

STATE OF TENNESSEE

Office of the Attorney General



HERBERT H. SLATERY III
ATTORNEY GENERAL AND REPORTER

P.O. BOX 20207, NASHVILLE, TN 37202
TELEPHONE (615)741-3491
FACSIMILE (615)741-2009



April 7, 2015

Sharla Dillion
Docket Manager
Tennessee Regulatory Agency
600 Deaderick Street, 4th Floor
Nashville, Tennessee 37242-0001

RE: Docket No. 14-00146 – Petition of Atmos Energy Corporation for a General Rate Case and Petition to Adopt Annual Review Mechanism and ARM Tariff

Dear Ms. Dillon:

Please find attached for filing in the above-referenced docket, the Direct Testimony of William H. Novak, the Direct Testimony of Christopher Klein, and the related Exhibits. We are filing one paper original and four paper copies of the testimonies and exhibits and, due to the volume of attachments, one paper original of all related workpapers and other documents and four CDs containing copies of the testimonies, exhibits, workpapers, and other documents.

Please note that in addition to the paper originals and the four CDs described above (which do not contain confidential information), we also are filing in sealed envelopes one paper original and four paper copies of confidential information that should not be posted on the TRA website.

Sincerely,

A handwritten signature in blue ink that reads "Wayne M. Irvin".

Wayne M. Irvin
Assistant Attorney General

**BEFORE THE TENNESSEE REGULATORY AUTHORITY
NASHVILLE, TENNESSEE**

Petition of Atmos Energy Corporation
For a General Rate Increase

)
)

DOCKET NO. 14-00146



PRE-FILED DIRECT TESTIMONY OF

CHRISTOPHER C. KLEIN, PH.D.

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

April 7, 2015

IN THE TENNESSEE REGULATORY AUTHORITY
AT NASHVILLE, TENNESSEE

IN RE:

N OF ATMOS ENERGY CORPORATION)
FOR A GENERAL RATE INCREASE) DOCKET NO. 14-00146
UNDER T.C.A. 65-5-103(A) AND)
ADOPTION OF AN ANNUAL RATE)
REVIEW MECHANISM UNDER T.C.A.)
65-5-103(D)(6))

AFFIDAVIT

I, Dr. Christopher C. Klein, Regulatory Economist, on behalf of the Consumer Advocate Division of the Attorney General's Office, hereby certify that the attached Direct Testimony represents my opinion in the above-referenced case and the opinion of the Consumer Advocate Division.




CHRISTOPHER C. KLEIN

Sworn to and subscribed before me
this 24th day of April, 2015. My Commission Expires JULY 6, 2015


NOTARY PUBLIC

My commission expires: July 6, 2015

**BEFORE THE TENNESSEE REGULATORY AUTHORITY
NASHVILLE, TENNESSEE**

April 7, 2015

DOCKET NO. 14-00146

**PRE-FILED DIRECT TESTIMONY OF
DR. CHRISTOPHER C. KLEIN**

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

2 **A.**My name is Christopher C. Klein. I am a Professor in the Economics and Finance
3 Department at Middle Tennessee State University (MTSU) in Murfreesboro, Tennessee.

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

5 **A.**I received a B. A. in Economics from the University of Alabama in 1976 and I received a
6 Ph. D. in Economics from the University of North Carolina at Chapel Hill in 1980.

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

8 **A.**I was employed as an Economist in the Antitrust Division of the Bureau of Economics at
9 the Federal Trade Commission (FTC) in Washington, D.C., for six years starting in 1980.
10 In 1986, I was hired as the first Economist for the Tennessee Public Service Commission
11 (TPSC). Although my title changed over the years, I functioned as the Chief Economist
12 for the TPSC and, after 1996, the Tennessee Regulatory Authority (TRA), until August of
13 2002, when I assumed my current position with MTSU.

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

15 **A.**I performed the economic analysis in antitrust investigations involving more than 20
16 industries and contributed to staff reports on mergers in the petroleum industry,
17 competition in grocery retailing, and the economics of predatory, or “sham,” litigation.

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

1 **A.** I was an expert witness for the staff of the TPSC in rate cases and other similar
2 proceedings involving telecommunications, natural gas, electric, and water utilities, as
3 well as motor carriers. I testified in 36 dockets before the TPSC on the issues of cost of
4 capital, rate design, and competitive effects. I also filed testimony before the Federal
5 Communications Commission (FCC).

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

7 **A.** I oversaw the Utility Rate Division and then the Economic Analysis Division. The TRA
8 staff no longer testified in proceedings before the agency, but provided analysis and
9 advice to the TRA Directors. I was responsible for all such advice and analysis provided
10 to the Directors by these Divisions, either individually or in concert with other TRA staff,
11 in all proceedings that came before the agency for resolution. These proceedings
12 included rate cases and tariff filings by public utilities, as well as those associated with
13 the implementation of the federal Telecommunications Act of 1996.

14 **Q.** **Were you a member of any regulatory committees or boards while you worked for**
15 **the TPSC and the TRA?**

16 **A.** Yes. I was a member of the National Association of Regulatory Utility Commissioners
17 (NARUC) Staff Subcommittee on Gas. I was a member of, and Chaired, the Research
18 Advisory Committee to the Board of Directors of the National Regulatory Research
19 Institute (NRRI). I also served on the State Staff of the FCC's Federal-State Joint Board
20 in CC Docket No.80-286 (the "Separations" Joint Board) and as a Group Leader on the
21 NARUC Staff Subcommittee on Accounts Multi-state Audit Team that produced the
22 1988 Report on Bell Communications Research.

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

1 **A.** I teach classes in the general area of applied microeconomics, including Principles of
2 Microeconomics, Intermediate Microeconomic Theory, Managerial Economics,
3 Economics of Antitrust and Regulation, and Econometrics, as well as undertaking
4 scholarly research, participating in various university committees, and serving on
5 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 Industrial Organization Society, and Alpha Pi Mu: the National
13 Industrial Engineering Honor Society, as well as Beta Gamma Sigma: the International
14 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 40 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 80 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 issues involving competition in the telecommunications

1 industry, as well as before the Tennessee Advisory Commission on Intergovernmental
2 Relations and the Tennessee Regulatory Authority. A complete list is provided in my
3 Vita beginning on page 7 of my Exhibit.

