CASE NUMBER:

99-176

Delta Natural Gas Company, Inc.
3617 Lexington Road
Winchester, Kentucky 40391-9797
Phone: 606-744-6171
Fax: 606-744-3623

November 16, 1999

Hon. Helen Helton
Executive Director
Public Service Commission
P O Box 615
Frankfort, KY 40602

RE: Delta Natural Gas Company Inc.
Case No. 99-176

Dear Mrs. Helton:

We deliver herewith for filing the original and ten (10) copies of the attached response to Post-Hearing Staff Data Request made to Mr. Steve Seelye during the hearing held in the above-styled action on October 28-29, 1999. We would appreciate your replacing the response with the other papers in the case. Thank you for your kind assistance.

Sincerely,

John F. Hall

John F. Hall
Vice President – Finance
Secretary and Treasurer

Enclosure

copy: Hon. Elizabeth E. Blackford (w/encl.)
Hon Robert M. Watt III (w/encl.)

1. Using Mr. Seelye's data and the minimum intercept model, Commission Staff obtained the following results:

$$Y = 1.81 + 0.77X \text{ (no weighting)},$$

where Y = Unit cost ($/foot)
X = diameter of pipe (inches).

When Commission Staff used the square root of Q as the weight, it obtained following results:

$$\sqrt{Q_i}\,Y_i = 389.3 + 1.089(\sqrt{Q_i}\,X_i)$$
$$\sqrt{Q_i}\,Y_i = -0.15885\,\sqrt{Q_i} + 1.296(\sqrt{Q_i}\,X_i)$$

In his direct testimony, Mr. Seelye obtained the predicted equation of $Y = 3.14 + 0.86X$ that results in a customer related allocation of 58 percent. See Testimony of William Steven Seelye, Exhibit 4-3. In his rebuttal testimony, Mr. Seelye obtained the equation of $Y = 2.92 + 0.802X$. See Rebuttal Testimony of William Steven Seelye at 12.

a. Describe in detail how the results in Exhibit 4-3 were obtained. Show each step of the calculations and state all assumptions used.

b. Describe all transformations (e.g., scaling of data or conversions from feet to inches and vice versa) performed to obtain the results in Exhibit 4-3.

c. What observations, if any, were deleted? Why?

d. State which of the following was estimated:

(1) $\Sigma w_i(Y_i - (a + b*X_i))$. (See Testimony of William Steven Seelye at 13.)
(2) $\Sigma w_i(Y - (a + bX_i))^2$. (See Rebuttal Testimony of William Steven Seelye at 11.)

e. According to Kmenta, a weighted least squares equation such as $\Sigma w_i Y_i = aSw_i + b*X_i Sw_i$ "can only be estimated if Σw_i is known and the intercept of the regression equation is zero." Given this proposition, how was each intercept (3.14 and 2.92) obtained?

RESPONSE:

a. The zero intercept was calculated by performing weighted least squares using the following steps (each step is shown on the attached output from the Excel spreadsheet utilized in the study):

STEP 1: Calculate the Average Unit Cost for each size and type of pipe (i.e., each category).

STEP 2: Transform the data as follows: Multiply the Average Unit Cost by the square root of the number of feet of pipe for each category of pipe (which will become the dependent or exogenous variable). Multiply the Pipe Size by the square root of the number of feet of pipe for each category of pipe (which will become one of the two independent or endogenous variables). The square root of the number of feet of pipe for each category of pipe will be the other dependent variable. We will then estimate the following model consisting of two independent variables and *no intercept*.

$$y_i\sqrt{n_i} = a\sqrt{n_i} + bx_i\sqrt{n_i}$$

STEP 3: Calculate the parameters *a* and *b* by performing least squares against the transformed data. *The regression must be run without an intercept.* This is the standard approach for weighted regression models. If Microsoft EXCEL's =LINEST function is used, the the const must be set equal to FALSE. (See attached.) If SAS is utilized then the regression must be performed with NOINT the switch. If SPSS is utilized then the regression must be performed with the "Include Constant in Equation" switch turned off. (Since this is the standard weighted least squares model, SAS and SPSS will calculate the same results by simply using WLS with the number of feet as weight.)

b. All transformations are shown in STEP 2, above.

c. No observations were deleted.

d. $\Sigma w_i(Y - (a + bX_i))^2$ was utilized. The square was left off in the Testimony of William Steven Seelye at 13.

e. As described above, weighted regression models must be performed without an intercept. The *a* parameter, in effect, becomes the "zero intercept" of the weighted regression model:

$$y_i\sqrt{n_i} = a\sqrt{n_i} + bx_i\sqrt{n_i}$$

Delta Natural Gas Company, Inc.

Zero Intercept Analysis
Account 376 -- Distribution Mains

December 31, 1998

Description	Pipe Size		Net Cost of Plant	Quantity (Feet)	Unit Cost ($ per Foot)
Distribution Main Pipe, Under 2" Plastic	1.500	$	2,231,078.61	442,766	5.03896
Distribution Main Pipe, 2" Plastic	2.000		18,188,528.24	3,625,826	5.01638
Distribution Main Pipe, 3" Plastic	3.000		134,564.05	56,307	2.38983
Distribution Main Pipe, 4" Plastic	4.000		9,919,137.81	1,077,977	9.20162
Distribution Main Pipe, 6" Plastic	6.000		423,231.99	51,168	8.27142
Distribution Main Pipe, Under 2" Steel	1.500		156,310.92	108,137	1.44549
Distribution Main Pipe, 2" Steel	2.000		570,319.60	429,630	1.32747
Distribution Main Pipe, 3" Steel	3.000		94,691.61	73,925	1.28091
Distribution Main Pipe, 4" Steel	4.000		1,397,414.92	259,512	5.38478
Distribution Main Pipe, 6" Steel	6.000		1,567,509.43	273,679	5.72755
Distribution Main Pipe, 8" Steel	8.000		514,861.18	79,984	6.43705
Total		$	35,197,648.36	6,478,911	

Step 1: Calculate average unit cost for each type of Distribution Mains.

Exhibit 4 - 1

Delta Natural Gas Company, Inc.

Zero Intercept Analysis
Account 376 -- Distribution Mains

December 31, 1998

n	y	x	est y	y*n^.5	n^.5	xn^.5
442,766	5.03896	1.50	4.431	3352.955121	665.4066426	998.1099639
3,625,826	5.01638	2.00	4.861	9551.994842	1904.160182	3808.320365
56,307	2.38983	3.00	5.721	567.0846021	237.2909606	711.8728819
1,077,977	9.20162	4.00	6.580	9553.6467	1038.256712	4153.026848
51,168	8.27142	6.00	8.300	1871.0236	226.2034482	1357.220689
108,137	1.44549	1.50	4.431	475.3375909	328.8419073	493.262861
429,630	1.32747	2.00	4.861	870.1036638	655.4616694	1310.923339
73,925	1.28091	3.00	5.721	348.2698141	271.8915225	815.6745675
259,512	5.38478	4.00	6.580	2743.131666	509.4232032	2037.692813
273,679	5.72755	6.00	8.300	2996.328499	523.1433838	3138.860303
79,984	6.43705	8.00	10.020	1820.491217	282.8144268	2262.515414

Step 2: Calculate the values for the transformed model:

$$Y\sqrt{n} = a\sqrt{n} + b \times \sqrt{n}$$

Exhibit 4 - 2

Delta Natural Gas Company, Inc.

Zero Intercept Analysis
Account 376 -- Distribution Mains

December 31, 1998

LINEST Array

0.859843974	3.141088385
0.444726482	1.317330508
0.828621645	1463.48052
21.75769162	9
93200170.1	19275977.1

Zero Intercept

Step 3: Perform least squared against the transformed model without an intercept:

$$y\sqrt{n} = a\sqrt{n} + b \times \sqrt{n}$$

The parameter estimate a is the zero-intercept for the weighted model.

A WILEY PUBLICATION IN APPLIED STATISTICS

The enclosed pages explain the model that was used.

Regression Analysis by Example

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residuals to detect the problem. The solution is usually prescribed as a two-stage procedure. In stage 1, the OLS residuals are used to estimate the parameters of the residual structure. In the second stage, these estimates are used to define a transformation or procedure that corrects for the lack of i.i.d. residuals and to produce estimates of the regression coefficients that usually have more precision than the OLS estimates.

5.2. HETEROSCEDASTIC MODELS

Three different heteroscedastic situations will be distinguished. The first two situations are fairly simple. In these two cases, once the necessity for WLS has been recognized, estimation can be accomplished in one step. The third situation is more complex and requires a two-stage estimation procedure. An example of the first heteroscedastic situation is found in Chapter 2 and will be reviewed here. The second situation is formulated, but no data is analyzed. The third heteroscedastic situation is demonstrated with two examples.

5.3. SUPERVISOR DATA

The first heteroscedastic situation has been treated in Chapter 2. There, data on X, the number of workers in an industrial establishment, and Y, the number of supervisors in the establishment were presented for 27 establishments. The regression model was

$$Y_i = \beta_0 + \beta_1 X_i + u_i. \tag{5.2}$$

It was argued that the variance of u_i depends on the size of the establishment as measured by X; that is, $\sigma_{u_i}^2 = k^2 X_i^2$ where k is a positive constant. (See Chapter 2 for details.) Empirical evidence for this type of heteroscedasticity is obtained by plotting the OLS residuals against X. A plot with the characteristics of Figure 5.1 typifies the situation. If corrective action is not taken and OLS is applied to the raw data, the resulting estimated coefficients will lack precision in a theoretical sense. In addition, for the type of heteroscedasticity present in this data, the estimated standard errors of the regression coefficients are often understated giving a false sense of precision. The problem is resolved by using a version of weighted least squares as described in Chapter 2.

This approach to heteroscedasticity may also be considered in multiple regression models. In Equation (5.1) the variance of the residuals may be affected by only one of the explanatory variables. (The case where the variance is a function of more than one explanatory variable is discussed later.) Empirical evidence is available from the plot of OLS residuals versus the suspected variable and correction is accomplished by extending the method applied in Chapter 2. The resulting estimates are obtained by a transformation of the data. For example, if the original model is given as Equation (5.1) and it is found that $\sigma_{u_i} = kX_{4i}$, then the estimates are produced by regressing Y_i/X_{4i} against $1/X_{4i}, X_{1i}/X_{4i}, \ldots, X_{3i}/X_{4i}, X_{5i}/X_{4i}, \ldots, X_{pi}/X_{4i}$. The resulting coefficient of $1/X_{4i}$ is b_0, an estimate of β_0, the coefficient of X_{1i}/X_{4i} is an estimate of β_1, and so on, and the intercept from the regression is an estimate of β_4. Refer to Chapter 2 for a detailed discussion of this method as applied in simple regression.

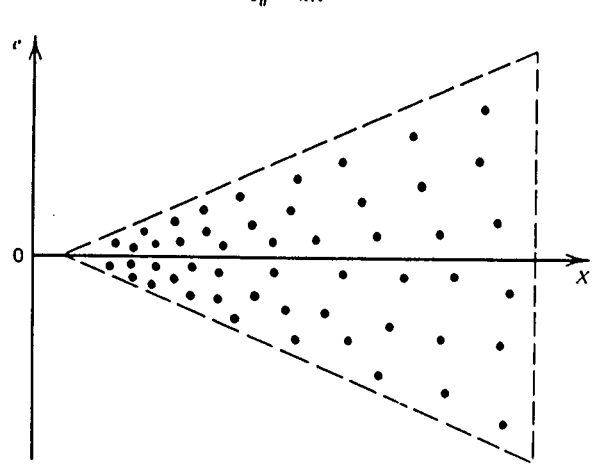


Fig. 5.1. Heteroscedastic residuals.

5.4. COLLEGE EXPENSE DATA

A second heteroscedastic situation arises frequently with large-scale survey data where measurements on individual sampling units are averaged over a well-defined cluster of units in order to obtain increased stability. Only the average and number of sampling units are reported as data. For example, consider a survey of undergraduate college students (or their parents) that is intended to assess total annual college-related expenses. Assume that the survey is also intended to collect information that will make it possible to relate expenses to characteristics of the institution attended. Regression analysis may be used with a model such as

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_6 X_{6i} + u_i. \tag{5.3}$$

The variables are defined in Table 5.1. The data may be collected by selecting a set of schools at random and then interviewing a prescribed number of randomly selected students at each school. The explanatory variables are characteristics of the school with the exception of X_6, which can be taken as an average over the student population. (The logic behind choosing these explanatory variables is left to the imagination of the reader.) Rather than using total expense Y for each student interviewed, the average expense for these students at each institution serves as the dependent variable. The precision of average expenditure is directly proportional to the square root of the sample size on which the average is based. That is, the variance of $\bar{Y}$ is σ^2/n and its standard deviation is $\sigma/\sqrt{n}$. If there are k institutions in the sample and $n_1, n_2, \ldots, n_k$ represent the number of students interviewed at each institution, the standard deviation of u_i in the model (Equation (5.1)) is $\sigma_{u_i} = \sigma/\sqrt{n_i}$ where σ is the standard deviation for annual expense for the population of individual students. Estimation of the regression coefficients is carried out using WLS with weights $w_i = 1/\sigma_{u_i}^2$ as in Chapter 2. Since $\sigma_{u_i}^2 = \sigma^2/n_i$, the regression coefficients are obtained by minimizing the weighted sum of squared residuals,

$$S = \sum_{i=1}^{k} n_i \left(Y_i - \beta_0 - \sum_{j=1}^{6} \beta_j X_{ji} \right)^2. \tag{5.4}$$

Note that the procedure implicitly recognizes that observations from institutions where a large number of students were interviewed are more reliable and should have more weight in determining the regression coefficients than observations from institutions where only a few students were interviewed. The differential precision associated with different observation may be taken as a justification for the weighting scheme.

The estimated coefficients and summary statistics may be computed

Table 5.1. Variables in cost of education survey

Name	Description
Y	Total annual expense (above tuition)
X_1	Size of city or town where school is located
X_2	Distance to nearest urban center
X_3	Type of school—public, private
X_4	Size of student body
X_5	Proportion of entering freshman that graduate
X_6	Distance from home

using a special WLS computer program or by transforming the data and using OLS as in the example in Chapter 2. If both sides of Equation (5.1) are multiplied by $n_i^{1/2}$, the new model will have residuals, $\epsilon_i = u_i \cdot n_i^{1/2}$ and $\sigma_{\epsilon_i} = \sigma$, a constant. That is, the regression model stated in the new variables is

$$Y_i n_i^{1/2} = \beta_0 n_i^{1/2} + \beta_1 X_{1i} n_i^{1/2} + \cdots + \beta_6 X_{6i} n_i^{1/2} + \epsilon_i. \tag{5.5}$$

The residuals in Equation (5.5) satisfy the necessary assumption of constant variance. Regression of $Y_i \cdot n_i^{1/2}$ against the seven new variables consisting of $n_i^{1/2}$, and the six transformed explanatory variables, $X_{ji} n_i^{1/2}$ using OLS will produce the desired estimates of the regression coefficients and their standard errors. Note that the regression with the transformed variables must be carried out with the constant term constrained to be zero. That is, β_0, the intercept of the original model is now the coefficient of $n_i^{1/2}$. Equation (5.5) has no intercept. More details on this point are given with the numerical example in section 5.6.

5.5. TWO-STAGE ESTIMATION

In the two preceding problems heteroscedasticity was expected at the outset. In the first problem the nature of the process under investigation suggests residual variances that increase with the size of the explanatory variable. In the second case, the method of data collection indicates heteroscedasticity. In both cases, homogeneity of variance is accomplished by a transformation. The transformation is constructed directly from information in the raw data. In the problem described in this section, there is also some prior indication that the variances are not equal. But here the exact structure of heteroscedasticity is determined empirically. As a result, estimation of the regression parameters requires two stages.

It is not a simple matter to detect heteroscedasticity in a general multiple regression situation. If present it is often discovered as a result of some good intuition on the part of the analyst on how observations may be grouped or clustered. For multiple regression models, the plot of residuals against $\hat{Y}_i$, the fitted values of the response variable, can serve as a first step. If the magnitude of the residuals appears to vary systematically with $\hat{Y}_i$, heteroscedasticity is suggested. The plot does not necessarily clearly identify the source of the problem. (See the following example.)

One direct method for investigating the presence of nonconstant variance is available when there are replicated measurements on the response variable corresponding to a set of fixed values of the explanatory variables. For example, in the case of one explanatory variable, we may have

EXCEL Function

LINEST

See Also

Calculates the statistics for a line by using the "least squares" method to calculate a straight line that best fits your data, and returns an array that describes the line. Because this function returns an array of values, it must be entered as an array formula. For more information about array formulas, click.

The equation for the line is:

y = mx + b or y = m1x1 + m2x2 + ... + b (if there are multiple ranges of x-values)

where the dependent y-value is a function of the independent x-values. The m-values are coefficients corresponding to each x-value, and b is a constant value. Note that y, x, and m can be vectors. The array that LINEST returns is {mn,mn-1,...,m1,b}. LINEST can also return additional regression statistics.

Syntax

LINEST(known_y's,known_x's,const,stats)

Known_y's is the set of y-values you already know in the relationship y = mx + b.

- If the array known_y's is in a single column, then each column of known_x's is interpreted as a separate variable.
- If the array known_y's is in a single row, then each row of known_x's is interpreted as a separate variable.

Known_x's is an optional set of x-values that you may already know in the relationship y = mx + b.

- The array known_x's can include one or more sets of variables. If only one variable is used, known_y's and known_x's can be ranges of any shape, as long as they have equal dimensions. If more than one variable is used, known_y's must be a vector (that is, a range with a height of one row or a width of one column).
- If known_x's is omitted, it is assumed to be the array {1,2,3,...} that is the same size as known_y's.

Const is a logical value specifying whether to force the constant b to equal 0.

- If const is TRUE or omitted, b is calculated normally.
- If const is FALSE, b is set equal to 0 and the m-values are adjusted to fit y = mx.

