BEFORE THE TENNESSEE REGULATORY AUTHORITY
NASHVILLE, TENNESSEE

Petition of Chattanooga Gas Company for	)	
General Rate Increase, Implementation of	)	
the EnergySmart Conservation Programs,	)	DOCKET NO. 09-00183
and Implementation of a Revenue	)	
Decoupling Mechanism	)	
	)	

PRE-FILED DIRECT TESTIMONY AND EXHIBITS OF

CHRISTOPHER C. KLEIN, PH.D.

ON BEHALF OF THE TENNESSEE ATTORNEY GENERAL
CONSUMER ADVOCATE AND PROTECTION DIVISION

MARCH 10, 2010

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DR. CHRISTOPHER C. KLEIN

1 **Q.** **Please state your name and your current position.**

2 **A.** My name is Christopher C. Klein and I am an Associate Professor in the Economics and

3 Finance Department at Middle Tennessee State University (MTSU) in Murfreesboro,

4 Tennessee.

5 **Q.** **What is your educational background?**

6 **A.** I received a B. A. in Economics from the University of Alabama in 1976 and I received a

7 Ph. D. in Economics from the University of North Carolina at Chapel Hill in 1980.

8 **Q.** **What is your professional experience involving regulated industries?**

9 **A.** I was employed as an Economist in the Antitrust Division of the Bureau of Economics at

10 the Federal Trade Commission (FTC) in Washington, D.C., for six years starting in 1980.

11 In 1986, I was hired as the first Economist for the Tennessee Public Service Commission

12 (TPSC). Although my title changed over the years, I functioned as the Chief Economist

13 for the TPSC and, after 1996, the Tennessee Regulatory Authority (TRA), until August of

14 2002, when I assumed my current position with MTSU.

15 **Q.** **What were your duties at the FTC?**

16 **A.** I performed the economic analysis in antitrust investigations involving more than 20

17 industries and contributed to staff reports on mergers in the petroleum industry,

18 competition in grocery retailing, and the economics of predatory or sham litigation.

1   **Q.**   **What was your primary responsibility at the TPSC?**

2   **A.**   I was an expert witness for the staff of the TPSC in rate cases and other similar

3   proceedings involving telecommunications, natural gas, electric and water utilities, as

4   well as motor carriers. I testified in 36 dockets before the TPSC on the issues of cost of

5   capital, rate design, and competitive effects. I also filed testimony before the Federal

6   Communications Commission (FCC).

7   **Q.**   **How did your responsibilities change when the TRA supplanted the TPSC?**

8   **A.**   I oversaw the Utility Rate Division and then the Economic Analysis Division. The TRA

9   staff no longer testified in proceedings before the agency, but provided analysis and

10   advice to the TRA Directors. I was responsible for all such advice and analysis provided

11   to the Directors by these Divisions, either individually or in concert with other TRA staff,

12   in all proceedings that came before the agency for resolution. These proceedings

13   included rate cases and tariff filings by public utilities, as well as those associated with

14   the implementation of the federal Telecommunications Act of 1996.

15   **Q.**   **Were you a member of any regulatory committees or boards while you worked for**

16   **the TPSC and the TRA?**

17   **A.**   Yes. I was a member of the National Association of Regulatory Utility Commissioners

18   (NARUC) Staff Subcommittee on Gas. I was a member of, and Chaired, the Research

19   Advisory Committee to the Board of Directors of the National Regulatory Research

20   Institute (NRRI). I also served on the State Staff of the FCC's Federal-State Joint Board

21   in CC Docket No.80-286 (the "Separations" Joint Board) and as a Group Leader on the

22   NARUC Staff Subcommittee on Accounts Multi-state Audit Team that produced the

23   1988 Report on Bell Communications Research.

1   Q.   **What is your primary responsibility at MTSU?**

2   A.   I teach classes in the general area of applied microeconomics, including Principles of

3   Microeconomics, Intermediate Microeconomic Theory, Managerial Economics, Business

4   and Government, and Econometrics, as well as undertaking scholarly research,

5   participating in various university committees, and serving on dissertation committees.

6   Q.   **Have you taught at any other universities?**

7   A.   I taught classes in the Economics of Regulation and in Antitrust Economics in the

8   Economics Department at Vanderbilt University for several years while I was employed

9   at the TRA.

10   Q.   **Are you a member of any professional organizations?**

11   A.   I am a member of the American Economic Association, the Southern Economic

12   Association, the Western Economic Association, the Industrial Organization Society, and

13   Alpha Pi Mu: the National Industrial Engineering Honor Society, as well as Beta Gamma

14   Sigma: the International Honor Society for Collegiate Schools of Business.

15   Q.   **Have you published articles in professional or academic journals and presented**

16   **papers at professional meetings?**

17   A.   More than 30 of my articles have appeared in professional or academic journals such as

18   *Energy Economics*, *Utilities Policy*, *The Electricity Journal*, *The Journal of Applied*

19   *Regulation* and many others. I have made more than 50 presentations at professional

20   meetings.

21   Q.   **Have you testified before any other governmental bodies in Tennessee?**

22   A.   Yes. I have testified before various committees of the Tennessee General Assembly on

23   regulatory issues, especially telecommunications issues and competition in the

1   telecommunications industry, as well as before the Tennessee Advisory Commission on

2   Intergovernmental Relations and the Tennessee Regulatory Authority. A complete list is

3   provided in my Vita, attached as my Exhibit 9.

4

5   **PURPOSE OF TESTIMONY**

6

7   Q.   **What is the purpose of your testimony?**

8   A.   I will address the Cost of Capital for Chattanooga Gas Company (CGC) and recommend

9   an allowed rate of return to be adopted for ratemaking purposes. This includes issues

10   regarding capital structure, cost of debt and cost of equity.

11   **Q.   Can you summarize your testimony pertaining to capital structure and cost of debt?**

12   A.   Yes. I recommend a capital structure consisting of 10% short term debt, 42% long term

13   debt, and 48% common equity as shown on Klein Exhibit 1. This structure is based on

14   the historical consolidated capital structures of AGL Resources, Inc. (AGL), the parent of

15   CGC, as shown on Klein Exhibit 2. I find the cost of debt proposed by CGC's witness

16   Mr. Hanson to be reasonable.

17   **Q.   Can you summarize your testimony on cost of equity?**

18   A.   I recommend a cost of equity of 9.5% based on Discounted Cash Flow (DCF) and Capital

19   Asset Pricing Model (CAPM) methods summarized in my Exhibits 3 and 5. I

20   recommend no additional adjustments for issuance costs, or initial dividend growth.

21   **Q.   What overall cost of capital do you recommend for use as the allowed rate of return**

22   **for CGC?**

1   A.   I recommend an overall weighted cost of capital of 7.29% for CGC as shown on my

2   Exhibit 1.

3   **Q.**   **Do any of your recommendations change if CGC's proposed decoupling plan is**

4   **adopted?**

5   A.   If CGC's decoupling plan is adopted, I recommend a 50 basis point reduction in the cost

6   of equity to 9.0% to reflect the reduce risk. This in turn reduces the overall weighted cost

7   of capital to 7.05%.

