of other Tennessee cities badly in need of redevelopment.

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Data Collected

Property Location, History, and Surrounding Area

Location. See included area map and Tennessee Assessor's Data. The site on which the solar microgrid is to be developed is [redacted] on the State of Tennessee's Control Map [redacted] It has no street address, but is located on the north side of Roosevelt Parkway, about 500 feet west of Dr. F. E. Wright Drive, in Jackson, Tennessee. The Assessor shows its size to be 28.54 acres, with a market value of $85,600.

It is bounded on the north by parcels 103.00 (undeveloped) and 2.00 containing Machine Tool and Supply Corporation (a small wholesaler), and on the south by an east-west row of eighteen houses which front Roosevelt Parkway on their south. To the west is parcel 1.01 and a small built-up area of homes and small commercial buildings along Carver Avenue and Bronzewood Cove. To the east is parcel 2.00 again, parcel 3.00 containing [redacted] (a small agency), and parcel 1.00 containing the Jackson Fire Department Station #3.

History. The property is owned by Hunt Properties, 1031 Greystone Sq., Jackson, TN 38305. It was purchased on 3/21/16.

It is leased with a purchase option to Community Development Enterprises - Jackson I (CDE) for development of the solar microgrid. David Hunt, owner of Hunt Properties, is working with CDE on this project. We intend to purchase the property before operations commence.

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City, District, and Neighborhood. The property is located in Jackson, Tennessee, a city which since 1999 "has faced considerable forces which have transformed its neighborhoods and downtown, including tornadoes, relocation of displaced residents, changes in the economy, and growth in the suburban fringe of the city rather than inner-city reinvestment" ("Jackson Revitalization Strategy/Community Redevelopment Act Workable Program," February, 2009).

A Community Redevelopment Agency (CDA) was established in 2009 and works with private entities and developers to form public-private partnerships that "help Jackson recover fully from its devastating losses, as well as bring its neighborhoods to a stable level of health and safety" (ibid). Our group has a long working relationship with CDA. Our development project is strongly supported by the Jackson municipal government, community groups, and colleges in the district.

The property to be developed lies in Census Tract 5, the northern section of the East Jackson Planning District (also Redevelopment District 2). This planning district has been classified as "deteriorated," the sole member of the lowest of three classes of condition in Jackson. It has been found to meet the requirements for a blighted and slum area under the Community Redevelopment Act of 1998. It is therefore classified as an Opportunity Zone, which makes its development eligible for New Market Tax Credits, Tax Increment Financing, grants from governments and foundations, city loans, bonding, a multi-bank loan pool, dedicated portions of sales taxes, and other public and private funding sources.

CDE's project to develop this solar microgrid is part of a wider effort by CDE and others to contribute to the redevelopment of East Jackson as a whole. Other components include building affordable housing, infrastructure improvements, and support of a historic black college in the district.

Physical Attributes

Site Access. One access point is from the site's frontage of approximately 122 feet along Roosevelt Parkway at the southwest corner of the property. Another access is from Stone Ridge Drive at the southeast corner of the

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property, which goes north from Roosevelt Parkway for a length of about 260 feet into the property. Carver Avenue provides access from the west into the northwest section of the property.

Topography. See topo map attached.

Flood-zone Status. Property is not in a flood zone.

Wind Zone. IV

Shading. None

Drainage. There is a small, dry creek bed running around the north and east boundaries of the property. It will probably be determined to be a "wet weather conveyance" rather than an active stream. The site is very unlikely to be considered a wetland, but a formal determination will have to be done. There are several deep ditches close to the edges of the property, and one that encroaches into its north-center area. These will be filled in, but drainage plans will have to be made for during construction and during ongoing operations.

Soils Condition/Composition. The National Resources Conservation Service published current Web Soil Survey for Madison County, Tennessee, version 14 as of September 16, 2019, shows 4 soil types on the site (see attachment). 57.4% of the site is Lexington silt loam, with 12% to 20% slopes. 34% of the site is Feliciana silt loam, with 2% to 5% slopes, northern phase. 7.8% of the site is Collins silt loam, with 0% to 2% slopes, "frequently flooded for brief durations," and the remaining .8% is Lexington silt loam with 8% to 12% slopes, severely eroded. However, the site will be graded and prepared according to the solar developer's specifications and requirements.

Existing Utilities. The property is eligible to hook up all utilities (electricity, gas, water, sewer, telephone, and internet) through Jackson's municipal utility, Jackson Energy Authority.

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Environment

Plant and Animal Habitat Data. We received a statement from [redacted], Fish and Wildlife Biologist for the U. S. Fish and Wildlife Service, 446 Neal St., Cookeville, TN 38501, [redacted], stating, "Personnel of the U.S. Fish and Wildlife Service have reviewed your request for any potential federally protected species or wetlands located on an approximate 29-acre parcel north of Roosevelt Parkway and ¼ mile west of Dr. F. E. Wright Drive in Jackson, Madison County, Tennessee. After reviewing our database, we offer the following comments: The site falls outside of any known Indiana bat (Myotis sodalis) or northern long-eared bat (Myotis septentrionalis) occurrence buffers, so we wouldn't anticipate adverse impacts to these species if tree clearing is needed. Our database does not indicate the presence of federally listed species in the vicinity of the site. Our National Wetland Inventory map database does not indicate wetlands on the parcel, however the site should be assessed to determine if any wetlands exist. There do appear to be drainage along the northern and eastern boundaries of the parcel, as well as some areas on the interior. If impacts are anticipated to these drainage, they should be assessed, and the Corps of Engineers and Tennessee Department of Environment and Conservation should be contacted to verify the results of the assessment and make a determination on Water of the State/US." We have been advised that no impacts to these drainage are likely as a result of our project.

[redacted] at the Tennessee Wildlife Resources Agency, [redacted], advised us that we are unlikely to face any requirements from his agency, but on June 10 we submitted all the information he needed to review the project. He said he'd respond soon.

Natural History. We discussed the natural history of the site with [redacted], zoologist for the Tennessee Department of Environment & Conservation's (DEC) Division of Natural Heritage, [redacted]. He looked at their databases and found no likely problems for rare or endangered plant or animal species or other issues. We

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submitted an application for an environmental review and should receive one by June 25, 2020.

Cultural History. We discussed the cultural history of the site with [redacted], state archaeologist and director of DEC's Division of Archaeology, [redacted]. He informed us that his office has no records of any archaeological points of interest on the site. If we obtain any federal financing, they will probably require a Phase I Archaeological Study, which takes about 60 days and must be done prior to clearing or grading the land. Typical costs are $1,000 to $2,000 per acre.

Community Impacts. Setbacks will be required from houses along Roosevelt Parkway, Carver Avenue, and Bronzewood Cove.

Entitlements

Zoning. According to the Jackson Planning Department manager, the property is presently zoned Agricultural (11). It is in a "green belt" for property tax purposes. The city of Jackson zones it RG-1, residential. Its assessed value is $8,900. It may need to be rezoned as Industrial by the city of Jackson, but more likely, it will be classified as a Utility, so no re-zoning necessary.

Title Report. Nothing is recorded against the property, including easements.

Water and Mineral Rights. Not separate from property title in Tennessee.

Utility Easements or Lines on the Property. JEA, the local utility, has checked and tells us that there are no utility easements on the property, and that they are unlikely to request any. If they did, the easements would be within the property setbacks, so would not affect development. They also tell us that there are no utility lines on or under the property, with the unlikely exception of a line and a sewer line just east of the site's east boundary. They appear to be off the site, but a boundary survey will determine it for sure. See attached map.

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Land Development

Permitting Authorities - Land. A Tennessee-certified hydrological professional must be engaged to conduct a hydroponic determination, including wetlands delineation and determining whether the surrounding dry creek bed is a "wet weather conveyance" (very likely). The hydroponic determination must be submitted along with the site plan and an application for Notice of Coverage to the Jackson Field Office of the Tennessee Department of Environment and Conservation, [redacted] manager, [redacted] They will review and issue a Notice of Coverage, which is required before the land can be cleared.

The Jackson Planning Department, [redacted], director, [redacted] will require a site plan, showing access and arrangement of panels on the site, to be reviewed by the Jackson Planning Commission. It will also need a vegetation impact evaluation before tree removal is approved (although they say the requirements are loose, so it will almost surely be approved). No environmental impact study or pollution study is required. Forms, applications, and other documents are found at http://www.cityofjackson.net/planning/forms-documents/.

The site is presently completely covered with trees, but will be cleared by CDE prior to construction of solar.

Permitting Authorities - Improvements. A construction permit must be issued by the Jackson Engineering Department, which requires an application with a site plan and a storm water plan for erosion control during the construction period.