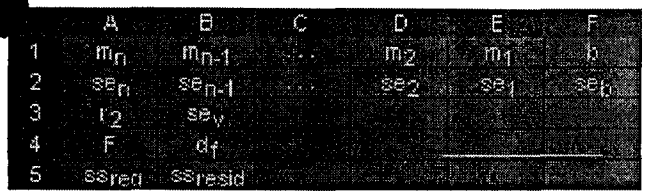
Stats is a logical value specifying whether to return additional regression statistics.

- If stats is TRUE, LINEST returns the additional regression statistics, so the returned array is {mn,mn-1,...,m1,b;sen,sen-1,...,se1,seb;r2,sey;F,df;ssreg,ssresid}.
- If stats is FALSE or omitted, LINEST returns only the m-coefficients and the constant b.

The additional regression statistics are as follows.

Statistic	Description
se1,se2,...,sen	The standard error values for the coefficients m1,m2,...,mn.
Seb	The standard error value for the constant b (seb = #N/A when const is FALSE).
r2	The coefficient of determination. Compares estimated and actual y-values, and ranges in value from 0 to 1. If it is 1, there is a perfect correlation in the sample — there is no difference between the estimated y-value and the actual y-value. At the other extreme, if the coefficient of determination is 0, the regression equation is not helpful in predicting a y-value. For information about how r2 is calculated, see "Remarks" later in this topic.
sey	The standard error for the y estimate.
F	The F statistic, or the F-observed value. Use the F statistic to determine whether the observed relationship between the dependent and independent variables occurs by chance.
df	The degrees of freedom. Use the degrees of freedom to help you find F-critical values in a statistical table. Compare the values you find in the table to the F statistic returned by LINEST to determine a confidence level for the model.
ssreg	The regression sum of squares.
ssresid	The residual sum of squares.

The following illustration shows the order in which the additional regression statistics are returned.



Remarks

- You can describe any straight line with the slope and the y-intercept:

  Slope (m):
  To find the slope of a line, often written as m, take two points on the line, (x1,y1) and (x2,y2); the slope is equal to (y2 - y1)/(x2 - x1).

  Y-intercept (b):
  The y-intercept of a line, often written as b, is the value of y at the point where the line crosses the y-axis.

  The equation of a straight line is y = mx + b. Once you know the values of m and b, you can calculate any point on the line by plugging the y- or x-value into that equation. You can also use the TREND function. For more information, see TREND.

- When you have only one independent x-variable, you can obtain the slope and y-intercept values directly by using the following formulas:

  Slope:
  INDEX(LINEST(known_y's,known_x's),1)

  Y-intercept:
  INDEX(LINEST(known_y's,known_x's),2)

- The accuracy of the line calculated by LINEST depends on the degree of scatter in your data. The more linear the data, the more accurate the LINEST model. LINEST uses the method of least squares for determining the best fit for the data. When you have only one independent x-variable, the calculations for m and b are based on the following formulas:

- The line- and curve-fitting functions LINEST and LOGEST can calculate the best straight line or exponential curve that fits your data. However, you have to decide which of the two results best fits your data. You can calculate TREND(known_y's,known_x's) for a straight line, or GROWTH(known_y's, known_x's) for an exponential curve. These functions, without the new_x's argument, return an array of y-values predicted along that line or curve at your actual data points. You can then compare the predicted values with the actual values. You may want to chart them both for a visual comparison.

- In regression analysis, Microsoft Excel calculates for each point the squared difference between the y-value estimated for that point and its actual y-value. The sum of these squared differences is called the residual sum of squares. Microsoft Excel then calculates the sum of the squared differences between the actual y-values and the average of the y-values, which is called the total sum of squares (regression sum of squares + residual sum of squares). The smaller the residual sum of squares is, compared with the total sum of squares, the larger the value of the coefficient of determination, r2, which is an indicator of how well the equation resulting from the regression analysis explains the relationship among the variables.

- Formulas that return arrays must be entered as array formulas. For more information about entering array formulas, clic.

- When entering an array constant such as known_x's as an argument, use commas to separate values in the same row and semicolons to separate rows. Separator characters may be different depending on your country settings.

- Note that the y-values predicted by the regression equation may not be valid if they are outside the range of the y-values you used to determine the equation.

ample 1 Slope and Y-Intercept

`LINEST({1,9,5,7},{0,4,2,3})` equals {2,1}, the slope = 2 and y-intercept = 1

Example 2 Simple Linear Regression

Suppose a small business has sales of $3,100, $4,500, $4,400, $5,400, $7,500, and $8,100 during the first six months of the fiscal year. Assuming that the values are entered in the range B2:B7, respectively, you can use the following simple linear regression model to estimate sales for the ninth month.

`SUM(LINEST(B2:B7)*{9,1})` equals `SUM({1000,2000}*{9,1})` equals $11,000

In general, SUM({m,b}*{x,1}) equals mx + b, the estimated y-value for a given x-value. You can also use the TREND function.

Example 3 Multiple Linear Regression

Suppose a commercial developer is considering purchasing a group of small office buildings in an established business district.

The developer can use multiple linear regression analysis to estimate the value of an office building in a given area based on the following variables.

Variable	Refers to the
y	Assessed value of the office building
x1	Floor space in square feet
x2	Number of offices
x3	Number of entrances
x4	Age of the office building in years

This example assumes that a straight-line relationship exists between each independent variable (x1, x2, x3, and x4) and the dependent variable (y), the value of office buildings in the area.

The developer randomly chooses a sample of 11 office buildings from a possible 1,500 office buildings and obtains the following data.

x1 Floor Space	x2 Offices	x3 Entrances	x4 Age	y Value
2,310	2	2	20	$142,000
2,333	2	2	12	$144,000
2,356	3	1.5	33	$151,000
2,379	3	2	43	$150,000
2,402	2	3	53	$139,000
2,425	4	2	23	$169,000
2,448	2	1.5	99	$126,000
2,471	2	2	34	$142,900
2,494	3	3	23	$163,000
2,517	4	4	55	$169,000
2,540	2	3	22	$149,000

"Half an entrance" means an entrance for deliveries only. When entered as an array, the following formula:

`LINEST(E2:E12,A2:D12,TRUE,TRUE)`

returns the following output.

-234.23716	2553.21066	12529.7682	27.6413874	52317.8305
13.2680115	530.669152	400.066838	5.42937404	12237.3616
0.99674799	970.578463	#N/A	#N/A	#N/A
459.753674	6	#N/A	#N/A	#N/A
1732393319	5652135.32	#N/A	#N/A	#N/A

The multiple regression equation, y = m1*x1 + m2*x2 + m3*x3 + m4*x4 + b, can now be obtained using the values from row 14:

y = 27.64*x1 + 12,530*x2 + 2,553*x3+ 234.24*x4 + 52,318

The developer can now estimate the assessed value of an office building in the same area that has 2,500 square feet, three offices, and two entrances and is 25 years old, by using the following equation:

y = 27.64*2500 + 12530*3 + 2553*2 - 234.24*25 + 52318 = $158,261

You can also use the TREND function to calculate this value. For more information, see TREND.

Example 4 Using The F And R2 Statistics

In the previous example, the coefficient of determination, or r2, is 0.99675 (see cell A16 in the output for LINEST), which would indicate a strong relationship between the independent variables and the sale price. You can use the F statistic to determine whether these results, with such a high r2 value, occurred by chance.

Assume for the moment that in fact there is no relationship among the variables, but that you have drawn a rare sample of 11 office buildings that causes the statistical analysis to demonstrate a strong relationship. The term "Alpha" is used for the probability of erroneously concluding that there is a relationship.

There is a relationship among the variables if the F-observed statistic is greater than the F-critical value. The F-critical value can be obtained by referring to a table of F-critical values in many statistics textbooks. To read the table, assume a single-tailed test, use an Alpha value of 0.05, and for the degrees of freedom (abbreviated in most tables as v1 and v2), use v1 = k = 4 and v2 = n - (k + 1) = 11 - (4 + 1) = 6, where k is the number of variables in the regression analysis and n is the number of data points. The F-critical value is 4.53.

The F-observed value is 459.753674 (cell A17), which is substantially greater than the F-critical value of 4.53. Therefore, the regression equation is useful in predicting the assessed value of office buildings in this area.

Example 5 Calculating The T-Statistics

Another hypothesis test will determine whether each slope coefficient is useful in estimating the assessed value of an office building in example 3. For example, to test the age coefficient for statistical significance, divide -234.24 (age slope coefficient) by 13.268 (the estimated standard error of age coefficients in cell A15). The following is the t-observed value:

t = m4 ÷ se4 = -234.24 ÷ 13.268 = -17.7

If you consult a table in a statistics manual, you will find that t-critical, single tail, with 6 degrees of freedom and Alpha = 0.05 is 1.94. Because the absolute value of t, 17.7, is greater than 1.94, age is an important variable when estimating the assessed value of an office building. Each of the other independent variables can be tested for statistical significance in a similar manner. The following are the t-observed values for each of the independent variables.

Variable	t-observed value
Floor space	5.1
Number of offices	31.3
Number of entrances	4.8
Age	17.7

These values all have an absolute value greater than 1.94; therefore, all the variables used in the regression equation are useful in predicting the assessed value of office buildings in this area.

Additional resources

2. In his rebuttal testimony, Mr. Seelye indicates that the estimated equation is now given by $Y = 2.92 + 0.802X_i$. See Rebuttal Testimony of William Steven Seelye at 14.

a. Is this equation to be used to allocate costs, rather than the equation that yielded an intercept of 3.14?

RESPONSE:

The data discussed in the Rebuttal Testimony of William Steven Seelye at 14 is simply a hypothetical example designed to illustrate that the standard formulation of weighted least squares produces the correct intercept and slope, whereas Dr. Estomin's approach produces an incorrect result. The estimated equation given by $Y = 2.92 + 0.802X_i$ should not be used to allocate costs. The correct zero intercept is $3.14 per foot.

WITNESS: Steve Seelye

3. Perform and submit the results of the following tests for heteroscedasticity:
   a. Glesjer Test
   b. Goldfeld-Quandt Test
   c. White's Test

RESPONSE:

When performing a regression analysis against *average* data, heteroscedasticity is inherently present in the underlying construction of the data. This is explained in Samprit Chatterjee and Bertram Price, *Regression Analysis by Example* (New York: John Wiley & Sons, 1991), Douglas C. Montgomery and Elizabeth A. Peck, *Introduction to Linear Regression Analysis* (New York: John Wiley & Sons, 1992), and Ashish Sen and Muni Srivastava, *Regression Analysis* (New York: Springer-Verlag, 1990). All three of these references are standard texts on regression analysis used by econometricians and statisticians, and all three references recommend utilizing the same model when performing a regression analysis against average data. We have included a copy of the relevant pages from these references in order to help clarify the issue. We have also underlined or marked certain sections in order to emphasize relevant material. Samprit Chatterjee and Bertram Price, *Regression Analysis by Example* explains in more explicit detail the form of the regression model utilized in Delta's cost of service study.

a. Glesjer Test

A description of the Glesjer Test is contained as Attachment 1. The Glesjer Test regresses the absolute value of the residuals from the OLS regression of average cost (the dependent variable) on size (the independent variable) against the independent variable (size). Residuals from the unweighted version of the OLS regression were used to determine whether there was heteroscedasticity in the unweighted version of the OLS model. Two different functional forms were evaluated with the absolute value of the residuals being regressed against size and size squared.

b. Goldfeld-Quandt Test

A description of the Goldfeld-Quandt Test is contained as Attachment 3. The Goldfed-Quandt Test uses a test statistic calculated from a ratio of the residual sum of squares for two subsamples of the data set used to estimate the original OLS regression. The regression results on the two subsamples needed to calculate the Goldfeld-Quandt test statistic are contained in Attachment 4. To form the two subsamples, there was one central observation omitted after sorting the data in ascending order based on size. The Goldfeld-Quandt test statistic has an F distribution with (n-c-2k)/2 degrees of freedom. The calculated Goldfeld-Quandt test statistic was:

$$\lambda = \frac{RSS_2}{RSS_1} = \frac{13.315}{10.540} = 1.263$$

The degrees of freedom were:

$$\frac{(n-c-2k)}{2} = \frac{(11-1-2*2)}{2} = 3$$

c. White's Test

A description of the White's Test for heteroscedasticity is contained as Attachment 5. White's Test utilizes an OLS regression of the squared residuals on the first and second order terms of the independent variables including the cross-products of the independent variables. Because there is only one independent variable, White's Test regresses the squared residuals on SIZE and SIZE^2. The test statistic is $n \cdot R^2$, which has a chi-square distribution with the degrees of freedom equal to the number of regressors. The regression results for White's Test are reported in Attachment 6. The test statistic for White's Test is:

$$n \bullet R^2 = 11 \bullet 0.113 = 1.243$$

At the 95% level of significance, chi-square with 2 degrees of freedom would be 5.99147.

WITNESS: Steve Seelye

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Regression Analysis by Example

SAMPRIT CHATTERJEE
BERTRAM PRICE

New York University
New York, New York

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residuals to detect the problem. The solution is usually prescribed as a two-stage procedure. In stage 1, the OLS residuals are used to estimate the parameters of the residual structure. In the second stage, these estimates are used to define a transformation or procedure that corrects for the lack of i.i.d. residuals and to produce estimates of the regression coefficients that usually have more precision than the OLS estimates.

5.2. HETEROSCEDASTIC MODELS

Three different heteroscedastic situations will be distinguished. The first two situations are fairly simple. In these two cases, once the necessity for WLS has been recognized, estimation can be accomplished in one step. The third situation is more complex and requires a two-stage estimation procedure. An example of the first heteroscedastic situation is found in Chapter 2 and will be reviewed here. The second situation is formulated, but no data is analyzed. The third heteroscedastic situation is demonstrated with two examples.

5.3. SUPERVISOR DATA

The first heteroscedastic situation has been treated in Chapter 2. There, data on X, the number of workers in an industrial establishment, and Y, the number of supervisors in the establishment were presented for 27 establishments. The regression model was

$$Y_i = \beta_0 + \beta_1 X_i + u_i. \tag{5.2}$$

It was argued that the variance of u_i depends on the size of the establishment as measured by X; that is, $\sigma_{u_i}^2 = k^2 X_i^2$ where k is a positive constant. (See Chapter 2 for details.) Empirical evidence for this type of heteroscedasticity is obtained by plotting the OLS residuals against X. A plot with the characteristics of Figure 5.1 typifies the situation. If corrective action is not taken and OLS is applied to the raw data, the resulting estimated coefficients will lack precision in a theoretical sense. In addition, for the type of heteroscedasticity present in this data, the estimated standard errors of the regression coefficients are often understated giving a false sense of precision. The problem is resolved by using a version of weighted least squares as described in Chapter 2.

This approach to heteroscedasticity may also be considered in multiple regression models. In Equation (5.1) the variance of the residuals may be affected by only one of the explanatory variables. (The case where the variance is a function of more than one explanatory variable is discussed

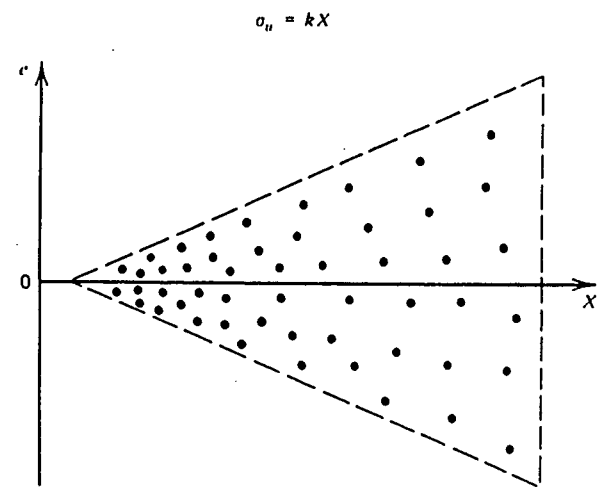

Fig. 5.1. Heteroscedastic residuals.

later.) Empirical evidence is available from the plot of OLS residuals versus the suspected variable and correction is accomplished by extending the method applied in Chapter 2. The resulting estimates are obtained by a transformation of the data. For example, if the original model is given as Equation (5.1) and it is found that $\sigma_{u_i} = kX_{4i}$, then the estimates are produced by regressing Y_i/X_{4i} against $1/X_{4i}, X_{1i}/X_{4i}, \ldots, X_{3i}/X_{4i}, X_{5i}/X_{4i}, \ldots, X_{pi}/X_{4i}$. The resulting coefficient of $1/X_{4i}$ is b_0, an estimate of β_0, the coefficient of X_{1i}/X_{4i} is an estimate of β_1, and so on, and the intercept from the regression is an estimate of β_4. Refer to Chapter 2 for a detailed discussion of this method as applied in simple regression.

5.4. COLLEGE EXPENSE DATA

A second heteroscedastic situation arises frequently with large-scale survey data where measurements on individual sampling units are averaged over a well-defined cluster of units in order to obtain increased stability. Only the average and number of sampling units are reported as data. For example, consider a survey of undergraduate college students (or their parents) that is intended to assess total annual college-related expenses. Assume that the survey is also intended to collect information that will make it possible to relate expenses to characteristics of the institution attended. Regression analysis may be used with a model such as

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_6 X_{6i} + u_i. \tag{5.3}$$

The variables are defined in Table 5.1. The data may be collected by selecting a set of schools at random and then interviewing a prescribed number of randomly selected students at each school. The explanatory variables are characteristics of the school with the exception of X_6, which can be taken as an average over the student population. (The logic behind choosing these explanatory variables is left to the imagination of the reader.) Rather than using total expense Y for each student interviewed, the average expense for these students at each institution serves as the dependent variable. The precision of average expenditure is directly proportional to the square root of the sample size on which the average is based. That is, the variance of Y is σ^2/n and its standard deviation is $\sigma/\sqrt{n}$. If there are k institutions in the sample and $n_1, n_2, \ldots, n_k$ represent the number of students interviewed at each institution, the standard deviation of u_i in the model (Equation (5.1)) is $\sigma_{u_i} = \sigma/\sqrt{n_i}$ where σ is the standard deviation for annual expense for the population of individual students. Estimation of the regression coefficients is carried out using WLS with weights $w_i = 1/\sigma_{u_i}^2$ as in Chapter 2. Since $\sigma_{u_i}^2 = \sigma^2/n_i$, the regression coefficients are obtained by minimizing the weighted sum of squared residuals,

$$S = \sum_{i=1}^{k} n_i \left(Y_i - \beta_0 - \sum_{j=1}^{6} \beta_j X_{ji} \right)^2. \qquad (5.4)$$

Note that the procedure implicitly recognizes that observations from institutions where a large number of students were interviewed are more reliable and should have more weight in determining the regression coefficients than observations from institutions where only a few students were interviewed. The differential precision associated with different observation may be taken as a justification for the weighting scheme.