8   **Q.**   **How is your testimony organized?**

9   A.   I will address the concept of cost of capital first, then capital structure and cost of debt.

10   This is followed by cost of equity, including the adjustment in the event that CGC's

11   decoupling plan is approved.

12

13   **COST OF CAPITAL**

14

15   **Q.**   **What do you mean by cost of capital?**

16   A.   I mean the rate of return necessary to induce investors to hold the debt and stock of a

17   company. This rate of return should be equal to that available to investors on alternative

18   investments of similar risk.

19   **Q.**   **How is the cost of capital related to the legal principles of determining the allowed**

20   **rate of return for regulated utilities?**

21   A.   The cost of capital concept embodies the economic principles for determining the

22   allowed rate of return set out by the U.S. Supreme Court in *Bluefield Water Works v.*

23   *P.S.C.* (262 U.S. 679, 1923) and *F. P. C. v. Hope Natural Gas Co.* (320 U. S. 591, 1944).

1   For instance, the Court stated in Hope that, "…the return to the equity owner should be

2   commensurate with returns on investments in other enterprises having corresponding

3   risks. That return, moreover, should be sufficient to assure confidence in the financial

4   integrity of the enterprise, so as to maintain its credit and to attract capital." (320 U.S.

5   603)   In my opinion, the allowed rate of return on the capital employed by CGC should

6   be set equal to its cost of capital.

7 **Q.**   **What are the consequences of not setting the allowed rate of return equal to the cost**

8   **of capital?**

9 A.   If the allowed rate of return is set below the cost of capital, then the company's credit

10   rating will fall and its cost of debt will rise. The price of its stock will decline to reflect

11   the lower expected return. Eventually, the company may face difficulties in financing

12   investments in new plant and equipment, causing the quality of its products and services

13   to decline.

14   If the allowed rate of return is set above the cost of capital, then the firm's

15   stockholders realize a capital gain as the price of the firm's stock rises to reflect the

16   higher return. Moreover, the capital gain is paid for by the firm's customers in the form

17   of excessively high prices.

18   Clearly, failure to set the allowed rate of return equal to the firm's cost of capital

19   is detrimental to the firm's customers as well as its stockholders.

20

21   **CAPITAL STRUCTURE AND COST OF DEBT**

22

23 **Q.**   **What was your first step in estimating the cost of capital for CGC?**

1   A.   My first step was to determine the appropriate capital structure and cost of debt for CGC.

2   I started with the capital structure proposed by CGC's witness Mr. Hanson based on the

3   capital structure of CGC's parent, AGL. I then compared this to the historical capital

4   structures of AGL as shown on my Exhibit 2. The structure proposed by Mr. Hanson

5   differs from the historical structures of AGL primarily in the proportion of short term

6   debt. Mr. Hanson proposes 6.04% short term debt, whereas the historical average over

7   2007-2009 is 11.60%. In this context, Mr. Hanson's figure likely represents a brief

8   departure from the long run capital structure of AGL, which appears likely to contain at

9   least 10% short term debt. For this reason, I propose a capital structure containing 10%

10   short term debt as shown on my Exhibit 1.

11   **Q.**   **How did you arrive at the cost of debt shown in your Exhibit 1?**

12   A.   Again, I started with the cost of long term and short term debt proposed by Mr. Hanson.

13   I found these to be reasonable and have adopted them in my recommended capital

14   structure.

15   **Q.**   **Why is it appropriate to use a capital structure based on AGL in estimating the cost**

16   **of capital for CGC?**

17   A.   Ordinarily, when estimating the cost of equity of a subsidiary, such as CGC, of a parent

18   corporation (AGL), the so-called double-leveraged capital structure is appropriate. In the

19   case of CGC, however, all of the debt of CGC consists of intra-company (AGL)

20   transactions, as does the debt of AGL – parent only. This suggests that AGL is run as a

21   consolidated company with funds flowing within the consolidated corporation as needed

22   by the operating entities and as directed by management of AGL. CGC states as much in

23   response to CAPD Discovery Question #89: "Since Chattanooga Gas Company and AGL

1   Resources, Inc., parent only, do not issue external debt instruments the consolidated costs

2   [sic] of capital is the appropriate actual cost of debt for these companies." Under these

3   circumstances, the consolidated capital structure and cost of capital of AGL is

4   appropriate for CGC.

5   **Q.**   **Does this also imply that any subsidiary of AGL is centrally financed and managed**

6   **by AGL consolidated?**

7   A.   Yes.

8

9   **COST OF EQUITY**

10

11   **Q.**   **How do you approach the cost of equity of CGC?**

12   A.   I look to the cost of equity of the parent enterprise, AGL Resources, Inc. consolidated.

13   This is the only AGL entity that issues external debt or stock, indicating that the

14   consolidated corporation is financed and managed as a whole from which the piece-parts,

15   such as subsidiaries, cannot be separated. In the case of CGC, even though it appears to

16   be organized as a separate subsidiary, it actually functions much as a division of AGL

17   and not as a separate corporation. Moreover, AGL –consolidated is the only entity in

18   which outside investors may invest. So far as the financial markets are concerned, AGL –

19   consolidated is the only entity that counts.

20   **Q.**   **How do you estimate the cost of equity of AGL?**

21   A.   I use the Discounted Cash Flow (DCF) and Capital Asset Pricing Model (CAPM)

22   methods.

23   **Q.**   **Can you explain the Discounted Cash Flow method?**

1 A.   Yes. The DCF method views investors as valuing a company's stock based on the

2   present value of the cash flows a stockholder expects to receive from owning the stock

3   over an infinite time horizon. These cash flows from stock ownership are just the

4   dividends paid by the company. Consequently, some simple mathematics show that the

5   rate of return an investor expects on stock ownership in a company is the dividend yield

6   for the current period plus the expected growth rate in that dividend. The dividend yield

7   is just the expected dividend divided by the current price of the stock.

8 **Q.**   **Have you computed a DCF cost of equity for AGL?**

9 A.   Yes. My Exhibit 3 shows this calculation for AGL and seven similar natural gas utilities

10   selected from Value Line. The dividend yield for AGL reported by Value Line in

11   December 2009 is 5% and the projected growth rate in dividends for AGL reported by

12   Value Line is 2.5%. The calculated DCF cost of equity for AGL using these figures is

13   7.5%.

14 **Q.**   **Is this the DCF cost of equity for AGL that you recommend?**

15 A.   No. The expected growth rate in dividends is particularly difficult to estimate in the DCF

16   method. For this reason, I also examined the dividend growth rates from Zack's in

17   October 2009 as used by Dr. Morin in his testimony for CGC. Further, I examined the

18   projected growth rate in earnings reported by Value Line, because dividends are paid out

19   of accumulated earnings. If earnings do not grow, neither will dividends. The result is a

20   DCF cost of equity range for AGL from 7.5% to 9.7%.

21 **Q.**   **How does AGL's DCF cost of equity compare to that of comparable natural gas**

22   **utilities?**

1   A.   My Exhibit 3 shows the DCF calculations for seven natural gas utilities covered by Value

2   Line. The resulting range of average DCF costs of equity for these firms is 9.10% to

3   10.87%.