The Jackson Building and Codes Department, (731) 425-08262, website at http://www.cityofjackson.net/building-housing-codes/forms-documents/, requires the electrical designs to be stamped and approved by a professional engineer certified in Tennessee and be licensed in Jackson to do electrical work (CE license). A Tennessee license can be the basis for a Jackson license for a small fee. The department will issue the electrical permits.

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Interconnection to Utilities

For Now. We definitely intend **not** to interconnect to the macrogrid, either the one owned by Jackson Energy Authority (JEA), the municipally-owned electric utility serving Jackson, Tennessee, or the regional one owned by TVA. We will sell all our electricity to nearby users and none back to JEA/TVA, because they presently only offer about [redacted] per kWh for such sales.

We will prevent any of our electricity, whether from solar or from our batteries, from back flowing onto the JEA/TVA grid in any way, including via our users, whether the macrogrid is up or down. This can be prevented by software monitoring and control and/or physical relays. We do want our users to have access to our energy when the macrogrid is down, but even this is not essential. The main goal is not to be considered interconnected, even via our users connections. (They will remain connected to JEA/TVA and will still draw a small amount of their electricity from this source.)

A Future Possibility. When and if TVA offers an attractive program to incentivize distributed solar generation, we may take advantage of it by interconnecting to JEA's grid at that time. They have 2 substations within 1 to 1.5 miles of our site, at least one of which has more than sufficient capacity to receive our energy. If, in such a future event, we would be sending substantial amounts of electricity back to the JEA/TVA grid, JEA and/or TVA might require a system impact study on their grids.

Utility Requirements

TVA. TVA is an independent, self-regulating, federal agency supplying electricity to local utilities throughout an eight-state region. Its regulations and policies therefore govern the local utilities (JEA for Jackson) and all customers connected to its grid through the grids of the local utilities.

[redacted] of TVA has assured us that TVA "follows all the regulations set forth by FERC under PURPA, including those listed in Title 18, Chapter 1, Subchapter K, Part 292: Regulations under sections 201 and 210 of PURPA."

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TVA is required by FERC to allow its customers to acquire their own sources of renewable energy "behind the meter." These sources of energy can be owned or leased by the customers or purchased from the owners of the energy sources through power-purchase agreements. These energy sources are not required to be located on property owned or leased by customers.

From our attorney's research and our discussions with [redacted] at TVA, there do not appear to be any other requirements or restrictions from TVA that apply to this project.

JEA. By not interconnecting to JEA's grid and ensuring that our electricity can never flow back to their grid (even when it's down), we are not subject to any requirements of any kind from JEA, per their electrical-systems [redacted]s@jaxenergy.com), and [redacted].

Regulatory Requirements

FERC (Federal Energy Regulatory Commission). We are completely exempt from PURPA and FERC (see attached email from FERC). FERC only regulates wholesale energy sales, such as sales of our energy to JEA/TVA. Since we're not doing that, we're not regulated by FERC.

If, in the future, we choose to interconnect and sell electricity to TVA (unlikely), we would be treated as a Qualifying Small Power Production Facility (QF) under 30 MW, making us exempt from PUHCA and most of PURPA. If under 20 MW, we'd be exempt from nearly all of PURPA.

NERC. The North American Electric Reliability Corporation regulates electrical generation, transmission, and interconnection. Tennessee falls under its Eastern Interconnection area and Southeast Reliability Corporation (SERC) regional entity.

[redacted], senior coordinator of registration and certification for SERC assured me that, since we are not interconnecting to the grid, we're not subject

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to SERC at all. And even if we were interconnected, we'd also be exempt because we're under 75 MVA and 100 kV in our transmission lines to users.

Tennessee Public Utilities Commission. We have been assured that we are unlikely to be regulated by the Tennessee PUC. We will ask for a determination letter as to whether we need a Certificate of Convenience and Necessity to be a private utility. If not, no regulation at all. If so, they only care that our rates are reasonable and they provide minimal regulation.

Potential Customers

[redacted] (see attachments). They fully support our project and want to buy its electricity. [redacted] has twice the number of students [redacted], so its bill is probably double [redacted]. See these attached files for details of [redacted] electricity usage:

- Usage
- Significant Electricity Accounts
- JEA Accounts History v.2
- Area - Earth
- Campus Map with Numbered Buildings
- Buildings (key to above map)

Nearby Commercial. Within a mile of our site, there are 17 commercial businesses. Two of these are probably too large for our microgrid, leaving 15 potential commercial users. We are investigating their interest in buying electricity from us and gathering data about their usage and bills.

Nearby Public Facilities. Fire Station #3, Forest Hill Park, and a Jackson Parks & Recreation Office are all practically adjacent to our site.

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Project Development

Distribution Strategy (see Wide Area Customers map and Its Key)

[redacted] Its electricity from the local utility, JEA, is wired overhead to buildings separately from poles on the nearest street. This wiring to the buildings is owned by JEA, so we can't use it. Each building has its own meter

It appears that we will also have to wire to each building separately. Poles along the streets or on the campus should allow us to avoid trenching. Of the approximately [redacted], some are far away from [redacted] and some use very little electricity. [redacted]

[redacted], but 7 of our other potential commercial users are on the way, so it adds only about .1 mile to our run. [redacted] at a central distribution point with a single meter, so we may be able to hook in at that point. [redacted]

[redacted] It has 11 buildings. Eight of these are close to public streets, and all but 1 are close to streets [redacted]

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To Nearby Commercial Users. There are 17 nearby commercial users. Leaving aside the two that are likely too large for us [redacted] we plan to connect 9, 11, or 15 of them, depending on their electricity needs.

Easements. Nearly all our potential users can be reached via neighboring railroad tracks, city streets, or across 1 or 2 other parcels, or some combination of these. Easements for wires and poles to connect the solar facility to its customers will be required. We're pursuing permission for an easement along the railroad tracks. We have been assured that the city of Jackson is likely to grant us the other easements we need across their land and along streets.

Wiring Runs. A single, one-mile run of wires and poles to the north of our site along a street can distribute energy to one [redacted], eight commercial sites (#1,2,3,13,14,15,16,19), and the fire station. A second, .7 mile run to the south along the railroad right of way can distribute energy to [redacted] and another large commercial site (#12). Therefore, it is likely that two runs totaling 1.7 miles, with takeoffs, will feed all the users we need.

However, if we need more, two more large commercial sites (#5,9) are available off a single, one-mile run to the east. If we need even more, two more commercial users (#4,17) are available off a single .6 mile run to the south. Finally, the furthest away are an additional .8 miles to the southeast (#10,18).

The total wiring distance should be about 1.7, 2.7, or 4.1 miles in the cases above, [redacted], with 1.7 by far the most likely.

Technology Review

Panels. We prefer to use SunPower panels with Maxeon technology for their high ratio of energy production to rated power output, therefore low cost of actual energy produced, excellent performance at low irradiance (important in Tennessee weather), efficiency, reliability, minimal degradation, longevity, and meaningful warranty with a history of honoring it with good support. This combination of advantages will give us the maximum energy our site can

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support at the lowest cost per kWh. It will minimize our costs for repairs and replacements. It will ensure the longest life of our system with minimal degradation. And when anything goes wrong, it ensures the manufacturer will repair or replace components without cost to us.

Currently, the highest-efficiency SunPower panel is the commercial, 72-cell, A-Series SPR-A425-COM at 22.89% efficiency, -.29%%/°C temp. coefficient of power, Maxeon Gen 5 cells (65% larger), size 1999mm x 1016mm. SunPower A-Series panels have the additional advantage, especially important in Jackson, of far higher resistance to wind loads than any other panels, according to tests in May, 2020: 67% higher than LG NeON R and Panasonic HIT, 125% higher than LG NeON 2, 150% higher than QCells Duo G5, and a full 275% higher than Solaria XT 400s. Their rating of 9,000 pa equates to a wind resistance up to 240 mph. The strongest one-minute sustained wind on record was 215 mph. Jackson is subject to periodic tornadoes, so this is an important benefit.

Inverters. We haven't investigated large inverters yet, but have used a [redacted] at max. AC power of 150,000 W and 98.803% CEC efficiency as a temporary stand in for our production estimates.

Trackers. We use the latest version of [redacted], that we have ourselves calibrated specifically for SunPower Maxeon panels (see attached SAM results). We have compared SAM's forecasted production of this equipment at the site with fixed ground mounts versus one-axis and two-axis trackers, using appropriate row spacing for each type. Our findings, although not definitive, are that fixed tracking, which uses much less ground and thereby permits far more panels, produces more energy per year than either type of tracking system. We are therefore inclined, pending advice from solar developers, to stick with fixed mounts.

Storage. We know we will need battery storage to reduce or eliminate our customers' demand charges by lowering their peak demands to under 50 kW.

