STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION

Docket No. DG 14-180

Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities
Distribution Service Rate Case

DIRECT TESTIMONY

OF

JAMES D. SIMPSON

Related to the Marginal Cost of Service Study

August 1, 2014

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FIGURES

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I. INTRODUCTION

Q. Please state your name, address, employer, position and professional qualifications.

A. My name is James D. Simpson. I am a Senior Vice President with Concentric Energy Advisors, 293 Boston Post Road West, Suite 500, Marlborough, Massachusetts 01752. My professional qualifications and experience have been provided in Attachment RATES-11.

II. SCOPE OF TESTIMONY

Q. What is your responsibility in this proceeding?

A. In this proceeding, I am responsible for: (1) designing the Revenue Decoupling Mechanism (Decoupling Testimony of James D. Simpson); (2) preparing the Marginal Cost Study (Marginal Cost Testimony of James D. Simpson); and 3) together with Company Witness Stephen R. Hall, developing the test year billing determinants and revenues and the rate design (Joint Rate Design Testimony of Stephen R. Hall and James D. Simpson) for Liberty Utilities (EnergyNorth Natural Gas) Corp. d/b/a Liberty Utilities ("EnergyNorth" or the "Company").

Q. Please summarize your testimony concerning the Marginal Cost Study.

A. I have prepared a Marginal Cost Study ("MCS"), which is contained in Attachments JDS/MCS-1 through JDS/MCS-11. To prepare this MCS, I used approaches and methodologies that are generally consistent with the marginal cost

study that the Company filed in its most recent distribution rate case, Docket No. DG 10-017. I made some revisions and modifications to the approach that was used in Docket No. DG 10-017 that I felt were appropriate to enhance the estimated marginal cost components, or with the intent of being consistent with principles of economic theory and marginal costs. The marginal costs that I have calculated in Attachments JDS/MCS-1 through JDS/MCS-11 are derived from data and special studies that I obtained from the Company.

As also shown on JDS/MCS-11, and supported by the remainder of the JDS/MCS schedules and workpapers, the estimated annual marginal distribution costs by rate class are summarized in Table 1, below.

Table 1: Total Marginal Costs by Rate Class ($1,000)

	R-1	R-3 R-4	G-41	G-42	G-43	G-51	G-52	G-53	G-54	Total
Customer	$1,539	$30,323	$3,830	$2,138	$76	$655	$433	$66	$96	$39,157
Capacity	$150	$11,428	$4,198	$5,809	$1,499	$483	$708	$735	$884	$25,894
Total	$1,689	$41,751	$8,028	$7,947	$1,575	$1,139	$1,141	$801	$980	$65,050
	2.6%	64.2%	12.3%	12.2%	2.4%	1.8%	1.8%	1.2%	1.5%	100.00%

III. MARGINAL COST STUDY

A. Economic Theory and Marginal Costs

Q. Please provide an economist's view of marginal cost.

A. "Marginal Cost" is an economic concept; it is a measure of the additional cost that a firm incurs to provide an additional unit of a good or a service. A well-established principle of economic theory is that the price of a good that is sold in a perfectly competitive market will be set at the marginal cost to produce that good. It is a

further well-established principle of economic theory that the best allocation of resources will occur, and the best consumption decisions will be made, in an economy in which the prices of goods are set at marginal costs.

It has been the Commission's rate-design policy and precedent since the mid-1980's to apply the concepts of marginal cost pricing in a rate case (a) to determine the share of total rate case revenue requirement for which each rate class is responsible; and (b) to set base distribution rates, in order to promote proper energy consumption decisions. The basis for the Company's current allocation of revenue requirement to classes, rate design, and current rate classifications was approved by the Commission in Order No. 23,675 dated April 5, 2001 in the Company's 2000 revenue neutral rate design proceeding, Docket No. DG 00-063.

