STATE OF TENNESSEE

BEFORE THE TENNESSEE REGULATORY AUTHORITY

In the Matter of the Application of	)	
TENNESSEE-AMERICAN WATER CO.	)	Docket 08-00039
Petition to Change and Increase Certain	)	
Rates for Water Service	)	

TESTIMONY OF

CHARLES W. KING

ON BEHALF OF
THE CONSUMER ADVOCATE AND PROTECTION DIVISION

AFFIDAVIT

STATE OF TENNESSEE
BEFORE THE TENNESSEE REGULATORY AUTHORITY

In The Matter of TENNESSEE-AMERICAN WATER CO.)
For approval of Adjustments to its Rates and Revised) Docket No.08-00039
Tariff.)

COUNTY OF HANCOCK)
STATE OF MAINE)

Before me this day appeared Charles W. King and stated:

1. My name is Charles W. King, I am the President of Snavely King Majoros O'Connor & Lee, Inc.

2. I have caused to be filed in the above-referenced case testimony on behalf of the Attorney General of Tennessee, Attachments A and B, and an exhibit.

3. The material was prepared entirely by me or under my direction.

4. The statements made and the data presented are true and correct to the best of my knowledge and belief.

[signature]
Charles W. King
July 16, 2008

Candace Gray
Notary Public

My Commission expires on

CANDACE M. GRAY
NOTARY PUBLIC
STATE OF MAINE
My Commission Expires May 1, 2015

I. <u>Introduction</u>

Q. Please state your name, position and business address.

A. My name is Charles W. King. I am President of the economic consulting firm of Snavely King Majoros O'Connor & Bedell, Inc. ("Snavely King"). My business address is 1220 L Street, N.W., Suite 410, Washington, D.C. 20005.

Q. Please describe Snavely King.

A. Snavely King, formerly Snavely, King & Associates, Inc., was founded in 1970 to conduct research on a consulting basis into the rates, revenues, costs and economic performance of regulated firms and industries. The firm has a professional staff of 10 economists, accountants, engineers and cost analysts. Most of its work involves the development, preparation and presentation of expert witness testimony before federal and state regulatory agencies. Over the course of its 38-year history, members of the firm have participated in over 1000 proceedings before almost all of the state commissions and all Federal commissions that regulate utilities or transportation industries.

Q. Have you prepared a summary of your qualifications and experience?

A. Yes. Attachment A is a summary of my qualifications and experience.

Q. Have you previously submitted testimony in regulatory proceedings?

A. Yes. Attachment B is a tabulation of my appearances as an expert witness before state and federal regulatory agencies.

Q. For whom are you appearing in this proceeding?

A. I am appearing on behalf of the Consumer Advocate and Protection Division ("CAPD") of the Office of the Attorney General of Tennessee.

Q. What are the objectives of your testimony?

A. This testimony addresses two topics. The first the depreciation study that has been sponsored by John Spanos on behalf of the Tennessee-American Water Company ("TAWC" or "the Company"). The second is the weather normalization adjustment that TAWC has made based on the forecasting model developed by Dr. Edward Spitzenagel.

II. <u>Depreciation</u>

Q. How have you performed your analysis of Mr. Spanos's depreciation study?

A. I first read Mr. Spanos's testimony and examined his exhibits. I then formulated a number of data requests which the CAPD forwarded to the Company. I examined carefully the responses to these exhibits and then performed the analyses that are summarized in the first three schedules of my exhibit.

Q. What is the conclusion of your analysis?

A. Schedule 3 presents the depreciation rates and test year accruals that I recommend. As the schedule shows, I recommend depreciation rates that yield $416,195 less than the depreciation rates proposed by Mr. Spanos.

<u>Depreciation – General</u>

Q. What is depreciation?

A. In 1958, the National Association of Railroad and Utility Commissioners sanctioned the following definition of depreciation:

> "Depreciation," as applied to depreciable utility plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of utility plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of elements, inadequacy, obsolescence, changes in the art, changes in demand, and requirements of public authorities.[1]

The second commonly cited definition of depreciation is that of the American Institute of Certified Public Accountants:

> Depreciation accounting is a system of accounting which aims to distribute the cost or other basic value of tangible capital assets, less salvage (if any) over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation. Depreciation for the year is the portion of the total charge under such a system that is allocated to the year. Although the allocation may properly take into account occurrences during the year, it is not intended to be a measurement of the effect of all such occurrences.[2]

If depreciation can be defined in a single sentence, I would say that it is the process of recovering the initial investment in tangible capital assets, adjusted for salvage, in a systematic fashion over the useful service life of the plant, recognizing that utility plant is typically a group of investments.