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We know little about battery technology or options for our facility. We rely on solar developers to inform us and propose good choices.

Panel Cleaning. We intend to equip the facility with highly economical RST-Cleantech panel-cleaning systems throughout. They provide short, programmable panel rinses with soft, clean water at night, using very little water and no chemicals. Set appropriately for site soiling and weather conditions, they prevent any soil from accumulating in the first place. This enables us to avoid building in a guesswork loss factor for soiling. It also lets us know what panel cleaning will cost, rather than have to build in an estimate for it as part of O&M expense.

Layout

We have attempted to calculate optimal row spacing following the guidance of CED Greentech and using the University of Oregon's SRML . By running different combinations of tilt and row spacing through SAM, we settled on mounting the panels in [redacted], with about [redacted] and there is no shading. This is based on choosing a minimum solar elevation angle of [redacted]. It yields an azimuth correction angle on [redacted].

Using these figures, we laid out 212 rows of panels on the site map attached, allowing room for truck access all around the site. 76 of the rows have 360 panels each, 60 rows have 336 panels, 56 rows have 57 panels, and 20 rows have 34 panels. This totals 51,010 panels (with 2 extra thrown in for a round number).

51,010 panels of 425W STC DC each is 21.679 MW STC DC of power output. Using SAM as described above, this should produce up to 40.45 GWh per year.

We realize solar developers can make much more accurate estimates than this, but we hope these careful calculations are at least close.

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Economic Analysis

Developers

We are presently investigating solar developers who might be qualified and interested in doing this project and the ones to follow in Jackson and other Tennessee cities. We prefer those who can provide SunPower panels. We want to ensure high quality equipment, construction, installation, and support. Since our general partnership will own and operate the solar facility, we want a developer who doesn't insist on owning it.

Financing

See attached "Roosevelt Financial Estimates." There are myriad sources of private and governmental financing for this project. First to consider are the tax benefits, because a solar developer may offer to take these in return for our leasing the equipment, and that would simply reduce the cost of development.

Tax Benefits. These tax benefits are

- Investment Tax Credit (ITC), 26%
- New Market Tax Credit (NMTC), 39% over 7 years
- Accelerated Depreciation, both first year and 5 year MACRS

Our tax attorney has confirmed that all three of these can be taken together. The present value of these three are 26% for the ITC, 34.6% for the NMTC, and between 23% and 42.1% for the depreciation, depending on whether the party taking the depreciation is a corporation or pass-through entity, and where it

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pays state income tax. Taken together, these add up to 83.6% minimum, 102.7% maximum, and 93.1% when averaged. This means that if a solar developer offers to take all these tax benefits and deduct most of the total from the cost of the system, our cost could be between $0 and about 16.4% of gross capital cost. [redacted]

If the solar developer is unable or unwilling to use all or some of these tax benefits, we have private investors who have adequate tax appetites for them. Various tax equity and flip structures are available to use these tax benefits.

TIF. The next source of funding to consider is Tax Increment Financing from the state of Tennessee, administered by Jackson's Community Redevelopment Agency (CRA). This program offers a project like ours an interest-free loan of up to 30 years of property taxes, to be repaid merely by paying the usual property taxes each year.

Our property taxes would be at most 16.2% of the gross cost of the development. This is based on 1.9619% city tax plus 2.35% county tax, or 4.3119% total tax on a maximum assessed value of 12.5% of the cost of improvements [redacted]

This would reduce the amount left for us to finance to a maximum of [redacted] TIF funding is not a sure thing, but we have discussed it with the City of Jackson, and they think it a good possibility.

Grants. Next come grants from private foundations and governmental entities. For example, the Rural Energy for America Program (REAP) of the U. S. Department of Agriculture's Rural Development office offers grants up to $500,000 for projects like ours.

Loans. Next come low-interest, government-guaranteed loans from sources including the federal Economic Development Administration, REAP again (loans up to 75% of the cost of the project), the Community Development Financial Institutions (CDFI) Fund for Opportunity Zones (like ours), the U. S. Department of Energy Loan Guarantee Program, the Appalachian Regional

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Commission, the Delta Regional Authority, the Southwest Tennessee Development District's Economic and Community Development Section, the Tennessee Energy Efficiency Loan Program (EELP), the Tennessee Department of Environment and Conservation, and the Jackson Regional Partnership. All these groups are also TVA Economic Development Partners.

Finally, we have private investors ready to step in for any additional financing needed.

Cost Estimates

Pre-Construction Preparation and Planning. Minimal costs for legal, tax advice, signing up customers, researching financing, and solar consulting, which we are doing ourselves.

Land Lease. Land is very inexpensive in East Jackson, so we don't expect the land-lease cost to be significant. One of the members of our joint venture owns the Roosevelt Parkway parcel, which we are using as our first site in this Feasibility Study. We are negotiating a ground lease giving us the option to purchase the parcel whenever we choose at close to its present market value.

Construction. We are currently looking to whatever solar developer we choose to handle everything, including design, permitting, interconnection, preparation of the site (except for removing the trees, filling in the few ditches, and grading to within 5% slope, which our group will do), trenching, laying cables, installing mounts, racks, panels, inverters, storage, transformers, wires and poles to customers, fencing, and any site security needed.

We have a preliminary, rough estimate of the cost for all of the above except storage, wiring, fencing, and security might be: [redacted] So for our estimated 21.679 MW STC DC, those costs might total [redacted].

We have a very rough estimate of storage needed at about 5 MWh, with installed costs ranging from [redacted], so costs between [redacted]

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Wiring and poles may cost up [redacted]. But since many of our potential customers lay along a line, we shouldn't have to string totally separate wires on separate poles to each customer. We should be able to have a kind of mini-trunk line with branches coming off it for each customer. We estimate [redacted]

The RST panel-cleaning system, fully installed, should cost around $.70 per watt, so $1,517,530 for the full system.

Other costs for fencing, security, and miscellaneous not anticipated should not be very significant compared to these major costs.

Therefore, the cost of the entire project should be roughly in the range of [redacted] before any tax benefits. The project is exempt from Tennessee sales tax, so our cost estimates have taken this into account.

Revenue Estimates

Our estimated production is [redacted]. based on SAM (attached). We believe we can sell all of it to nearby colleges and commercial users. JEA's blended rate for our prospective commercial customers [redacted] on the commercial rate (GSA2) schedule.

[redacted]

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[redacted]

Commercial Users. We would sell the rest of our production, about 24,741 MWh/yr., to about 8 to 13 nearby commercial users. Using JEA's estimate of the average blended rate of [redacted] for these GSA 2 customers, we roughly estimate their JEA bills to be about [redacted], and about [redacted] after we wire them up. Again, estimating savings of 10% to them or [redacted], we would charge them about [redacted]

In Sum. We therefore expect revenues of about [redacted] The RECs will be taken either by us or by our customers. At 40,451 MWh/yr., these can be sold on the market for at least $40,451/yr. [redacted] Power Purchase Agreements with all customers will be signed prior to the beginning of the design and planning phase of the project.

Expenses and Loan Repayments

Our largest ongoing operating cash flow will probably be loan repayments, which could could be as little as $0 (if we receive TIF funding or tax benefits cover the full cost of the project) or as high as [redacted] if we have to borrow the maximum of [redacted]. Next highest expense would be property taxes, if we do not receive TIF funding. This would be between [redacted] Our insurance brokers estimate property insurance to be between [redacted] We estimate minor O&M (because of the RST automatic cleaning systems), so we estimate that plus management, administration, bookkeeping, accounting, legal, professional

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at between [redacted] We will either own the property or pay a very small amount for the ground lease.

We therefore estimate total operating expenses plus repayments of loan principal to be between [redacted].

With the 25-year reliable performance guarantees and warranties on SunPower equipment, we don't have to set aside much in the way of reserves for replacements. Other equipment will have to be repaired or replaced after warranties expire, but that is far off.

Cash Flow

This leaves cash flow without TIF funding [redacted] year, or between [redacted] both assuming no grants and 30-year loans at 4%.