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 Atmos Energy Corporation (Atmos) and recommend
9 an allowed rate of return for ratemaking purposes. This includes issues regarding capital
10 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 concur in part with the capital structure presented by Atmos's witness Joe T.
13 Christian, with the exception of the exclusion of short term debt. I recommend a capital
14 structure with 1.5% short term debt at a cost rate of 2.0% as shown on page 2 of my
15 Exhibit.

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

17 A. I recommend a cost of equity of 9.0% based on the Discounted Cash Flow (DCF) and
18 Capital Asset Pricing Model (CAPM) methods shown on pages 3 through 6 of my
19 Exhibit. I recommend no additional adjustment for quarterly payment of dividends or
20 flotation costs.

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

1 A. I recommend an overall weighted cost of capital of 7.55% as shown on page 2 of my
2 Exhibit.

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

4 A. I will address the concept of cost of capital first, then capital structure and cost of debt.
5 This is followed by cost of equity.
6

7 **COST OF CAPITAL**
8

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

10 A. I mean the rate of return necessary to induce investors to hold the debt and stock of a
11 company. This rate of return should be equal to that available to investors on alternative
12 investments of similar risk.

13 **Q. How is the cost of capital related to the legal principles of determining the allowed
14 rate of return for regulated utilities?**

15 A. The cost of capital concept embodies the economic principles for determining the
16 allowed rate of return set out by the U.S. Supreme Court in *Bluefield Water Works v.*
17 *P.S.C.* (262 U.S. 679, 1923) and *F. P. C. v. Hope Natural Gas Co.* (320 U. S. 591, 1944).
18 For instance, the Court stated in *Hope* that, "...the return to the equity owner should be
19 commensurate with returns on investments in other enterprises having corresponding
20 risks. That return, moreover, should be sufficient to assure confidence in the financial
21 integrity of the enterprise, so as to maintain its credit and to attract capital." (320 U.S.
22 603). In my opinion, the allowed rate of return on the capital employed by Atmos should
23 be set equal to its cost of capital.

Q. What are the consequences of not setting the allowed rate of return equal to the cost of capital?

A. If the allowed rate of return is set below the cost of capital, then the company's credit rating will fall and its cost of debt will rise. The price of its stock will decline to reflect the lower expected return. Eventually, the company may face difficulties in financing investments in new plant and equipment, causing the quality of its products and services to decline.

If the allowed rate of return is set above the cost of capital, then the price of the firm's stock rises to reflect the higher return and the firm's stockholders realize a capital gain. Moreover, the capital gain is paid for by the firm's customers in the form of excessively high prices.

Clearly, failure to set the allowed rate of return equal to the firm's cost of capital is detrimental to the firm's customers as well as its stockholders.

CAPITAL STRUCTURE AND COST OF DEBT

Q. What was your first step in estimating the cost of capital for Atmos?

A. My first step was to determine the appropriate capital structure and cost of debt for Atmos. I started with the capital structure at June 30, 2014, proposed by Atmos's witness Joe T. Christian. I compared it to the historical capital structures of Atmos submitted in response to CAPD DR Set No. 1, Question No. 1-38. Atmos's historical capital structures for June 30, 2012 and 2013, show short term debt of 4.47% and 2.74% respectively. Consequently, it is important to recognize the use of short term debt by

1 Atmos, even if it is eventually converted to long term debt or equity at some point in the
2 future. For example, the capital structure proposed in the previous rate case (Dkt. 12-
3 00064) by Atmos's witness Dr. Vander Weide was the average structure for 2010-2012
4 and included 1.26% short term debt. I recommend including 1.50% short term debt in
5 Atmos's capital structure at a cost rate of 2.0%. Atmos's cost rate on short term debt was
6 1.98% in 2012 and 1.48% in 2013. Interest rates remain low and in the same vicinity as
7 in these years. I recommend a cost rate on short term debt of 2.0% that recognizes the
8 possibility that interest rates may rise in the future. The end result is more favorable to
9 Atmos than the historical averages would be. My recommended capital structure is
10 shown on page 2 of my Exhibit.

11 **Q. Did you apply double leverage to arrive at your recommended capital structure?**

12 A. No. Atmos is not organized as a parent company with subsidiaries, but as a single
13 corporation with various divisions. Double-leverage is only applied to parent-subsidiary
14 organizations. It is not applicable to Atmos's corporate organizational structure.

15 **Q. How did you arrive at the cost of long term debt shown page 2 of your Exhibit?**

16 A. Again, I started with the cost of long term debt proposed by Atmos's Mr. Christian. He
17 proposed the weighted average cost of long term debt as of October 2014, which
18 recognizes long term debt that came due after June 30, 2014, and was replaced with new
19 long term debt of the same amount, but at a different cost rate. I found this reasonable
20 and have adopted it in my recommended capital structure.

21
22 **COST OF EQUITY**
23

1 **Q. How do you estimate Atmos Energy's cost of equity?**

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

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

5 A. Yes. The DCF method views investors as valuing a company's stock based on the
6 present value of the cash flows a stockholder expects to receive from owning the stock
7 over an infinite time horizon. These cash flows from stock ownership are just the
8 dividends paid by the company. Consequently, some simple mathematics show that the
9 rate of return an investor expects on stock ownership in a company is the dividend yield
10 for the current period plus the expected growth rate in that dividend. The dividend yield
11 is just the expected dividend divided by the current price of the stock.

12 **Q. Have you computed a DCF cost of equity for Atmos?**

13 A. Yes. Page 3 of my Exhibit shows this calculation for Atmos and eight natural gas
14 distribution utilities selected from Value Line for which growth rates are available. I start
15 with dividend yields reported by Value Line, as well as more recent yields reported by
16 the *Wall Street Journal*. I use both expected growth in earnings per share and in
17 dividends per share for the growth rate in the DCF formula. Earnings are the source of
18 dividend payments to stockholders, so earnings growth is often an indicator of dividend
19 growth. For Atmos, Value Line projects an annual earnings growth rate of 7% and a
20 dividend growth rate of 5%. Consequently, the calculated DCF indicates a range of
21 7.83% to 10.0%, with a midpoint of 8.91%. The midpoint of the DCF range for the eight
22 natural gas utilities is very nearly the same at 8.90%. Thus, the DCF estimate for Atmos
23 is consistent with that for the eight comparable natural gas utilities.