4   **Q.**   **How did you select these seven natural gas utilities?**

5   A.   I looked for natural gas utilities covered by Value Line's "Ratings and Reports" that were

6   comparable in size and riskiness to AGL. My Exhibit 4 shows the market capitalization,

7   a measure of size, and "beta", a measure of relative risk, for each of these firms and

8   AGL. Other natural gas utilities covered by Value Line were eliminated because their

9   capitalization was less than $1.0 billion, or Value Line's projected dividend growth rate

10   was zero.

11 **Q.**   **What do you conclude from the DCF analysis?**

12 A.   The DCF range of cost of equity for AGL is 7.5% to 9.7% with a midpoint of 8.6%, but

13   the seven other gas utilities average 9.10% to 10.87% with a midpoint of 9.99%. This

14   suggests an appropriate cost of equity for AGL in the upper part of the DCF range for

15   AGL. In my judgment, a cost of equity of 9.5% is appropriate for AGL.

16 **Q.**   **What other cost of equity methods did you use?**

17 A.   I also used the Capital Asset Pricing Model or CAPM.

18 **Q.**   **Can you explain the CAPM?**

19 A.   Yes. In the CAPM, an investor's required return on an investment is based on the

20   relative riskiness of the investment. That is, an investor must be compensated with a

21   higher expected return for investing in a riskier investment. The CAPM begins by

22   estimating the risk premium required on a broad portfolio of common stocks relative to a

23   risk-free asset. This risk premium is then adjusted for a particular stock's riskiness

1   relative to the market – that is, the broad portfolio of stocks. This is done by using the

2   stock's beta, which measures the riskiness of the stock relative to the market. The

3   resulting CAPM cost of equity consists of the risk-free return plus beta times the market

4   risk premium.

5   Q.   **How do you estimate the risk premium?**

6   A.   I use the estimates from the *2009 Ibbotson Risk Premia Over Time Report: Estimates for*

7   *1926-2009* published by Morningstar and submitted in response to CAPD Discovery

8   Question #98 (Ibbotson). Ibbotson reports risk premia of the Standard and Poor's (S&P)

9   500 stocks over various U. S. government debt instruments. U. S. government bills and

10   bonds are widely considered to have the lowest risk of default of all available debt

11   instruments.

12 Q.   **How do you choose the risk-free instrument and the appropriate risk premium?**

13 A.   Technically, the lowest risk is associated with very short term Treasury bills, because the

14   short time frame provides the least opportunity for default and little chance that the

15   expected inflation rate will not be realized over the life of the investment. Nevertheless,

16   these short term bills also embody short term returns that may not reflect all factors

17   affecting the expected return on a stock for a multi-year period.   If one chooses longer

18   term bonds as the "risk-free" instrument, however, then expected returns over multiple

19   years may be better captured, but more risk is also introduced. This is the risk that the

20   actual inflation rate over the life of the bond may differ from expectations. This causes

21   the real, inflation adjusted, return on the bond to also differ from expectations. This

22   inflation risk in a longer term bond raises the necessary return above the risk-free rate.

23   The analyst must then trade-off any bias introduced by higher risk in longer term

1   instruments against capturing the factors affecting the risk-free return over a longer

2   period.

3   **Q.**   **How do you make this trade-off?**

4   A.   Since current interest rates on Treasury bills (T-bills) are at historically very low levels,

5   some consideration for longer term bonds is appropriate. The risk premium of stocks

6   over T-bills reported by Ibbotson is 7.9%, and the risk premium of stocks over the

7   income component of Intermediate term bonds (5-year) is 7%. I also use returns for T-

8   bills (0.2%) and T-bonds (2.75%) that are near their 12 month highs in order to mitigate

9   the unusually low current returns. Using these figures, the CAPM cost of equity for an

10   "average" stock is 8.1% and 9.75%.

11   **Q.**   **How do you adjust these estimates for specific companies such as AGL?**

12   A.   The risk premium is adjusted using a stock's beta. I use betas for AGL and the seven

13   natural gas utilities reported by Value Line. These companies are less risky than the

14   average stock, so their betas range from 0.6 to 0.75. An average stock, or a broad

15   portfolio of stocks representing the market return, has a beta of 1.0. My Exhibit 5 shows

16   the resulting range of CAPM cost of equity estimates. For AGL, the range is 6.13% to

17   8.0%. Since the CAPM for each company is determined by each company's beta, the

18   seven comparable natural gas utilities have CAPM cost of equity estimates equal to or

19   lower than AGL's.

20   **Q.**   **Are there other factors that can affect these CAPM cost of equity estimates?**

21   A.   Yes. The pertinent factor at this time is the tendency for the risk premium to expand

22   when interest rates, and bond returns, are low and shrink when interest rates are high.

1   Consequently, because short term interest rates are near zero, the CAPM cost of equity

2   estimates likely underestimate the current cost of equity slightly.

3   **Q.   What do you conclude on the cost of equity for AGL?**

4   A.   The DCF and CAPM estimates taken as a group suggest a cost of equity for AGL

5   between 8.0% and 10.0%. In selecting a value from this range, I choose to err on the side

6   of caution against the possibility that interest rates and required returns rise significantly

7   in the next few years. For this reason I recommend a cost of equity for AGL, and

8   consequently for CGC, of 9.5%.

9   **Q.   How does you cost of equity of 9.5% compare to that recommended by CGC's**

10   **witness Dr. Morin?**

11   A.   Dr. Morin recommends a cost of equity for CGC of 11.0%, but this includes several items

12   with which I disagree, especially the adjustment for issuance costs.   Nevertheless, his

13   DCF calculations for AGL shown on his Exhibits RAM-4 and RAM-5 produce a range of

14   9.02% to 10.3% including his adjustments. His CAPM estimates range from 9.2% to

15   9.5% without the adjustment for flotation costs and 9.5% to 10% with his adjustment.

16   My recommended cost of equity of 9.5% is well within these ranges.

17   **Q.   In this context, what aspects of Dr. Morin's analysis prompt his recommendation of**

18   **11.0%?**

19   A.   His choice of "comparable" firms, his risk premium analysis, and his adjustments for

20   flotation costs, the higher risk associated with CGC as a stand-alone entity, and CGC's

21   lack of a decoupling mechanism appear to be the main drivers of his recommendation.

22   Several of these are derived from his attempt to estimate the cost of equity of CGC as if it

23   were independent of AGL. This would be appropriate if AGL's interest in CGC were

1   simply that of an arms-length, disinterested investor. This is obviously not the case.

2   Hence, the upward adjustments in the cost of equity for CGC recommended by Dr.

3   Morin, based on his view of CGC as a small independent company lacking a decoupling

4   plan, are unnecessary on that basis alone.