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Conclusions

We believe due diligence and research over the past three months reported in this study, show that it is entirely feasible to develop our planned community solar microgrid on our site in Jackson, Tennessee. Specifically:

- Our 28.54 acre site is physically suitable
- It will be cleared and graded, is not in a flood zone, and is unshaded
- It has all forms of utilities available

- There are no environmental issues and no study is needed
- An archaeological study is only required if we use federal funding
- It will be zoned as a utility without re-zoning required
- There are no exceptions to the title and no utility easements

- It should be easy to obtain permission to develop the site
- Standard construction, electrical, and building permits are available
- There are no utility constraints, since no interconnection to the grid

- There are no federal regulatory requirements, since not interconnected
- Regulation from the Tennessee PUC will either be slight or not at all

- We have more than enough nearby potential customers
- Easements across adjacent sites & along railroad & streets are available
- Wiring runs to users are likely to be under 1.7 miles total

- We estimate 21.679 MW maximum will fit on site, fixed, no tracking

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- With best SunPower equipment, this should produce 40.45 GWh/year
- With about 5 MWh of batteries, we can minimize users' remaining bills
- RST-Cleantech automatic panel cleaning systems minimize O&M cost

- Financing assisted by tax benefits of 83.6% to 102.7% of capital cost
- Investors lined up with sufficient appetites for part or all tax benefits
- Additional financing available from TIF, grants, and low-interest loans

- Operating cash outflows only [redacted] per year
- Revenues of approximately [redacted]
- Net positive cash flow of [redacted]

The success of this project will open the way to many more community solar microgrids across the country, particularly in opportunity zones where weather, policies, or rates make individually-owned solar uneconomical. As community solar, it will greatly broaden the availability of solar to homes, businesses, institutions, and public facilities, offering lower electricity costs, environmental benefits, and economies of scale. As microgrids, they will provide greater energy resiliency, efficiency, and power quality to users, while reducing stress on utility transmission and distribution systems.

This project will demonstrate the feasibility of this new model for solar: an NREL Special Purpose Entity model, but disconnected from the grid and wired directly to users behind their meters. It will significantly expand the potential for solar throughout the country, thereby speeding wide adoption of solar.

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THIS INSTRUMENT PREPARED BY:
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COMMUNITY DEVELOPMENT ENTERPRISES - JACKSON I
(A JOINT VENTURE)

THIS JOINT VENTURE AGREEMENT (hereinafter "Agreement") is entered into to be effective as of this 3rd day of September, 2020 by and between E A Solar, LLC, a Delaware limited liability company (hereinafter "E A S"), Hunt Solar, LLC, a Delaware limited liability company, (hereinafter "Hunt"), and SynEnergy, Inc., a Virginia corporation, (hereinafter "SE").

RECITALS

WHEREAS, the parties desire to secure the commitment of one or more parcels of land in Jackson, Tennessee on which to develop a solar energy project (the "Property");

WHEREAS, the parties shall seek out prospective users of the electrical power;

WHEREAS, the parties desire to provide a development plan for a solar energy facility, and then construct the facility (the "Solar Facility");

WHEREAS, the parties desire to manage the Solar Facility once it is operational, and sell the electricity it produces;

NOW THEREFORE, for and in consideration of the mutual agreements and undertakings herein, receipt and sufficiency of which valuable consideration is hereby acknowledged, the parties agree to be bound as follows:

1. Name. The name of the joint venture partnership is Community Development Enterprises - Jackson I ("Joint Venture").

2. Ownership. The initial percentage of ownership interests of each party in the Joint Venture shall be:

E A Solar, LLC	70%
Hunt Solar, LLC	12%
SynEnergy, Inc.	12%
Reserved	6%

In addition to an initial ownership interest percentage, each party in the Joint Venture shall be credited with a Capital Account. If at the earlier of ninety days after the commencement of commercial operations or at the end of the third year following the date of this Agreement, the net

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profits from the Joint Venture as allocated under Section 14 below have not resulted in an adjustment where the percentages based on Capital Accounts equals the initial ownership interest percentage, then net profits will be specially allocated consistent with Section13 to reduce the Capital Account balance of the party with the largest Capital Account until the Capital Account percentages of the parties are the same as the ownership interest percentages of the parties. At this time it is difficult to forecast all the possible expenses that will arise in the pre-commercial operation of the Solar Facility. This adjustment shall take into consideration all adjustments to the Capital Accounts of the parties, including, but not limited to, additional Capital Contributions, withdrawals, or reductions in Capital Contributions and any changes in the ownership of the Joint Venture by assignment or by allowing new parties to join the Joint Venture. It is anticipated that new parties may join the Joint Venture, causing a dilution in the percentage ownership interests stated above.

3. Business. The business purpose is to obtain an interest in real property on which to develop, finance, construct and operate a Solar Facility as described in this Agreement, and to carry on all other activities which in the opinion of the parties are necessary, proper, convenient, or advisable for the development and ownership of the Solar Facility on the Property. Hunt will provide office space for the Joint Venture to have a presence in Jackson through construction of the Solar Facility.

4. Term. This Agreement shall commence when signed and shall continue so long as the Joint Venture holds an interest in the real property on which the solar energy facility is constructed, or the term ends by one of the parties in accordance with Section 19 of this Agreement.

5. Property. E A S will conduct the initial due diligence to determine whether the Property is suitable for development as a solar energy project considering the surrounding users of electric power. The Joint Venture will enter into a lease of the Property that will become a long term lease after the Joint Venture votes to construct the Solar Facility and approves financing. When approved, the Joint Venture will acquire the land outright or by long term lease for the construction of the Solar Facility. The Joint Venture will obtain written commitments from persons who are geographically close to the Solar Facility and who desire to acquire part of the electrical output from the Solar Facility for their own uses. The written commitments will become energy purchase agreements before completion of the Solar Facility or earlier as required for financing.

Hunt and/or SE shall act as consultants in land and easement acquisitions, engaging in business development for users of electricity, and assisting the Solar and Microgrid Developers by interfacing with divisions of local governmental in Jackson Tennessee. Hunt and SE will facilitate introductions, obtain advice, and obtain and provide assistance in securing options for possible funding for projects, especially funding from local government. Hunt and SE will identify and seek to obtain easements necessary to deliver electric power to the prospective users.

The parties will obtain written commitments for easements (or other rights to use land or existing easements) necessary to connect the users who sign written commitments to the Solar

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Facility. The parties will investigate the local permitting requirements and meet the persons in local government who issue permits for projects of this nature. Once clearing and grading are approved by local government, Hunt and SE shall, directly or indirectly, clear the land, grade the land, filling in ditches and ledges as required, and removing underground boulders consistent with the site plan prepared by or for the solar developer as further discussed in Paragraph 10 below. Hunt and SE shall prepare all required storm water detention required on the site plan and, if required, compact the soils for construction of the Solar Facility.

6. Feasibility Study. E A S will prepare a feasibility study that will generally define the parameters of the project, state technical options for solar energy, forecast development costs, project benefits to users, and determine local market needs for solar energy. The feasibility study will identify the required access to land or buildings on the site, the potential users of the electrical output, the anticipated yield of electric energy in kilowatt hours, an expected purchase price, and possible financing options. E A S will conduct and oversee the due diligence described in the feasibility study. E A S will identify federal, state and local utility and/or regulatory requirements for the construction, development and operation of a solar facility. Hunt and SE will assist E A S on any research and analysis requested, including by way of example, the subjects of solar installation and microgrid construction.

7. Solar and Microgrid Developers Proposal. Once the Joint Venture agrees on the Feasibility Study and holds the Property, E A S will solicit proposals to construct and finance the Solar Facility from one or more Solar and Microgrid Developers. E A S will review and evaluate these proposals.

E A S will make an initial due diligence assessment of financing proposals presented by the Solar and Microgrid Developers. As part of this due diligence, E A S will investigate other prospective sources of financing for the Solar Facility, including government and public sources of funds, community development lenders and economic development lenders, and private lenders and/or investors. Hunt and/or SE will assist E A S as requested in obtaining local approvals, permits, and financing options for the Solar Facility. The E A S due diligence process will conclude with a recommendation to the Joint Venture. Membership in the Joint Venture may require expansion to accommodate financing the Solar Facility through debt and equity offerings. This will likely result in a dilution of interests among the current parties to this Agreement.

8. Marketing and Community Relations. Hunt and SE will develop an economic impact assessment for the Joint Venture. Hunt and SE will assist the Joint Venture in developing a plan to promote and advocate for the construction of the Solar Facility in Jackson on the proposed site with stake holders in the community, with all divisions of federal, state, and local government with offices in Jackson, and with quasi-government entities such as the Jackson Energy Authority. Hunt and SE will identify potential local grants and tax incentives for a Solar Facility, and in conjunction with the Joint Venture, investigate and advocate for suitable programs. Hunt and SE will assist in executing these plans as required by the Joint Venture.

Hunt and SE will assist in the development of a marketing plan to gather information on and identify potential priority user/participants of the electricity generated by the Solar Facility.

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Initial priority user/participants include [redacted] and [redacted]. Others will be identified based on electrical needs, location proximity to the Solar Facility, and ability to obtain easements and permissions to run power to the potential user/participant. Hunt and SE will present the benefits of the Solar Facility to prospective users/participants. The objective of the marketing plan is to sign letters of intent to use solar energy, followed by formal agreements as construction is scheduled to begin on the Solar Facility.