1 **Q. Did you examine the historical dividend growth for Atmos?**

2 A. I examined the data on historical dividend payments per share for Atmos shown on page
3 4 of my Exhibit. Quarterly dividend payments have increased by about 5.4% and 7.2% in
4 the past two years, while showing no growth in 2012 and about 1.5% each year going
5 back to 2007. Note also that dividends increase once per year in November rather than
6 increasing by a uniform proportion each quarter as some quarterly-dividend models
7 assume.

8 **Q. How did you select the eight natural gas utilities for your DCF analysis?**

9 A. I looked for natural gas utilities covered by Value Line's "Ratings and Reports" that were
10 comparable in size and riskiness to Atmos. I limited the natural gas companies to those
11 with total capital of over \$1.0 billion. I then eliminated companies for which adequate
12 earnings and dividend data were not available. I also examined the "beta," a measure of
13 relative risk, for the remaining companies. Betas for these companies ranged from 0.7 to
14 0.85, all less than 1.0, and similar to Atmos's beta of 0.85, indicating similar riskiness.

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

16 A. The midpoint of the DCF cost of equity range for Atmos of 8.91% and is very similar to
17 the midpoint of the DCF ranges for the comparable firms of 8.90%. This suggests that
18 the appropriate DCF cost of equity estimate for Atmos is in the vicinity of 8.90%. To try
19 to confirm the DCF analysis, I turn to the Capital Asset Pricing Model or CAPM.

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

21 A. Yes. In the CAPM, an investor's required return on an investment is based on the
22 relative riskiness of the investment. That is, an investor must expect a higher return in
23 order to invest in a riskier enterprise. The CAPM begins by estimating the risk premium

1 required on a broad portfolio of common stocks relative to a risk-free asset. This risk
2 premium is then adjusted for a particular stock's riskiness relative to the market – that is,
3 the broad portfolio of stocks. This is done by using the stock's beta, which measures the
4 riskiness of the stock relative to the market. The resulting CAPM cost of equity consists
5 of the risk-free return plus beta times the market risk premium.

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

7 A. I calculate risk premia from *Ibbotson® SBBI®, 2014 Classic Yearbook*, submitted in
8 response to the CAPD DR Set No. 1, Question No. 1-41. I calculate these risk premia by
9 subtracting the income portion of the return on long term government bonds, intermediate
10 government bonds and short term bills from the total return on large company stocks.
11 U.S. government bills and bonds are widely considered to have the lowest risk of default
12 of all available debt instruments.

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

14 A. Technically, the lowest risk is associated with very short term Treasury bills, because the
15 short time frame provides the least opportunity for default and little chance that the
16 expected inflation rate will not be realized over the life of the investment. Nevertheless,
17 these short term bills also embody short term returns that may not reflect all factors
18 affecting the expected return on a stock for a multi-year period. If one chooses longer
19 term bonds as the "risk-free" instrument, however, then expected returns over multiple
20 years may be better captured, but more risk is also introduced. This is the risk that the
21 actual inflation rate over the life of the bond may differ from expectations. If this occurs,
22 then the real, inflation adjusted, return on the bond also differs from expectations. This
23 inflation risk in a longer term bond raises the necessary return above the risk-free rate.

1 The analyst must then trade-off any bias introduced by higher risk in longer term
2 instruments against capturing the factors affecting the risk-free return over a longer
3 period.

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

5 A. Since current interest rates on Treasury bills (T-bills) are at historically very low levels,
6 some consideration for longer term bonds is appropriate. The risk premium of stocks
7 over T-bills from Ibbotson is 8.6%, while the risk premium of stocks over the income
8 component of intermediate term bonds (5-year) is 7.6%, and the risk premium over long
9 term bonds is 7.0%. The most recent yield for T-bills is 0.033%, for five-year T-Notes is
10 1.416%, for 10-year T-Notes is 1.93%, and for 30-year T-bonds is 2.512%. Using these
11 figures the CAPM cost of equity for an “average” stock – a stock whose beta is 1.0 –
12 ranges from 8.63% to 9.5%.

13 **Q. How do you adjust these estimates for specific companies such as Atmos?**

14 A. The risk premium is adjusted using a stock’s beta. I use betas for Atmos and the gas
15 utilities previously selected as reported by Value Line. These companies are less risky
16 than the average stock, so their betas range from 0.7 to 0.85. An average stock, or a
17 broad portfolio of stocks representing the market return, has a beta of 1.0. Page 6 of my
18 Exhibit shows the resulting range of CAPM cost of equity estimates. Here, I substitute
19 the recent 5-year T-bond yield for the yield on T-bills to reflect the likelihood that
20 interest rates will rise in the near future. For Atmos, the CAPM cost of equity is 8.81%.
21 Since the CAPM for each company is determined by each company’s beta, the
22 comparable natural gas utilities all have very similar CAPM cost of equity estimates

1 between 7.38% and 8.81%. The CAPM for a stock with a beta of one, the market
2 average, is 10.10% in the case that interest rates rise.

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

4 A. Yes. The pertinent factor at this time is the tendency for the risk premium to expand
5 when interest rates and bond yields are low and shrink when interest rates and bond
6 yields are high. Consequently, because short term interest rates are near zero, the CAPM
7 cost of equity estimates may underestimate the current cost of equity. Also, as Dr.
8 Vander Weide points out in his testimony, there is some evidence that the CAPM
9 underestimates the cost of equity for firms with betas less than one. Nevertheless, it is
10 reasonable to expect that the cost of equity of relatively low-risk utilities is less than the
11 cost of equity of the market portfolio – that is, the CAPM estimate for a beta of one.

12 **Q. What range of cost of equity estimates is associated with a beta equal to one?**

13 A. Using short term instruments, a stock with a beta of one has a cost of equity equal to the
14 current T-bill rate (0.033%) plus the risk premium for stocks over T-bills (8.6%) or
15 8.633%. Using 5-year instruments, the cost of equity for a stock with a beta of one is
16 $1.461\% + 7.6\% = 9.061\%$. Similarly, using long term bonds, the cost of equity for a beta
17 of one becomes $2.512\% + 7.0\% = 9.512\%$.