B. Marginal Cost Study Methodology

1. Overview

Q. Please describe the components of the Company's marginal costs that you estimated.

A. I prepared calculations and analyses to estimate the marginal Distribution Function-related costs[1] that the Company would incur to serve (a) additional demand when the Company is experiencing design day conditions; and (b) additional customers.

[1] As I explain in Section III.C.2, I also developed an estimate of production plant marginal costs to account for production function facilities that serve a distribution function.

In general terms, to estimate the costs that the Company would incur to serve additional peak day demand I calculated (1) the additional plant-related distribution mains costs; and (2) the additional Operations and Maintenance ("O&M") that would be caused by an increment to design day demand. I also calculated (3) the additional general plant-related costs associated with the additions to distributions mains; and (4) the additional Administrative and General ("A&G") expenses associated with the additional O&M expenses. Lastly, I calculated additional factors to account for the effect of bad debt and working capital on the marginal costs that I calculated.

In accordance with rate design precedents that were established in Docket No. DG 00-063, I did not calculate Production Function-related marginal costs (i.e. gas supply costs that are recovered through the Company's Cost of Gas mechanism).

Q. Please describe the data that you used to develop your estimates of the Company's marginal costs.

A. The Company provided Concentric with (a) distribution plant and general plant balances by account from 1989 to the present; and (b) distribution, customer, customer accounting and marketing, A&G, and Materials and Supplies and Prepayments Expenses, also for the period 1989 to the present. I adjusted that data using an appropriate price index. I used a Handy-Whitman index to restate plant additions in 2013 constant dollars, and I used the Implicit Price Deflator for Gross

Domestic Product, published by Bureau of Economic Analysis to restate expenses in constant 2013 dollars.

The Company provided engineering studies and unit cost estimates that I used in several of the estimates of marginal costs.

Q. Please describe the primary types of analysis that you used to calculate the components of marginal cost that you listed in Section III.B.1, above.

A. For many of the marginal cost components, I used a statistical process for estimating the relationship between a specific measure of costs[2] and a specific "Cost Driver" variable that I selected[3]. The general form of the regression equations that I estimated is as follows:

$$Cost\ Variable = a\ + b\ x\ Cost\ Driver\ variable \qquad \text{[EQ 1]}$$

Regression analyses are often used to estimate components of marginal costs because the regression coefficient, the term "b" in the equation above, sometimes referred to as the slope of the equation, is the estimated marginal cost of the Cost Variable that is associated with a small change in the Cost Driver variable[4]. To estimate the regression equations, I generally used all years' data that the Company provided to me.

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2 Some of the Cost Variables that I use include mains-related distribution plant, customer-related O&M expense; or A&G Expense.

3 Some of the "Cost Driver" variables that I used include design day demand, and number of customers.

4 The term "a" is the intercept of the equation. It is the level of the Cost Variable that is constant, regardless of the level of the Cost Driver variable.

For some cost components, I also calculated average unit costs if I could not find a reliable statistical relationship between a Cost Variable and a Cost Driver variable. The general form of the average cost equation that I calculated is as follows:

$$Average\ Unit\ Cost = {\sum_{i=1}^{i=n} Cost\ Variable_{year\ i}} \Big/ {\sum_{i=1}^{i=n} Cost\ Driver_{year\ i}} \quad \text{[EQ 2]}$$

Although average unit costs are generally not direct estimates of marginal costs in the same way that regression coefficients can be, average costs are used in marginal cost studies, average unit costs are appropriate, if carefully prepared.

Q. Please describe the general approach that you used in performing the marginal cost study regression analyses.

A. I reviewed the regression equations that I developed to ensure that the estimates were reasonable and that they did not violate important statistical requirements. Specifically, I tested each equation to ensure that there is no statistically significant level of autocorrelation in the regression equation. Autocorrelation is a violation of the requirements of regression analysis[5], which would inappropriately affect the regression statistics, if not corrected. The statistical software that I used, SPSS, can identify and correct for autocorrelation.