5 **Q.**   **Do you agree with Dr. Morin's choice of comparable firms?**

6 A.   No. Although Dr. Morin's natural gas utilities selected from Value Line are nearly the

7   same as those I select, they are more comparable to AGL than to CGC. It is his selection

8   of combination gas and electric utilities, however, which is most inappropriate. These

9   firms face much different risks than natural gas utilities due to their electric operations.

10   The electric industry is differently affected by weather and faces risks associated with

11   emissions and their future regulation at generating plants, as well as environmental issues

12   associated with coal, a major fuel for generation, especially coal mining methods. His

13   DCF estimates for these combination utilities are much higher than for natural gas

14   utilities, averaging 11.5% to 11.8% (Exhibit RAM-6).

15 **Q.**   **Do you disagree with his risk premium analysis?**

16 A.   Yes. He applies the risk premium method to utility equity returns compared to returns on

17   utility bonds. The CAPM employs similar methods, but measures the risk premium of

18   stocks relative to a risk-free rate, which is largely independent of stock returns. The

19   difference between stock returns and a risk-free rate of return reflects *only* the added risk

20   embodied in stocks. The problem with Dr. Morin's utility risk premium is that the

21   returns on utility bonds and utility stocks are not independent. Changes in risk in the

22   utility industries will affect *both* utility stocks and bonds. For example, if the interest rate

23   paid by utilities on bonds declines, due to lower perceived risk in the industry generally,

1   the price of utilities' stock will increase because profits are now higher due to lower debt

2   cost. Consequently, the risk premium for utility stocks will appear to increase, even

3   though overall risk has declined. This introduces bias into these risk premium estimates.

4   This questionable risk premium analysis leads to a much higher estimated cost of equity,

5   approaching 11%.

6 **Q.   How do you view Dr. Morin's adjustment for flotation costs?**

7 A.   Dr. Morin is correct that these costs must be recovered, but he overestimates the effect on

8   the cost of equity. He estimates that issuance costs are 4% of the proceeds from a sale of

9   new stock to the public and that market pressure accounts for another 1%, for a total of

10   5%. Accounting for these costs then requires a 30 basis point increase in the cost of

11   equity. AGL's recent stock sales to the public, however, incurred issuance costs of only

12   2.99% to 3.5% (CGC TRA FG Item 84-3). Moreover, the adjustment does not have to be

13   applied to all of the equity components of capital structure, since most of AGL's equity

14   funding is derived from retained earnings and other non-public sources. These factors

15   reduce the adjustment into the area of 10 basis points. Given the small size of the

16   adjustment, the much larger range of uncertainty surrounding the appropriate cost of

17   equity, and the lack of adjustments for factors such as quarterly payment of dividends

18   that reduce the cost of equity, I recommend no adjustment for flotation costs. In addition,

19   dividend yields have declined since December 2009 when the yields I use were reported

20   by Value Line. This fall in yields, if implemented in the DCF, would reduce the

21   estimated cost of equity by more than the adjustment for flotation costs.

22 **Q.   Do you disagree with Dr. Morin's upward adjustments in CGC's cost of equity for**

23   **CGC's higher risk and lack of a decoupling plan?**

1   A.   Yes. These are caused only by Dr. Morin's choice to estimate the cost of equity of CGC

2   as an independent firm. He must select comparable firms to CGC, since CGC's stock is

3   not traded. These firms are much larger than CGC and many have some form of

4   decoupling in place. Hence, he adjusts his cost of equity estimates *upward* for these

5   factors. I view CGC as an inseparable part of AGL and estimate AGL's cost of equity

6   using market data on AGL. This incorporates AGL's size and current decoupling status,

7   including that of CGC. Consequently, no *upward* adjustments are necessary for these

8   items. In fact, I recommend a *reduction* in the cost of equity by 50 basis points if CGC's

9   decoupling plan is approved by the TRA, as discussed in detail below. I also note that

10   any efficiencies that CGC enjoys as a part of AGL are recognized and shared with

11   ratepayers in my approach.

12

13   **ADJUSTMENTS FOR REDUCED RISK UNDER DECOUPLING**

14

15   **Q.**   **How do you measure the effect of adopting CGC's decoupling mechanism on its**

16   **required return on equity?**

17   A.   Using the Capital Asset Pricing Model (CAPM), the change in the return on equity due to

18   a reduction in risk after decoupling can be expressed as

19                $ROE_1 - ROE_2 = [(\sigma_1 - \sigma_2)/\sigma_{j1}]\,(\beta_1 r_p)$

20   where σ_1 and σ_2 represent the standard deviation in the company's return on equity before

21   and after decoupling, β_1 is the company's "beta" before decoupling, and r_p is the "risk

22   premium," or the difference between the risk-free rate of return and the market return.

23   The derivation of this expression is shown on my Exhibit 6. I then use regression

1   analysis to estimate the change in the standard deviation of CGC's equity return, $[(\sigma_1 -$

2      $\sigma_2)/\sigma_1]$, when the variation caused by variation in residential volumes is removed by

3   decoupling. Using this estimate, along with a range of risk premia encompassing the risk

4   premia I advocate, as well as those advocated by Dr. Morin, and various values for beta, I

5   calculate values for the change in the return on equity. My regression analysis appears in

6   my Exhibit 8. The calculated changes in expected equity returns due to the risk reduction

7   from decoupling are shown on my Exhibit 7.

8   **Q.**   **What do these calculations show?**

9   A.   My Exhibit 7 shows changes in the expected equity return for risk reductions of 5%,

10   10%, and 15%; risk premia of 7.0% and 5.0%; and values of beta of 0.5, 0.75 and 1.0.

11   The resulting range of cost of equity effects over all these combinations is very wide,

12   from 12.5 to 105 basis points. I focus on the 10% risk reduction, 7.0% risk premium, and

13   beta of 0.75 which indicate a reduction in the cost of equity due to decoupling of 52.5

14   basis points.

15   **Q.**   **Do any assumptions underlie your analysis?**

16   A.   Yes. The derivation of the change in the expected equity return using the CAPM

17   assumes that the correlation coefficient between the firm's return and the market return

18   does not change and that the standard deviation of the market return does not change.

19   The calculation of the proportional change in the standard deviation of CGC's equity

20   return assumes that decoupling completely removes the effect of variation in residential

21   volumes on the equity return.

22   **Q.**   **Are these assumptions reasonable?**

1   A.   Yes. CGC and its parent AGL are much too small relative to the entire stock market, or

2   the market for all investments, for changes in their earnings to affect the variability of the

3   market return. The correlation coefficient between AGL's return and the market return

4   could increase, decrease, or stay the same as the standard deviation of CGC's equity

5   return decreases after decoupling. In any event, the change would be an order of

6   magnitude less than the change in CGC's standard deviation. That is, if CGC's equity

7   risk (standard deviation) falls by 10% after decoupling, then the change, if any, in the

8   correlation coefficient would likely be zero to plus or minus 1%. In this context, the

9   assumption of no change in the correlation coefficient is reasonable. On the other hand,

10   the chance that CGC's decoupling mechanism *exactly* offsets the effect of the variation in

11   residential volumes on the equity return is very small. Consequently, I take this into

12   account in choosing my recommended risk adjustment to CGC's return on equity.