Q. Can depreciation be calculated with precision?

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[1] *Uniform System of Accounts for Class A and Class B Electric Utilities,* 1958, rev. 1962.
[2] American Institute of Certified Public Accountants, *Accounting Research and Terminology Bulletin #1.*

A. No. Depreciation requires considerable application of judgment. The judgment pertains to the estimation of the future surviving life of plant as indicated by past patterns of retirements, industry trends, and corporate investment plans. Net salvage rates involve judgment as to the likely future salvage value and the cost to remove plant now in service.

Q. How does this judgmental characteristic of depreciation influence the TRA's approach to the subject?

A. The TRA must recognize that the development of depreciation rates is not a refined science subject to mathematical precision. Because depreciation analysts use judgment in their estimation of depreciation, the TRA must necessarily exercise its own judgment in assessing the rationale and data that underlie alternative depreciation rates. This is why, in this proceeding, the TRA must choose among depreciation rates that yield differing annual accruals.

Q. What are the basic parameters required to develop a depreciation rate?

A. At its simplest level, the only parameter that is absolutely required is an estimate of the service life of the asset being retired. The reciprocal of that number can be used as the depreciation rate.

However, because most utility depreciation is applied to accounts that are groups of assets, it is usually necessary to estimate an average service life and to describe the dispersion of retirements around that average. In the gas utility industry, this dispersion is usually described in terms of 31 "Iowa Curves," so named because they were developed at Iowa State University. These curves describe how closely the retirements are grouped around the average service life and whether they tend to occur more rapidly before, after or coincident with the average service life.[3]

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[3] For a complete discussion of Iowa Curves, see Appendix A, part 3 of *Public Utility Depreciation Practices*, National Association of Regulatory Utility Commissioners, August 1996.

Virtually all major utilities, including those in Tennessee, employ what is known as "remaining life depreciation." This procedure computes annual depreciation accruals by dividing the unrecovered net investment by the estimated remaining years of the asset (or group of assets). The depreciation rates are then the result of dividing these annual accruals by the gross plant investment in the respective accounts. Remaining life depreciation effectively ensures that any past under- or over-accruals of depreciation are recovered during the remaining life of the assets in the account.

The final component of depreciation is what is called "net salvage." It is the net of the salvage value of the material when it is taken out of service and the cost to remove that material. For gas plant, the cost to remove plant is almost always more than the salvage, so that net salvage is negative. When net salvage is negative, the forecast net costs of removal are added to the total amount that has to be depreciated over the life of the plant.

Q. **Please illustrate how the parameters you have just described are used to develop depreciation rates.**

A. Beginning with the simplest example, assume a single asset with a 20 year life. Its depreciation rate is the reciprocal of 20:

$$1/20 = 5\%$$

Now, let us assume that the asset is expected to have salvage value equivalent to 5 percent of its investment value. The depreciation rate declines:

$$\frac{1-.05}{20} = \frac{.95}{20} = 4.75\%$$

Assume next that the cost of removing this asset amounts to 15 percent of its value. The depreciation rate increases:

$$\frac{1 - .05 + .15}{20} = \frac{1.10}{20} = 5.5\%$$

This is called a “whole life” rate because it is based on the whole life of 20 years. To develop the remaining life rate, we must identify some additional items of data: the original investment, the depreciation reserve (the amount of depreciation that has already been recovered), and the remaining life of the asset.