18 **Q. How do you get the CAPM cost of equity of 10.10% for a stock with a beta of one**
19 **shown on page 6 of your Exhibit?**

20 A. For the CAPM shown on page 6 of my Exhibit, I substitute the current yield on 5-year T-
21 notes for the rate on T-bills as the risk-free instrument. I do this to infer the effect of
22 higher interest rates in the future, even though higher risk is introduced by the possibility
23 that inflation will differ from expectations over the five-year term of the T-note. This

1 also offsets the possibility that the CAPM underestimates the cost of equity when interest
2 rates are low or for firms with a beta less than one.

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

4 A. The DCF estimates suggest a cost of equity of about 8.9% for Atmos and the eight
5 comparable natural gas utilities. My CAPM cost of equity estimate for Atmos is 8.81%.
6 The maximum CAPM cost of equity results from using a beta of one and the long term
7 Treasury bond as the risk-free rate yielding 9.5%. This is an upper bound on the cost of
8 equity for Atmos. On this basis, I recommend a cost of equity for Atmos of 9.0%.

9 **Q. How does your cost of equity of 9.0% compare to that recommended by Atmos's**
10 **witness Dr. Vander Weide?**

11 A. Dr. Vander Weide recommends a cost of equity range for Atmos of 10.1% to 11.2% with
12 a midpoint of 10.7%, but this includes several items with which I disagree, especially the
13 adjustments for flotation or issuance costs and quarterly payment of dividends.

14 **Q. What aspects of Dr. Vander Weide's analysis affect his recommendation of 10.7%?**

15 A. His choice of "comparable" firms, his risk premium analysis, and his adjustments for
16 flotation costs and quarterly payment of dividends appear to be the main drivers of his
17 recommendation.

18 **Q. Do you agree with Dr. Vander Weide's choice of comparable firms?**

19 A. No. Although Dr. Vander Weide's natural gas utilities selected from Value Line overlap
20 with those I select, some are not comparable to Atmos. The two companies included by
21 Dr. Vander Weide, but not by me, are Laclede and UGI. While Laclede may be
22 unobjectionable, its DCF estimate using my method and Dr. Vander Weide's data is only
23 7.45%, UGI is problematic. UGI is not primarily a gas utility, but has significant propane

1 operations and other businesses. I did not include UGI for this reason and it contributes
2 to the higher DCF estimates for comparable firms presented by Dr. Vander Weide.

3 Furthermore, the earnings growth rate for NiSource of 10.40% used by Dr.
4 Vander Weide appears to be an outlier. None of his other companies have a growth rate
5 greater than 7.65% and most are between 4.0% and 7.0%. Excluding NiSource reduces
6 the average DCF cost of equity on Exhibit JVW-1, Schedule 1, from 9.5% to 9.11%. Dr.
7 Vander Weide's market-weighted average of these estimates exacerbates the effect of
8 NiSource, since it is over twice as large in market capitalization as the next largest firm.
9 Without NiSource and market weighting, Dr. Vander Weide's DCF average is 9.11%,
10 similar to my recommended cost of equity 9.0%, even though his DCF estimates include
11 additional adjustments with which I disagree.

12 **Q. Why doesn't the inclusion of NiSource in your comparable firms affect your DCF**
13 **estimates of the cost of equity in the same way?**

14 A. There are several reasons. First, Value Line's earnings growth forecast for NiSource is
15 lower at 9%. Secondly, I incorporate dividend growth rate forecasts into my estimates, as
16 well as earnings growth forecasts. I also use the DCF estimates to define a range from
17 which I select the midpoint, rather than computing an average. Even so, if I applied my
18 method (annual dividend yield plus growth rate) to Dr. Vander Weide's Schedule 1 data,
19 the resulting average DCF is only 9.11% and without NiSource is 8.61%. Hence, the
20 items that pump up Dr. Vander Weide's DCF estimates are his adjustments for quarterly
21 dividends and flotation costs along with the market-weighting of the estimates in
22 computing an average that exaggerates the influence of NiSource.

23 **Q. Do you agree with his risk premium analysis?**

1 A. No. He applies the risk premium method to equity returns compared to returns on
2 corporate bonds. The CAPM employs similar methods, but measures the risk premia of
3 stocks relative to government instruments that are risk-free in that there is little chance of
4 default. Moreover, short term government bills are preferred because the chance that
5 inflation and interest rates will diverge from investor expectations over the life of a short-
6 term bill is virtually nil. The difference between stock or equity returns and a risk-free
7 rate of return reflects *only* the added return required for the risk embodied in stocks over
8 and above the return required to offset the time value of money.

9 The problem with Dr. Vander Weide's risk premium analyses is that the returns
10 on corporate bonds do not embody only the time value of money, but also include some
11 return for inflation or interest rate risk, as well as the risk of default. Stocks are not
12 subject to inflation risk, because stock prices and stock returns will adjust for changes in
13 inflation as firms adjust their prices for their products, nor are they subject to default risk
14 in the same way that bonds are, since stocks returns can rise when profits far exceed
15 default levels even if the probability of default does not change. Consequently, there is
16 no reason to expect this difference in returns on corporate bonds and stocks, either
17 utilities or the S&P 500, to be stable over time and this can introduce bias or inaccuracies
18 into the risk premium estimates.

19 **Q. Do you agree with Dr. Vander Weide's CAPM estimates of the cost of equity?**

20 A. No. I disagree with his use of long-term government bonds, rather than short-term bills,
21 to calculate the risk premium. Even ignoring this, the main source of Dr. Vander
22 Weide's higher CAPM estimates is his use of a long-term T-bond yield *forecast* of 4.8%
23 for the risk-free rate. If he used the current 30-year bond yield of about 2.5% for the risk

1 free rate, his CAPM estimate, without adjustment for flotation costs, would fall into a
2 range of 8% to 8.4%. The current 30-year T-bond yield already reflects investor
3 expectations for interest rates over the life of the bond. A further forecast is not
4 necessary.