[5] Autocorrelation is a violation of the assumption that the regression equation error terms are uncorrelated. In the presence of autocorrelation, the regression does not produce Best Linear Unbiased Estimates.

I also tested each equation to look for "structural shifts" which are changes in the relationship between the Cost Variable and Cost Driver variable starting in a specific year and continuing for a number of years. I specifically looked for structural shifts that might have been related to the acquisition of EnergyNorth by KeySpan in 2000, the later acquisition of KeySpan by National Grid in 2007 and the acquisition of EnergyNorth by Liberty in 2012[6]. If I determined that a Cost Variable did have a structural shift, I tested additional regression equations that allowed the slope and intercept terms to be different for the time periods before and after the time of the structural shift. If a regression equation with terms addressing the structural shift was superior to other regression equations, I used the slope coefficient of the structural shift regression equation as the marginal cost estimate.

Q. What criteria did you use to accept or reject a regression equation?

A. To assess whether a regression equation provided a reliable estimate of the marginal cost component, I reviewed the regression equation statistics; specifically, I reviewed:

- The reasonableness of the regression equation results; I considered that an equation was reasonable if the slope coefficient had the "right sign"[7], and

[6] However, because the transfer of ownership from National Grid to Liberty occurred recently, it is unlikely that there has been sufficient time for any effect of the transfer of ownership to have resulted in changes in costs relationships that are statistically observable.

[7] The slope coefficient is the "right" sign if the coefficient is positive. A negative slope would mean, for example, that as design day demand increased, the distribution mains plant additions in a year would decrease.

was the "right size"[8].

- The explanatory power of the regression equation as a whole, as measured by the R-squared statistic.
- The explanatory power of the slope coefficient, as measured by the t statistic.

C. Marginal Cost Study Results

1. Overview

Q. Please describe how you have organized the marginal cost study.

A. The schedules that make up the Marginal Cost Study are provided in the List of Attachments. Table 2 provides a summary of the Marginal Cost Study schedules.

Table 2: Summary of Marginal Cost Study Schedules

Attachment	Pages	Topics
JDS/MCS-1	1 - 6	Calculation of marginal Capacity-related Plant Additions
JDS/MCS-2	1	Calculation of marginal Customer-related Plant Additions
JDS/MCS-3	1-2	Calculation of marginal Production Capacity-related Expenses
JDS/MCS-4	1-2	Calculation of marginal Distribution Capacity-related Expenses
JDS/MCS-5	1 - 7	Calculation of marginal Customer-related Expenses
JDS/MCS-6	1-4	Development of loading factors
JDS/MCS-7	1 - 8	Calculation of Levelized Fixed Charge Rates
JDS/MCS-8	1	Summary of Marginal Capacity Costs
JDS/MCS-9	1	Summary of Marginal Customer Costs
JDS/MCS-10	1	Summary of Marginal Cost Estimates
JDS/MCS-11	1	Marginal Unit Costs per Dth

[8] The "right size" is a subjective test to ensure that the slope coefficient is not implausibly large or small.

2. Marginal Distribution Capacity-related Plant Addition Costs

Q. Please provide an overview of the approach that you used to estimate marginal distribution capacity-related plant addition costs.

A. I estimated three separate components of marginal distribution capacity-related plant addition costs that are associated with: (a) production plant capacity that is used in lieu of mains reinforcement projects to address low pressure in an area of the distribution system at times of high (design day) demand; (b) main-related plant additions associated with system reinforcement projects, which are constructed to meet forecast design day demand; and (c) main-related plant additions that are associated with main extensions to connect new, off-the-main customers.

Q. Please describe the Company study that you used to estimate the marginal cost of production plant capacity that is used in lieu of main reinforcement projects.

A. I asked the Company to prepare an engineering study to estimate the capacity from any of the Company's LNG or LP facilities that would be needed during design day conditions to deliver gas to customers in a specific section of the distribution system because the capacity of the distribution system is not sufficient to deliver gas from the Company's gate stations to that section of the distribution system.