9. Construction Financing. After the construction cost proposals are obtained from the Solar and Microgrid Developers and written financing commitments obtained, the Joint Venture shall vote to approve the purchase and construction proposal of one or more of the Solar and Microgrid Developers, vote to approve the construction financing for the Solar Facility, and vote to approve a licensed contractor for the Solar Facility. The Joint Venture is not restricted in its construction financing, and can finance construction of the Solar Facility through available means, including private equity, loans, and/or capital leases, or any combination. The Joint Venture will be the borrower or the lessee of improvements. The Joint Venture has authority to pledge all or a portion of its interests in the Solar Facility and the Property as collateral. Additionally, the parties to the Joint Venture may be asked to pledge their ownership interests in the Joint Venture as collateral, if required, to obtain construction financing. If any one or more of the individual persons who are directly or indirectly owners of entities who are parties to this Agreement are required to personally guarantee all or any part of any debt of the Joint Venture, he or she may require all or some of the other individual persons who directly or indirectly own part of the entities who are parties to this Joint Venture to sign a contribution agreement in which they proportionately share in the liability in the event of default.

10. Construction and Development Expenses. The Joint Venture may obtain a bridge loan to cover all or part of budgeted pre-construction development expenses. The parties have incurred costs and expenses prior to the execution of the Agreement in furtherance of developing the Solar Facility. Each party shall prepare a detailed list of costs and expenses and provide said itemization for approval by the Manager. Provided the lender agrees, approved pre-construction expenses may be reimbursed at the time the first draw is paid to the general contractor tasked with building the Solar Facility. The total pre-construction expenditures shall be considered a loan to the Joint Venture until paid.

After the first draw, all expenses that are not on the budget require approval of the Manager. All costs associated with the development of the Solar Facility that are described on the budget shall be paid by the Joint Venture, and no individual person shall be personally responsible. All expenses require approval of the Managers. Each party shall send an invoice to the Manager monthly for pre-approved expenses that are part of the budget and tied to specific components in the development and construction of the Solar Facility. Payment will be made within 30 days of receipt of such invoices or at the time of the next draw request.

11. Planned Improvements and Insurance. The Joint Venture will maintain a construction checking account. The account will be funded from the first draw on the construction loan(s) or other available financing. Pre-construction cash expenses will not be reimbursed to the parties at the time construction financing closes. Pre-construction cash expenses and pre-commercial

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operation expenses will be part of the initial Capital Account of each respective party and will be adjusted in accordance with Sections 2 and 14. The Joint Venture will construct the Solar Facility. The Joint Venture will insure the Property, and will acquire builder's risk insurance for construction of the Solar Facility, naming the parties to the Joint Venture as additional co-insured. The Joint Venture may acquire other insurances that are customary in the development and construction of a Solar Facility.

The Joint Venture will review and approve the Solar and Microgrid Developers' final engineering and detailed design drawing prior to construction. The Joint Venture will review and approve the design and proposed construction of the electric grid that delivers power to users. Hunt and SE will assist the Manager of the Joint Venture in reviewing contractors and construction proposals for construction of the Solar Facility and the electrical microgrid. Before a construction permit and other required permits are issued, the Joint Venture will prepare a proposed project implementation and construction schedule with the project participants. The Joint Venture, together with the construction financing lenders or lessors, will approve a final project implementation and construction schedule which will become the basis for the time lines in the construction contracts with the contractors and suppliers hired by the Solar and Microgrid Developers and/or licensed contractor and approved by the Joint Venture. The Joint Venture will review and approve the construction agreements with the licensed contractor and other necessary contractors recommended by the Solar and Microgrid Developers.

The Joint Venture will obtain any necessary pre-construction approval from the Tennessee Valley Authority ("TVA") and from the Jackson Energy Authority ("JEA") so that all requirements and expectations are understood and budgeted.

Once clearing and grading are approved by local government, Hunt and/or SE shall clear the land, grade the land, filling in ditches and ledges as required, and removing underground boulders consistent with the site plan prepared by or for the solar developer. If the City of Jackson pays the Joint Venture for site preparation, the Joint Venture will reimburse Hunt and/or SE or its contractor for site preparation expense up to the amount received from the City of Jackson. Hunt and/or SE shall prepare all required storm water detention required on the site plan and, if required, compact the soils for construction of the Solar Facility. Hunt and/or SE shall complete site preparation within sixty (60) days following approval of the site plan by local government. If Hunt and/or SE fails to proceed and make significant progress on site preparation, the Manager of the Joint Venture and/or E A S has the right to assume responsibility for site preparation and reimburse its cost of site preparation from the initial distributions to Hunt and SE.

12. Management. The daily affairs of the Joint Venture shall be managed by E A S (the "Manager"). E A S may delegate management powers to one or more individual managers. Except as otherwise provided by a majority vote of the ownership interests, the Manager shall have the authority to take all necessary or reasonable actions, consistent with the budget, to oversee construction and manage the daily operations of the Joint Venture. The Solar and Microgrid Developers and/or a general contractor shall construct the footers and install the improvements to the Property to build the Solar Facility. The Manager shall review and approve the work, and monitor the progress of construction. Unless required by an emergency situation, and except as

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expressly provided in the budget, the Manager shall not have the authority to commit to any contract for a term exceeding ONE (1) year, or exceeding [redacted] DOLLARS in total, without a vote of at least eighty-two percent (82%) of the parties to the Joint Venture by ownership interests. Provided, however, that no action in contravention of this Agreement may be taken without the vote of ninety-four percent (94%) of the parties to the Joint Venture by ownership interests.

The Manager will approve periodic draws to pay the Solar and Microgrid Developers and/or contractors based on percentage of completion of the Solar Facility. The Manager and/or lender may designate an independent construction inspection during the construction process.

As the Solar Facility nears completion, if not already completed, the Joint Venture will enter into contracts with users and/or participants in the solar energy project. After construction is complete the construction loan will be converted to long term financing. An independent vendor will conduct performance testing of the Solar Facility. The Manager will obtain preparation of as built drawings (if required for permitting) from the Solar and Microgrid Developers or from persons recommended by the Solar and Microgrid Developers.

After construction is complete, performance testing confirmed, and contracts signed with the users and/or participants, the Manager shall hire service contractors operating and maintaining equipment, including grounds maintenance, site monitoring, performing preventative maintenance, and performing corrective maintenance. The Manager shall oversee the commercial operation of the solar project, including, but not limited to, the administrative tasks of invoicing users for electric use in the form of rent, collection, bookkeeping and tax preparation. The Manager shall establish an Operating Budget to determine estimated available cash flow for division and distribution according to Section 15. The Manager will also serve in the capacity of customer relations and customer support, maintaining good relations with existing users who participate and identifying and delivering power to new prospective users.

The Manager(s) will devote the time and attention to the Joint Venture required for successful operation of a Solar Facility. The Manager(s) shall receive a salary or guaranteed payment in an amount agreed upon by an eighty-two percent (82%) vote of all the parties to the Joint Venture by ownership interests. Hunt and SE will assist the Manager in developing a customer service plan.

13. Budget. The Joint Venture shall prepare a proposed construction budget. At the recommendation of the Manger, the Joint Venture shall approve by majority vote of the ownership interests the construction budget for the Solar Facility on the Property. After construction, the Manger shall prepare a proposed operating budget. At least annually, the Joint Venture shall by a majority vote of the ownership interests approve the operating budget for the Solar Facility, including the ordinary expenses for the management and maintenance of the Property and Solar Facility.

14. Expenses and Capital Calls. As a condition of entering into this Joint Venture, E A S, Hunt, and SE agree that when cash reserves are insufficient, to make additional contributions to

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the capital of the Joint Venture as the parties approve by a vote of [redacted] of the parties based on ownership interests for necessary reserves needed from time to time in construction the Solar Facility and/or carrying on the business of the Joint Venture. All such additional contributions to capital shall be pro rata to the ownership interest of each party in the Joint Venture. Any such additional contributions to capital shall be made promptly after the call for such, and in any event within thirty (30) days thereafter. If the Capital Call is not met on a pro rata basis to the ownership interest of each party in the Joint Venture, then net profits will be specially allocated consistent with Section14 to reduce the Capital Account balance of the party(s) who failed to meet the Capital Call so that the disproportionate capital contribution required to fund the Capital Call will be returned to the party(s) meeting the Capital Call until the Capital Account percentages of the parties are the same as the ownership interest percentages in the Joint Venture. Alternatively, the Joint Venture is authorized to borrow funds from one or more parties to the Joint Venture or from third party private persons to fund the capital requirements of the Joint Venture. A vote of [redacted] of the parties to the Joint Venture by ownership interests is required to authorize the Joint Venture to borrow funds from a party or third party on the terms presented.