In this illustration, let us assume that the asset originally cost $1 million and that past depreciation charges have recovered $400,000. This means that we have yet to recover $600,000 in original cost, plus a negative net salvage (i.e. net cost of removal) amounting to 10% of the original cost, or $100,000. The total amount yet to be recovered is thus $700,000. Let us further assume that the asset is 10 years old, leaving 10 years of remaining life. In remaining life depreciation, the unrecovered amount is divided by the remaining life years:

$$\frac{\$700{,}000}{10 \text{ years}} = \$70{,}000 \text{ required annual accrual}$$

The depreciation rate is then calculated by dividing the annual amount to be recovered by the gross investment, in this case:

$$\frac{\$70{,}000}{\$1{,}000{,}000} = 7.0\%$$

<u>The TAWC Depreciation Study</u>

Q. What method of depreciation has Mr. Spanos used to develop his proposed depreciation rates?

A. Mr. Spanos has used the vintage group, average life group procedure and the remaining life method. These procedures require estimates of the average service life, the retirement dispersion curve, and the net salvage percentage for each plant account.

Q. How did Mr. Spanos estimate his service lives and retirement dispersions?

A. Almost 75 percent of all of TAWC's plant is found in the following five accounts:

A/C 331	Transmission and Distribution Mains
A/C 333	Customer Services
A/C 334.1	Meters
A/C 334.2	Meter Installations
A/C 335	Hydrants

These are "mass property" accounts that consist of many units of property that are continually being retired, replaced and added to. Because of the very large amount of account activity, Mr. Spanos was able to obtain a fairly clear impression of the pattern of retirements relative to additions. In the case of TAWC, Mr. Spanos had the further benefit of "actuarial" data, that is, a record of the date of placement of each unit that has been retired. This permitted him to construct an "observed life table" for each account. This is a schedule that reports the dispersion of retirements by age similar to the actuarial tables used by life insurance companies to estimate the life expectancy of various classifications of people. Using these tables, Mr. Spanos was able to identify with some precision the pattern of past retirements by age and from that information to estimate the likely service life and retirement dispersion of the existing plant in these accounts.

Mr. Spanos did not have refined retirement data for many of the other smaller plant accounts. For these accounts, he was required to make estimates based on the limited information available from the Company's records, discussions with Company personnel, and his own experience as a depreciation analyst.

Q. What is your assessment of Mr. Spanos's life and survivor curve parameters?

A. As noted, Mr. Spanos had the advantage of extensive actuarial data in making his life and survivor curve estimates for the five largest mass property accounts. While I might quibble with some of his selections[4], I recommend that the Authority accept his judgment with regard to these accounts. As for the remaining accounts, I have no basis for accepting or rejecting Mr. Spanos's life and curve shape parameters. In the interest of minimizing the areas of controversy, I recommend that they, too, be accepted.

Q. How did Mr. Spanos develop his net salvage factors?

A. It is not at all clear how Mr. Spanos developed his proposed net salvage factors. He developed the account spread sheets that utility depreciation analysts typically rely upon for these factors, which are multi-year comparisons of net removal costs with the value of plant retired. For reasons I will discuss, these numbers are typically quite unstable, varying from one year to the next by orders of magnitude. This is one of the reasons I object to basing net salvage factors on these comparisons.

But then, Mr. Spanos failed to rely on even these highly unreliable indicators. For example, the Company's data indicate that during the last eight years, there has been little or no removal cost associated with retired services. The ratio of net removal costs to retirements has been less than 10 percent since 1997, less than five percent since 2000. Yet, Mr. Spanos recommends a net salvage ratio of minus 30 percent for this account. Conversely, the ratio of retired mains to net salvage has averaged about 45 percent in recent years, yet Mr. Spanos proposes a negative 30 percent net salvage ratio for this account also.

Q. If Mr. Spanos had paid more attention to the ratios of retirements to net removal cost, would you support his net salvage factors?

[4] For example, his Services A/C 333 life is somewhat shorter than indicated by the actuarial data.

A. No. These ratios are a poor basis for establishing net salvage factors for both conceptual and statistical reasons.

The conceptual problem relates to the practice of comparing dollars of very different values. The net removal costs are, of course, recent costs, presumably experienced in the year in which they are reported. The retirements are expressed in very different dollars, specifically the dollars that were spent when the retiring plant was placed in service. Those dollars may be many years old. There has been a very large amount of inflation over the last few decades, so that the old dollars in which the retirements are expressed were worth much more than the new dollars in which the removal costs are expressed. As a consequence, the numerator of the net salvage fraction, expressed in current dollars, is quite high, while the denominator, expressed in old dollars, is very low. The result is an unrealistically high ratio.