Q. Please explain how you estimated production plant capacity that is used in lieu of main reinforcement projects.

A. The results of the Company's engineering analysis, which indicates that 13.1% of the LNG and LP vaporization capacity would be used to address distribution pressure issues on design day, are provided as Attachment JDS/MCS-1, page 2.

Because I needed to determine the marginal cost associated with the production plant capacity that is used in lieu of main reinforcement projects, I also asked the Company to estimate the cost of hypothetical additions to existing Liberty LP and LNG facilities, and the cost of new LNG and LP production facilities constructed in the Company's service territory. From the Company's estimated costs of new LNG and LP production facilities, I determined that the estimated cost in 2013 dollars of a hypothetical 10,000 Mcf additional LNG capacity was the best representation of the marginal cost-based value of the production capacity that is currently being used to address pressure issues. The calculation of the marginal cost of production plant that has a distribution function (pressure support) is provided in JDS/MCS-1, page 1, Line 11; the Company's estimated production capacity costs are provided in Workpaper JDS/MCS-1, pages 1 – 5.

Q. Please explain why you determined that the estimated cost in 2013 dollars of a hypothetical 10,000 Mcf additional LNG capacity is an appropriate measure of

the marginal cost of production plant capacity that is used in lieu of main reinforcement projects.

A. I used the "peaker" approach to estimate the marginal capacity costs of production plant capacity that is used in lieu of main reinforcement projects. The peaker approach is a commonly used method to estimate production capacity costs in gas and electric marginal and avoided cost analyses. According to the peaker method, the production capacity cost is set at the cost of the least-cost capacity available. I determined that the costs of adding an incremental 10,000 Mcf of daily LNG capacity at the Tilton LNG facility was the most appropriate measure of the least-cost capacity available[9].

Q. Please describe the Company study that you used to estimate the marginal cost of Distribution main additions that are associated with system reinforcement projects.

A. I asked the Company to prepare an engineering study of forecasted system reinforcement projects that the Company would be required to construct in the next ten years, 2015 to 2024, to meet the Company's projected design day demand during that period. The engineering study that I asked the Company to prepare is different from the Company's actual distribution asset plan, which takes into account (a) projects that will be required to meet projected load growth; (b) projects

[9] As shown in Workpaper JDS/MCS-1, page 2, the incremental propane project costs are less than the incremental LNG project. Nonetheless, the costs of the incremental LNG project was selected as the peaker facility for this MCS because LP production is constrained to be less than a fixed percent of total local sendout.

that are included in the Company's Cast Iron Bare Steel ("CIBS") replacement program; and (c) other distribution replacement and relocation plans. The Company's distribution asset plan is different from the projections that I requested because the actual asset plan may combine a reinforcement project with a CIBS replacement project or other replacement or relocation projects, which is likely to affect the timing and location of reinforcement projects.

Q. Please explain how you estimated the costs of Distribution main additions that are associated with system reinforcement projects.

A. I prepared a regression analysis to estimate the statistical relationship between the projected cost of system reinforcement projects and projected design day demand. The Company's reinforcement project forecast[10] that I used in my statistical analysis, and the regression equation that I estimated are provided in Attachment JDS/MCS-1 page 3. Based on this analysis, I determined that the marginal cost of system reinforcement is $146.06 per Dth.

Q. Please describe that data that you used to estimate the marginal cost of main extensions.

A. The Company provided data on the cost of main extension projects from 1989 to 2013; the Company's main extension data is provided in Attachment JDS/MCS-1 page 4.

[10] The Company's reinforcement forecast analysis is also provided in Workpaper JDS-MCS-1 Page 3.

Q. Please explain how you estimated the marginal cost of main extensions.

A. I prepared a regression analysis to estimate the statistical relationship between the cost of main extensions and design day demand, based on the historical data from 1989 to 2013. The regression results are summarized on Attachment JDS/MCS-1 page 5, lines 27-29. However, I did not use the regression results to estimate the marginal cost of main extensions because the slope coefficient was not statistically significant. Because I could not use the results of the regression equation to estimate the marginal cost of main extensions, I used the average cost, calculated from 2003 to 2013; the analysis that I prepared is provided in Attachment JDS/MCS-1 Pages 4 and 5, Lines 30 to 33.