5 **Q. Do you agree with Dr. Vander Weide's adjustments for flotation costs and quarterly**
6 **dividend payments?**

7 A. No. These adjustments, properly conceived, are offsetting and can be ignored for
8 ratemaking purposes. The quarterly dividend payment adjustment, for example, is based
9 on the idea that since the firm has to pay these sums out over the course of the year,
10 rather than all at once at the end, then the firm has to borrow that money at a cost that
11 should be recognized in its cost of equity. The problem with this is that it ignores the
12 profits the firm will earn over the course of the year. The profits of the firm for
13 regulatory purposes are not calculated in this way, but we all know that the firm's profits
14 are not earned all at once at the end of the year. Consequently, a firm earning profits over
15 the course of the year will have the money available to pay quarterly dividends out of
16 those profits and still have profits left to invest to earn an additional return before the end
17 of the year. The end result is that the firm earns higher profits, even after paying
18 quarterly dividends, than those calculated for regulatory purposes when these timing
19 issues are taken into account. These higher profits are sufficient to cover any adjustment
20 for flotation costs as well.

21 I should point out that I am not advocating trying to capture these timing effects
22 for regulatory purposes. Assuming that profits for return purposes are earned all at once
23 at the end of the year is a convenient fiction that removes countless small and difficult to

1 resolve issues from rate proceedings. If one were to try to account for the time value of
2 profits earned over the course of the year, then one would have to decide how often to
3 measure them (daily, weekly, monthly, or quarterly) – shorter periods will require much
4 finer measurement of costs and revenues – and at what rate to value them over time. The
5 timing of rate cases could also become issues for companies affected by weather. The
6 result for a natural gas utility with a test year beginning in October would be far different
7 than the result for a test year beginning in May, for example. As I have suggested, many
8 of these timing effects will be offsetting, very difficult to measure accurately, or to some
9 degree arbitrary, making them best ignored for most purposes.

10
11 **CONCLUSION**

12
13 **Q. Can you summarize your recommendations for the cost of capital of Atmos?**

14 A. Yes. I recommend the modified capital structure for Atmos as of June 30, 2014, shown
15 on page 2 of my Exhibit. I agree with Mr. Christian on the cost rate of long term debt,
16 but suggest a cost rate on short term debt of 2.0%. I recommend a cost of equity of 9.0%
17 resulting in an overall cost of capital of 7.55%.

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

19 A. Yes.
20

**BEFORE THE TENNESSEE REGULATORY AUTHORITY
NASHVILLE, TENNESSEE**

Petition of Atmos Energy Corporation)
For a General Rate Increase) DOCKET NO. 14-00146

PRE-FILED DIRECT EXHIBIT OF

CHRISTOPHER C. KLEIN, PH.D.

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

April 7, 2015

**Atmos Energy Corporation
Capital Structure and Cost of Capital**

<u>Component</u>	<u>%</u>	<u>Cost Rate</u>	<u>Wtd. Cost</u>
Short Term Debt	1.50%	2.00%	0.03%
Long Term Debt	43.41%	5.90%	2.56%
Common Equity	<u>55.09%</u>	9.00%	<u>4.96%</u>
Total	100%		7.55%

**Discounted Cash Flow Analysis
Gas Distribution Utilities**

<u>Company</u>	<u>Beta</u>	<u>Total Capital</u>	<u>Div. Yield</u>		<u>Projected Growth Rates Earnings</u>	<u>Dividends</u>	<u>DCF Range</u>
			<u>VL</u>	<u>WSJ</u>			
Atmos En. Midpoint	0.85	\$8.0b	3.0%	2.83%	7.0%	5.0%	7.83-10.0% 8.91%
<u>Natural Gas Utilities</u>							
AGL Res.	0.85	\$9.175b	4.10%	4.13%	6.5%	4.5%	8.6-10.63%
NiSource	0.85	\$18.81b	2.4%	3.9%	9.0%	3.5%	5.9-12.9%
NJR	0.80	\$1.83b	2.9%	2.91%	2.0%	3.5%	4.9-6.41%
NW Nat. Gas	0.70	\$1.85b	3.8%	3.90%	5.5%	2.5%	6.3-9.4%
Piedmont	0.80	\$2.885b	3.4%	3.56%	3.0%	3.0%	6.4-6.56%
SJI	0.80	\$2.55b	3.6%	3.66%	7.5%	7.0%	10.6-11.16%
SW Gas	0.85	\$3.65b	2.5%	2.79%	6.0%	7.5%	8.5-10.29%
WGL	0.75	\$2.19b	3.4%	3.33%	4.5%	3.0%	6.33-7.9%
Overall Range (without Atmos)							4.9-12.9%
Midpoint (Gas)							8.90%

Sources: 1) Beta, Total Capital, Dividend Yield, and Growth Rates from Value Line, *Ratings and Reports*, March 6, 2015.
2) Dividend Yield, *Wall Street Journal* (WSJ.com), March 25, 2015, based on closing prices for March 24, 2015.

Atmos Energy
Quarterly Dividends Paid on Common Stock
Jan. 1, 2007-November 20, 2014

Date	Dividends	Close Price	Annual Yield(%)	Growth(%)
11/20/2014	0.39	53.08	2.94	5.40541
8/21/2014	0.37	50.21	2.95	0
5/22/2014	0.37	50.42	2.94	0
2/20/2014	0.37	45.30	3.27	0
11/21/2013	0.37	44.95	3.29	7.24638
8/22/2013	0.345	41.08	3.36	0
5/16/2013	0.345	44.13	3.13	0
2/28/2013	0.345	38.17	3.62	0
11/21/2012	0.345	34.27	4.03	0
8/23/2012	0.345	35.15	3.93	0
5/23/2012	0.345	32.38	4.26	0
2/23/2012	0.345	32.05	4.31	0
11/22/2011	0.345	33.11	4.17	1.470588235
8/23/2011	0.34	32.20	4.22	0
5/23/2011	0.34	33.08	4.11	0
2/23/2011	0.34	33.37	4.08	0
11/23/2010	0.34	29.97	4.54	1.492537313
8/23/2010	0.335	28.48	4.71	0
5/21/2010	0.335	26.80	5.00	0
2/23/2010	0.335	27.18	4.93	0
11/23/2009	0.335	27.99	4.79	1.515151515
8/21/2009	0.33	27.90	4.73	0

5/21/2009	0.33	24.06	5.49	0
2/23/2009	0.33	22.62	5.84	0
11/21/2008	0.33	24.03	5.49	1.538461538
8/21/2008	0.325	27.05	4.81	0
5/22/2008	0.325	27.53	4.72	0
2/21/2008	0.325	26.85	4.84	0
11/21/2007	0.325	26.47	4.91	1.5625
8/23/2007	0.32	27.35	4.68	0
5/23/2007	0.32	32.51	3.94	0
2/22/2007	0.32	32.53	3.93	

Sources: Klein Exhibit, page 4, Dkt. 12-00064; Atmos Response to CAPD DR Set No. 1, Question 1-39, DKT 14-00156.