This issue is particularly relevant in water systems. The principal mass property water accounts have very long average service lives, 90 years in the case of mains and 70 years in the case of services. If the denominator of the mains net salvage factor is in 90-year old dollars, its value is multiples of the value of the numerator.

The statistical problem has to do with the valuation of the retirements. TAWC maintains records of the original cost of each unit of plant in its system. These original unit costs vary radically over time as inflation erodes the value of the dollar. The age mix of plant retired differs each year. In 2004, the average age of a dollar of retired main may be, say, 50 years. The valuation of those retired mains will reflect the value of a dollar in 1954. The next year, the average dollar of retired main may be much newer, say, 30 years. Those retirements will reflect 1974 dollars.

As a result, the value of retired plant is highly unstable, and that instability shows up in the Company's records. The value of mains retired in 2003 was $243,545. In the next year, 2004, the value was $89,651. In 2005, $65,225 in mains were retired; but in 2006, retirements were $208,053.

Q. Is there a better way to develop net salvage ratios?

A. For the major distribution accounts, the answer is yes. I have asked the Company to provide me with the number of units retired during the last seven years in each of the five largest accounts: mains, services, meters, meter installations and hydrants. I also asked for the total number of units (feet of main, services, meters and hydrants) in service. From Mr. Spanos's workpapers, I also have the net cost of removing these units. When I divide the annual average of these removal costs by the number of units, I derive a cost to remove a single unit in each account. I then multiply that cost by the total number of units in service to develop an estimate of the total cost to remove all the units in the account. This total cost, ratioed to the value of the plant in service, produces a net salvage ratio.[5]

By avoiding the use of retirement values, I produce a set of net salvage ratios that are rooted in solid, relatively stable numbers.

Q. Have you presented these calculations?

A. Yes. These calculations are presented in Schedule 1 of my exhibit. I have combined the two sub-accounts of account 334, A/C 334.1 Meters and A/C 334.2 Meter Installations, because the removal cost and salvage data are combined in the Company's records. The result is a set of net salvage ratios that with one exception (meters) are significantly lower than those used by Mr. Spanos:

[5] Although the Company supplied 2007 retirements, Mr. Spanos's workpapers do not have 2007 removal costs. For this reason, Schedule 2 covers the period 2001 through 2006.

Account		Net Salvage Ratios King	Spanos
331	Mains	(15.9%)	(35%)
333	Services	(0.3%)	(30%)
334.1	Meters	(2.9%)	4%
334.2	Meter Installations	(2.9%)	(20%)
335	Hydrants	(16.5%)	(30%)

Q. How have you developed your recommended depreciation rates?

A. I differ from the Company's depreciation rates only with respect to the five accounts listed above. My recommended depreciation rates for these accounts are developed on Schedule 2 of my exhibit. I begin with the plant balances in column A, which I increase by the negative net salvage ratios in Column B to derive in Column C the total amount to be recovered. This amount is reduced by the book reserve for each account to yield the amount still to be recovered. That amount is divided by the remaining life to produce the annual accrual. The annual accrual divided by the plant balance creates the depreciation rate.

Q. What are the test year depreciation expenses?

A. Using the Company's calculation of test year plant in service, I develop the total depreciation expense in Schedule 3 of my exhibit. It is $4,208,119, which is $416,195 lower than the $4,624,314 proposed by the Company.

III. Weather Normalization

Q. What is "weather normalization?"

A. Weather normalization is the process whereby the historical record of water consumption is translated into a forecast based on "normal" weather. This normal weather consumption is then used to predict the revenues during the test year. In this case the test year, or "attrition year" as the Company describes it, is from September 2008 through August 2009.

Q. What is the effect of the Company's weather normalization process?

A. The Company's weather normalization witness, Edward L. Spitzenagel, Jr. predicts that the average daily consumption per residential customer will be 141.81 gallons, which is 3.23 gallons, or 2.3 percent less than the average consumption of 145.13 gallons during 2007. This means that the volumetric revenue at present rates is reduced by 2.3 percent for the forecast year relative to 2007.

For commercial customers, Dr. Spitzenagel forecasts average per customer consumption at 1,029.41 gallons daily. This estimate is 14.25 gallons, or 1.4 percent less than the average per-customer daily consumption of 1,043.66 gallons in 2007. This adjustment translates into a reduction of 1.4 percent in per-customer volumetric revenue in the test year.