The estimated coefficients and summary statistics may be computed

Table 5.1. Variables in cost of education survey

Name	Description
Y	Total annual expense (above tuition)
X_1	Size of city or town where school is located
X_2	Distance to nearest urban center
X_3	Type of school—public, private
X_4	Size of student body
X_5	Proportion of entering freshman that graduate
X_6	Distance from home

using a special WLS computer program or by transforming the data and using OLS as in the example in Chapter 2. If both sides of Equation (5.1) are multiplied by $n_i^{1/2}$, the new model will have residuals, $\epsilon_i = u_i \cdot n_i^{1/2}$ and $\sigma_{\epsilon_i} = \sigma$, a constant. That is, the regression model stated in the new variables is

$$Y_i n_i^{1/2} = \beta_0 n_i^{1/2} + \beta_1 X_{1i} n_i^{1/2} + \cdots + \beta_6 X_{6i} n_i^{1/2} + \epsilon_i. \qquad (5.5)$$

The residuals in Equation (5.5) satisfy the necessary assumption of constant variance. Regression of $Y_i \cdot n_i^{1/2}$ against the seven new variables consisting of $n_i^{1/2}$, and the six transformed explanatory variables, $X_{ji} n_i^{1/2}$ using OLS will produce the desired estimates of the regression coefficients and their standard errors. Note that the regression with the transformed variables must be carried out with the constant term constrained to be zero. That is, β_0, the intercept of the original model is now the coefficient of $n_i^{1/2}$. Equation (5.5) has no intercept. More details on this point are given with the numerical example in section 5.6.

5.5. TWO-STAGE ESTIMATION

In the two preceding problems heteroscedasticity was expected at the outset. In the first problem the nature of the process under investigation suggests residual variances that increase with the size of the explanatory variable. In the second case, the method of data collection indicates heteroscedasticity. In both cases, homogeneity of variance is accomplished by a transformation. The transformation is constructed directly from information in the raw data. In the problem described in this section, there is also some prior indication that the variances are not equal. But here the exact structure of heteroscedasticity is determined empirically. As a result, estimation of the regression parameters requires two stages.

It is not a simple matter to detect heteroscedasticity in a general multiple regression situation. If present it is often discovered as a result of some good intuition on the part of the analyst on how observations may be grouped or clustered. For multiple regression models, the plot of residuals against $\hat{Y}_i$, the fitted values of the response variable, can serve as a first step. If the magnitude of the residuals appears to vary systematically with $\hat{Y}_i$, heteroscedasticity is suggested. The plot does not necessarily clearly identify the source of the problem. (See the following example.)

One direct method for investigating the presence of nonconstant variance is available when there are replicated measurements on the response variable corresponding to a set of fixed values of the explanatory variables. For example, in the case of one explanatory variable, we may have

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(continued after index)

Ashish Sen Muni Srivastava

Regression Analysis
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Problems

Exercise 5.1: Consider the regression model

$$y_t = \beta_0 + \beta_1 t + \epsilon_t \text{ for } t = 1, \ldots, n.$$

(This model is called a linear trend model.) The design matrix X for this model is given by

$$X' = \begin{pmatrix} 1 & 1 & \ldots & 1 \\ 1 & 2 & \ldots & n \end{pmatrix}.$$

Show that $n^{-1}(X'X) \to \infty$ (i.e., at least one element of $X'X \to \infty$) as $n \to \infty$ but that $h_{ii} \to 0$ as $n \to \infty$.

Exercise 5.2: Would it be appropriate, as far as normality is concerned, to use the F test given in Chapter 3 to test hypotheses about β for the example? Use the independent variables used in Example 4.3, p. 88.

Exercise 5.3: Examine the residuals and h_{ii}'s from the model of Exercise 4.4, p. 96. Discuss the appropriateness of the conclusions you reached when you did Exercise 4.4.

Exercise 5.4: From the point of view of normality, comment on each of the tests you ran in Exercise 3.13, p. 77.

Exercise 5.5: For the two regressions in Exercise 3.14, p. 79, can one assume normality of the errors?

Exercise 5.6: Test for normality of observations in the data set used for Exercise 2.15, p. 53.

Exercise 5.7: *Using a bootstrap sample size of 200, obtain the 90 per cent point of the distribution of the test statistic in Exercise 1.11, p. 24 (after removing the outlier). Compare it with the one you obtained using a t distribution.

Exercise 5.8: *Using bootstrapping, obtain the 90 per cent points of the distributions of the parameter estimates you obtained in part 1 of Exercise 3.14, p. 79. Use a sample size of 500.

CHAPTER 6

Unequal Variances

6.1 Introduction

One of the great values of the Gauss-Markov theorem is that it provides conditions which, if they hold, assure us that least squares is a good procedure. These conditions can be checked and if we find that one or more of them are seriously violated, we can take action that will cause at least approximate compliance. This and the next few chapters will deal with various ways in which these G-M conditions can be violated and what we would then need to do.

This chapter is devoted to the second G-M condition, which states that var (ϵ_i) = var (y_i) is a constant, σ^2. Violation of this condition is often called *heteroscedasticity*, while compliance is referred to as *homoscedasticity*. Recall that heteroscedasticity does not bias the least squares estimates of β_j's, but it causes variances of parameter estimates to be large and can affect R^2, s^2 and tests substantially. The test of the general linear hypothesis (Chapter 2) is affected also because under heteroscedasticity, $s^2(X'X)^{-1}$ need no longer be an unbiased estimate of the covariance matrix of β.

6.2 Detecting Heteroscedasticity

Very frequently, we can determine if heteroscedasticity is likely to be present from an understanding of the underlying situation and also (as we shall see in later sections) determine what corrective measures might be taken. For example, if the dependent variable is a counted variable, it is likely to have approximately a Poisson distribution (as in the case of telephone mains in Example 1.2, p. 10); then the variance σ_i^2 of the ith observation is approximately $\mathrm{E}(y_i)$. If $y_i = m_i/n_i$ is a proportion of counts m_i and n_i, its variance would probably be close to $\mathrm{E}(y_i)(1 - \mathrm{E}(y_i))/n_i$. When y_i is the mean $\sum_{\alpha=1}^{n_i} z_\alpha/n_i$ of homoscedastic variables $z_1, \ldots, z_{n_i}$, then $\sigma_i^2 \propto n_i^{-1}$.

Even where the distribution cannot be guessed, some idea of the variance can be. Consider house prices for an entire metropolitan area. It would appear less likely that a house worth \$50,000 would sell for \$100,000 than that a million dollar one would sell for \$1,050,000. To continue this intuition-based discussion, it appears to be more likely that the less expensive house would sell for \$60,000 than the more expensive one for \$1.2 million. Thus, the standard deviation of the selling price is not constant, nor does it vary

in proportion to the intrinsic value. Rather, it is something in between.

At this stage the reader might wish to recall some of the random variables he/she might have encountered and see if their variances (or quantities proportional to them) can be guessed (the reader might be surprised at how often this is possible!).

Another way of checking to see if heteroscedasticity is present is through plots. If $\sigma_i^2 = \text{var}(\epsilon_i)$ varies with $\text{E}(y_i)$, a plot of the residuals (which are estimates of ϵ_i's) against the $\hat{y}_i$'s (which are estimates of $\text{E}(y_i)$'s) *might* show the residuals e_i to be more spread out for some values of $\hat{y}_i$ than for others. Standardized or Studentized residuals (see Section 8.3, p. 156) could also be used and might even be preferable (see Cook and Weisberg, 1982).

d.	sp.	d.	sp.	d.	sp.	d.	sp.
4	4	14	10	29	18	57	27
2	5	17	10	34	18	78	27
4	5	11	12	47	18	64	28
8	5	19	12	30	19	84	28
8	5	21	12	48	20	54	29
7	7	15	13	39	21	68	29
7	7	18	13	42	21	60	30
8	8	27	13	55	21	67	30
9	8	14	14	56	24	101	30
11	8	16	14	33	25	77	31
13	8	16	15	48	25	85	35
5	9	14	16	56	25	107	35
5	9	19	16	59	25	79	36
13	9	34	16	39	26	138	39
8	10	22	17	41	26	110	40
		29	17			134	40

EXHIBIT 6.1: Data on Automobile Speed (sp.) and Distance Covered to Come to a Standstill After Braking (d.)
SOURCE: Ezekiel and Fox (1959). Reproduced, with permission, from Ezekiel, M. and F.A. Fox, *Methods of Correlation and Regression Analysis*. © 1959 John Wiley & Sons, Inc.

Example 6.1
Exhibit 6.2 illustrates a plot of e_i's against $\hat{y}_i$ after fitting an ordinary least squares model

$$\text{distance} = \beta_1 \,\text{speed} + \beta_2 \,\text{speed}^2 \qquad (6.1)$$

to the data in Exhibit 6.1. The plot here would seem to indicate the existence of heteroscedasticity. (By contrast, Exhibit 6.6 seems to indicate virtually no heteroscedasticity.)

If there are enough data points, plots like Exhibit 6.2 can also give us an idea of how the variance of the y_i's varies with the $\text{E}(y_i)$'s. Divide the range of the $\hat{y}_i$'s into three portions, making a reasonable compromise between getting portions of roughly equal widths and getting roughly equal numbers of points in each portion. In the case of Exhibit 6.2, suitable break points might be 25 and 72. Let the medians of the $\hat{y}_i$'s within each such partition be $y^{(1)}$, $y^{(2)}$ and $y^{(3)}$ and let the corresponding inter-quartile range of the e_i's be $Q^{(1)}$, $Q^{(2)}$ and $Q^{(3)}$. A plot of the $Q^{(k)}$'s against the $y^{(k)}$'s can help identify a relationship between $\text{var}(y_i)$ and $\text{E}(y_i)$. In the case of Exhibit 6.2 such a plot is approximately a straight line, suggesting that the standard deviations of y_i's are roughly proportional to $\text{E}(y_i)$'s and, therefore, $\text{var}(y_i) \propto [\text{E}(y_i)]^2$. The reader is requested to carry out these steps in Exercise 6.9. ■

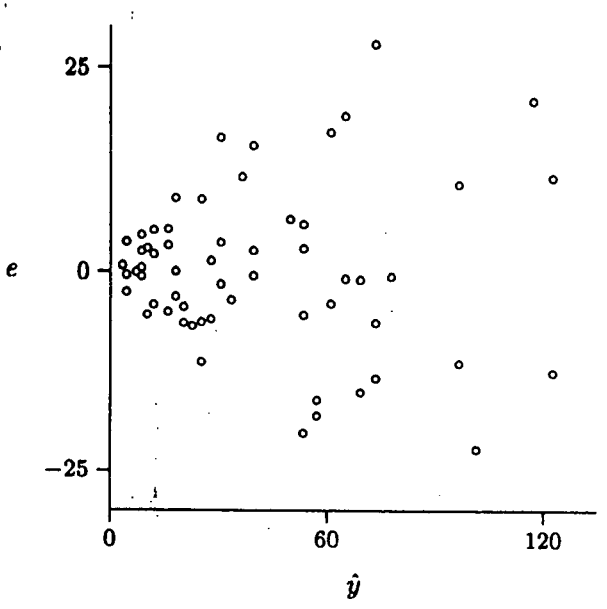

EXHIBIT 6.2: Plot of Residuals against Predicted for Speed-Braking Distance Data

Sometimes σ_i varies with one or more x_{ij}'s. For example, if we were regressing total hospital charges against severity of illness, the attending physician and the sex and age of the patient (as in Exercise 4.9, p. 97), it is not unlikely that the variance of charges might vary with one or more of the independent variables. Some physicians might order essentially the same set of preliminary laboratory and other medical tests for all patients, while others might tailor the order to the individual case. As people get older

they become more susceptible to a wider range of diseases. Consequently, whether certain medical tests are more likely to be ordered for older patients and whether they are ordered or not affect variability of charges. However, it should be emphasized that it is the variation in the variance of the *dependent* variable that is a violation of the second G-M condition.

It is also possible that the variance of the y_i's could vary with changes in variables not included in the model. For example, it is known that *some* respondents inflate their income when they are attracted to the interviewer. Then the variance of income would vary with the interviewer. Similarly, different laboratory equipment, different machines, etc., can affect variance.

In such cases, it may be useful to examine plots of residuals against each independent variable and each variable that we expect affects the variance. Many careful analysts routinely obtain plots of e_i against all the x_{ij}'s and against $\hat{y}_i$. However, none of these plots are entirely safe in that heteroscedasticity can be present and not be apparent from them.

A number of other plots have also been suggested in the literature, including plotting the absolute values, squares or logarithms of the absolute values of residuals or the Standardized residuals against predicted values, other variables and even $(1 - h_{ii})s$. One advantage cited is that some of these plots make identification of the nature of the heteroscedasticity (e.g., the relationship between var (y_i) and $\mathrm{E}(y_i)$) easier. For example, since the log of the absolute values of residuals may be considered to be a proxy for the log of standard deviations of y_i's, and log of the predicteds that for the log of the expectation of the y_i's, the slope of a line fitting their plot would yield α when heteroscedasticity is described by var $(y_i) = [\mathrm{E}(y_i)]^{2\alpha}$. For further discussion of these and other methods, see Carroll and Ruppert (1988, p.29 *et seq.*) and Cook and Weisberg (1982).

6.2.1 Formal Tests

A number of formal tests have also been proposed. A large number of them essentially test whether the variances σ^2 of individual ϵ_i's are related to some other variable(s), e.g., the independent variables or functions of them. A fair number of these approaches attempt to relate $|e_i|$'s, e_i^2's or the rank of $|e_i|$'s to other variables. A review of several procedures is given in Judge *et al.* (1985, see especially pp. 446–454) and Madansky (1988, p. 75 *et seq.*). One such test consists of testing for significance the correlation between the ranks of the absolute values of the residuals with the ranks of $\hat{y}_i$'s or those of individual independent variable values (such a correlation between ranks is called the Spearman correlation).

Another such test is that given by White (1980). It may be shown that under homoscedasticity, if each $h_{ii} \to 0$, $S_1 = n^{-1}s^2X'X$ and $S_2 = n^{-1}\sum_{i=1}^{n} e_i^2 x_i x_i'$ are asymptotically equivalent, while the presence of heteroscedasticity can cause them to be quite different. Therefore, one can base a test on the comparison of S_1 and S_2. Such a test is available, for

example, in SAS. A relatively simple test statistic based on this principle (and also, incidentally, on the principle mentioned in the last paragraph) is $nR^2_{(h)}$, where $R^2_{(h)}$ is the usual R^2 from a regression of the e_i^2's against the independent variables x_{ij}'s and all their square and product terms (including a constant term even if one is not present in the original model and with any redundant variables eliminated). Under the hypothesis of no heteroscedasticity and provided the fourth moment of all the observations are the same, $nR^2_{(h)}$ has asymptotically a chi-square distribution with degrees of freedom equal to one less than the number of independent variables in the above mentioned regression.

Like many other tests for violations of specific Gauss-Markov conditions, White's test is also sensitive to other violations. Therefore, one needs to examine plots or in other ways assure oneself that it is indeed heteroscedasticity that is causing $nR^2_{(h)}$ to be high.

It might be noted in passing that S_2, which is provided by SAS, can be used to estimate the covariance matrix of b when heteroscedasticity is present — see White (1980) and SAS (1985b).

6.3 Variance Stabilizing Transformations

When heteroscedasticity occurs we can take one of two types of actions to make the σ_i's approximately equal. One consists of transforming y_i appropriately when the variance of y_i depends on its mean; the other involves weighting the regression. We consider the former in this section; the latter will be examined in the next section.

For any function $f(y)$ of y with continuous first derivative $f'(y)$ and finite second derivative $f''(y)$, we know from elementary calculus that

$$f(y_i) - f(\eta_i) = (y_i - \eta_i)f'(\eta_i) + \tfrac{1}{2}(y_i - \eta_i)^2 f''(\theta), \tag{6.2}$$

where θ lies between y_i and η_i, and $\eta_i = \mathrm{E}(y_i)$. Thus, when $(y_i - \eta_i)^2$ is small, we have

$$f(y_i) - f(\eta_i) \approx f'(\eta_i)(y_i - \eta_i). \tag{6.3}$$

Squaring and taking expectations of both sides of (6.3), we get approximately,

$$\mathrm{var}\,(f(y_i)) \approx (f'(\eta_i))^2 \sigma_i^2(\eta_i), \tag{6.4}$$

where $\sigma_i^2(\eta_i)$ is the variance of the random variable y_i with mean η_i. Thus, in order to find a suitable transformation f of y_i which would make var $(f(y_i))$ approximately a constant, we need to solve the equation

$$f'(\eta_i) = c/\sigma_i(\eta_i), \tag{6.5}$$

where c is any constant. Such a transformation f is called a variance stabilizing transformation.