**Capital Asset Pricing Model
Natural Gas Distribution Companies**

<u>Company</u>	<u>Beta</u>	<u>Risk Premium</u>	<u>Weighted RP</u>	<u>5-year T-bond Current Yield</u>	<u>CAPM</u>
Atmos En.	0.85	8.6%	7.31%	1.50%	8.81%
AGL Res.	0.85	8.6%	7.31%	1.50%	8.81%
NiSource	0.85	8.6%	7.31%	1.50%	8.81%
NJR	0.80	8.6%	6.88%	1.50%	7.38%
NW Nat. Gas	0.70	8.6%	6.02%	1.50%	7.52%
Piedmont	0.80	8.6%	6.88%	1.50%	7.38%
SJI	0.80	8.6%	6.88%	1.50%	7.38%
SW Gas	0.85	8.6%	7.31%	1.50%	8.81%
WGL	0.75	8.6%	6.45%	1.50%	7.95%
Market	1.0	8.6%	8.60%	1.50%	10.10%

Sources: Beta: Value Line, *Ratings and Reports*, March 6, 2015.

Risk Premium: calculated from *Ibbotson® S&P® 2014 Classic Yearbook*, submitted in response to the CAPD DR Set No. 1, Question No. 1-41, Dkt. 14-00146.

Current Yields: 3-month T-bill 0.033%; 1-year T-Note 0.237%; 5-year T-Note 1.416%; 10-year T-note 1.93%; 30-year T-Bond 2.512% : *Wall Street Journal* (WSJ.com), March 25, 2015.

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 Professor of Economics, 2013-Present Associate Professor of Economics, 2002-2013
2002-Present	Consultant Clients included: AGL Resources, Inc.; Reseller Coalition; Tennessee Advisory Commission on Intergovernmental Relations; Tennessee American Water Company, Inc.; Tennessee Attorney General, Consumer Advocate and Protection Division; 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: *Applied Economics, Contemporary Economic Policy, Eastern Economic Journal, Land Economics, Management and Decision Economics, Media 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, 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, 2012.
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, Economics of Antitrust and Regulation
ECON 4570, Managerial Economics
ECON 4620/5620, Econometrics and Forecasting
ECON 4720, Economic Issues in the Music Industry
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, *U.S. Trade Deficit, Productivity Growth and Offshore Outsourcing*, Ph. D. 2006.
- Jennifer Wilgus, *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

- "The Music Industry as a Vehicle for Economic Analysis," *Journal of Economic Education*, forthcoming.
- "Education Production Functions," *Encyclopedia of Educational Theory and Philosophy*, D. Phillips ed., Sage: Los Angeles, 2014.
- "Econometrics as a Capstone Course in Economics," *Journal of Economic Education*, 2013.
- "Identifying the Best Buys in U.S. Higher Education," with E. Anthon Eff and Reuben Kyle, *Research in Higher Education*, 2012.
- "Chart Turnover and Sales in the Recorded Music Industry: 1990-2005," with Shea W. Slonaker, *Review of Industrial Organization*, 36:351-372, 2010.
- "What Can We Learn from Education Production Studies?" with E. Anthon Eff, *Eastern Economic Journal*, 36:450-479, 2010.
- "Public Transportation Ridership Levels," with Christopher R. Swimmer, *Journal for Economic Educators*, 10(1): 40-46, Summer 2010.
- "Analysis of U.S. Foreign Aid Determinants for 2003," with Joshua M. Hill, *Journal for Economic Educators*, 9(1): 48-52, Summer 2009.
- "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.
- "Telephone Penetration in Tennessee: Are Intrastate Universal Service Policies Effective?" with Aster R. Adams and David B. Sapper, *Journal of Applied Regulation*, 2, November 2004, pp. 87-108.
- "A Switching Regime Approach to Measuring the Effects of Technological Change in Ocean Shipping," with J. David Bass and Reuben Kyle, *Journal of Productivity Analysis*, 22:1-2, July-September,

2004, pp. 29-49..

"The Financial Implications of Unbundling on Bell Company Profits: A Review of the Evidence," with T. Randolph Beard and George S. Ford, *CommLaw Conspectus: The Journal of Communications Law and Policy*, v. 12 n.1, Fall/Winter 2003.

"Bell Companies as Profitable Wholesale Firms: The Financial Implications of UNE-P," with T. Randolph Beard, *Phoenix Center Policy Paper No. 17*, November 2002, www.phoenix-center.org.

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

"Regulation vs. Deregulation: It's All in the Externalities," *Tennessee's Business*, Middle Tennessee State 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, *Papers and Proceedings of the Nineteenth Annual Meeting of the Midsouth Academy of Economics and Finance*, v. 16, 1992.