15. Share of Available Net Profits or Losses. The net profits from the sale of electricity and any other revenues shall generally be shared according to the ownership interests in the Joint Venture at the time the profits are realized. However, at all times, distribution of profit shall be made in the following manner: (1) before cash distributions are shared according to the ownership interest percentages, expenses related to the operation of the Joint Venture (including, but not limited to, cash costs of construction, development expenses, commercial launching of the project, repairs, replacement parts, and maintenance, real estate taxes; insurance payments, and consulting, engineering and professional fees), with an allowance for a reasonable cash reserve, and for all debts and obligations, except for long term financing, shall be paid; then (2) each party shall be reimbursed for its cash contributions to the extent required to bring the capital account percentages in line with the ownership interest percentages pursuant to Sections 2 and 13; then (3) a cash reserve account(s) shall be maintained based on the operating budget and anticipated capital expenditures; then (4) after the above payments, profits or losses shall be allocated among parties to the Joint Venture based on their respective ownership interest percentages. For purposes of the allocating gain or loss, the following income tax definitions apply:

15.01 "Net Profits" or "Net Losses" shall mean, for each year of the Joint Venture, an amount equal to the Joint Venture's taxable income or loss for such year determined in accordance with Code Section 703(a), including, for such purpose, all items of income, gain, loss, or deduction required to be separately stated pursuant to Code Section 703(a)(1).

15.02 Allocations. It is the intention of the parties that the allocations under this Agreement shall have substantial economic effect as provided in Code § 704. To the extent of any allocation, adjustment, or distribution which would otherwise not have such substantial economic effect, then the qualified income offset as contemplated by the Regulations at 26 CFR 1.704-1(b)(2)(ii)(d) shall apply as necessary so that items of the income and gain shall be specially allocated to the

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party receiving such allocation in an amount and manner sufficient to eliminate the deficit balance in a party's capital account created by such adjustment, allocation, or distribution in as expeditious a manner as possible. In addition, any allocation of items of income or gain specially made pursuant to this paragraph shall be taken into account in computing subsequent allocations of net profits under this Agreement, so that the net amount of any items allocated to each party pursuant to this Agreement shall, to the extent possible, be equal to the net amount that would have been allocated to each such party pursuant to this Agreement if such adjustment, allocation, or distribution which triggered this special allocation had not occurred.

16. Withdrawals. No party to the Joint Venture shall have the right to withdraw any funds from its capital account in the Joint Venture without the prior written approval of eighty-two percent (82%) of the parties based on ownership interests of the Joint Venture.

17. User Participation. The Parties may enter into one or more written lease agreements to allow a user to acquire an interest in the Solar Facility for the electrical power needs of the Lessee. The Parties agree that all amounts collected under any lease shall be collected by, and any expenditures as the lessors shall be expended through, the Joint Venture.

18. No Right to Transfer. No party shall have the right to sell, assign, encumber, pledge or otherwise transfer an ownership interest in the ground lease for the Property or in this Joint Venture, whether voluntarily or involuntarily, including by operation of law, or the order of any court, without the prior written approval of eighty-two percent (82%) of the parties to the Joint Venture based on ownership interests unless otherwise provided in this Agreement. Upon the termination of existence of a party to the Joint Venture which is an entity, the successors at law shall continue to be subject to each and every term of this Agreement. Any purported transfer of an interest in violation of this Agreement shall be of no force or effect.

19. Adding Owners. An additional party(s) may be added to the Joint Venture with the prior written approval of [redacted] of the parties to the Joint Venture based on ownership interests, and on such terms as may be so approved in writing.

20. Mutual Agreement to End Business Relationship. Notwithstanding anything to the contrary in this Agreement, the rights conferred upon the Parties under this Paragraph 17 shall not be exercised by any party before December 31, 2022, unless otherwise agreed in writing by all Parties.

20.01. Notice. Should any Party or Parties, or other successors, desire to end the business relationship of the Parties as described herein, then the Party or Parties initiating such, hereinafter collectively the Initiating Party(s), shall give written notice to the remaining Party(s) of their desire to withdraw from the Joint Venture or otherwise end their business relationship with the Remaining Parties and the Joint Venture (the "Initial Notice"). In the Initial Notice, the Initiating Party shall give written notice to the Remaining Party(s), of the price per percentage of ownership interest in the Property at

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which they are offering to buy out the Remaining Party(s) or to sell to the Remaining Party (the "Mandatory Price").

20.02. Buy or Sell Option. The Remaining Party(s) shall have the irrevocable option exercisable by the sending of written notice (the "Buy or Sell Notice") to the Initiating Party, within thirty (30) calendar days after receipt of the Initial Notice, to either buy all of the Joint Venture ownership interests of the Initiating Party at the Mandatory Price or to sell to the Initiating Party all of their ownership interests at the Mandatory Price. Should the Remaining Parties fail to exercise the Buy or Sell Option as provided for in this subparagraph within the time for such exercise, then the Remaining Party shall be deemed to have chosen to sell, and the Initiating Party shall proceed to buy as provided below.

20.03. Contingencies as to Notice.

(a) Should less than all of the Remaining Party(s) provide notice of the decision to purchase the interests of the Initiating Party, then those of the Remaining Parties so providing the notice to purchase the interest of the Initiating Party shall be the purchaser and the ownership interest of the Remaining Party not so purchasing shall be unaffected. Should a purchase occur under this Subsection (a), then all remaining owners shall continue to be subject to all of the provisions of this Agreement, including the buy and sell provisions of this Paragraph 18.

(b) Should more than one of the Remaining Party(s) provide notice of the decision to purchase the interests of the Initiating Party(s), then those of the Remaining Parties so providing the notice to purchase the interest of the Initiating Party shall be entitled to purchase such pro rata to their respective ownership interests in the Property. Should a purchase occur under this Subsection (b), then all remaining owners shall continue to be subject to all of the provisions of this Agreement, including the buy and sell provisions of this Paragraph 19.

20.04. Offers Irrevocable. The sending of each notice, as provided above, shall constitute an irrevocable agreement to proceed on the terms of this Paragraph 18, and an irrevocable offer to buy or sell on such terms.

20.05. Closing. At the closing of the sale under this paragraph, the Mandatory Price shall be paid in cash, or as the parties otherwise agree in writing. The Selling Party(s) shall execute a Special Warranty Deed conveying their interest in the Property to the buying Party(s) and an Assignment of the equipment that forms the improvement of the Solar Facility. The closing under this paragraph shall occur at 10:00 A.M. at a place selected by the Joint Venture on the thirtieth (30th) calendar day (or, if the thirtieth (30th) calendar day is not a Business Day, on the first Business Day following such calendar day) after the respective parties elect, or are deemed to have elected, to buy or sell as provided in this paragraph or such other place and date as the parties may in writing agree.

20.06. Other Obligations. Upon the buy-out of the ownership of a party, at the

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time of the closing of such transaction, any and all loans which have been made to the Joint Venture by the selling party, or the Selling Party's family, shall be paid in full with interest, and likewise any loans or other extensions of credits to or on behalf of the Joint Venture which have been guaranteed by the Selling Party, or any member of the Selling Party's family, or is secured by the Selling Party or the Selling Party's family's assets, shall be either paid by the purchaser or the purchaser shall cause the release of such guaranty or lien.

21. Books and Records. The Parties shall keep adequate books and records setting forth a true and accurate account of all business transactions arising out of and in connection with the Joint Venture.

22. Merger Clause. This Agreement constitute the entire understanding and agreement between the parties with respect to the Property and the development of a Solar Facility. All prior agreements and understanding between any of the parties merge into this Agreement so that it is the only statement of the intent of the parties. There are no agreements, understandings, restrictions, or warranties between the parties other than those herein set forth.

23. Amendment. This Agreement may be amended by a majority of the Joint Venture to obtain financing the Solar Facility through debt or equity (or a combination), or to allow for the legal use of the Solar Facility by users under Tennessee law. This amendment may cause a dilution in the interests of the initial parties to this Agreement. After the completion of construction of the Solar Facility and conversion to long term debt or equity financing, this Agreement may not be changed, modified, waived or discharged, in whole or in part, unless in writing and signed by all parties hereto. Such writing must set forth as its express purpose the amendment of this Agreement. This Agreement may not be amended orally, by implication, waiver, course of dealing or industry custom.

24. Assigns. All of the terms and conditions of this Agreement are binding on the successors and permitted assigns of each party to this Joint Venture. This business of the Joint Venture shall not be assigned or transferred without the written agreement of all parties. In the event of the insolvency or bankruptcy of a party to this Joint Venture, the legal representative of such party shall succeed only to the right of such party to receive allocations and distributions hereunder, and this Joint Venture shall not be deemed null and void. Should the party(s) holding a majority of the ownership interests agree in writing to transfer their ownership interests, whether by sale, ownership swap, merger, or other entity combination, division, or spin-off, or by conversion of The Joint Venture into a LLC, or another partnership, corporation or other form of entity, then, upon written request of the majority party(s), all remaining party(s) shall be bound to so transfer their ownership interest in The Joint Venture on at least the same terms and conditions, and upon any party failing to execute any necessary document to do so, such may be deemed executed for the purposes of completing the transaction.