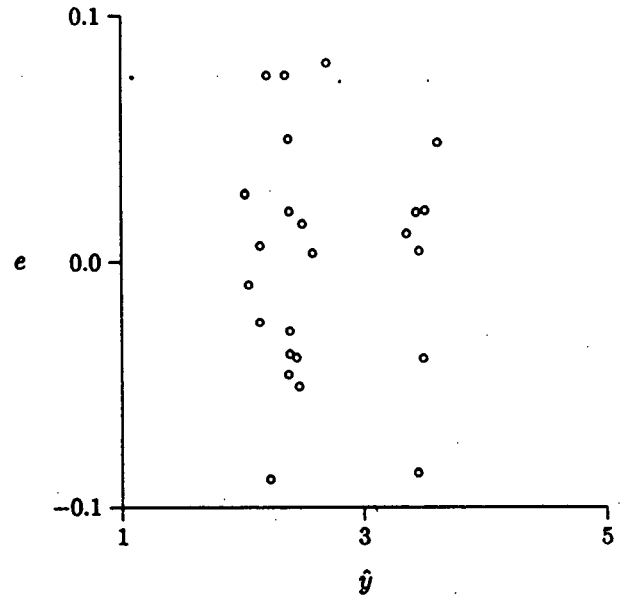

EXHIBIT 6.5: Residual vs. Predicted Plot for the Regression of Logarithm of Speed Against Density and Density^2

some of the x_{ij}'s. This simple relationship would be lost if we replaced y_i by, say, $\sqrt{y_i}$. In other cases, a transformation of y which is not variance stabilizing may be desirable for other reasons (see Chapter 9). In some situations we may expect that σ_i is a function of one of the independent variables and it is this relationship we wish to exploit. Fortunately, in such cases, homoscedasticity may be achieved in another way, as we shall see in the next section.

6.4 Weighting

Suppose $\text{var}(\epsilon_i) = \sigma_i^2 = c_i^2\sigma^2$ where c_i^2 are known constants. Then constancy of variance can also be achieved by dividing both sides of each of the equations of the regression model,

$$y_i = \beta_0 + \beta_1 x_{i1} + \cdots + \beta_k x_{ik} + \epsilon_i, \quad i = 1, \ldots, n,$$

by c_i, i.e., by considering

$$y_i/c_i = \beta_0/c_i + \cdots + \beta_k x_{ik}/c_i + \epsilon_i/c_i, \quad i = 1, \ldots, n. \tag{6.8}$$

Model (6.8) is clearly homoscedastic. Each $w_i = (c_i)^{-2}$ is called a weight, the nomenclature coming from the fact that now we are minimizing a

weighted sum of squares,

$$\sum w_i(y_i - \beta_0 - \beta_1 x_{i1} \cdots - \beta_k x_{ik})^2. \tag{6.9}$$

Obviously, when the σ_i's (or a quantity proportional to them) are known, weights are not difficult to compute.

The estimate of $\boldsymbol{\beta}$ obtained from the model (6.8), i.e., by minimizing (6.9), is called a *weighted least squares* (WLS) estimate of β and will be denoted by $\boldsymbol{b}_{WLS}$. When $c_i = 1$, i.e., when least squares is not 'weighted', we call it *ordinary least squares (OLS)* — which is what we have been doing until this point in the book. Nowadays, WLS estimates can be obtained from just about all statistical packages.

Example 6.3

Suppose for each value $\boldsymbol{x}_i$ of the independent variables, w_i observations $y_{i\ell_i}$ are taken. Assume that the model is $y_{i\ell_i} = \boldsymbol{x}_i'\boldsymbol{\beta} + \epsilon_{i\ell_i}$ where $\ell_i = 1, \ldots, w_i$, $i = 1, \ldots, n$ and $\epsilon_{i\ell_i}$'s meet the Gauss-Markov conditions. In particular, let $\text{var}(\epsilon_{i\ell_i}) = \sigma^2$. Write $\bar{y}_i = \sum_{\ell_i=1}^{w_i} y_{i\ell_i}/w_i$. Suppose that only these averages have been recorded, i.e., the individual observations $y_{i\ell_i}$ are not available.

Then, since $\text{E}[\bar{y}_i] = \boldsymbol{x}_i'\boldsymbol{\beta}$, one might be tempted to use OLS in order to obtain an estimate of $\boldsymbol{\beta}$, i.e., to implicitly minimize $\sum_{i=1}^n (\bar{y}_i - \boldsymbol{x}_i'\boldsymbol{\beta})^2$. But

$$\text{var}(\bar{y}_i) = w_i^{-2} \sum_{\ell_i=1}^{w_i} \text{var}(y_{i\ell_i}) = w_i^{-2} \sum_{\ell_i=1}^{w_i} \text{var}(\epsilon_{i\ell_i}) = \sigma^2/w_i.$$

Therefore, this approach would violate Gauss-Markov conditions and could lead to inferior estimates. Intuitively speaking also, the approach violates the principle of 'one observation – one vote.'

Obviously, it would be preferable to minimize $\sum_{i=1}^n \sum_{\ell_i=1}^{w_i} (y_{i\ell_i} - \boldsymbol{x}_i'\boldsymbol{\beta})^2$. But since $\sum_{\ell_i=1}^{w_i} [(y_{i\ell_i} - \bar{y}_i)] = 0$, this equals

$$\sum_{i=1}^n \sum_{\ell_i=1}^{w_i} (y_{i\ell_i} - \bar{y}_i + \bar{y}_i - \boldsymbol{x}_i'\boldsymbol{\beta})^2 = \sum_{i=1}^n \sum_{\ell_i=1}^{w_i} [(y_{i\ell_i} - \bar{y}_i)^2 + (\bar{y}_i - \boldsymbol{x}_i'\boldsymbol{\beta})^2]$$
$$= \sum_{i=1}^n \sum_{\ell_i=1}^{w_i} (y_{i\ell_i} - \bar{y}_i)^2 + \sum_{i=1}^n w_i(\bar{y}_i - \boldsymbol{x}_i'\boldsymbol{\beta})^2.$$

Since the first term in the last expression does not include $\boldsymbol{\beta}$, minimizing it is equivalent to minimizing

$$\sum_{i=1}^n w_i(\bar{y}_i - \boldsymbol{x}_i'\boldsymbol{\beta})^2.$$

Since $\text{var}(\bar{y}_i) = \sigma^2/w_i$, we see from (6.9) that this yields the appropriate WLS estimate

It should be pointed out that while the OLS estimate of β using all the observations is the same as the WLS estimate using the means $\bar{y}_i$'s, the estimates of the error variances from the two models could be different. If all the observations were used in an OLS model, then an unbiased estimate of σ^2 would be

$$\left(\sum_{i=1}^{n} w_i - k - 1\right)^{-1} \sum_{i=1}^{n} \sum_{\ell_i=1}^{w_i} [(y_{i\ell_i} - \bar{y}_i)^2 + (\bar{y}_i - x_i' b_{WLS})^2], \qquad (6.10)$$

When β is a $k+1$-vector. On the other hand, if the averages were used in a WLS procedure, an unbiased estimator of the error variance would be

$$(n-k-1)^{-1} \sum_{i=1}^{n} w_i (\bar{y}_i - x_i' b_{WLS})^2,$$

as we shall see shortly. ■

In order to obtain expressions for various estimates, let us now describe weighting in matrix notation. Let Ω be a diagonal matrix with diagonal elements $c_1^2, \ldots, c_n^2$. When we do weighted regression, the original model $y = X\beta + \epsilon$, with $\mathrm{E}(\epsilon) = \mathbf{0}$ and $\mathrm{cov}(\epsilon) = \sigma^2\Omega$, is transformed to the model $y^{(\Omega)} = X^{(\Omega)}\beta + \epsilon^{(\Omega)}$, where $y^{(\Omega)} = Cy$, $X^{(\Omega)} = CX$ and $\epsilon^{(\Omega)} = C\epsilon$ and C is a diagonal matrix with non-zero elements $c_1^{-1}, \ldots, c_n^{-1}$. Since $C\Omega C' = I$, it follows that $\mathrm{cov}(\epsilon^{(\Omega)}) = \sigma^2 I$. Hence, the variables with superscript (Ω) satisfy the Gauss-Markov conditions, and least squares analysis can be carried out using them.

However, if we prefer to work with the original variables, we may write the estimate of β as (since $CC' = C'C = \Omega^{-1}$)

$$b_{WLS} = (X^{(\Omega)\prime} X^{(\Omega)})^{-1} X^{(\Omega)\prime} y^{(\Omega)} = (X'\Omega^{-1}X)^{-1} X'\Omega^{-1} y. \qquad (6.11)$$

Therefore,

$$\begin{aligned} \mathrm{cov}(b_{WLS}) &= (X'\Omega^{-1}X)^{-1} X'\Omega^{-1}(\sigma^2\Omega)\Omega^{-1}X(X'\Omega^{-1}X)^{-1} \\ &= \sigma^2 (X'\Omega^{-1}X)^{-1}. \end{aligned}$$

The residual vector is

$$\begin{aligned} e^{(\Omega)} &= y^{(\Omega)} - \hat{y}^{(\Omega)} = y^{(\Omega)} - X^{(\Omega)} b_{WLS} = Cy - CXb_{WLS} \\ &= C(y - Xb_{WLS}) = C(y - \hat{y}_{WLS}), \end{aligned}$$

where $\hat{y}_{WLS} = Xb_{WLS}$. Hence,

$$e_i^{(\Omega)} = (y_i - \hat{y}_{i,WLS})/c_i = \sqrt{w_i}(y_i - \hat{y}_{i,WLS}),$$

where $\hat{y}_{i,WLS}$ is the ith component of $\hat{y}_{WLS}$. Thus, an unbiased estimate of σ^2 is given by

$$(n-k-1)^{-1} \sum (e_i^{(\Omega)})^2 = (n-k-1)^{-1} \sum w_i (y_i - \hat{y}_{i,WLS})^2.$$

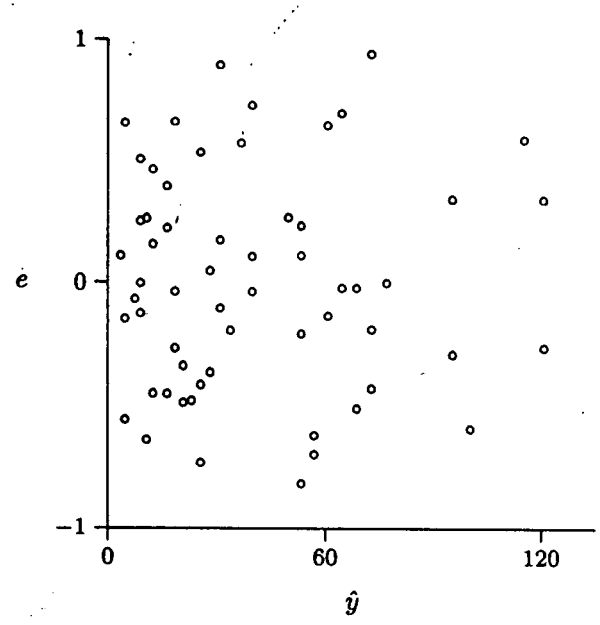

EXHIBIT 6.6: Residual vs. Predicted Plot for the Weighted Regression of Braking Distance Against Speed

Had we ignored the presence of heteroscedasticity, and obtained the OLS estimator $b_{OLS} = (X'X)^{-1}X'y$, then

$$\mathrm{cov}(b_{OLS}) = (X'X)^{-1}X(\sigma^2\Omega)X(X'X)^{-1} = \sigma^2(X'X)^{-1}X'\Omega X(X'X)^{-1}.$$

From the Gauss-Markov theorem, it follows that for a non-null vector a,

$$\mathrm{var}\,(a'b_{WLS}) \leq \mathrm{var}\,(a'b_{OLS}),$$

where, of course, $a'b_{WLS}$ and $a'b_{OLS}$ are estimates of $a'\beta$. Therefore, under heteroscedasticity, appropriate weighting yields preferable estimates. Weighted least squares is a special case of *generalized least squares* considered in Chapter 7.

Example 6.4 (Continuation of Example 6.1, Page 112)
Exhibit 6.6 shows the residual versus predicted plot resulting from running a regression on the data of Exhibit 6.1 using speed^{-2} as weight. (This weight has also been suggested in Hald, 1960; it is equivalent to using

$$\text{distance/speed} = \beta_1 + \beta_2\,\text{speed}$$

as the model.) The reader is invited to compare Exhibit 6.6 with Ex-

The 'residuals' in Exhibit 6.6 are $\sqrt{w_i}[y_i - \hat{y}_{i,WLS}]$ which, apart from being theoretically appropriate, are also the ones to plot if one wishes to check if homoscedasticity has been approximately achieved. ■

When running WLS, the user of regression packages needs to bear in mind the fact that usually packages will give $y_i - \hat{y}_{i,WLS}$ as residuals instead of $\sqrt{w_i}(y_i - \hat{y}_{i,WLS})$, which we have seen are the appropriate ones. Moreover, some packages respond to a command to weight with integer-valued w_i's by making each data point (y_i, x_i) into w_i copies of it. (If w_i's are not integers, some packages will truncate the w_i's to their integer values.) When w_i's are integers this form of weighting yields the same estimates we would get had we done the weighting the usual way (by minimizing (6.9)). The estimate of b_{WLS} is the same and the covariance matrix of b_{WLS} is $\sigma^2(X'WX)^{-1}$ where $W = \text{diag}(w_1, \ldots, w_n)$. However, we need to be careful regarding the estimate of σ^2. As we have already seen, an unbiased estimate of σ^2 is $\sum_{i=1}^n w_i(y_i - \hat{y}_{i,WLS})^2/(n-k-1)$, but if an OLS package program is used unaltered, it would compute the estimate of σ^2 to be $\sum_{i=1}^n w_i(y_i - \hat{y}_{i,WLS})^2/(\sum_{i=1}^n w_i - k - 1)$, which would be wrong and will frequently be extremely small (See also Example 6.3 and Exercise 6.6).

Example 6.5 (Continuation of Example 6.3, Page 119)
The reason why 'brute force' application of OLS, after making copies of the data points, yields a poor estimate of σ^2 can be seen from the discussion of Example 6.3. The 'brute force' application is the same as the problem considered there, if we set $y_{i\ell_i} = \bar{y}_i$ for $\ell_i = 1, \ldots, w_i$ and each i. But this makes the first term in (6.10) equal to zero and yields a (frequently severe) underestimate of σ^2. The fact is that we would be treating each set of w_i $\bar{y}_i$'s as independent observations, when they are not! ■

In Example 6.4, we weighted with a function of the independent variable; we may also weight using the dependent variable. For the reader's convenience, Exhibit 6.7 presents a table of weights for various types of dependent variables and various transformations of them (weights for the transformations were computed from variances obtained by using (6.4)). *However, we should point out that in practice the theoretical distribution of the dependent variable is not the only cause of heteroscedasticity.* The error term can be affected by variables left out. For example, consider the dependent variable average household size by state and assume that the data were obtained from the census. Although this is a mean of n_i counted variables, the n_i's are so large that the appropriate formula in Exhibit 6.7 would give variances which would be nearly zeros. Therefore, if we encounter a non-zero s, it would imply that the reason for the variance is not just the theoretical distribution of average sample size.

Weighting with functions $w[\mathrm{E}(y_i)]$ of $\mathrm{E}(y_i)$ presents a problem since $\mathrm{E}(y_i)$ is not known. On occasion one might be able to use y_i as an estimate

Type of Variable	Untransformed y_i	$\sqrt{y_i}$	$\log(y_i)$
Counts (Poisson)	z_i^{-1}	1 (i.e., apply ordinary least squares)	z_i
Proportion of counts (of form $y_i = m_i/n_i$)	$n_i z_i^{-1}(1-z_i)^{-1}$	$n_i(1-z_i)^{-1}$	$n_i z_i(1-z_1)^{-1}$
Homoscedastic variable	1 (obviously)	z_i	z_i^2
Means of n_i homoscedastic variables	n_i	$n_i z_i$	$n_i z_i^2$
Mean of n_i counted variables	$n_i z_i^{-1}$	n_i	$n_i z_i$

LEGEND AND NOTES: $z_i = \mathrm{E}(y_i)$. Columns for $\sqrt{y_i}$ and $\log(y_i)$ were computed using the approximate formula

$$\text{var}\,(f(y)) = (\text{var}\,(y))(f'(z))^2;$$

where f' represents the derivative, and z represents the mean of y. The entries in the table are the reciprocal of the variances.

EXHIBIT 6.7: Suggested Weights

of $\mathrm{E}(y_i)$ and weight with $w[y_i]$'s but this usually leads to bias. Frequently, a better approach is to obtain ordinary least squares estimates, compute $\hat{y}_i$'s, and *then* run a least squares procedure using as weights $w[\hat{y}_i]$'s.

Of course, this would usually give different, and presumably better, estimates of β and $\mathrm{E}(y_i)$'s. One could then use the most recently obtained estimates of $\mathrm{E}(y_i)$'s to compute weights and run a weighted least squares procedure again. These iterations can be continued until some convergence criterion is satisfied. This procedure is often called *iteratively reweighted least squares*. Computer programs for it are also available, although most common linear least squares packages do not include it. Since nonlinear least squares involves iterative procedures anyway, they can often be used to advantage to carry out such iterations (see Appendix C, especially Section C.2.4, p. 305; also see SAS, 1985b, especially pp. 597–598; and Wilkinson, 1987, especially p. NONLIN-25). As discussed in Section C.2.4, when some nonlinear least squares programs are applied to weighted linear least

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To perform a second iteration, we would define a new regressor variable $x' = x^{-0.92}$ and fit the model

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x'$$
$$= 3.1039 - 6.6784x'$$

Then a second regressor $w' = x' \ln x'$ is formed and we fit

$$\hat{y} = \hat{\beta}_0^* + \hat{\beta}_1^* x' + \hat{\gamma} w'$$
$$= 3.2409 - 6.445x' + 0.5994w'$$

The second-step estimate of α is thus

$$\alpha_2 = \frac{\hat{\gamma}}{\hat{\beta}_1} + \alpha_1 = \frac{0.5994}{-6.6784} + (-0.92) = -1.01$$

which again supports the use of the reciprocal transformation on x.

3.8 WEIGHTED LEAST SQUARES

Linear regression models with nonconstant error variance can also be fitted by the method of *weighted least squares*. In this method of estimation the deviation between the observed and expected values of y_i is multiplied by a weight w_i chosen inversely proportional to the variance of y_i. The weighted least squares function is

$$S(\beta_0, \beta_1) = \sum_{i=1}^{n} w_i (y_i - \beta_0 - \beta_1 x_i)^2 \tag{3.19}$$

The resulting least squares normal equations are

$$\begin{aligned} \hat{\beta}_0 \sum_{i=1}^{n} w_i + \hat{\beta}_1 \sum_{i=1}^{n} w_i x_i &= \sum_{i=1}^{n} w_i y_i \\ \hat{\beta}_0 \sum_{i=1}^{n} w_i x_i + \hat{\beta}_1 \sum_{i=1}^{n} w_i x_i^2 &= \sum_{i=1}^{n} w_i x_i y_i \end{aligned} \tag{3.20}$$

Solving (3.20) will produce weighted least squares estimates of β_0 and β_1.