13   **Q.   How do you use regression analysis to measure the change in risk due to**

14   **decoupling?**

15   A.   Linear Regression Analysis is a statistical or econometric technique for estimating the

16   linear relationship among a dependent variable and one or more explanatory variables

17   from data on these variables. It can also calculate the amount of variation in the

18   dependent variable that is "left over" after its relationship to other variables is taken into

19   account. I regress return on equity for several years against measures of residential

20   consumption, one at a time, for the same years. I then calculate the standard deviation of

21   the return before and after taking the effect of residential consumption into account. This

22   leads me to the proportional change in the standard deviation of the equity return that

23   results if decoupling exactly offsets the effect of variations in residential consumption on

1   the equity return. I perform this analysis of gas company returns on equity and

2   residential consumption using national data from the American Gas Association.

3 **Q.   What do the regression analyses and accompanying calculations show?**

4 A.   I calculate changes in the standard deviation of equity returns, or "risk", ranging from

5   roughly from 5% to 15%.

6 **Q.   What value of this change in risk do you recommend?**

7 A.   I recommend a change in risk of 10% to reflect the effect of CGC's decoupling proposal.

8 **Q.   Did you perform any statistical tests on these values?**

9 A.   No. Unfortunately, the small number of observations available for the regression

10   analysis, seven years or fewer, renders any statistical tests invalid. This occurs because

11   the test statistics are assumed to follow certain distributions based on underlying normal

12   distributions, the familiar "bell curve." With 30 observations or more, it is generally

13   acceptable to approximate any distribution with a normal distribution; as the number of

14   observations grows, any distribution will approach a normal distribution. With so few

15   observations, however, the normality assumptions are not justified and statistical tests are

16   not valid. In this context, the regressions are best interpreted as merely calculating

17   devices.

18 **Q.   How do you use the risk reduction to calculate a change in the return on equity?**

19 A.   To calculate the resulting change in the equity return due to a risk reduction, I also need

20   values for beta and the risk premium. I have chosen a range of risk premia advocated by

21   the cost of capital witnesses in this proceeding and values of beta between 0.5 and 1.0.   I

22   also use values of 5%, 10%, and 15% for the risk reduction due to decoupling. The

1   results shown in my Exhibit 7 indicate the sensitivity of the change in the equity return to

2   changes in the underlying values of these items.

3 **Q.   What adjustment to CGC's return on equity do you recommend if CGC's**

4 **decoupling proposal is approved?**

5 A.   I recommend a reduction in CGC's return on equity of 50 basis points due to reduced risk

6   under decoupling.

7 **Q.   How do you use the figures in your Exhibit 7 to arrive at this 50 basis point**

8 **reduction?**

9 A.   I start with my recommendation of a 10% reduction in risk from decoupling.   The

10   appropriate beta is that for AGL, which is 0.75. A beta of 0.75 and a 10% risk reduction

11   yields a change in the equity return of 52.5 basis points.

12 **Q.   How does your recommended reduction of 50 basis points compare to that**

13 **recommended by Dr. Morin?**

14 A.   Dr. Morin recommends an adjustment of 25 basis points to CGC's equity return due to

15   decoupling. CGC's Response to CAPD Discovery Question #99, however, makes clear

16   that two of the three approaches used by Dr. Morin yield adjustments in the 30 – 40 basis

17   point range while the third yields a 20 basis point adjustment. From these, Dr. Morin

18   chooses a very conservative 25 basis point figure. Moreover, in TRA Docket No. 06-

19   00175, involving a decoupling proposal by CGC that was not adopted by the TRA, Dr.

20   Morin recommended a decoupling adjustment in CGC's equity return of 50 basis points.

21 **Q.   Would your recommended reduction in CGC's cost of equity due to decoupling**

22 **change if one of Dr. Dismukes's alternatives is adopted?**

1 A. Yes. The reduction in the cost of equity due to decoupling would change if Dr.

2 Dismukes's New Jersey Option or Washington Option is adopted by the TRA. These

3 options do not automatically remove all volume related risks in the affected rate groups.

4 As a result, the required adjustment to the CGC's cost of equity would be reduced. While

5 it is difficult to estimate the appropriate adjustment in advance, it is my opinion that the

6 adjustment would be cut roughly in half. That is, the reduction in the cost of equity due

7 to the adoption of one of Dr. Dismukes's options would lie in the area of 25 basis points.

8

9 **CONCLUSION**

10

11 **Q. Can you summarize your recommendations for the allowed rate of return for CGC?**

12 A. Yes. I recommend a return on equity of 9.5% and a capital structure containing 10%

13 short term debt as shown on my Exhibit 1. This produces and overall return of 7.29%. If

14 CGC's decoupling plan is adopted, I recommend a return on equity of 9.0% and an

15 overall return of 7.05%. If one of Dr. Dismukes's options is adopted, I recommend a

16 return on equity of 9.25% and an overall return of 7.17%.

17 **Q. Does this conclude your testimony at this time?**

18 **A.** Yes.

19

20

21

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23

Chattanooga Gas Company
Recommended Capital Structure and Cost of Capital

Component	%	Cost Rate	Weighted Cost
Short Term Debt	10.0%	2.04%	0.204%
Long Term Debt	42.0%	6.03%	2.53%
Common Equity	48.0%	9.50%	4.56%
Total	100%		7.29%

Chattanooga Gas Company
Consolidated Capital Structures of AGL Resources, Inc.
June 30, 2007, 2008, 2009[1]
And Hanson's Recommendation[2]

Component	Hanson	2009	2008	2007	Historical Average	Overall Average
Short Term Debt	6.94%	14.26%	11.38%	9.16%	11.60%	10.44%
Long Term Debt	42.15%	40.15%	43.04%	43.84%	42.34%	42.30%
Common Equity	50.90%	45.59%	45.58%	47.00%	46.06%	47.26%
Total	100%	100%	100%	100%	100%	100%

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[1]   Response to CAPD Discovery Request 89, Attachments 89-4, 89-3, 89-2.
[2]   Exhibit RDH-4, Schedule 1.