Q. In summary, what is the marginal cost of distribution capacity-related plant additions?

A. The total marginal cost of distribution capacity-related plant additions is summarized in Table 3 below.

Table 3: Marginal Cost of Distribution Capacity-related Plant Additions

Marginal Plant additions Component	$ per Dth	Source
Production in lieu of Reinforcement	$82.58	JDS/MCS-1 page 1
Reinforcement	$146.06	JDS/MCS-1 page 6
Extension	$889.73	JDS/MCS-1 page 6
Total cost of Marginal Plant additions	$1,118.37	

3. Marginal Customer-related Plant Addition Costs

Q. Please explain how you estimated marginal Customer-related plant addition costs.

A. Marginal Customer-related plant addition costs measure the marginal cost to connect a customer, which includes the current installed cost of a meter and a service. Because the cost of a meter and a service is generally correlated with the size of the customer, I asked the Company to provide an analysis of the current installed cost of a meter, and installed cost of a service that is typical for each rate class. The Company's analysis is provided in Attachment JDS/MCS-2.

The Company directed me to use the results of the analysis of the number of customers per service that had been developed for the Company's 2010 MCS[11]. Also, the Company directed me to assume that the estimated meters per customers is 1.0[12].

Q. In summary, what is the marginal cost of customer-related plant additions?

A. The total marginal cost of customer-related plant additions is summarized in Table 4.

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[11] The estimate of the customers per service in Attachment JDS/MCS-2 is based on the understanding that that some residential and small C&I customers (rate classes R-1, R-3 and R-4; G-41 and G-51) are located in an apartment building, condominium complex, office building, strip mall or shopping center, and are served from a single gas service. The Company believes that it more likely that medium and large use C&I customers are served by a dedicated service.

[12] As stated in the Company's tariffs, the Company's policy is generally to separately meter and bill each customer / meter.

Table 4: Marginal Cost of Customer-Related Plant Additions

	R-1	R-3 R-4	G-41	G-42	G-43	G-51	G-52	G-53	G-54
Meter	$230	$230	$344	$1,319	$2,775	$344	$1,319	$2,775	$12,506
Service	$2,134	$2,134	$2,636	$8,236	$9,380	$2,636	$8,236	$9,380	$18,154
Total	$2,364	$2,364	$2,980	$9,555	$12,155	$2,980	$9,555	$12,155	$30,660

Source: JDS/MCS-2 Page 1, Lines 4, 8, 9

4. Marginal Capacity-related Production (Pressure Support) Expense

Q. Please explain how you estimated Marginal Capacity-related Production (Pressure Support) Operations and Maintenance costs.

A. I prepared a regression analysis to estimate the statistical relationship between (a) the capacity-related operations and maintenance expense associated with the Company's LNG and LP facilities; and (b) design day demand, based on historical data from 1989 to the present that the Company provided. The regression results are summarized on Attachment JDS/MCS-3 Pages 1 and 2, lines 27 and 28. However, I did not use the regression results to estimate marginal capacity-related production O&M expense because the regression results are not plausible. Specifically, it is not plausible that capacity-related production O&M expense would decrease as design day demand increases, which is the meaning of the negative slope coefficient. Because I could not use the results of the regression equation to estimate the marginal capacity-related production (pressure support) operations and maintenance costs, I used the average cost, calculated from 2002 to 2012; the analysis that I prepared is provided in Attachment JDS/MCS-3 Pages 1 and 2, Lines 31 to 37.

5. Marginal Distribution Capacity-related Operations and Maintenance Expense

Q. Please explain how you estimated the Marginal Cost of Capacity-related Distribution Operations and Maintenance Expense.