To use weighted least squares, the weights w_i must be known. In some problems, the weights may be easily determined. For example, if the observation y_i is actually an average of n_i observations at x_i and if all *original* observations have constant variance σ^2, then the variance of y_i is $V(y_i) = V(\varepsilon_i) = \sigma^2/n_i$, and we would choose the weights as $w_i = n_i$. Sometimes the

variance of y_i may be a function of the regressor, for example, $V(y_i) = V(\varepsilon_i) = \sigma^2 x_i$. In that case we would use $w_i = 1/x_i$ as the weights. When the primary source of error is measurement error and different observations are measured by different instruments of unequal but known accuracy, weighted least squares may be employed with the weights chosen being inversely proportional to the variances of measurement error. In many problems we will not know the weights initially and will have to estimate them based on the results of an ordinary (unweighted) least squares fit.

A more general treatment of weighted least squares will be given in Chapter 9 (Section 9.2). We now give an example of weighted least squares illustrating one approach to estimating the weights.

Example 3.11. The average monthly income from food sales and the corresponding annual advertising expenses for 30 restaurants is shown in

Table 3.8 Restaurant Food Sales Data

Obs. i	(a) Income, y_i	(b) Advertising Expense, x_i	(c) $\bar{x}$	(d) s_y^2	(e) Weights, w_i
1	81,464	3,000			6.21771E-08
2	72,661	3,150	3,078.3	26,794,620	5.79507E-08
3	72,344	3,085			5.97094E-08
4	90,743	5,225			2.98667E-08
5	98,588	5,350	5,287.5	30,722,010	2.90195E-08
6	96,507	6,090			2.48471E-08
7	126,574	8,925			1.60217E-08
8	114,133	9,015			1.58431E-08
9	115,814	8,885	8,955.0	52,803,698	1.61024E-08
10	123,181	8,950			1.59717E-08
11	131,434	9,000			1.58726E-08
12	140,564	11,345			1.22942E-08
13	151,352	12,275			1.12852E-08
14	146,926	12,400	12,377.5	77,280,167	1.11621E-08
15	130,963	12,525			1.10416E-08
16	144,630	12,310			1.12505E-08
17	147,041	13,700			1.00246E-08
18	179,021	15,000			9.09750E-09
19	166,200	15,175			8.98563E-09
20	180,732	14,995	15,095.0	120,571,040	9.10074E-09
21	178,187	15,050			9.06525E-09
22	185,304	15,200			8.96988E-09
23	155,931	15,150			9.00144E-09
24	172,579	16,800			8.06478E-09
25	188,851	16,500	16,650.0	132,388,990	8.22031E-09
26	192,424	17,830			7.57287E-09
27	203,112	19,500			6.89136E-09
28	192,482	19,200			7.00460E-09
29	218,715	19,000	19,262.5	138,856,867	7.08218E-09
30	214,317	19,350			6.94752E-09

Example 11.1. Relationship between compensation and productivity. To illustrate the Park approach, we use the data given in Table 11.1 to run the following regression:

$$Y_i = \beta_1 + \beta_2 X_i + u_i$$

where Y = average compensation in thousands of dollars, X = average productivity in thousands of dollars, and i = ith employment size of the establishment. The results of the regression were as follows:

$$\begin{aligned} \hat{Y}_i &= 1992.3452 + 0.2329X_i \\ \text{se} &= (936.4791) \quad (0.0998) \\ t &= \quad (2.1275) \quad (2.333) \qquad R^2 = 0.4375 \end{aligned} \tag{11.5.3}$$

The results reveal that the estimated slope coefficient is significant at the 5% level on the basis of a one-tail t test. The equation shows that as labor productivity increases by, say, a dollar, labor compensation on the average increases by about 23 cents.

The residuals obtained from regression (11.5.3) were regressed on X_i as suggested in Eq. (11.5.2), giving the following results:

$$\begin{aligned} \ln \hat{u}_i^2 &= 35.817 - 2.8099 \ln X_i \\ \text{se} &= (38.319) \quad (4.216) \\ t &= \quad (0.934) \quad (-0.667) \qquad R^2 = 0.0595 \end{aligned} \tag{11.5.4}$$

Obviously, there is no statistically significant relationship between the two variables. Following the Park test, one may conclude that there is no heteroscedasticity in the error variance.[11]

Glejser test.[12] The Glejser test is similar in spirit to the Park test. After obtaining the residuals $\hat{u}_i$ from the OLS regression, Glejser suggests regressing the absolute values of $\hat{u}_i$ on the X variable that is thought to be closely associated with σ_i^2. In his experiments, Glejser used the following functional forms:

$$|\hat{u}_i| = \beta_1 + \beta_2 X_i + v_i$$

$$|\hat{u}_i| = \beta_1 + \beta_2 \sqrt{X_i} + v_i$$

$$|\hat{u}_i| = \beta_1 + \beta_2 \frac{1}{X_i} + v_i$$

$$|\hat{u}_i| = \beta_1 + \beta_2 \frac{1}{\sqrt{X_i}} + v_i$$

$$|\hat{u}_i| = \sqrt{\beta_1 + \beta_2 X_i} + v_i$$

$$|\hat{u}_i| = \sqrt{\beta_1 + \beta_2 X_i^2} + v_i$$

where v_i is the error term.

---

[11] The particular functional form chosen by Park is only suggestive. A different functional form may reveal significant relationships. For example, one may use $\hat{u}_i^2$ instead of $\ln \hat{u}_i^2$ as the dependent variable.

[12] H. Glejser, "A New Test for Heteroscedasticity," *Journal of the American Statistical Association*, vol. 64, 1969, pp. 316–323.

Again as an empirical or practical matter, one may use the Glejser approach. But Goldfeld and Quandt point out that the error term v_i has some problems in that its expected value is nonzero, it is serially correlated (see Chapter 12), and ironically it is heteroscedastic.[13] An additional difficulty with the Glejser method is that models such as

$$|\hat{u}_i| = \sqrt{\beta_1 + \beta_2 X_i} + v_i \quad \text{and} \quad |\hat{u}_i| = \sqrt{\beta_1 + \beta_2 X_i^2} + v_i$$

are nonlinear in the parameters and therefore cannot be estimated with the usual OLS procedure.

Glejser has found that for large samples the first four of the preceding models give generally satisfactory results in detecting heteroscedasticity. As a practical matter, therefore, the Glejser technique may be used for large samples and may be used in the small samples strictly as a qualitative device to learn something about heteroscedasticity. For an application of the Glejser method see Section 11.7.

Spearman's rank correlation test. In exercise 3.8 we defined the Spearman rank correlation coefficient as

$$r_s = 1 - \frac{6\sum d_i^2}{n(n^2-1)} \tag{11.5.5}$$

where d_i = difference in the ranks assigned to two different characteristics of the ith individual or phenomenon and n = number of individuals or phenomena ranked. The preceding rank correlation coefficient can be used to detect heteroscedasticity as follows: Assume $Y_i = \beta_0 + \beta_1 X_i + u_i$.

Step 1. Fit the regression to the data on Y and X and obtain the residuals $\hat{u}_i$.

Step 2. Ignoring the sign of $\hat{u}_i$, that is, taking their absolute value $|\hat{u}_i|$, rank both $|\hat{u}_i|$ and X_i (or $\hat{Y}_i$) according to an ascending or descending order and compute the Spearman's rank correlation coefficient given previously.

Step 3. Assuming that the population rank correlation coefficient ρ_s is zero and $n > 8$, the significance of the sample r_s can be tested by the t test as follows:[14]

$$t = \frac{r_s\sqrt{n-2}}{\sqrt{1-r_s^2}} \tag{11.5.6}$$

with df $= n - 2$.

[13] For details, see Goldfeld and Quandt, op. cit., Chap. 3.

[14] See G. Udny Yule and M. G. Kendall, *An Introduction to the Theory of Statistics*, Charles Griffin & Company, London, 1953, p. 455.

Regression

Attachment 2
Glesjer Test Results
Page 1

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: ABS_RES

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.184[a]	.034	-.074	1.0613	2.017

a. Predictors: (Constant), SIZE

b. Dependent Variable: ABS_RES

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.355	1	.355	.315	.588[a]
	Residual	10.137	9	1.126		
	Total	10.491	10			

a. Predictors: (Constant), SIZE

b. Dependent Variable: ABS_RES

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.214	.667		3.319	.009
	SIZE	-8.81E-02	.157	-.184	-.561	.588

a. Dependent Variable: ABS_RES

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.5091	2.0818	1.8856	.1883	11
Residual	-1.3708	2.4460	1.413E-16	1.0068	11
Std. Predicted Value	-1.999	1.042	.000	1.000	11
Std. Residual	-1.292	2.305	.000	.949	11

a. Dependent Variable: ABS_RES

Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SIZESQR[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: ABS_RES

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.216[a]	.047	-.059	1.0542	2.045

a. Predictors: (Constant), SIZESQR

b. Dependent Variable: ABS_RES

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.489	1	.489	.440	.524[a]
	Residual	10.002	9	1.111		
	Total	10.491	10			

a. Predictors: (Constant), SIZESQR

b. Dependent Variable: ABS_RES

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.090	.442		4.724	.001
	SIZESQR	-1.13E-02	.017	-.216	-.664	.524

a. Dependent Variable: ABS_RES

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.3655	2.0643	1.8856	.2212	11
Residual	-1.4180	2.3988	.0000	1.0001	11
Std. Predicted Value	-2.351	.808	.000	1.000	11
Std. Residual	-1.345	2.275	.000	.949	11

a. Dependent Variable: ABS_RES

Attachment 3
Goldfeld-Quandt Test

For 8 df this t value is not significant even at the 10% level of significance; the p **value** is 0.17. Thus, there is no evidence of a systematic relationship between the explanatory variable and the absolute values of the residuals, which might suggest that there is no heteroscedasticity.

Goldfeld-Quandt test.[15] This popular method is applicable if one assumes that the heteroscedastic variance, σ_i^2, is positively related to *one* of the explanatory variables in the regression model. For simplicity, consider the usual two-variable model:

$$Y_i = \beta_1 + \beta_2 X_i + u_i$$

Suppose σ_i^2 is positively related to X_i as

$$\sigma_i^2 = \sigma^2 X_i^2 \tag{11.5.9}$$

where σ^2 is a constant.[16]

Assumption (11.5.9) postulates that σ_i^2 is proportional to the square of the X variable. Such an assumption has been found quite useful by Prais and Houthakker in their study of family budgets. (See Section 11.6.)

If (11.5.9) is appropriate, it would mean σ_i^2 would be larger, the larger the values of X_i. If that turns out to be the case, heteroscedasticity is most likely to be present in the model. To test this explicitly, Goldfeld and Quandt suggest the following steps:

Step 1. Order or rank the observations according to the values of X_i, beginning with the lowest X value.

Step 2. Omit c central observations, where c is specified a priori, and divide the remaining $(n - c)$ observations into two groups each of $(n - c)/2$ observations.

Step 3. Fit separate OLS regressions to the first $(n-c)/2$ observations and the last $(n - c)/2$ observations, and obtain the respective residual sums of squares RSS_1 and RSS_2, RSS_1 representing the RSS from the regression corresponding to the smaller X_i values (the small variance group) and RSS_2 that from the larger X_i values (the large variance group). These RSS each have

$$\frac{(n-c)}{2} - k \quad \text{or} \quad \left(\frac{n-c-2k}{2}\right) \text{df}$$

where k is the number of parameters to be estimated, including the intercept. (Why?) For the two-variable case k is of course 2.

Step 4. Compute the ratio

$$\lambda = \frac{\text{RSS}_2/\text{df}}{\text{RSS}_1/\text{df}} \tag{11.5.10}$$

---

[15] Goldfeld and Quandt, op. cit., Chap. 3.

[16] This is only one plausible assumption. Actually, what is required is that σ_i^2 be monotonically related to X_i.

If u_i are assumed to be normally distributed (which we usually do), and *if the assumption of homoscedasticity is valid*, then it can be shown that λ of (11.5.10) follows the F distribution with numerator and denominator df each of $(n - c - 2k)/2$.

If in an application the computed $\lambda(= F)$ is greater than the critical F at the chosen level of significance, we can reject the hypothesis of homoscedasticity, that is, we can say that heteroscedasticity is very likely.

Before illustrating the test, a word about omitting the c central observations is in order. These observations are omitted to sharpen or accentuate the difference between the small variance group (i.e., RSS_1) and the large variance group (i.e., RSS_2). But the ability of the Goldfeld-Quandt test to do this successfully depends on how c is chosen.[17] For the two-variable model the Monte Carlo experiments done by Goldfeld and Quandt suggest that c is about 8 if the sample size is about 30, and it is about 16 if the sample size is about 60. But Judge et al. note that $c = 4$ if $n = 30$ and $c = 10$ if n is about 60 have been found satisfactory in practice.[18]

Before moving on, it may be noted that in case there is more than one X variable in the model, the ranking of observations, the first step in the test, can be done according to any one of them. Thus in the model: $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + u_i$, we can rank-order the data according to any one of these X's. If a priori we are not sure which X variable is appropriate, we can conduct the test on each of the X variables, or via a Park test, in turn, on each X.

Example 11.3. The Goldfeld-Quandt test. To illustrate the Goldfeld-Quandt test, we present in Table 11.3 data on consumption expenditure in relation to income for a cross section of 30 families. Suppose we postulate that consumption expenditure is linearly related to income but that heteroscedasticity is present in the data. We further postulate that the nature of heteroscedasticity is as given in (11.5.9). The necessary reordering of the data for the application of the test is also presented in Table 11.3.

Dropping the middle 4 observations, the OLS regressions based on the first 13 and the last 13 observations and their associated residual sums of squares are as shown next (standard errors in the parentheses).

Regression based on the first 13 observations:

$$\hat{Y}_i = 3.4094 + 0.6968X_i$$
$$(8.7049) \quad (0.0744)$$
$$r^2 = 0.8887$$
$$RSS_1 = 377.17$$
$$df = 11$$

[17]Technically, the power of the test depends on how c is chosen. In statistics, the *power of a test* is measured by the probability of rejecting the null hypothesis when it is false [i.e., by 1 − Prob (type II error)]. Here the null hypothesis is that the variances of the two groups are the same, i.e., homoscedasticity. For further discussion, see M. M. Ali and C. Giaccotto, "A Study of Several New and Existing Tests for Heteroscedasticity in the General Linear Model," *Journal of Econometrics*, vol. 26, 1984, pp. 355–373.

[18]George G. Judge, R. Carter Hill, William E. Griffiths, Helmut Lütkepohl, and Tsoung-Chao Lee, *Introduction to the Theory and Practice of Econometrics*, John Wiley & Sons, New York, 1982, p. 422.

Regression

Attachment 4
Goldfeld-Quandt Test Results
Page 1

Variables Entered/Removed[b,c]

Model	Variables Entered	Variables Removed	Method
1	SIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: AVGCOST

c. Models are based only on cases for which GQSELECT = 1.00

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	GQSELECT = 1.00 (Selected)	GQSELECT ~= 1.00 (Unselected)				GQSELECT = 1.00 (Selected)	GQSELECT ~= 1.00 (Unselected)
1	.187[a]	.	.035	-.287	2.1068	3.308	.581

a. Predictors: (Constant), SIZE

b. Unless noted otherwise, statistics are based only on cases for which GQSELECT = 1.00.

c. Dependent Variable: AVGCOST

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.484	1	.484	.109	.763[a]
	Residual	13.315	3	4.438		
	Total	13.800	4			

a. Predictors: (Constant), SIZE

b. Dependent Variable: AVGCOST

c. Selecting only cases for which GQSELECT = 1.00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.180	3.567		1.172	.326
	SIZE	-.568	1.720	-.187	-.330	.763

a. Dependent Variable: AVGCOST

b. Selecting only cases for which GQSELECT = 1.00

Casewise Diagnostics[b]

Case Number	Status	Std. Residual	AVGCOST
7	X[a]	3.462	9.20
9	X[a]	3.560	8.27
11	X[a]	3.229	6.44

a. GQSELECT ~= 1.00 (Unselected)

b. Dependent Variable: AVGCOST

Residuals Statistics[a,b]

	GQSELECT = 1.00 (Selected)				
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.4754	3.3278	3.0436	.3480	5
Residual	-1.8823	1.9728	8.882E-17	1.8245	5
Std. Predicted Value	-1.633	.816	.000	1.000	5
Std. Residual	-.893	.936	.000	.866	5

Residuals Statistics[a,b]

	GQSELECT ~= 1.00 (Unselected)				
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.3660	2.4754	1.2441	1.0427	6
Residual	-1.1945	7.5008	4.8064	3.3237	6
Std. Predicted Value	-9.798	-1.633	-5.171	2.996	6
Std. Residual	-.567	3.560	2.281	1.578	6

a. Dependent Variable: AVGCOST

b. Pooled Cases

Regression

Variables Entered/Removed[b,c]

Model	Variables Entered	Variables Removed	Method
1	SIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: AVGCOST

c. Models are based only on cases for which GQSELECT = 2.00

Model Summary[b,c]

Model	R		R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson Statistic	
	GQSELECT = 2.00 (Selected)	GQSELECT ~= 2.00 (Unselected)				GQSELECT = 2.00 (Selected)	GQSELECT ~= 2.00 (Unselected)
1	.206[a]	.375	.043	-.277	1.8744	3.145	.263

a. Predictors: (Constant), SIZE

b. Unless noted otherwise, statistics are based only on cases for which GQSELECT = 2.00.

c. Dependent Variable: AVGCOST

ANOVA[b,c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.468	1	.468	.133	.739[a]
	Residual	10.540	3	3.513		
	Total	11.009	4			

a. Predictors: (Constant), SIZE

b. Dependent Variable: AVGCOST

c. Selecting only cases for which GQSELECT = 2.00

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.149	3.247		2.510	.087
	SIZE	-.204	.560	-.206	-.365	.739

a. Dependent Variable: AVGCOST

b. Selecting only cases for which GQSELECT = 2.00

Casewise Diagnostics[b]

Case Number	Status	Std. Residual	AVGCOST
2	X[a]	-3.413	1.45
4	X[a]	-3.421	1.33
6	X[a]	-3.337	1.28

a. GQSELECT ~= 2.00 (Unselected)

b. Dependent Variable: AVGCOST

Residuals Statistics[a,b]

	GQSELECT = 2.00 (Selected)				
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	6.5138	7.3316	7.0045	.3421	5
Residual	-1.9468	1.8700	1.776E-16	1.6233	5
Std. Predicted Value	-1.434	.956	.000	1.000	5
Std. Residual	-1.039	.998	.000	.866	5

Residuals Statistics[a,b]

	GQSELECT ~= 2.00 (Unselected)				
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	7.5360	7.8427	7.7064	.1397	6
Residual	-6.4130	-2.7241	-4.9566	1.7628	6
Std. Predicted Value	1.554	2.450	2.052	.408	6
Std. Residual	-3.421	-1.453	-2.644	.940	6

a. Dependent Variable: AVGCOST

b. Pooled Cases

White's general heteroscedasticity test. Unlike the Goldfeld-Quandt test, which requires reordering the observations with respect to the X variable that supposedly caused heteroscedasticity, or the BGP test, which is sensitive to the normality assumption, the general test of heteroscedasticity proposed by White does not rely on the normality assumption and is easy to implement.[21] As an illustration of the basic idea, consider the following three-variable regression model (the generalization to the k-variable model is straightforward):

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i \tag{11.5.20}$$

The White test proceeds as follows:

Step 1. Given the data, we estimate (11.5.20) and obtain the residuals, $\hat{u}_i$.