25. Relationship of Parties. This Joint Venture shall be construed as a partnership for the ownership and operation of income producing, improved real property whose rights and obligations are defined by this Agreement. The parties will file a Partnership Tax Return for this

joint business activity under the direction of the Manager. The Manager shall use his reasonable efforts to deliver to each party a Form K-1 and such other information, if any, with respect to The Joint Venture as may be necessary for the preparation of each party's income tax returns. Each party will receive a statement showing its share of income, gain or loss, expense, and credits for such taxable year for federal income tax purposes. Any deficiency for taxes imposed on any party (including penalties, additions to tax or interest imposed with respect to such taxes) shall be paid by such Party and if paid by The Joint Venture, shall be recoverable from such Party by The Joint Venture. The Manager shall serve as the Partnership Representative for The Joint Venture in matters before the Internal Revenue Service.

26. Other Business. The parties to this Agreement may have interests in businesses other than the Joint Venture business considered herein. It is mutually agreed by the parties that the parties may each engage in any business other than those discussed under this Agreement in such manner and at such times as they and each of them shall, from time to time, desire completely free of any restriction, interest or claim by the Agreement. In consideration of this, each party hereby agrees to indemnify and hold the other harmless against any and all loss, judgments, damages, liabilities and expenses that may be incurred by reason of such party's private, outside business.

27. Indemnity. Each member of the Joint Venture is responsible for its own acts and omissions. Each member of the Joint Venture agrees to defend, indemnify, and save and hold the other members of the Joint Venture harmless from and against any loss, damage, liability, suit, claim, lien, cost, or expense (including reasonable attorneys' fees) resulting from its own actions, or the acts of its consultants, agents, or assigns, in the exercise of its obligations under this Agreement or in the exercise of its business that is not within the scope of this Agreement.

28. Dispute Resolution. Any disagreements or disputes between the parties regarding the terms of this Agreement shall be resolved by holding two (2) face to face meetings at which time the parties shall attempt to resolve the dispute in good faith. In the event a proposed action by a party results in a deadlocked vote, the parties agree that each party's designated certified public accountant shall mutually select an independent certified public accountant who shall hear the proposed action as a mediator, and recommend a resolution to the dispute. If the dispute is not resolved in these meetings or by an independent certified public accountant, the parties shall jointly select a mediator for non-binding mediation. If the parties are unable to resolve the dispute through mediation, the parties agree to submit to expedited binding arbitration through the procedures established by the American Arbitration Association. In the event either party requires the assistance of legal counsel to assist in the negotiation, arbitration, or litigation of, or involving, this Agreement, the prevailing party shall be entitled to its costs and reasonable attorney's fees.

29. Validity of Agreement. If any provision of this Agreement is held to be illegal, invalid or unenforceable under present or future law, such provision shall be fully severable, and this Agreement shall be construed and enforced as if such illegal, invalid or unenforceable provision had never comprised a part of this Agreement, and the remaining provisions of this Agreement shall remain in full force and effect and not be affected by the illegal, invalid or unenforceable provision or by its severance from this Agreement, provided that both parties may still effectively realize the complete benefit of the transaction contemplated hereby.

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30. Notice and Meetings. Any notice required or permitted to be delivered hereunder shall be deemed to be delivered (a) when delivered, if personally delivered or by an overnight or other courier service, or (b) whether or not actually received, when deposited in the United States mail, postage prepaid, certified mail, return receipt requested, addressed to either party's address of record, or (c) by email or other electronic means when the recipient affirmatively confirms receipt and the confirmed electronic signature is held by the sender in compliance with Tennessee law. Meetings of the Parties, for any purpose or purposes, may be called by a majority in interest of the parties based on ownership interest percentages. The parties may designate any place either in or outside the State of Tennessee as the place of meetings for any meeting of the parties. A meeting may take place by telephone conference call or any other form of electronic communication through which the parties may simultaneously hear each other. Meetings are also subject to the following:

30.1 Action by Parties Without a Meeting. Action required or permitted to be taken at a meeting of parties may be taken without a meeting if the action is evidenced by one or more written consents describing the action taken, signed by parties holding at least a majority of the ownership interest percentages, except that on matters otherwise requiring the consent of a greater percentage of the ownership interest percentages under this Agreement.

30.2 Notice of Meetings. Except for construction progress issues, written notice by email stating the place, day and hour of the meeting and confirmed by the recipient, and describing the purpose or purposes for which the meeting is called shall be delivered not less than three (3) days nor more than two (2) months before the date of the meeting, to each party entitled to vote at such meeting. When any notice is required to be given to a party, the party may waive notice in writing, whether before, at, or after the time stated for the meeting. Attendance by a party is a waiver of notice of such meeting, except if the party objects at the beginning of the meeting to the transaction of business because the meeting is not lawfully called or convened and does not otherwise participate in the consideration of any matter at the meeting.

30.3 Construction and Development Issues. All votes of parties to this Joint Venture on construction and development issues that are not under the authority of the Manager, and which the Manager designates as urgent, may be taken by electronic means where the vote is affirmed by the Manager to the voting party by electronic means. The Manager may give as little as twenty-four (24) hours notice for construction and development issues that require prompt response. If a party does not cast its vote within the required time, the party is deemed to have voted in favor of the proposal submitted to the vote by the Manager.

31. Cooperation. The parties shall execute such documents hereafter from time to time as may be required to carry out the respective obligations of the parties hereunder.

32. Waiver of Right to Partition. In consideration of the foregoing and the dissolution provisions herein contained, each Party hereby irrevocably waives, releases, and surrenders any and all rights that such Party might have to maintain any action to partition any of the Property in kind or to maintain a legal action for partition of the same by sale, judicial or otherwise, during the term of this Agreement.

33. Dissolution and Winding Up. The Joint Venture shall be dissolved and its affairs wound up following the sale of the Solar Facility and the assignment or other conveyance of the Property ("Dissolution Event"). Upon dissolution of The Joint Venture, the Manager or other persons required or permitted by law to carry out the winding up of the affairs of The Joint Venture shall promptly notify all parties of such dissolution; shall wind up the affairs of The Joint Venture; shall prepare and file all instruments or documents required by law to be filed to reflect the dissolution of The Joint Venture; and, after collecting the debts and obligations owed to The Joint Venture and after paying or providing for the payment of all liabilities and obligations of The Joint Venture, shall distribute the assets of The Joint Venture first to the extent of Capital Accounts, and the balance according to the ownership interest percentage of each party.

34. Entire Agreement. This Agreement constitutes the entire agreement of the Parties as to these matters and any prior discussions, warranties, representations, understandings or agreements are merged herein and barred hereby. Each Party warrants and represents that it is not relying on any information, projection, prediction or representation, written or verbal, from any source, except as expressly set forth in this Agreement.

35. Tennessee Contract. This Agreement shall be a Tennessee contract. This Agreement shall be performed in, and construed under, the laws of the State of Tennessee. In any litigation in relation to this Agreement, the prevailing party shall be entitled to recover reasonable attorneys' fees and all costs of litigation, including, but not limited to, discovery, depositions, travel, court costs, experts and the like.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement as of the date first above written.

E A Solar, LLC

By: Dennis Emberling
Dennis Emberling, Chief Executive Officer

Hunt Solar, LLC

By: David Hunt
David Hunt, Authorized Member

JSC Confidential - 500100

SynEnergy, Inc.

By: _____
John C. Meyer Jr., CEO

STATE OF TENNESSEE)
)
COUNTY OF DAVIDSON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named Dennis Emberling, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized representative of E A Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 21st day of September, 2020.

_____
NOTARY PUBLIC

My Commission Expires: 1323

Leslie Walsh
State of Tennessee Notary Public
Davidson County

STATE OF TENNESSEE)
)
COUNTY OF MADISON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named David Hunt, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized member of Hunt Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 17 day of September 2020.

_____
NOTARY PUBLIC

My Commission Expires: 9.21.21

DENISE NORWALK
STATE OF TENNESSEE NOTARY PUBLIC
COUNTY OF MADISON
MY COMMISSION EXPIRES 04-23-2021

JSC Confidential - 500101

SynEnergy, Inc.

By: _____
John C. Meyer Jr., CEO

STATE OF TENNESSEE)
)
COUNTY OF DAVIDSON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named Dennis Emberling, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized representative of E A Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this ___ day of _____, 2020.