- "Ramsey Prices for Natural Gas Distribution Utilities," *Proceedings of the Seventh NARUC Biennial Regulatory Information Conference*, National Regulatory Research Institute, Columbus, OH, 1990.
- "Intervention as Entry Deterrence: Evidence from Sham Litigation Cases," *Proceedings of the Seventh NARUC 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.
- "Predation in the Courts: Legal Versus Economic Analysis in Sham Litigation Cases," *International Review of Law & Economics*, June 1990.
- "Rate Design for Natural Gas Utilities: A Comparison of Ramsey and Cost of Service Pricing," *NRRI Quarterly Bulletin*, December 1989.
- "Dissecting Divestiture: A Telecommunications Book Review Article," *Review of Industrial Organization*, October 1989.
- The Economics of Sham Litigation: Theory, Cases, and Policy*, Bureau of Economics Staff Report, Federal Trade Commission, April 1989.
- "New Agreements, Non-affiliate Revenues, and Economic Issues," with Mike Amato and Francis Fok, in *Report on Bell Communications Research*, National Association of Regulatory Utility Commissioners, 1988.
- "Merger Incentives and Cost of Capital Regulation of Subsidiaries," *Midsouth Journal of Economics and Finance*, March 1988.
- "Strategic Sham Litigation: Economic Incentives in the Context of the Case Law," *International Review of Law & Economics*, December 1986.
- "Is There a Principle for Defining Industries? Comment," *Southern Economic Journal*, October 1985.
- "A Note on Defining Geographic Markets," with Ed Rifkin and Noel Uri, *Regional Science and Urban Economics*, February 1985.
- "Process Analysis, Capital Utilization, and the Existence of Dual Cost and Production Functions," FTC Bureau of Economics Working Paper No. 116, May 1984.
- "A General Theory of Hedonic Pricing of Capital as a Factor of Production," FTC Bureau of Economics Working Paper No. 105, December 1983.
- "The International Market for Crude Oil," with Fred Lipson and Harvey Blumenthal, in *Mergers in the Petroleum Industry*, Federal Trade Commission, 1982.

PRESENTATIONS

- “The Music Industry as a Vehicle for Economic Analysis,” Southern Economic Association Annual Conference, Atlanta, GA, November 2014.
- “The Music Industry as a Vehicle for Economic Analysis,” American Economic Association National Conference on Teaching Economics, Chicago, IL, May 2013.
- “Supply Innovation and Sales of Recorded Music: 1990-2010,” Southern Economic Association Annual Conference, New Orleans, LA, November 2012.
- “Econometrics as a Capstone Course in Economics,” American Economic Association National Conference on Teaching Economics, Boston, MA, May 2012.
- “Music Supply, Chart Turnover, and the Random Copying Hypothesis in the Digital Age,” with Shea Slonaker, International Industrial Organization Conference, Arlington, VA, March 2012.
- “Econometrics as a Capstone Course in Economics,” Southern Economic Association Annual Conference, Washington, DC, November 2011.
- “Do State Funded Merit Scholarships for Higher Education Reduce High School Dropout Rates for All Students?” with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, Washington, DC, November 2011.
- “Do State Funded Merit Scholarships for Higher Education Improve Pre-College Academic Performance?” with Elizabeth A. Perry-Sizemore, Southern Economic Association Annual Conference, Atlanta, GA, November 2010.
- “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.
- "The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, International Industrial Organization Conference, Atlanta, April 2005.
- "Anticompetitive Litigation and the "Baselessness" Standard for Antitrust Liability," Southern Economic Association Meeting, New Orleans, November 2004.
- "The Price of Quality: Hedonic Estimation of Implicit Market Models for Higher Education," with Reuben Kyle, Southern Economic Association Meeting, New Orleans, November 2004.
- "VoIP: Let's Ask the Right Questions," Tennessee Regulatory Authority Forum on VoIP, Nashville Public Library, April 30, 2004.
- "Telephone Penetration in Tennessee: Are Intrastate Universal Service Policies Effective?" with Aster Rutibablira and David B. Sapper, Southern Economic Association Meeting, San Antonio, TX, November 2003.
- "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.
- "The Economics of Time as a Resource," Southern Economic Association meeting, Atlanta, GA, November 1997.
- "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.
- "A Switching Regime Approach to Measuring the Effects of Technological Change in Ocean Shipping," with Reuben Kyle, Southern Economic Association meeting, New Orleans, November 1995.
- "Productivity Growth in Telecommunications: The Case of Tennessee," Southern Economic Association meeting, New Orleans, November 1995.
- "Local Service Price Variations and 'Subsidies' in Telecommunications," Southern Economic Association meeting, Orlando, November 1994.
- "Dynamic Effects of Regulatory Policy on Intrastate Long Distance Telephone Rates," Southern Economic Association meeting, Orlando, November 1994.
- "Single Service Price Variations and 'Subsidies' in the Pricing of Telecommunications Services," Ninth NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1994.
- "Suit, Countersuit, and Settlement in Sham Litigation," Annual Meeting of the Midsouth Academy of Economics and Finance, Nashville, February 1994.
- "New Evidence on the Effect of Regulation on Intrastate Long Distance Telephone Rates," Annual Meeting of the Midsouth Academy of Economics and Finance, Nashville, February 1994.
- "What is Undue Price Discrimination for a Public Utility?" Southern Economic Association meeting, New Orleans, November 1993.
- "Regulated Utility Prices and the Preferences of Regulators," with George Sweeney, Southern Economic Association meeting, New Orleans, November 1993.
- "A Test for Strategic Behavior Under Rate of Return Regulation," Southern Economic Association meeting, Washington, November 1992.
- "New Evidence on the Effect of Regulatory Policy on Intrastate Long Distance Telephone Rates," Southern Economic Association meeting, Washington, November 1992.
- "Technological Change and the Production of Ocean Shipping Services," with Reuben Kyle, Atlantic Economic Association meeting, Plymouth, MA, October 1992.
- "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.
- "Technological Change and the Production of Ocean Shipping Services," with Reuben Kyle, Southern Economic Association meeting, Nashville, November 1991.
- "Suit, Countersuit, and Settlement in Sham Litigation Cases," Southern Economic Association meeting, Nashville, November 1991.
- "Implementing Third Best Pricing Rules for Natural Gas Distribution Utilities," Southern Economic Association meeting, Nashville, November 1991.
- "Trucking Regulation in Tennessee," with Jennifer Jose and Reuben Kyle, Southern Economic Association meeting, Nashville, November 1991.
- "Research and Development in Regulated Markets: The Case of Bell Communications Research," Southern Economic Association meeting, New Orleans, November 1990.
- "Incentives for Trial and Settlement in Sham Litigation," Southern Economic Association meeting, New Orleans, November 1990.
- "Ramsey Prices for Natural Gas Distribution Utilities," Seventh NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1990.
- "Intervention as Entry Deterrence: Evidence from Sham Litigation Cases," Seventh NARUC Biennial Regulatory Information Conference, Columbus, OH, September 1990.
- "Funding Research and Development in Regulated Industries: The Case of Bell Communications Research," Ninth Annual Conference of the Advanced Workshop in Regulation and Public Utility Economics, New Paltz, NY, May 30 - June 1, 1990.
- "Incentives for Trial and Settlement in Sham Litigation," Bureau of Economics Seminar, Federal Trade Commission, February 1990.
- "Estimating Ramsey Prices for Natural Gas Utilities," Southern Economic Association meeting, Orlando, November 1989.
- "Incentives for Trial and Settlement in Sham Litigation," Department of Economics Seminar Series, Auburn University, November 1989.
- "Natural Gas Rate-Making: Now and In the Future," Associated Valley Industries Natural Gas Seminar, Nashville, October 1989.
- "Estimating Ramsey Prices for Natural Gas Utilities," Advanced Workshop in Regulation and Public Utility Economics, Eighth Annual Conference, Newport, RI, May 29-31, 1989.
- "The Role of Bell Communications Research in the Telecommunications Markets," Midsouth Academy of Economics and Finance Annual Conference, Nashville, February 1989.
- "The Organizational Structures of Public Utilities Under Different Regulatory Regimes," Southern Economic Association meeting, San Antonio, November 1988.