Step 2. We then run the following (*auxiliary*) regression:

$$\hat{u}_i^2 = \alpha_1 + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \alpha_4 X_{2i}^2 + \alpha_5 X_{3i}^2 + \alpha_6 X_{2i} X_{3i} + v_i \tag{11.5.21}$$[22]

That is, the squared residuals from the original regression are regressed on the original X variables or regressors, their squared values, and the cross product(s) of the regressors. Higher powers of regressors can also be introduced. Note that there is a constant term in this equation even though the original regression may or may not contain it. Obtain the R^2 from this (auxiliary) regression.

Step 3. Under the null hypothesis that there is no heteroscedasticity, it can be shown that sample size (n) times the R^2 obtained from the auxiliary regression *asymptotically* follows the chi-square distribution with df equal to the number of regressors (excluding the constant term) in the auxiliary regression. That is,

$$n \cdot R^2 \underset{\text{asy}}{\sim} \chi^2_{\text{df}} \tag{11.5.22}$$

where df is as defined previously. In our example, there are 5 df since there are 5 regressors in the auxiliary regression.

Step 4. If the chi-square value obtained in (11.5.22) exceeds the critical chi-square value at the chosen level of significance, the conclusion is that there is heteroscedasticity. If it does not exceed the critical chi-square value, there is no heteroscedasticity, which is to say that in the auxiliary regression (11.5.21), $\alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$ (see footnote 22).

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[21] H. White, "A Heteroscedasticity Consistent Covariance Matrix Estimator and a Direct Test of Heteroscedasticity," *Econometrica*, vol. 48, 1980, pp. 817–818.

[22] Implied in this procedure is the assumption that the error variance of u_i, σ_i^2, is functionally related to the regressors, their squares, and their cross products. If all the partial slope coefficients in this regression are simultaneously equal to zero, then the error variance is the homoscedastic constant equal to α_1.

Regression

Attachment 6
White's Test Results
Page 1

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SIZE, SIZESQR[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: RES_OSQR

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.337[a]	.113	-.108	5.3731	2.369

a. Predictors: (Constant), SIZE, SIZESQR

b. Dependent Variable: RES_OSQR

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.502	2	14.751	.511	.618[a]
	Residual	230.961	8	28.870		
	Total	260.463	10			

a. Predictors: (Constant), SIZE, SIZESQR

b. Dependent Variable: RES_OSQR

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.883	7.290		-.121	.907
	SIZESQR	-.408	.422	-1.564	-.968	.361
	SIZE	3.424	3.858	1.434	.887	.401

a. Dependent Variable: RES_OSQR

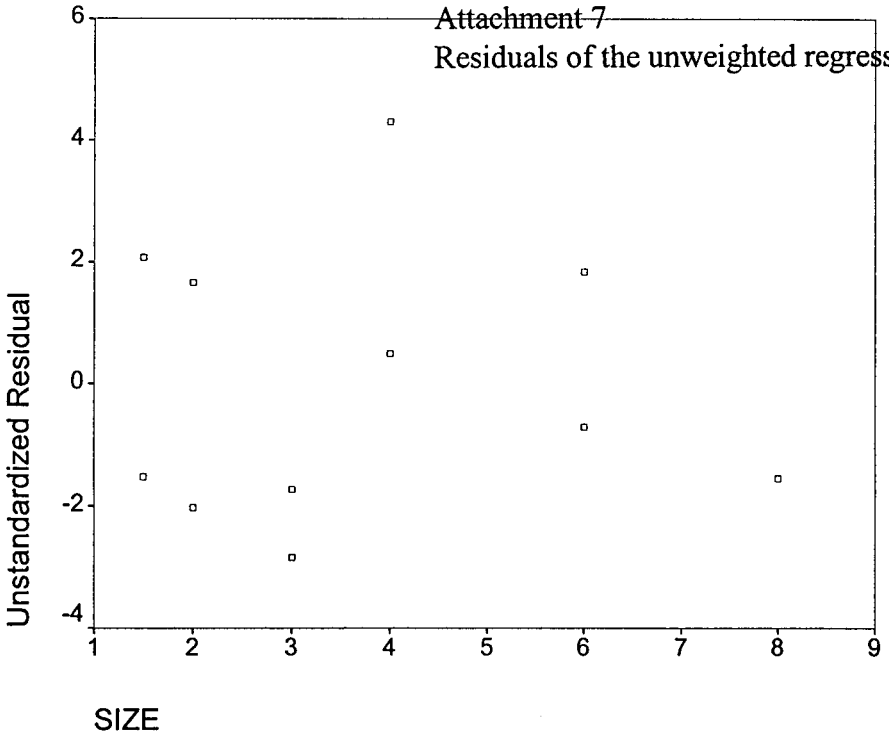
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.3723	6.2781	4.5091	1.7176	11
Residual	-6.0374	12.2767	-2.30E-15	4.8058	11
Std. Predicted Value	-2.409	1.030	.000	1.000	11
Std. Residual	-1.124	2.285	.000	.894	11

a. Dependent Variable: RES_OSQR

Graph

Attachment 7
Residuals of the unweighted regression plotted against SIZE



	size	feet	avgcost	totcost	wsize	wcost	sqrtfeet
1	1.50	442766.0	5.04	2231080	998.11	3352.96	665.41
2	1.50	108137.0	1.45	156311.0	493.26	475.34	328.84
3	2.00	3625826	5.02	18188521	3808.32	9551.99	1904.16
4	2.00	429630.0	1.33	570320.9	1310.92	870.11	655.46
5	3.00	56307.00	2.39	134564.2	711.87	567.09	237.29
6	3.00	73925.00	1.28	94691.27	815.67	348.27	271.89
7	4.00	1077977	9.20	9919135	4153.03	9553.64	1038.26
8	4.00	259512.0	5.38	1397415	2037.69	2743.13	509.42
9	6.00	51168.00	8.27	423232.0	1357.22	1871.02	226.20
10	6.00	273679.0	5.73	1567510	3138.86	2996.33	523.14
11	8.00	79984.00	6.44	514861.0	2262.52	1820.49	282.81

Attachment 8
Data set used for determining heteroscedasticity

	res_w	res_o	abs_reso	sizesqr	res_osqr	gqselect
1	404.63822	2.07277	2.07	2.25	4.30	1.00
2	-981.71257	-1.52070	1.52	2.25	2.31	1.00
3	296.29629	1.66461	1.66	4.00	2.77	1.00
4	-2315.94618	-2.02430	2.02	4.00	4.10	1.00
5	-790.36618	-1.73310	1.73	9.00	3.00	1.00
6	-1207.11930	-2.84202	2.84	9.00	8.08	.00
7	2721.43368	4.30754	4.31	16.00	18.55	2.00
8	-609.10875	.49070	.49	16.00	.24	2.00
9	-6.49906	1.83502	1.84	36.00	3.37	2.00
10	-1345.83921	-.70885	.71	36.00	.50	2.00
11	-1013.26439	-1.54167	1.54	64.00	2.38	2.00

4. Perform and submit the results that are obtained when the minimum system method is used to allocate demand and customer charges.

RESPONSE:

Attached is a cost of service study which utilizes the minimum system method to classify costs as demand- and customer-related. The following table compares the class rates of return from Delta's original cost of service study with the class rates of return from the revised cost of service study utilizing the minimum system methodology.

Customer Class	Actual ROR at Current Rates		ROR at Proposed Rates	
	Original Study	Revised Study	Original Study	Revised Study
Residential (GS)	3.97%	1.53%	6.48%	3.57%
Commercial Small (GS)	10.11%	10.47%	13.01%	13.43%
Large Commercial & Industrial (GS)	11.43%	29.33%	12.52%	31.39%
Interruptible (IS)	27.37%	69.16%	25.52%	65.18%
Special Contracts	9.44%	65.10%	9.44%	65.10%
Off-System Sales (OS)	10.70%	99.39%	10.70%	99.39%
Total System	7.31%	7.31%	9.31%	9.31%

WITNESS: Steve Seelye

REVISED COST OF SERVICE STUDY

USING THE MINIMUM SYSTEM METHODOLOGY

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Plant in Service							
Storage Plant							
350-357	Storage Plant	PT350	F003	$ 10,563,026	-	-	10,563,026
Total Storage Plant		PTST		$ 10,563,026	$ -	$ -	$ 10,563,026
Transmission and Gathering Plant							
325-371	Transmission	PT365	F005	$ 27,532,254	-	-	-
Distribution Plant							
374.00	Land and Land Rights	PT374	F008	$ 248,478	-	-	-
375.00	Structures & Improvements	PT375	F008	103,373	-	-	-
376.00	Mains	PT376	F009	46,498,998	-	-	-
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	965,592	-	-	-
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	390,893	-	-	-
380.00	Services	PT380	F010	7,634,653	-	-	-
381.00	Meters	PT381	F011	5,454,418	-	-	-
382.00	Meter Installations	PT382	F011	2,365,154	-	-	-
383.00	House Regulators	PT383	F011	2,190,578	-	-	-
384.00	House Regulator Installations	PT384	F011	-	-	-	-
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	1,202,371	-	-	-
Sub-Total Distribution Plant		PTDSUB		67,054,508	-	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Plant in Service								
Storage Plant								
350-357	Storage Plant	PT350	F003	-	-	-	-	-
Total Storage Plant		PTST		$ -	$ -	$ -	$ -	$ -
Transmission and Gathering Plant								
325-371	Transmission	PT365	F005	-	4,091,293	23,440,961	-	-
Distribution Plant								
374.00	Land and Land Rights	PT374	F008	-	-	-	-	248,478
375.00	Structures & Improvements	PT375	F008	-	-	-	-	103,373
376.00	Mains	PT376	F009	-	-	-	-	-
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	-	-	-	-	965,592
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	-	-	-	-	390,893
380.00	Services	PT380	F010	-	-	-	-	-
381.00	Meters	PT381	F011	-	-	-	-	-
382.00	Meter Installations	PT382	F011	-	-	-	-	-
383.00	House Regulators	PT383	F011	-	-	-	-	-
384.00	House Regulator Installations	PT384	F011	-	-	-	-	-
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	-	-	-	-	-
Sub-Total Distribution Plant		PTDSUB		-	-	-	-	1,708,336

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Plant in Service							
Storage Plant							
350-357	Storage Plant	PT350	F003	-	-	-	-
Total Storage Plant		PTST		$ -	$ -	$ -	$ -
Transmission and Gathering Plant							
325-371	Transmission	PT365	F005	-	-	-	-
Distribution Plant							
374.00	Land and Land Rights	PT374	F008	-	-	-	-
375.00	Structures & Improvements	PT375	F008	-	-	-	-
376.00	Mains	PT376	F009	6,909,751	39,589,247	-	-
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	-	-	-	-
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	-	-	-	-
380.00	Services	PT380	F010	-	-	7,634,653	-
381.00	Meters	PT381	F011	-	-	-	5,454,418
382.00	Meter Installations	PT382	F011	-	-	-	2,365,154
383.00	House Regulators	PT383	F011	-	-	-	2,190,578
384.00	House Regulator Installations	PT384	F011	-	-	-	-
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	-	-	-	1,202,371
Sub-Total Distribution Plant		PTDSUB		6,909,751	39,589,247	7,634,653	11,212,521

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Plant in Service							
Storage Plant							
350-357	Storage Plant	PT350	F003	-	-	10,563,026	ok
Total Storage Plant		PTST		$ -	$ -	10,563,026	ok
Transmission and Gathering Plant							
325-371	Transmission	PT365	F005	-	-	27,532,254	ok
Distribution Plant							
374.00	Land and Land Rights	PT374	F008	-	-	248,478	ok
375.00	Structures & Improvements	PT375	F008	-	-	103,373	ok
376.00	Mains	PT376	F009	-	-	46,498,998	ok
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	-	-	965,592	ok
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	-	-	390,893	ok
380.00	Services	PT380	F010	-	-	7,634,653	ok
381.00	Meters	PT381	F011	-	-	5,454,418	ok
382.00	Meter Installations	PT382	F011	-	-	2,365,154	ok
383.00	House Regulators	PT383	F011	-	-	2,190,578	ok
384.00	House Regulator Installations	PT384	F011	-	-	-	ok
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	-	-	1,202,371	ok
Sub-Total Distribution Plant		PTDSUB		-	-	67,054,508	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Plant in Service (Continued)							
Distribution Plant (Continued)							
387.00	Other Equipment	PT387	PTDSUB	-	-	-	-
Total Distribution Plant		PTD		$ 67,054,508	$ -	$ -	$ -
Transmission-Distribution Subtotal		PTTD		$ 94,586,762	$ -	$ -	$ -
Storage-Transmission-Distribution Subtotal		PTSUB		$ 105,149,788	$ -	$ -	$ 10,563,026
Other Plant in Service							
301-303	Intangible Plant	PT301	PTSUB	54,937	-	-	5,519
389-399	General Plant	PT389	PTSUB	14,553,800	-	-	1,462,030
Total Other Plant in Service		PTOPIS		14,608,737	-	-	1,467,549
Adjustments							
Tranex Plant 367-371			F005	$ 4,605,527	$ -	$ -	$ -
Tranex Acquisition Adjustment			F005	(970,198)	-	-	-
Circle R			PTSUB	408,962	-	-	41,083
Total Adjustments				$ 4,044,291	$ -	$ -	$ 41,083
Total Plant in Service		PTIS		$ 123,802,816	$ -	$ -	$ 12,071,658

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Plant in Service (Continued)							
Distribution Plant (Continued)							
387.00 Other Equipment	PT387	PTDSUB	-	-	-	-	-
Total Distribution Plant	PTD		$ -	$ -	$ -	$ -	$ 1,708,336
Transmission-Distribution Subtotal	PTTD		$ -	$ 4,091,293	$ 23,440,961	$ -	$ 1,708,336
Storage-Transmission-Distribution Subtotal	PTSUB		$ -	$ 4,091,293	$ 23,440,961	$ -	$ 1,708,336
Other Plant in Service							
301-303 Intangible Plant	PT301	PTSUB	-	2,138	12,247	-	893
389-399 General Plant	PT389	PTSUB	-	566,277	3,244,467	-	236,451
Total Other Plant in Service	PTOPIS		-	568,414	3,256,714	-	237,344
Adjustments							
Tranex Plant 367-371		F005	$ -	$ 684,381	$ 3,921,146	$ -	$ -
Tranex Acquisition Adjustment		F005	-	(144,171)	(826,027)	-	-
Circle R		PTSUB	-	15,912	91,170	-	6,644
Total Adjustments			$ -	$ 556,122	$ 3,186,289	$ -	$ 6,644
Total Plant in Service	PTIS		$ -	$ 5,215,829	$ 29,883,964	$ -	$ 1,952,324

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Plant in Service (Continued)							
Distribution Plant (Continued)							
387.00	Other Equipment	PT387	PTDSUB	-	-	-	-
Total Distribution Plant		PTD		$ 6,909,751	$ 39,589,247	$ 7,634,653	$ 11,212,521
Transmission-Distribution Subtotal		PTTD		$ 6,909,751	$ 39,589,247	$ 7,634,653	$ 11,212,521
Storage-Transmission-Distribution Subtotal		PTSUB		$ 6,909,751	$ 39,589,247	$ 7,634,653	$ 11,212,521
Other Plant in Service							
301-303	Intangible Plant	PT301	PTSUB	3,610	20,684	3,989	5,858
389-399	General Plant	PT389	PTSUB	956,380	5,479,554	1,056,714	1,551,927
Total Other Plant in Service		PTOPIS		959,990	5,500,238	1,060,702	1,557,785
Adjustments							
Tranex Plant 367-371			F005	$ -	$ -	$ -	$ -
Tranex Acquisition Adjustment			F005	-	-	-	-
Circle R			PTSUB	26,874	153,976	29,694	43,609
Total Adjustments				$ 26,874	$ 153,976	$ 29,694	$ 43,609
Total Plant in Service		PTIS		$ 7,896,615	$ 45,243,461	$ 8,725,049	$ 12,813,915