_____
NOTARY PUBLIC

My Commission Expires: _____

STATE OF TENNESSEE)
)
COUNTY OF MADISON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named David Hunt, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized member of Hunt Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this ___ day of _____, 2020.

_____
NOTARY PUBLIC

My Commission Expires: _____

JSC Confidential - 500102

STATE OF VIRGINIA)
)
COUNTY OF GLOUCESTER)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named R John C. Meyer Jr., with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the CEO of SynEnergy, Inc., and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 16 day of SEPT, 2020.

NOTARY PUBLIC

My Commission Expires: 08/31/2023

JEREMY NARDOZZI
NOTARY PUBLIC
REG. #7838012
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES AUGUST 31, 2023

JSC Confidential - 500103

THIS INSTRUMENT PREPARED BY:
John A. Beam, III, Esq.
Equitus Law Alliance, PLLC
709 Taylor Street
P.O. Box 280240
Nashville, TN 37228-0240

FIRST AMENDMENT TO THE JOINT VENTURE AGREEMENT OF COMMUNITY DEVELOPMENT ENTERPRISES - JACKSON I

This First Amendment to the Joint Venture Agreement of Community Development Enterprises - Jackson I is made and entered into by and between E A Solar, LLC, a Delaware limited liability company (hereinafter "E A S"), Hunt Solar, LLC, a Delaware limited liability company, (hereinafter "Hunt"), and SynEnergy, Inc., a Virginia corporation, (hereinafter "SE").

WHEREAS, the parties entered into the Joint Venture Agreement of Community Development Enterprises - Jackson I (the "Joint Venture Agreement") effective September 3, 2020;

WHEREAS, the Joint Venture Agreement provides for the amendment of the Joint Venture Agreement, and the parties desire to amend the Joint Venture Agreement.

NOW, THEREFORE, in consideration of the premises and the mutual covenants herein contained, and contained in the Joint Venture Agreement, the parties hereto, agree and certify as follows:

1. The last paragraph in Section 11 of the Joint Venture Agreement is amended by deleting it in its entirety and inserting a new last paragraph in Section 11, as follows:

> Once clearing and grading are approved by local government, Hunt and/or SE shall clear the land, grade the land, filling in ditches and ledges as required, and removing underground boulders consistent with the site plan prepared by or for the solar developer and the Joint Venture. Hunt and/or SE will request the City of Jackson to pay for site preparation. The Joint Venture

will reimburse Hunt and/or SE or its contractor for site preparation expenses that are not paid for by the City of Jackson. Hunt and/or SE shall prepare all required storm water detention required on the site plan and, if required, compact the soils for construction of the Solar Facility. Hunt and/or SE shall complete site preparation within sixty (60) days following approval of the site plan by local government. If Hunt and/or SE fails to proceed and make significant progress on site preparation, the Manager of the Joint Venture and/or E A S has the right to assume responsibility for site preparation and reimburse its cost of site preparation from the initial distributions to Hunt and SE.

2. Except as hereby specifically amended, the Joint Venture Agreement shall remain and continue in full force and effect, and the Joint Venture Agreement, except as herein amended shall for all purposes be and constitute the Joint Venture Agreement of Community Development Enterprises - Jackson I.

3. The amendment to the Joint Venture Agreement, as set forth in this Amendment to the Joint Venture Agreement, shall be effective as of October 31, 2020.

IN WITNESS WHEREOF, this Amendment to the Joint Venture Agreement of Community Development Enterprises - Jackson I has been executed as of the date set forth by the name of each party below.

E A Solar, LLC

By: Dennis Emberling
Dennis Emberling, Chief Executive Officer

12/18/20
Date

Hunt Solar, LLC

By: _____
David Hunt, Authorized Member

_____
Date

SynEnergy, Inc.

By: _____
John C. Meyer Jr., CEO

12/01/20
Date

STATE OF TENNESSEE)
COUNTY OF DAVIDSON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named Dennis Emberling, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized representative of E A Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 7 day of December, 2020.

Brandee P.
NOTARY PUBLIC

My Commission Expires: July 2024

BRANDEE PERRIN
STATE OF TENNESSEE NOTARY PUBLIC
DAVIDSON COUNTY

STATE OF TENNESSEE)
COUNTY OF MADISON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named David Hunt, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized member of Hunt Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this ___ day of _____, 2020.

_____
NOTARY PUBLIC

My Commission Expires: _____

STATE OF VIRGINIA)
COUNTY OF GLOUCESTER)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named R John C. Meyer Jr., with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the CEO of SynEnergy, Inc., and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 1 day of December, 2020.

Brooklyn Inge
NOTARY PUBLIC

My Commission Expires: 09/30/2023

BROOKLYN NICHOLE INGE
NOTARY PUBLIC
REG. #7855875
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES SEPT. 30, 2023

JSC Confidential - 500106

THIS INSTRUMENT PREPARED BY:
John A. Beam, III, Esq.
Equitus Law Alliance, PLLC
709 Taylor Street
P.O. Box 280240
Nashville, TN 37228-0240

FIRST AMENDMENT TO THE JOINT VENTURE AGREEMENT OF COMMUNITY DEVELOPMENT ENTERPRISES - JACKSON I

This First Amendment to the Joint Venture Agreement of Community Development Enterprises - Jackson I is made and entered into by and between E A Solar, LLC, a Delaware limited liability company (hereinafter "E A S"), Hunt Solar, LLC, a Delaware limited liability company, (hereinafter "Hunt"), and SynEnergy, Inc., a Virginia corporation, (hereinafter "SE").

WHEREAS, the parties entered into the Joint Venture Agreement of Community Development Enterprises - Jackson I (the "Joint Venture Agreement") effective September 3, 2020;

WHEREAS, the Joint Venture Agreement provides for the amendment of the Joint Venture Agreement, and the parties desire to amend the Joint Venture Agreement.

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1. The last paragraph in Section 11 of the Joint Venture Agreement is amended by deleting it in its entirety and inserting a new last paragraph in Section 11, as follows:

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will reimburse Hunt and/or SE or its contractor for site preparation expenses that are not paid for by the City of Jackson. Hunt and/or SE shall prepare all required storm water detention required on the site plan and, if required, compact the soils for construction of the Solar Facility. Hunt and/or SE shall complete site preparation within sixty (60) days following approval of the site plan by local government. If Hunt and/or SE fails to proceed and make significant progress on site preparation, the Manager of the Joint Venture and/or E A S has the right to assume responsibility for site preparation and reimburse its cost of site preparation from the initial distributions to Hunt and SE.

2. Except as hereby specifically amended, the Joint Venture Agreement shall remain and continue in full force and effect, and the Joint Venture Agreement, except as herein amended shall for all purposes be and constitute the Joint Venture Agreement of Community Development Enterprises - Jackson I.

3. The amendment to the Joint Venture Agreement, as set forth in this Amendment to the Joint Venture Agreement, shall be effective as of October 31, 2020.

IN WITNESS WHEREOF, this Amendment to the Joint Venture Agreement of Community Development Enterprises - Jackson I has been executed as of the date set forth by the name of each party below.

E A Solar, LLC

By: Dennis Emberling
Dennis Emberling, Chief Executive Officer

DE
12/18/20
Date

Hunt Solar, LLC

By: David Hunt
David Hunt, Authorized Member

12-2-2020
Date

SynEnergy, Inc.

By: _____
John C. Meyer Jr., CEO

_____
Date

STATE OF TENNESSEE)
COUNTY OF DAVIDSON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named Dennis Emberling, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized representative of E A Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 18 day of December, 2020.

NOTARY PUBLIC

My Commission Expires: 9 July 2024

BRANDEE PERRIN STATE OF TENNESSEE NOTARY PUBLIC DAVIDSON COUNTY

STATE OF TENNESSEE)
COUNTY OF MADISON)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named David Hunt, with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the authorized member of Hunt Solar, LLC, and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 2 day of December, 2020.

NOTARY PUBLIC

My Commission Expires: 4-21-21

DENISE NORWALK STATE OF TENNESSEE NOTARY PUBLIC COUNTY OF MADISON MY COMMISSION EXPIRES 04-21-2021

STATE OF VIRGINIA)
COUNTY OF GLOUCESTER)

Personally appeared before me, a Notary Public in and for the above jurisdiction, the within named R John C. Meyer Jr., with whom I am personally acquainted (or who was identified to me on the basis of satisfactory evidence), and who acknowledged that he is the CEO of SynEnergy, Inc., and executed the foregoing Agreement for the purposes therein contained.

Witness my hand and official seal this 18 day of December, 2020.

NOTARY PUBLIC

My Commission Expires: 9 July 2024

BRANDEE PERRIN STATE OF TENNESSEE NOTARY PUBLIC DAVIDSON COUNTY