A. I prepared a regression analysis to estimate the statistical relationship between (a) the capacity-related distribution operations and maintenance expense; and (b) design day demand, based on historical data from 1989 to the present that the Company provided. The regression results are summarized on Attachment JDS/MCS-4 Pages 1 and 2, lines 25 to 28; additional analysis is provided on Lines 29 to 33. Based on this analysis, I determined that the marginal cost of capacity-related distribution operations and maintenance expense should be estimated as the slope coefficient of the regression equation.

6. Marginal Customer-related Operations and Maintenance Expense

Q. Please explain how you estimated Marginal Customer-related Distribution Operations and Maintenance Expenses.

A. I prepared a regression analysis to estimate the statistical relationship between (a) the customer-related distribution operations and maintenance expense associated with operating and maintaining customer meters and services; and (b) the number of annual customers based on historical data from 1989 to 2012 that the Company provided. The regression results are summarized on Attachment JDS/MCS-5 Pages 1 and 2, lines 26 to 32; additional analysis is provided on Lines 33 to 37. Based on

this analysis, I determined that the marginal cost of customer-related distribution operations and maintenance expense should be estimated as the average from 2002-2012 on Line 36 of Attachment JDS/MCS-5 Page 2. I did not use the regression results to estimate marginal cost of customer-related distribution operations and maintenance expense because although I could identify regression equations that passed the standard statistical tests, the estimated slope coefficients of those regression equations were not plausible – they were not consistent with average cost results.

I prepared additional analysis, which is provided in Attachment JDS/MCS-5, page 3, to allocate the customer-related O&M expense to rate classes in a way that reflects that the cost to maintain meters and services is related to the size of the meter and service, which varies by rate class. As shown in Attachment JDS/MCS-5, page 3 Column (C), the marginal customer-related O&M expense was allocated to rate classes based on the marginal service and meter plant per customer, JDS/MCS-2 Page 1. The results of this allocation process are shown in Attachment JDS/MCS-5, page 3 Column (G).

7. Marginal Customer Accounting and Marketing Expense

Q. Please explain how you estimated Marginal Customer Accounting and Marketing Expenses.

A. I prepared a regression analysis to estimate the statistical relationship between (a)

customer accounting and marketing expenses, excluding bad debt expense; and (b) the number of annual customers based on historical data from 1989 to 2012 that the Company provided. The regression results are summarized on Attachment JDS/MCS-5 Page 5, lines 25 to 30; I determined that regression results are not suitable for estimating the marginal customer accounting and marketing expenses because I could not identify a statistically valid regression equation with a slope coefficient that was also plausible.

Therefore, based on the additional analysis that I prepared, which is provided on Lines 31 to 37, I determined that the marginal customer accounting and marketing expenses should be estimated as the average cost per customer, measured from 2002 to 2012.

In addition, because marginal customer accounting and marketing expenses, excluding bad debt expense, generally do not vary by rate class, the marginal cost per customer as shown on Attachment JDS/MCS-5 Page 5, Line 37, applies to all EnergyNorth rate classes.

Lastly, I prepared JDS/MCS-5, Page 7, to calculate the proforma bad debt expense rate by rate class, based on data provided by the Company.

8. Marginal Loading Factors and Adjustment Factors

Q. Please explain how you estimated Marginal Loading Factors.

A. I calculated several loading factors to account for cost components that are relatively small or for which it is difficult to develop marginal cost-type statistical relationships. I developed loading factors for the following four cost components: (a) plant-related A&G expense; (b) non-plant-related A&G expense; (c) M&S and prepayments; and (d) general plant. For each of the loading factors, I prepared regression analyses for the period 1989 to 2012 or 2013 using the loading factor cost component as the dependent variable, and an appropriate measure of cost, utility plant or total O&M expense as the independent variable. Some of the loading factor regression results were not statistically meaningful[13]. In those instances, I calculated annual ratios of the dependent variable divided by the independent variable; and the loading factor that I used in the MCS is based on averages of the calculated ratio over a range of years that would result in a representative long run loading factor. The loading factor analyses for (a) plant-related A&G expense; (b) non-plant-related A&G expense; (c) M&S and prepayments; and (d) general plant are provided in Attachments JDS/MCS-6 Pages, 1 through 4.