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Plant in Service (Continued)							
Distribution Plant (Continued)							
387.00	Other Equipment	PT387	PTDSUB	-	-	-	ok
Total Distribution Plant		PTD		$ -	$ -	67,054,508	ok
Transmission-Distribution Subtotal		PTTD		$ -	$ -	94,586,762	ok
Storage-Transmission-Distribution Subtotal		PTSUB		$ -	$ -	105,149,788	ok
Other Plant in Service							
301-303	Intangible Plant	PT301	PTSUB	-	-	54,937	ok
389-399	General Plant	PT389	PTSUB	-	-	14,553,800	ok
Total Other Plant in Service		PTOPIS		-	-	14,608,737	ok
Adjustments							
Tranex Plant 367-371			F005	$ -	$ -	$ 4,605,527	ok
Tranex Acquisition Adjustment			F005	-	-	(970,198)	ok
Circle R			PTSUB	-	-	408,962	ok
Total Adjustments				$ -	$ -	4,044,291	ok
Total Plant in Service		PTIS		$ -	$ -	123,802,816	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Net Plant in Service						
Total Gas Utility Plant in Service			$ 123,802,816	$ -	$ -	$ 12,071,658
Less:						
Reserve for Depreciation						
Storage	DEPRUS	PTST	$ 911,302	-	-	911,302
Tranex		PT365	2,488,848	-	-	-
Tranex		PT389	6,000	-	-	603
Canada Mountain	DEPCM	PTST	(742,254)	-	-	(742,254)
Non-Utility Property		PT389	18,592	-	-	1,868
Transmission	DEPRTR	PT365	8,788,496	-	-	-
Distribution	DEPRDI	PTD	16,184,415	-	-	-
General	DEPRGE	PT389	7,575,547	-	-	761,016
Total Depreciation Reserve	DEPR		$ 35,230,946	$ -	$ -	$ 932,535
Net Plant in Service	NPTIS		$ 88,571,870	$ -	$ -	$ 11,139,123

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Net Plant in Service							
Total Gas Utility Plant in Service			$ -	$ 5,215,829	$ 29,883,964	$ -	$ 1,952,324
Less:							
Reserve for Depreciation							
Storage	DEPRUS	PTST	-	-	-	-	-
Tranex		PT365	-	369,843	2,119,005	-	-
Tranex		PT389	-	233	1,338	-	97
Canada Mountain	DEPCM	PTST	-	-	-	-	-
Non-Utility Property		PT389	-	723	4,145	-	302
Transmission	DEPRTR	PT365	-	1,305,971	7,482,525	-	-
Distribution	DEPRDI	PTD	-	-	-	-	412,328
General	DEPRGE	PT389	-	294,758	1,688,811	-	123,078
Total Depreciation Reserve	DEPR		$ -	$ 1,971,529	$ 11,295,824	$ -	$ 535,805
Net Plant in Service	NPTIS		$ -	$ 3,244,301	$ 18,588,140	$ -	$ 1,416,519

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Net Plant in Service						
Total Gas Utility Plant in Service			$ 7,896,615	$ 45,243,461	$ 8,725,049	$ 12,813,915
Less:						
Reserve for Depreciation						
Storage	DEPRUS	PTST	-	-	-	-
Tranex		PT365	-	-	-	-
Tranex		PT389	394	2,259	436	640
Canada Mountain	DEPCM	PTST	-	-	-	-
Non-Utility Property		PT389	1,222	7,000	1,350	1,983
Transmission	DEPRTR	PT365	-	-	-	-
Distribution	DEPRDI	PTD	1,667,752	9,555,343	1,842,716	2,706,277
General	DEPRGE	PT389	497,815	2,852,219	550,041	807,809
Total Depreciation Reserve	DEPR		$ 2,167,183	$ 12,416,820	$ 2,394,542	$ 3,516,709
Net Plant in Service	NPTIS		$ 5,729,432	$ 32,826,640	$ 6,330,507	$ 9,297,206

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Net Plant in Service						
Total Gas Utility Plant in Service			$ -	$ -	123,802,816	ok
Less:						
Reserve for Depreciation						
Storage	DEPRUS	PTST	-	-	911,302	ok
Tranex		PT365	-	-	2,488,848	ok
Tranex		PT389	-	-	6,000	ok
Canada Mountain	DEPCM	PTST	-	-	(742,254)	ok
Non-Utility Property		PT389	-	-	18,592	ok
Transmission	DEPRTR	PT365	-	-	8,788,496	ok
Distribution	DEPRDI	PTD	-	-	16,184,415	ok
General	DEPRGE	PT389	-	-	7,575,547	ok
Total Depreciation Reserve	DEPR		$ -	$ -	35,230,946	ok
Net Plant in Service	NPTIS		$ -	$ -	88,571,870	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Net Utility Plant						
Net Plant in Service			$ 88,571,870	$ -	$ -	$ 11,139,123
Construction Work In Progress						
Storage	CWIPUS	PTST	$ 213,713	-	-	213,713
Tranex	CWIPCM	PTST	38,502	-	-	38,502
Transmission	CWIPTR	PT365	391,747	-	-	-
Distribution	CWIPMA	PTD	1,042,470	-	-	-
General	CWIPCO	PT389	316,310	-	-	31,776
Sub-Total CWIP	CWIPST		2,002,743	-	-	283,991
Administrative & Engineering Overhead	CWIPOH	CWIPST	(581,482)	-	-	(82,455)
Total Constr. Work In Progress	CWIP		$ 1,421,261	$ -	$ -	$ 201,536
Gas Stored Underground Non-Current	CWIP117	PTST	328,092	-	-	328,092
Adjustments						
Remove Canada Mountain		PTST	$ (10,605,135)	-	-	(10,605,135)
Non-Utility		PT389	18,592	-	-	1,868
Total Adjustments			$ (10,586,543)	$ -	$ -	$ (10,603,267)
Total Net Utility Plant	TNP		$ 79,734,680	$ -	$ -	$ 1,065,484

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Net Utility Plant							
Net Plant in Service			$ -	$ 3,244,301	$ 18,588,140	$ -	$ 1,416,519
Construction Work In Progress							
Storage	CWIPUS	PTST	-	-	-	-	-
Tranex	CWIPCM	PTST	-	-	-	-	-
Transmission	CWIPTR	PT365	-	58,214	333,534	-	-
Distribution	CWIPMA	PTD	-	-	-	-	26,559
General	CWIPCO	PT389	-	12,307	70,515	-	5,139
Sub-Total CWIP	CWIPST		-	70,521	404,048	-	31,698
Administrative & Engineering Overhead	CWIPOH	CWIPST	-	(20,475)	(117,312)	-	(9,203)
Total Constr. Work In Progress	CWIP		$ -	$ 50,046	$ 286,736	$ -	$ 22,495
Gas Stored Underground Non-Current	CWIP117	PTST	-	-	-	-	-
Adjustments							
Remove Canada Mountain		PTST	-	-	-	-	-
Non-Utility		PT389	-	723	4,145	-	302
Total Adjustments			$ -	$ 723	$ 4,145	$ -	$ 302
Total Net Utility Plant	TNP		$ -	$ 3,295,070	$ 18,879,021	$ -	$ 1,439,316

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Net Utility Plant						
Net Plant in Service			$ 5,729,432	$ 32,826,640	$ 6,330,507	$ 9,297,206
Construction Work In Progress						
Storage	CWIPUS	PTST	-	-	-	-
Tranex	CWIPCM	PTST	-	-	-	-
Transmission	CWIPTR	PT365	-	-	-	-
Distribution	CWIPMA	PTD	107,423	615,479	118,693	174,317
General	CWIPCO	PT389	20,786	119,092	22,966	33,729
Sub-Total CWIP	CWIPST		128,209	734,570	141,659	208,046
Administrative & Engineering Overhead	CWIPOH	CWIPST	(37,225)	(213,277)	(41,130)	(60,405)
Total Constr. Work In Progress	CWIP		$ 90,984	$ 521,293	$ 100,530	$ 147,641
Gas Stored Underground Non-Current	CWIP117	PTST	-	-	-	-
Adjustments						
Remove Canada Mountain		PTST	-	-	-	-
Non-Utility		PT389	1,222	7,000	1,350	1,983
Total Adjustments			$ 1,222	$ 7,000	$ 1,350	$ 1,983
Total Net Utility Plant	TNP		$ 5,821,639	$ 33,354,934	$ 6,432,387	$ 9,446,830

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Net Utility Plant						
Net Plant in Service			$ -	$ -	88,571,870	ok
Construction Work In Progress						
Storage	CWIPUS	PTST	-	-	213,713	ok
Tranex	CWIPCM	PTST	-	-	38,502	ok
Transmission	CWIPTR	PT365	-	-	391,747	ok
Distribution	CWIPMA	PTD	-	-	1,042,470	ok
General	CWIPCO	PT389	-	-	316,310	ok
Sub-Total CWIP	CWIPST		-	-	2,002,743	ok
Administrative & Engineering Overhead	CWIPOH	CWIPST	-	-	(581,482)	ok
Total Constr. Work In Progress	CWIP		$ -	$ -	2,002,743	ok
Gas Stored Underground Non-Current	CWIP117	PTST	-	-	328,092	ok
Adjustments						
Remove Canada Mountain		PTST	-	-	(10,605,135)	ok
Non-Utility		PT389	-	-	18,592	ok
Total Adjustments			$ -	$ -	(10,586,543)	ok
Total Net Utility Plant	TNP		$ -	$ -	79,734,680	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Net Cost Rate Base						
Total Net Utility Plant			$ 79,734,680	$ -	$ -	$ 1,065,484
Less:						
Accum. Deferred Income Taxes	DIT	NPTIS	$ 8,436,725	-	-	1,061,033
Investment Tax Credit	ITC	NPTIS	-	-	-	-
Plus:						
Materials and Supplies	MSP	NPTIS	$ 451,812	-	-	56,822
Prepayments	PPY	NPTIS	106,884	-	-	13,442
Gas Stored Underground	GSU	F003	265,579	-	-	265,579
Cash Working Capital	CWC	OMT	1,097,255	-	-	63,116
Adjustments:						
Unamortized Debt		NPTIS	$ 3,108,925	-	-	390,990
Regulatory		NPTIS		-	-	-
Advances for Construction		PT376	(220,060)	-	-	-
Depreciation Adjustment		DEPR	(20,212)	-	-	(535)
Net Cost Rate Base	NCRB		$ 76,088,138	$ -	$ -	$ 793,865

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Net Cost Rate Base							
Total Net Utility Plant			$ -	$ 3,295,070	$ 18,879,021	$ -	$ 1,439,316
Less:							
Accum. Deferred Income Taxes	DIT	NPTIS	-	309,029	1,770,574	-	134,928
Investment Tax Credit	ITC	NPTIS	-	-	-	-	-
Plus:							
Materials and Supplies	MSP	NPTIS	-	16,549	94,820	-	7,226
Prepayments	PPY	NPTIS	-	3,915	22,431	-	1,709
Gas Stored Underground	GSU	F003	-	-	-	-	-
Cash Working Capital	CWC	OMT	12,778	44,969	257,651	-	14,497
Adjustments:							
Unamortized Debt		NPTIS	-	113,877	652,455	-	49,721
Regulatory		NPTIS	-	-	-	-	-
Advances for Construction		PT376	-	-	-	-	-
Depreciation Adjustment		DEPR	-	(1,131)	(6,480)	-	(307)
Net Cost Rate Base	NCRB		$ 12,778	$ 3,164,221	$ 18,129,324	$ -	$ 1,377,234

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Net Cost Rate Base						
Total Net Utility Plant			$ 5,821,639	$ 33,354,934	$ 6,432,387	$ 9,446,830
Less:						
Accum. Deferred Income Taxes	DIT	NPTIS	545,745	3,126,832	602,999	885,586
Investment Tax Credit	ITC	NPTIS	-	-	-	-
Plus:						
Materials and Supplies	MSP	NPTIS	29,226	167,451	32,292	47,426
Prepayments	PPY	NPTIS	6,914	39,614	7,639	11,219
Gas Stored Underground	GSU	F003	-	-	-	-
Cash Working Capital	CWC	OMT	56,221	322,118	61,234	101,897
Adjustments:						
Unamortized Debt		NPTIS	201,106	1,152,234	222,205	326,337
Regulatory		NPTIS	-	-	-	-
Advances for Construction		PT376	(32,701)	(187,359)	-	-
Depreciation Adjustment		DEPR	(1,243)	(7,124)	(1,374)	(2,018)
Net Cost Rate Base	NCRB		$ 5,535,418	$ 31,715,037	$ 6,151,385	$ 9,046,107

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Net Cost Rate Base						
Total Net Utility Plant		$	-	$ -	79,734,680	ok
Less:						
Accum. Deferred Income Taxes	DIT	NPTIS	-	-	8,436,725	ok
Investment Tax Credit	ITC	NPTIS	-	-	-	ok
Plus:						
Materials and Supplies	MSP	NPTIS	-	-	451,812	ok
Prepayments	PPY	NPTIS	-	-	106,884	ok
Gas Stored Underground	GSU	F003	-	-	265,579	ok
Cash Working Capital	CWC	OMT	162,771	-	1,097,255	ok
Adjustments:						
Unamortized Debt		NPTIS	-	-	3,108,925	ok
Regulatory		NPTIS	-	-	-	ok
Advances for Construction		PT376	-	-	(220,060)	ok
Depreciation Adjustment		DEPR	-	-	(20,212)	ok
Net Cost Rate Base	NCRB	$	162,771	$ -	-	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses							
Operation Expenses							
Operation Expenses -- Labor							
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	$ 13,903	-	-	-
1.754.0100	Compressor Station Payroll	OM754.01	F004	41,071	-	-	-
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	22,516	-	-	22,516
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	17,191	-	-	17,191
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	1,761	-	-	1,761
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	2,210,003	-	-	-
1.903.0100	Cashering Payroll	OM903.01	F012	495,671	-	-	-
1.920.0100	Administrative Payroll	OM920.01	NPTIS	2,006,502	-	-	252,345
1.926.0100	Time Off Payroll	OM926.01	NPTIS	454,147	-	-	57,115
Total Labor		OMLBOE		$ 5,262,766	$ -	$ -	$ 350,929

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses								
Operation Expenses								
Operation Expenses -- Labor								
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	-	2,066	11,837	-	-
1.754.0100	Compressor Station Payroll	OM754.01	F004	41,071	-	-	-	-
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	-	-	-	-	-
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	-	-	-	-	-
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	-	-	-	-	-
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	-	95,592	547,694	-	39,915
1.903.0100	Cashering Payroll	OM903.01	F012	-	-	-	-	-
1.920.0100	Administrative Payroll	OM920.01	NPTIS	-	73,496	421,095	-	32,090
1.926.0100	Time Off Payroll	OM926.01	NPTIS	-	16,635	95,310	-	7,263
Total Labor		OMLBOE		$ 41,071	$ 187,789	$ 1,075,935	$ -	$ 79,268

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses							
Operation Expenses							
Operation Expenses -- Labor							
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	-	-	-	-
1.754.0100	Compressor Station Payroll	OM754.01	F004	-	-	-	-
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	-	-	-	-
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	-	-	-	-
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	-	-	-	-
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	161,445	924,996	178,382	261,979
1.903.0100	Cashering Payroll	OM903.01	F012	-	-	-	-
1.920.0100	Administrative Payroll	OM920.01	NPTIS	129,794	743,653	143,411	210,618
1.926.0100	Time Off Payroll	OM926.01	NPTIS	29,377	168,317	32,459	47,671
Total Labor		OMLBOE		$ 320,617	$ 1,836,965	$ 354,253	$ 520,268

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses							
Operation Expenses							
Operation Expenses -- Labor							
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	-	-	13,903	ok
1.754.0100	Compressor Station Payroll	OM754.01	F004	-	-	41,071	ok
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	-	-	22,516	ok
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	-	-	17,191	ok
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	-	-	1,761	ok
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	-	-	2,210,003	ok
1.903.0100	Cashering Payroll	OM903.01	F012	495,671	-	495,671	ok
1.920.0100	Administrative Payroll	OM920.01	NPTIS	-	-	2,006,502	ok
1.926.0100	Time Off Payroll	OM926.01	NPTIS	-	-	454,147	ok
Total Labor		OMLBOE		$ 495,671	$ -	5,262,766	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Transmission and Distribution							
1.900.0200	Operation Transportation Exp	OM900.02	F005	$ 538,911	-	-	-
1.920.0200	Adm Transportation Exp	OM920.02	F005	90,000	-	-	-
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	78,673	-	-	5,222
1.880.0200	Operations Office Utility	OM880.02	LBTOT	44,599	-	-	2,960
1.880.0300	Operation Office Misc	OM880.03	LBTOT	99,132	-	-	6,580
1.880.0400	Fees Training School	OM880.04	LBTOT	14,173	-	-	941
1.880.0500	Uniforms	OM880.05	OM900.01	49,153	-	-	-
1.880.0600	Welding Supplies	OM880.06	PTTD	7,770	-	-	-
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	3,654	-	-	367
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	14,520	-	-	1,459
1.871.0000	Telemetry Costs	OM871.00	PTSUB	35,141	-	-	3,530
1.753.0200	Wells & Gathering Misc	OM753.02	F005	(1,399)	-	-	-
1.754.0200	Compressor Station Misc	OM754.02	F004	21,773	-	-	-
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	2,374	-	-	2,374
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	9,485	-	-	9,485
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	5,484	-	-	5,484
1.825.0000	CM Storage Well Royalties	OM825.00	F003	54,064	-	-	54,064
1.856.0000	Right of Way Clearing	OM856.00	PTTD	54,869	-	-	-
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	53,056	-	-	5,330
Total Transmission and Distribution Oper Exp				$ 1,175,431	$ -	$ -	$ 97,796