Q. Is it important to examine Dr. Spitzenagel's forecasts and the forecasting methodology?

A. Yes, it is. The effect of Dr. Spitzenagel's weather normalization is to decrease forecast volumetric revenue by about 1.8 percent. This decrease translates into a corresponding increase in the level of revenue requested by the Company in this rate case.

Q. Would you please describe Dr. Spitzenagel's weather normalization forecasting methodology?

A. Dr. Spitzenagel describes his model very briefly in the seven pages of his testimony. He describes various alternatives that he explored with limited success, but these descriptions are sketchy and qualitative. The approach that Dr. Spitznagel ultimately selects is to apply 24 separate models of identical form, with parameters individually determined. The 24 models respectively comprehend residential and commercial consumption in each of the 12 calendar months, based on historical data for each month. Dr. Spitzenagel uses the models to forecast consumption for each year in the period 2006 through 2010, inclusive.

Dr. Spitzenagel's models contain a term to represent "secular" trend, that is, the trend in overall consumption independent of weather. Dr. Spitzenagel explains that owing to gradual introduction of water–conserving fixtures and appliances, "the use of water appears to be gradually declining over time." He does not discuss population growth, commercial changes, or other demographic or economic shifts that may be significant over the period.

Q. What did you find in your analysis of Dr. Spitzenagel's model?

A. Dr. Spitzenagel states that month is a powerful predictor, but the individual model results do not follow an orderly pattern that reflects normal monthly temperature variations, even for residential consumption. Average monthly temperatures for Chattanooga follow a typical bell–shaped pattern, as shown in Schedule 4 of my exhibit. July has the highest temperatures; June and August next, May and September next etc.

In the first column of Schedule 5 I show the ranking of months by temperature, hottest to coldest, as abstracted from Schedule 4. The second column is Dr. Spitzenagel's model–predicted residential consumption, highest at the top. The third column is his model–predicted commercial demand, again highest at the top. The predictions shown are for 2006, the initial year for the forecast.

The annual patterns for temperature and predicted consumption are not similar. For example, August is the second hottest month, but it ranks fourth in predicted residential consumption. The coldest month is January, but the model's prediction is for January to have more residential water consumption than either February or March. Such variations may be expected in a given year. January is not the coldest month every year; in some years February or March is colder. But based on many years of data, a more regular pattern in the predictions should be evident.

Another major anomaly that calls the model predictions into serious question is the fact that the "secular" trend factors display a peculiar seasonal effect. This is shown in my Schedule 6 of my exhibit. The schedule shows Dr. Spitznagel's secular trends ranked, most negative at the top, least negative (or most positive) at the bottom. Note that the secular trends vary by month. In the first place, Dr. Spitzenagel's testimony indicates that the trends should be negative because of declining consumption. However, for several months, the commercial trends are positive. Secondly, the secular trends vary quite widely by month, particularly the trends for commercial consumption. They should not vary a great deal by month because they are supposed to represent non–seasonal factors. Third, the annual pattern of the residential secular trends is similar in some respects to the annual pattern of the commercial secular trends. August has the most negative trend in both series. March has the most positive commercial trend, and the second to least negative residential trend. The consistency of these observations suggests that the "secular trend" is in fact measuring some seasonal effects.

The secular trends vary enough to change the ranking of predicted consumption by month, which is inexplicable. The effect is most noticeable for the commercial consumption. Schedule 7 shows the rankings of predicted commercial consumption in 2006 and 2010. Because of the variation in secular trends by month, there are some major differences. For example, December rises from sixth place in 2006 to second place in 2010. August falls from fifth place to ninth. The "secular trend" is hardly secular.

Q. What do you conclude with respect to Dr. Spitzenagel's models?

A. I conclude that, notwithstanding Dr. Spitzenagel's statistical analyses, his results do not stand the test of reasonableness. They do not predict variations in monthly water consumption that conform with temperature variations, and they contain a secular trend that does not conform to the conventional definition of a secular variable. I therefore recommend that his predictions, and the revenue effects that are based on them, be disregarded by the TRA.

Q. Does this complete your testimony?

A. Yes. It does.