Summary of
Discounted Cash Flow
Cost of Equity Estimates

Company	Dividend Yield	Value Line Dividend Growth	Zack's Dividend Growth	DCF Range	Value Line Earnings Growth	E.G. DCF
AGL Resources	5.0%	2.5%	4.7%	7.5-9.7%	3.5%	8.5%
Atmos Energy	4.9%	1.5%	5.0%	6.4-9.9%	4.0%	8.9%
New Jersey Res.	3.8%	7.0%	-----	10.8%	5.5%	9.3%
Northwest N. Gas	3.9%	6.5%	6.0%	10.4-9.9%	5.0%	8.9%
Piedmont N. Gas	4.5%	3.5%	7.0%	8.0-11.5%	8.0%	12.5%
South Jersey Ind.	3.7%	8.0%	9.8%	11.7-13.5%	5.5%	9.2%
Southwest Gas	3.7%	5.0%	7.0%	8.7-10.7%	6.0%	9.7%
WGL Holdings	4.7%	3.0%	5.0%	7.7-9.7%	4.0%	8.7%
Average of 7 Companies				9.10-10.87%		9.6%

Sources: Dividend yield and Value Line projected growth rates from Value Line Investment Survey, *Ratings and Reports*, December 11, 2009. Zack's projected dividend growth rates as of 10/2009 from Morin Exhibit RAM-4.

Market Capitalization and Beta
AGL and Seven Natural Gas Utilities

Company	Beta	Capitalization
AGL Resources	0.75	$2.7 billion
Atmos Energy	0.65	$2.5 billion
New Jersey Res.	0.65	$1.5 billion
Northwest N. Gas	0.60	$1.2 billion
Piedmont N. Gas	0.65	$1.8 billion
South Jersey Ind.	0.65	$1.1 billion
Southwest Gas	0.75	$1.2 billion
WGL Holdings	0.65	$1.6 billion

Source: Value Line Investment Survey, *Ratings and Reports*, December 11, 2009.

Summary of
Capital Asset Pricing Model (CAPM)
Cost of Equity Analysis

Company	Beta	Short-Term Risk Premium	T-bill Yield	Intermediate Risk Premium	5-year T-bond Yield	CAPM Range
AGL Resources	0.75	5.925%	0.2%	5.25%	2.75%	6.13-8.0%
Atmos Energy	0.65	5.135%	0.2%	4.55%	2.75%	5.34-7.30%
New Jersey Res.	0.65	5.135%	0.2%	4.55%	2.75%	5.34-7.30%
Northwest N. Gas	0.60	4.74%	0.2%	4.20%	2.75%	4.94-6.95%
Piedmont N. Gas	0.65	5.135%	0.2%	4.55%	2.75%	5.34-7.30%
South Jersey Ind.	0.65	5.135%	0.2%	4.55%	2.75%	5.34-7.30%
Southwest Gas	0.75	5.925%	0.2%	5.25%	2.75%	6.13-8.0%
WGL Holdings	0.65	5.135%	0.2%	4.55%	2.75%	5.34-7.30%

Sources:
1) Beta: Value Line Investment Survey, *Ratings and Reports*, December 11, 2009.
2) Short Term Risk Premium = Beta x 7.9%
3) Intermediate Term Risk Premium = Beta x 7.0%
4) Risk Premia for stock returns over short-term T-bills (7.9%) and intermediate-term T-bonds (7.0%) from Response to CAPD Discovery Request #98.
5) T-bill and T-bond yields from The Wall Street Journal, http://online.wsj.com, March 3, 2010.

Change in Return on Equity Due to Reduced Risk from Decoupling

From the Capital Asset Pricing Model, a firm's expected return on equity is:

$$ROE = r_f - \beta r_p$$

where r_f is the risk-free return, r_p is the risk premium (the difference between the risk-free return and the stock market return), and β is the individual firm's beta. Beta can be written as

$$\beta = \rho_{jm}\sigma_j\sigma_m = \sigma_j (\rho_{jm}\sigma_m) \qquad \text{for any firm j}$$

where ρ_{jm} is the correlation coefficient between the firm's return on equity and the market return; σ_j is the standard deviation of the firm's return on equity; and σ_m is the standard deviation of the market return. The change in risk due to decoupling will reduce the standard deviation of the firm's return, σ_j. Assuming that ρ_{jm} and σ_m do not change, then the change in the firm's return on equity as a result of decoupling may be calculated as

$$ROE_1 - ROE_2 = [r_f - \beta_1 r_p] - [r_f - \beta_2 r_p] = [\beta_1 - \beta_2]r_p$$

where subscripts 1 and 2 indicate before and after implementation of decoupling, respectively. Some further algebraic manipulation and substitution of $\sigma_j (\rho_{jm}\sigma_m)$ for β, gives

$$ROE_1 - ROE_2 = [(\beta_1 - \beta_2)/ \beta_1](\beta_1 r_p) = [(\sigma_{j1} - \sigma_{j2})/\sigma_{j1}] (\beta_1 r_p)$$

Given values for σ_{j1}, σ_{j2}, β_1, and r_p, the change in the firm's return on equity can be calculated.

Changes in the Expected Return on Equity
For Various Values of Beta, the Risk Premium,
and the Percentage Risk Reduction from Decoupling

5% Risk Reduction
(Proportional Change in Sigma = 0.05)

		Risk Premium	
		7.0	5.0
	1	0.35	0.25
Beta	0.75	0.2625	0.1875
	0.5	0.175	0.125

10% Risk Reduction
(Proportional Change in Sigma = 0.10)

		Risk Premium	
		7.0	5.0
	1	0.70	0.50
Beta	0.75	0.525	0.375
	0.5	0.175	0.25

15% Risk Reduction
(Proportional Change in Sigma = 0.15)

		Risk Premium	
		7.0	5.0
	1	1.05	0.75
Beta	0.75	0.7875	0.5625
	0.5	0.525	0.375

**Data, Regression Results, and Calculation
of Proportional Change in Risk from Decoupling
National AGA Data**

Year	ROE	Residential Consumption	Residential Consumption PerCustomer
1995	10.1	5382.9	96.6
2000	7.8	5126.2	83.9
2004	9.3	5006.9	77.9
2005	12.4	4945.6	75.8
2006	6.2	4508.2	68.5
2007	8.8	4868.3	73

Source: American Gas Association, Tables 6-2 and 11-12,
www.aga.org/Research/statistics/annualstats/

Regression Results and Calculations

1) ROE = -8.72039 + 0.003583(Rcons)

Total sum of squares:22.12   Residual sum of squares:16.72183

$\sigma_1 = (22.15/5)^{0.5} = 2.103331$ $\sigma_2 = (16.72183/5)^{0.5} = 1.828761$

Proportional change in σ = (2.103331 – 1.828761)/2.103331 = 0.13054

2) ROE = 3.819701 + 0.0666(RconsPerCus)

Total sum of squares: 22.12   Residual sum of squares: 19.94217

$\sigma_1 = (22.15/5)^{0.5} = 2.103331$ $\sigma_2 = (19.94217/5)^{0.5} = 1.997106$

Proportional change in σ = (2.103331 – 1. 997106)/2.103331 = 0.050503

VITA

CHRISTOPHER C. KLEIN

EDUCATION:

Ph. D. (Economics), University of North Carolina - Chapel Hill (1980)
B. A. (Economics), University of Alabama - Tuscaloosa (1976)

EXPERIENCE:

2002-Present	**Middle Tennessee State University** Associate Professor of Economics
2002-Present	**Consultant** Clients include: AGL Resources, Inc.; Tennessee Advisory Commission on Intergovernmental Relations; Tennessee American Water Company, Inc.; Tennessee Department of Environment and Conservation; US LEC of Tennessee, Inc.; Verizon Wireless; West Virginia American Water Company, Inc.; Z-Tel Communications, Inc.
1996-2002	**Tennessee Regulatory Authority** Chief, Economic Analysis Division, 1997-2002 Chief, Utility Rate Division, 1996-97
1998-2001	**Vanderbilt University** Adjunct Associate Professor of Economics
1986-1996	**Tennessee Public Service Commission** Director, Utility Rate Division, 1994-96 Economist & Research Director, 1993-94 Commission Economist, 1986-1993
1990-1994	**Middle Tennessee State University** Adjunct Faculty, Department of Economics and Finance
1980-1986	**Federal Trade Commission** Economist, Bureau of Economics - Antitrust Division

PROFESSIONAL ACTIVITIES:
Editor, *Journal for Economic Educators*, 2007 to present.
Member 1994-96, State Staff, Federal-State Joint Board, Federal Communications Commission
    CC Docket No.80-286 ("Separations" Joint Board).
Chair 1993-95, member 1990-95, Research Advisory Committee to the Board of Directors of the
    National Regulatory Research Institute at Ohio State University.
Member 1990-95, Staff Subcommittee on Gas, National Association of Regulatory Utility
    Commissioners.

Group Leader: Economics, Contracts, and Non-affiliate Revenue; NARUC* Staff Subcommittee on Accounts Multi-state Audit Team, 1988 Report on Bell Communications Research.

Referee: *Contemporary Economic Policy, Eastern Economic Journal, Land Economics, Review of Industrial Organization, Social Science Quarterly, Southern Economic Journal.*

Memberships: American Economic Association (AEA, since 1981), Southern Economic Association (1982), Industrial Organization Society (1986), Western Economic Association (2003).

HONORS:

Beta Gamma Sigma, International Honor Society for Collegiate Schools of Business, 2008

Top 30 Score, 2003-2004 Student Evaluation of Faculty Performance, Jones College of Business, Middle Tennessee State University.

Resolution of Recognition, National Regulatory Research Institute, 1995

Listed in various Who's Who publications since 1990

Certificate of Commendation, Federal Trade Commission,1985

First in my class to complete the Ph. D., 1980

Alpha Pi Mu, National Industrial Engineering Honorary, 1973

GRANTS RECEIVED:

MTSU Jones College Summer Research Grant: 2004, 2005, 2007.

MTSU Faculty Research and Creative Activity Academic Year Grant: 2004-2005 (with Reuben Kyle)

MTSU Faculty Research and Creative Projects Committee Summer Salary Grant: 2006, 2009.

TEACHING

At MTSU

ECON 2420, Principles of Economics – Microeconomics

ECON 3520, Intermediate Microeconomic Theory

ECON 4400, Business and Government

ECON 4570, Managerial Economics

ECON 4620, Econometrics and Forecasting

ECON 7121, Seminar in Applied Microeconomic Theory (Ph.D. Program)

ECON 7250, Methods of Outcome Assessment (Ph.D. Program)

Student Internships (ECON/FIN 4890, ECON/FIN 5890, ECON/FIN 6440)

At Vanderbilt University

ECON 252, Antitrust Economics

ECON 283, Economics of Regulation

MTSU Dissertation Committees

Shea W. Slonaker, Chair, *Three Essays on the Recorded Music Industry*, Ph. D. 2009.

Hua Liu, Member, *U.S. Trade Deficit, Productivity Growth and Offshore Outsourcing*, Ph. D. 2006.

Jennifer Wilgus, Member, *A Life-Cycle Approach to Human Capital Investment and Skill-Biased Technological Change*, Ph. D. 2005.

Anealia Sasser, *A Theoretical Examination of Title IV Financial Aid for Higher Education*, D.A. 2004.

Vanderbilt University Dissertation Committees:

Aster Adams, *The Impact of Deregulation and Competition on Efficiency, Financial Performance, and Shareholder Wealth of Electric Utilities in the United States*, Ph. D. 2009.

David B. Sapper, *Trial Selection and the Effects of Sentencing Reform in Criminal Antitrust Cases: A Theoretical and Empirical Analysis*, Ph. D. 2006.

T. Randolph Beard, *Bankruptcy, Safety Expenditure, and Safety Regulation in the Motor Carrier Industry*, Ph. D. 1988

PUBLICATIONS AND WORKING PAPERS

"Identifying the Best Buys in U.S. Higher Education," with E. Anthon Eff and Reuben Kyle, in revision, 2009.

"The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, in revision, 2009.

"Do State Funded Merit Scholarships Induce Students to Learn more in High school?" with Elizabeth A. Perry-Sizemore, in revision, 2009.

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"What Can We Learn from Education Production Studies?" with E. Anthon Eff, forthcoming, *Eastern Economic Journal*, 2010..

"Intra-district Public School Funding Equity and Performance in Nashville, Tennessee," *Journal of Education Finance*, Summer 2008.

"A Tale of Three Inputs: Cost and Production Duality with Time Utilization of Capital," *Applied Economics Research Bulletin*, 1(1) 2008.

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"Connecting Tennessee: Bridging the Digital Divide," with Rose M. Gregory, *NRRI Quarterly Bulletin*, vol. 21 no. 3, Spring 2001.

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    University, v. 11, n. 3 (November), 2001.

"The Role of Public Power in a Restructured Electric Power Industry," with David Sapper, *The Electricity Journal*,
    August/September 2001.

"Regulator Preferences and Utility Prices: Evidence from Natural Gas Distribution Utilities," with George Sweeney,
    Energy Economics, vol. 21, n. 1, 1999.

"Competition in Telecommunications: A Progress Report for Tennessee," *Tennessee's Business*, Middle Tennessee
    State University, Murfreesboro, TN; vol. 9, n. 1, 1999.

"Technological Change and the Production of Ocean Shipping Services," with Reuben Kyle, *Review of Industrial
    Organization*, December 1997.

"The Haunting of Universal Service: Open Markets, Efficient Funding and the Ghost of the Fair Rate of Return,"
    Proceedings of Tenth NARUC Biennial Regulatory Information Conference, National Regulatory
    Research Institute, Columbus, OH, 1996.

"Productivity Growth in Telecommunications: The Case of Tennessee," *Proceedings of Tenth NARUC Biennial
    Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1996.

"Capture vs. Compromise: Entry Regulation of Intrastate Trucking," with Reuben Kyle and Jennifer Wilgus,
    Logistics and Transportation Review, v. 32 n. 3, September 1996.

"Price Discrimination: What is 'Undue' for a U.S. Utility?" *Utilities Policy*, vol. 4 no. 4, October 1994.

"Single Service Price Variations and 'Subsidies' in the Pricing of Telecommunications Services," *Proceedings of
    Ninth NARUC Biennial Regulatory Information Conference*, National Regulatory Research Institute,
    Columbus, OH, 1994.

"What Is Undue Price Discrimination by a Regulated Utility?" *NRRI Quarterly Bulletin*, March 1994.