"New Agreements, Non-affiliate Revenues, and Economic Issues," Report on Bell Communications Research, NARUC Multi-state Audit Team, presented to NARUC Staff Sub-committee on Accounts, Kalispell, Montana, September 1988.

"Predation in the Courts: Empirical Analysis of Sham Litigation Cases," Joint Session of the Industrial Organization Society and the American Economic Association, Chicago, December 1987.

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

"Merger Incentives and Organizational Structures Under Cost of Capital Regulation," Southern Economic Association meeting, Washington, November 1987.

"Merger Incentives and Cost of Capital Regulation of Subsidiaries," Midsouth Academy of Economics and Finance Annual Conference, Mobile, February 1987.

"The Incidence of Predatory Sham Litigation," Southern Economic Association meeting, New Orleans, November 1986.

"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.

"Strategic Sham Litigation: Economic Incentives in the Context of the Case Law," Southern Economic Association meeting, Atlanta, November 1984.

"A General Theory of Hedonic Pricing of Capital as a Factor of Production," Southern Economic Association meeting, Washington, November 1983.

ECONOMIC TESTIMONY

Testimony before the Public Service Commissions of Alabama, Louisiana, North Carolina, and South Carolina on behalf of the Reseller Coalition, various docket numbers, August 2010-May 2011.

In the United States District Court for the Middle District of Tennessee: Owner-Operator Independent Drivers Association Inc. v. Keith Bissell, No. 3-90-0251, March 1992, (Affidavit).

Before the Federal Communications Commission: Represcribing the Authorized Rate of Return for Interstate Services of Local Exchange Companies, CC Docket No. 89-624, March 1990.

Before the Tennessee General Assembly: various Committees, 1994 - present.

Before the Tennessee Advisory Commission on Intergovernmental relations:
"Report on Pole Attachment Rate Study," with Reuben Kyle, January 18, 2007.

Before the Tennessee Regulatory Authority (docket numbers in parentheses):

Petition of Piedmont Natural Gas Company, Inc. for Approval of a CNG Infrastructure Rider to Its Approved Rate Schedules and Service (14-00086), December 2014.

Petition to Revise Performance Based Ratemaking Mechanism Rider in Atmos Energy Corporation's Tariff (13-00111), November 2013.

Petition of Atmos Energy Corporation for an Adjustment of Rates (12-00064), September 2012.

Petition of Berry's Chapel Utility, Inc. to Change and Increase Rates and Charges (11-00198), April 2012.

Petition of Piedmont Natural Gas, Inc. for an Adjustment to Its Rates, Approval of Changes to Its Rate Design, Amortization of Certain Deferred Assets, Approval of New Depreciation Rates, Approval of Revised Tariffs and Service Regulations, and Approval of a New Energy Efficiency Program and GTI Funding, (11-00144), December 2011.

Petition of Tennessee American Water Company to Change and Increase Certain Rates and Charges so as To Permit It to Earn a Fair and Adequate Rate of Return on Its Property Used and Useful in Furnishing Water Service to Its Customers, (11-00189), April 2011.

Petition of Chattanooga Gas Company for General Rate Increase, Implementation of the EnergySmart Conservation Programs, and Implementation of a Revenue Decoupling Mechanism, (09-00183), April 2010.

Petition of Piedmont Natural Gas Company, Inc. to Implement a Margin Decoupling Tracker (MDT) and Related Energy Efficiency and Conservation Programs, (09-00104), December 2009.

Tennessee Rural Coalition Petition for Suspension and Modification Pursuant to 47 U.S.C. 1251(f)(2), (06-00228), May 2007.

Complaint of US LEC of Tennessee, Inc. against Electric Power Board of Chattanooga (02-00562), Feb. 2004.

Before the Tennessee Public Service Commission* (docket numbers in parentheses):

BellSouth D/B/A South Central Bell (95-02614) October 1995.**

United Telephone - Southeast (95-02615) September 1995.

United Telephone - Southeast (93-04818) January 1994.**

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.**

Kingsport Power Company (90-05736) Nov. 1990.**

AT&T - South Central States (90-07460) Oct. 1990.**

L & L Trucking (90-03514; 90-04786) August 1990.**

South Central Bell Tel. Co. (90-05953) August 1990.**

* Written (prefiled) testimony on cost of capital, rate design, competitive effects, and/or other issues.

** Oral testimony as well as written.

GTE South (90-01273) June 1990.
Radio Common Carriers (89-11234) Nov. 1989.**
Nashville Gas Co. (89-10491) Oct. 1989.
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.
Ooltewah-Collegedale Telephone Co. (89-02321) May 1989.
Kingsport Power Co. (89-02126) March 1989.**
Chattanooga Gas Co. (88-01363) February 1989.**
Tennessee-American Water Co. (U-87-7534) March 1988.
Tellico Telephone Co. (U-87-7532) February 1988.
Claiborne Telephone Co. (U-87-7508) November 1987.**
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.**