[13] For example, the slope coefficient was not the "right" sign, or was not statistically significant, or the overall goodness of fit for the regression equation, as measured by the R Square was poor.

Q. Please explain how you calculated a sendout/sales adjustment factor.

A. The measures of capacity-related marginal cost that are used in the MCS are calculated unit costs per dekatherm (or therm) of design day demand, measured at customers' meters. The total distribution system demand is greater than the demand measured at customers' meters to account for the difference between the measured amount of gas entering the distribution system (from interstate pipelines at city gates and from on-system peaking resources) and the measured amount of gas leaving the distribution system (through customer and company meters)[14]. I calculated a sales/sendout adjustment factor based on the lost and unaccounted factor that was included in the Company's 2013 Integrated Resource Plan, filed November 1, 2013 in Docket No. DG 13-313. This adjustment factor is used in JDS/MCS-8 Page 1, Line 24.

9. Fixed Carrying Charge Rate

Q. Please explain how you calculated the Fixed Carrying Charge Rates.

A. The marginal cost that I calculated for mains, services, meters and production facilities is the initial cost of an asset that is placed into service. Fixed carrying charge rates ("FCCR") are used to convert the marginal cost of plant additions from a cost that represents the estimated marginal investment into the levelized annual cost of that investment. Attachment JDS/MCS-7 Page 1 is a summary of the

[14] The primary sources of these differences include meter measurement; adjustments for atmospheric pressure, gas distribution pressure, or gas temperature; gas theft, and leaks caused by third party damage to the distribution system, corrosion or breaks.

FCCRs for (a) mains; (b) services; (c) meters; and (d) production plant. This page shows Economist's and Engineer's FCCR results.

An Economist's FCCR is based on annual streams of costs that are fixed in real dollars, and therefore vary in nominal dollars; an Engineer's FCCR is based on annual streams of costs that are constant in nominal dollars and therefore vary in real dollars. However, the present values of the Economist's and Engineer's costs and revenues are identical. For marginal cost analyses, the Economist's FCCR calculations are generally accepted as being the appropriate version because the Economist's FCCR appropriately accounts for the reduced value, due to price inflation, of the revenue requirements of that plant addition in future years and therefore better reflects the economic and financial implications of regulated ratemaking.

Attachment JDS/MCS-7, pages 2 through 7 provide the assumptions that were used in the calculation of the FCCR, and the detailed calculations of the four FCCRs. The calculations of the FCCR follow standard rate making principles to determine revenue requirements associated with plant additions, including return, taxes, depreciation, salvage value, etc.

D. Summary of Marginal Cost Study Results

Q. Please explain the schedules that you have prepared to summarize the Marginal Cost results.

A. Attachment JDS/MCS-8 Page 1 shows the calculation of unit marginal distribution capacity costs, including all loading factors and adjustments.

Attachment JDS/MCS-9 Page 1 shows the calculation of unit marginal customer costs, including all loading factors and adjustments.

Attachment JDS/MCS-10 Page 1 shows the calculation of unit marginal customer and capacity costs, adjusted for bad debts. Attachment JDS/MCS-10 Page 1 also shows the calculation of total marginal costs by rate class, which is used in designing the Company's proposed base distribution rates in this proceeding to allocate the Company's requested distribution revenue requirement to firm rate classes[15].

JDS/MCS-11 Page 1 shows unit customer-related and demand-related marginal costs by rate class.

[15] As explained in the Joint Rate Design Testimony of Stephen R. Hall and James D. Simpson, the equiproportional adjustment method was used to adjust total marginal costs by rate class to the Company's proposed distribution revenue requirement in this proceeding.

Q. Does this conclude your testimony?

A. Yes, it does.