"A Comparison of Cost-Based Pricing Rules for Natural Gas Distribution Utilities," *Energy Economics*, July 1993.

"Negotiating a Transportation Rate Under Threat of Bypass: A Case Study," *Proceedings of the Eighth Biennial
    Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1992.

"A Multinomial Logit Model of Intrastate Trucking Regulation in Tennessee," with Jennifer Jose and Reuben Kyle,
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    Finance*, v. 16 ,1992.

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    Information Conference*, National Regulatory Research Institute, Columbus, OH, 1990.

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    Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH,
    1990.

Book Review, *Changing the Rules: Technological Change, International Competition, and Regulation in
    Communications*, Edited by Robert W. Crandall and Kenneth Flamm, Brookings 1989; *Review of
    Industrial Organization*, Fall 1990.

"Double Leverage and Strategic Financing Decisions," *NRRI Quarterly Bulletin*, v. 11, n. 3, September 1990.

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"Rate Design for Natural Gas Utilities: A Comparison of Ramsey and Cost of Service Pricing," *NRRI Quarterly Bulletin*, December 1989.

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PRESENTATIONS

"The Effect of State Funded Merit Scholarships for Higher Education on Pre-College Academic Performance," with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, San Antonio, TX, November 2009.

"The Effect of State Funded Merit Scholarships for Higher Education on High School Graduation Rates," with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, Washington, DC, November 2008.

"Identifying the Best Buys in U.S. Higher Education," with E. Anthon Eff and Reuben Kyle, Southern Economic Association Annual Conference, Washington, DC, November 2008.

"Product Variety and Sales in the Recorded Music Industry: 1990-2005," with Shea Slonaker, International Industrial Organization Conference, Arlington, VA, May 2008.

"Identifying the Best Buys in U.S. Higher Education," with E. Anthon Eff and Reuben Kyle, Academy of Economics and Finance Annual Meeting, Nashville, TN, February 2008.

"Product Variety and Sales in the Recorded Music Industry: 1990-2005," with Shea Slonaker, Academy of Economics and Finance Annual Meeting, Nashville, TN, February 2008.

"Do State Funded Merit Scholarships Induce Students to Learn more in High school?" with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, New Orleans, LA, November 2007.

"The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, Southern Economic Association Annual Conference, New Orleans, LA, November 2007.

"The Shifting Appeal of Sham Litigation: Evidence from Appellate Decisions 1971-2006," International Industrial Organization Conference, Savannah, GA, April 2007.

"The Shifting Appeal of Sham Litigation: Evidence from Appellate Decisions 1980-2006," Scholar's Week Poster Fair, MTSU, April 2007

"Causality Tests for Public School Funding and Performance," Southern Economic Association Meeting, Charleston, SC, November 2006.

"The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, Southern Economic Association Meeting, Washington, November 2005.

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"Telephone Penetration in Tennessee: Are Intrastate Universal Service Policies Effective?" with Aster Rutibablira and David B. Sapper, International Industrial Organization Conference, Boston MA, April 4-5, 2003.

"A Critique of Educational Production Functions," Southern Economic Association meeting, New Orleans, LA, November 2002.

"Connecting Tennessee: Bridging the Digital Divide," with Rose M. Gregory, American Economic Association meeting, joint session with the Transportation and Public Utilities Group, Atlanta, GA, January 2002.

"Long Term Contracts as Anticompetitive Devices in Telecommunications," Southern Economic Association Annual Meeting, Tampa, FL, November 2001.

"The Role of Public Power in a Restructured Electric Power Industry," American Economic Association meeting, joint session with the Transportation and Public Utilities Group, Boston, MA, January 2000.

"Universal Telephone Service in Tennessee: A Pre-Competition Assessment," with David Sapper, Southern Economic Association meeting, New Orleans, LA, November 1999.

"Trucks, Planes, Trains, and Wires? Short-haul vs. Long-haul Long Distance Rates in Telecommunications," with Reuben Kyle, Southern Economic Association meeting, Baltimore, MD, November 1998.

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"Cost and Production Duality with Capital Utilization," Department of Economics Seminar Series, Vanderbilt University, February 1997.

"Maximum Impropriety: The 'Baselessness' Standard for Improper Litigation," Southern Economic Association meeting, Washington, November 1996.

"Cost and Production Duality with Capital Utilization," Southern Economic Association meeting, Washington, November 1996.

"The Haunting of Universal Service: Open Markets, Efficient Pricing, and the Ghost of the Fair Rate of Return," Tenth NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1996.

"Productivity Growth in Telecommunications: The Case of Tennessee," Tenth NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1996.

"Productivity Growth in Telecommunications: The Case of Tennessee," Advanced Workshop in Regulation and Public Utility Economics, 15th Annual Conference, Lake George, NY, May 1996.

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"Negotiating a Transportation Rate Under Threat of Bypass: A Case Study," Eighth Biennial Regulatory Information Conference, Columbus, OH, September 1992.

"A Multinomial Logit Model of Intrastate Trucking Regulation in Tennessee," with Jennifer W. Jose and Reuben Kyle, Midsouth Academy of Economics and Finance annual meeting, Mobile, February 1992.

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"Rate of Return on Equity," National Conference on Unit Valuation Standards, Nashville, December 1987.

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"A Welfare Analysis of the Department of Justice Merger Guidelines," Southern Economic Association meeting, Dallas, November 1985.

"A Duality Approach to Labor Costs and Shiftwork," Southern Economic Association meeting, Atlanta, November 1984.

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        Chattanooga Gas Company (93-06946) December 1993.
        South Central Bell Tariff 93-039 (93-03038) May 1993.**
        South Central Bell (92-13527, et al) April 1993.**
        Kingsport Power Co. (92-04425) October 1992.
        United Cities Gas Co.(92-02987) Sept. 1992.
        L & L Trucking, Inc. (91-06786) February 1992.**
        Chattanooga Gas Company (91-03765) October 1991.
        GTE South (91-05738) August 1991.**
        Nashville Gas Company (91-02636) August 1991.
        Intra-LATA "Competition" (89-11065, et al) Feb. 1991.
        United Intermountain Tel. Co.(90-07832) Dec. 1990.**
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        United Cities Gas Co. (89-10017) Sept. 1989.
        Crockett Telephone Co. (89-02325) May 1989.
        ALLTEL Tennessee (89-02324) May 1989.
        West Tennessee Telephone Co. (89-02323) May 1989.
        Peoples Telephone Co. (89-02322) May 1989.
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        Tennessee-American Water Co. (U-87-7534) March 1988.
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        Nashville Gas Co. (U-87-7499) October 1987.**
        Kingsport Power Co. (U-86-7472) May 1987.**
        United Cities Gas Co. (U-86-7442) February 1987.**
        General Telephone of the South (U-86-7437) Nov. 1986.**

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[*]   Written (prefiled) testimony on cost of capital, rate design, competitive effects, and/or other issues.
[**]   Oral testimony as well as written.