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)								
Operation Expense -- Transmission and Distribution								
1.900.0200	Operation Transportation Exp	OM900.02	F005	-	80,082	458,829	-	-
1.920.0200	Adm Transportation Exp	OM920.02	F005	-	13,374	76,626	-	-
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	637	2,804	16,067	-	1,182
1.880.0200	Operations Office Utility	OM880.02	LBTOT	361	1,590	9,108	-	670
1.880.0300	Operation Office Misc	OM880.03	LBTOT	803	3,534	20,246	-	1,489
1.880.0400	Fees Training School	OM880.04	LBTOT	115	505	2,895	-	213
1.880.0500	Uniforms	OM880.05	OM900.01	-	2,126	12,181	-	888
1.880.0600	Welding Supplies	OM880.06	PTTD	-	336	1,926	-	140
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	-	142	815	-	59
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	-	565	3,237	-	236
1.871.0000	Telemetry Costs	OM871.00	PTSUB	-	1,367	7,834	-	571
1.753.0200	Wells & Gathering Misc	OM753.02	F005	-	(208)	(1,191)	-	-
1.754.0200	Compressor Station Misc	OM754.02	F004	21,773	-	-	-	-
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	-	-	-	-	-
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	-	-	-	-	-
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	-	-	-	-	-
1.825.0000	CM Storage Well Royalties	OM825.00	F003	-	-	-	-	-
1.856.0000	Right of Way Clearing	OM856.00	PTTD	-	2,373	13,598	-	991
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	-	2,064	11,828	-	862
Total Transmission and Distribution Oper Exp				$ 23,690	$ 110,656	$ 633,998	$ -	$ 7,301

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Transmission and Distribution							
1.900.0200	Operation Transportation Exp	OM900.02	F005	-	-	-	-
1.920.0200	Adm Transportation Exp	OM920.02	F005	-	-	-	-
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	4,780	27,387	5,281	8,065
1.880.0200	Operations Office Utility	OM880.02	LBTOT	2,710	15,525	2,994	4,572
1.880.0300	Operation Office Misc	OM880.03	LBTOT	6,023	34,509	6,655	10,163
1.880.0400	Fees Training School	OM880.04	LBTOT	861	4,934	951	1,453
1.880.0500	Uniforms	OM880.05	OM900.01	3,591	20,573	3,967	5,827
1.880.0600	Welding Supplies	OM880.06	PTTD	568	3,252	627	921
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	240	1,376	265	390
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	954	5,467	1,054	1,548
1.871.0000	Telemetry Costs	OM871.00	PTSUB	2,309	13,231	2,551	3,747
1.753.0200	Wells & Gathering Misc	OM753.02	F005	-	-	-	-
1.754.0200	Compressor Station Misc	OM754.02	F004	-	-	-	-
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	-	-	-	-
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	-	-	-	-
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	-	-	-	-
1.825.0000	CM Storage Well Royalties	OM825.00	F003	-	-	-	-
1.856.0000	Right of Way Clearing	OM856.00	PTTD	4,008	22,965	4,429	6,504
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	3,486	19,976	3,852	5,658
Total Transmission and Distribution Oper Exp				$ 29,530	$ 169,194	$ 32,628	$ 48,848

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Transmission and Distribution							
1.900.0200	Operation Transportation Exp	OM900.02	F005	-	-	538,911	ok
1.920.0200	Adm Transportation Exp	OM920.02	F005	-	-	90,000	ok
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	7,246	-	78,673	ok
1.880.0200	Operations Office Utility	OM880.02	LBTOT	4,108	-	44,599	ok
1.880.0300	Operation Office Misc	OM880.03	LBTOT	9,131	-	99,132	ok
1.880.0400	Fees Training School	OM880.04	LBTOT	1,305	-	14,173	ok
1.880.0500	Uniforms	OM880.05	OM900.01	-	-	49,153	ok
1.880.0600	Welding Supplies	OM880.06	PTTD	-	-	7,770	ok
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	-	-	3,654	ok
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	-	-	14,520	ok
1.871.0000	Telemetry Costs	OM871.00	PTSUB	-	-	35,141	ok
1.753.0200	Wells & Gathering Misc	OM753.02	F005	-	-	(1,399)	ok
1.754.0200	Compressor Station Misc	OM754.02	F004	-	-	21,773	ok
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	-	-	2,374	ok
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	-	-	9,485	ok
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	-	-	5,484	ok
1.825.0000	CM Storage Well Royalties	OM825.00	F003	-	-	54,064	ok
1.856.0000	Right of Way Clearing	OM856.00	PTTD	-	-	54,869	ok
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	-	-	53,056	ok
Total Transmission and Distribution Oper Exp				$ 21,790	$ -	1,175,431	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)						
Operation Expense -- Customer Accounts						
1.903.0200 Customer Collections & Billing	OM903.02	F012	$ 214,271	-	-	-
1.904.0000 Uncollectible Accounts	OM904.00	F012	345,870	-	-	-
Total Customer Accounts			$ 560,141	$ -	$ -	$ -
Operation Expense -- Administrative & General						
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	$ 553,713	-	-	36,755
1.923.0000 Outside Services	OM923.00	LBTOT	343,946	-	-	22,831
1.924.0000 Insurance	OM924.00	NPTIS	419,058	-	-	52,702
1.926.0200 Employee Benefits	OM926.02	LBTOT	1,361,086	-	-	90,349
1.913.0000 Advertising	OM913.00	NPTIS	10,775	-	-	1,355
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	104,940	-	-	13,198
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	440,458	-	-	55,394
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	(2,046,578)	-	-	(257,385)
Total Administrative and General	OMTAG		$ 1,187,397	$ -	$ -	$ 15,198
Total Operation Expense	OMTEO		$ 8,185,735	$ -	$ -	$ 463,924

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Customer Accounts							
1.903.0200 Customer Collections & Billing	OM903.02	F012	-	-	-	-	-
1.904.0000 Uncollectible Accounts	OM904.00	F012	-	-	-	-	-
Total Customer Accounts			$ -	$ -	$ -	$ -	$ -
Operation Expense -- Administrative & General							
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	4,486	19,737	113,085	-	8,318
1.923.0000 Outside Services	OM923.00	LBTOT	2,787	12,260	70,244	-	5,167
1.924.0000 Insurance	OM924.00	NPTIS	-	15,350	87,946	-	6,702
1.926.0200 Employee Benefits	OM926.02	LBTOT	11,028	48,517	277,976	-	20,445
1.913.0000 Advertising	OM913.00	NPTIS	-	395	2,261	-	172
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	-	3,844	22,023	-	1,678
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	-	16,134	92,437	-	7,044
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	-	(74,964)	(429,505)	-	(32,731)
Total Administrative and General	OMTAG		$ 18,302	$ 41,272	$ 236,467	$ -	$ 16,796
Total Operation Expense	OMTEO		$ 83,062	$ 339,717	$ 1,946,400	$ -	$ 103,364

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)						
Operation Expense -- Customer Accounts						
1.903.0200 Customer Collections & Billing	OM903.02	F012	-	-	-	-
1.904.0000 Uncollectible Accounts	OM904.00	F012	-	-	-	-
Total Customer Accounts			$ -	$ -	$ -	$ -
Operation Expense -- Administrative & General						
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	33,642	192,752	37,172	56,765
1.923.0000 Outside Services	OM923.00	LBTOT	20,897	119,731	23,090	35,260
1.924.0000 Insurance	OM924.00	NPTIS	27,107	155,312	29,951	43,988
1.926.0200 Employee Benefits	OM926.02	LBTOT	82,696	473,805	91,372	139,534
1.913.0000 Advertising	OM913.00	NPTIS	697	3,993	770	1,131
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	6,788	38,893	7,500	11,015
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	28,492	163,243	31,481	46,234
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	(132,387)	(758,506)	(146,275)	(214,825)
Total Administrative and General	OMTAG		$ 67,934	$ 389,224	$ 75,060	$ 119,102
Total Operation Expense	OMTEO		$ 418,081	$ 2,395,382	$ 461,941	$ 688,218

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)						
Operation Expense -- Customer Accounts						
1.903.0200 Customer Collections & Billing	OM903.02	F012	214,271	-	214,271	ok
1.904.0000 Uncollectible Accounts	OM904.00	F012	345,870	-	345,870	ok
Total Customer Accounts			$ 560,141	$ -	560,141	ok
Operation Expense -- Administrative & General						
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	51,000	-	553,713	ok
1.923.0000 Outside Services	OM923.00	LBTOT	31,679	-	343,946	ok
1.924.0000 Insurance	OM924.00	NPTIS	-	-	419,058	ok
1.926.0200 Employee Benefits	OM926.02	LBTOT	125,363	-	1,361,086	ok
1.913.0000 Advertising	OM913.00	NPTIS	-	-	10,775	ok
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	-	-	104,940	ok
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	-	-	440,458	ok
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	-	-	(2,046,578)	ok
Total Administrative and General	OMTAG		$ 208,042	$ -	1,187,397	ok
Total Operation Expense	OMTEO		$ 1,285,645	$ -	8,185,735	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector		Total Company		Gas Supply Demand		Gas Supply Commodity		Storage Demand
Operation and Maintenance Expenses (Continued)											
Maintenance Expense											
Maintenance Expense -- Labor											
1.764.0100	Maint Well & Gathering - Payroll	OM764.01	F005	$	1,870		-		-		-
1.765.0100	Maint Compressor Station - Payroll	OM765.01	F004		2,533		-		-		-
1.887.0100	Maint Trans & Dist - Payroll	OM887.01	PTTD		74,033		-		-		-
1.835.0100	CM Maint of Meas & Regulators - Payro	OM835.01	F003		1,870		-		-		1,870
1.834.0100	CM Maint of Compressors - Payroll	OM834.01	F003		1,481		-		-		1,481
1.832.0100	CM Maint of Resevoirs	OM832.01	F003		1,501		-		-		1,501
1.893.0100	Maint of Meters & Regulators - Payroll	OM893.01	F011		21,123		-		-		-
1.894.0100	Mant of Other Equipment - Payroll	OM894.01	PTSUB		14,397		-		-		1,446
Total Maintenance Labor		OMLBME		$	118,810	$	-	$	-	$	6,299

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)							
Maintenance Expense							
Maintenance Expense -- Labor							
1.764.0100 Maint Well & Gathering - Payroll	OM764.01	F005	-	278	1,592	-	-
1.765.0100 Maint Compressor Station - Payroll	OM765.01	F004	2,533	-	-	-	-
1.887.0100 Maint Trans & Dist - Payroll	OM887.01	PTTD	-	3,202	18,347	-	1,337
1.835.0100 CM Maint of Meas & Regulators - Payro	OM835.01	F003	-	-	-	-	-
1.834.0100 CM Maint of Compressors - Payroll	OM834.01	F003	-	-	-	-	-
1.832.0100 CM Maint of Resevoirs	OM832.01	F003	-	-	-	-	-
1.893.0100 Maint of Meters & Regulators - Payroll	OM893.01	F011	-	-	-	-	-
1.894.0100 Mant of Other Equipment - Payroll	OM894.01	PTSUB	-	560	3,209	-	234
Total Maintenance Labor	OMLBME		$ 2,533	$ 4,040	$ 23,149	$ -	$ 1,571

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)							
Maintenance Expense							
Maintenance Expense -- Labor							
1.764.0100	Maint Well & Gathering - Payroll	OM764.01	F005	-	-	-	-
1.765.0100	Maint Compressor Station - Payroll	OM765.01	F004	-	-	-	-
1.887.0100	Maint Trans & Dist - Payroll	OM887.01	PTTD	5,408	30,987	5,976	8,776
1.835.0100	CM Maint of Meas & Regulators - Payro	OM835.01	F003	-	-	-	-
1.834.0100	CM Maint of Compressors - Payroll	OM834.01	F003	-	-	-	-
1.832.0100	CM Maint of Resevoirs	OM832.01	F003	-	-	-	-
1.893.0100	Maint of Meters & Regulators - Payroll	OM893.01	F011	-	-	-	21,123
1.894.0100	Mant of Other Equipment - Payroll	OM894.01	PTSUB	946	5,420	1,045	1,535
Total Maintenance Labor		OMLBME		$ 6,354	$ 36,407	$ 7,021	$ 31,435

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)							
Maintenance Expense							
Maintenance Expense -- Labor							
1.764.0100	Maint Well & Gathering - Payroll	OM764.01	F005	-	-	1,870	ok
1.765.0100	Maint Compressor Station - Payroll	OM765.01	F004	-	-	2,533	ok
1.887.0100	Maint Trans & Dist - Payroll	OM887.01	PTTD	-	-	74,033	ok
1.835.0100	CM Maint of Meas & Regulators - Payro	OM835.01	F003	-	-	1,870	ok
1.834.0100	CM Maint of Compressors - Payroll	OM834.01	F003	-	-	1,481	ok
1.832.0100	CM Maint of Resevoirs	OM832.01	F003	-	-	1,501	ok
1.893.0100	Maint of Meters & Regulators - Payroll	OM893.01	F011	-	-	21,123	ok
1.894.0100	Mant of Other Equipment - Payroll	OM894.01	PTSUB	-	-	14,397	ok
Total Maintenance Labor		OMLBME		$ -	$ -	118,810	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector		Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)								
Maintenance Expense -- Transmission and Distribution								
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	$	31,246	-	-	3,139
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB		13,523	-	-	1,358
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB		68,262	-	-	-
1.893.0200	Maint of Meters & Regulators	OM893.02	F011		63,874	-	-	-
1.764.0200	Maint Wells & Gathering	OM764.02	F005		3,337	-	-	-
1.765.0200	Maint Compressor Station	OM765.02	F004		15,248	-	-	-
1.831.0200	CM Maint Structures	OM831.02	F003		609	-	-	609
1.832.0200	CM Maint Resevoirs	OM832.02	F003		47	-	-	47
1.833.0200	CM Maint of Lines	OM833.02	F003		110	-	-	110
1.834.0200	CM Maint of Compressors	OM834.02	F003		5,725	-	-	5,725
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003		1,834	-	-	1,834
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003		1,052	-	-	1,052
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008		2,103	-	-	-
1.889.0000	Maint Station Trans & Distr	OM889.00	F008		4,222	-	-	-
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB		72,217	-	-	7,255
Total Transmission & Distribution Maintenance				$	283,408	$ -	$ -	$ 21,129

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)								
Maintenance Expense -- Transmission and Distribution								
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	-	1,216	6,966	-	508
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB	-	526	3,015	-	220
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB	-	3,772	21,614	-	-
1.893.0200	Maint of Meters & Regulators	OM893.02	F011	-	-	-	-	-
1.764.0200	Maint Wells & Gathering	OM764.02	F005	-	496	2,841	-	-
1.765.0200	Maint Compressor Station	OM765.02	F004	15,248	-	-	-	-
1.831.0200	CM Maint Structures	OM831.02	F003	-	-	-	-	-
1.832.0200	CM Maint Resevoirs	OM832.02	F003	-	-	-	-	-
1.833.0200	CM Maint of Lines	OM833.02	F003	-	-	-	-	-
1.834.0200	CM Maint of Compressors	OM834.02	F003	-	-	-	-	-
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003	-	-	-	-	-
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003	-	-	-	-	-
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008	-	-	-	-	2,103
1.889.0000	Maint Station Trans & Distr	OM889.00	F008	-	-	-	-	4,222
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB	-	2,810	16,099	-	1,173
Total Transmission & Distribution Maintenance				$ 15,248	$ 8,820	$ 50,534	$ -	$ 8,225

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)							
Maintenance Expense -- Transmission and Distribution							
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	2,053	11,764	2,269	3,332
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB	889	5,091	982	1,442
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB	6,371	36,504	-	-
1.893.0200	Maint of Meters & Regulators	OM893.02	F011	-	-	-	63,874
1.764.0200	Maint Wells & Gathering	OM764.02	F005	-	-	-	-
1.765.0200	Maint Compressor Station	OM765.02	F004	-	-	-	-
1.831.0200	CM Maint Structures	OM831.02	F003	-	-	-	-
1.832.0200	CM Maint Resevoirs	OM832.02	F003	-	-	-	-
1.833.0200	CM Maint of Lines	OM833.02	F003	-	-	-	-
1.834.0200	CM Maint of Compressors	OM834.02	F003	-	-	-	-
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003	-	-	-	-
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003	-	-	-	-
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008	-	-	-	-
1.889.0000	Maint Station Trans & Distr	OM889.00	F008	-	-	-	-
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB	4,746	27,190	5,243	7,701
Total Transmission & Distribution Maintenance				$ 14,059	$ 80,549	$ 8,494	$ 76,349

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)							
Maintenance Expense -- Transmission and Distribution							
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	-	-	31,246	ok
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB	-	-	13,523	ok
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB	-	-	68,262	ok
1.893.0200	Maint of Meters & Regulators	OM893.02	F011	-	-	63,874	ok
1.764.0200	Maint Wells & Gathering	OM764.02	F005	-	-	3,337	ok
1.765.0200	Maint Compressor Station	OM765.02	F004	-	-	15,248	ok
1.831.0200	CM Maint Structures	OM831.02	F003	-	-	609	ok
1.832.0200	CM Maint Resevoirs	OM832.02	F003	-	-	47	ok
1.833.0200	CM Maint of Lines	OM833.02	F003	-	-	110	ok
1.834.0200	CM Maint of Compressors	OM834.02	F003	-	-	5,725	ok
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003	-	-	1,834	ok
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003	-	-	1,052	ok
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008	-	-	2,103	ok
1.889.0000	Maint Station Trans & Distr	OM889.00	F008	-	-	4,222	ok
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB	-	-	72,217	ok
Total Transmission & Distribution Maintenance				$ -	$ -	283,408	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)						
Maintenance of General Plant						
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	$ 41,253	-	-	4,144
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	22,273	-	-	1,478
1.932.0300 Maint General Structures	OM932.03	LBTOT	21,263	-	-	1,411
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	55,176	-	-	3,663
Total Maintenance of General Plant			$ 139,965	$ -	$ -	$ 10,697
Total Maintenance Expense	OMTME		$ 542,182	$ -	$ -	$ 38,124
Total Operation and Maintenance Expenses	OMT		$ 8,727,917	$ -	$ -	$ 502,048
Sub-Total Payroll	LBTOT		$ 5,381,576	$ -	$ -	$ 357,228

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)							
Maintenance of General Plant							
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	-	1,605	9,196	-	670
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	180	794	4,549	-	335
1.932.0300 Maint General Structures	OM932.03	LBTOT	172	758	4,343	-	319
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	447	1,967	11,269	-	829
Total Maintenance of General Plant			$ 800	$ 5,124	$ 29,357	$ -	$ 2,153
Total Maintenance Expense	OMTME		$ 18,581	$ 17,984	$ 103,040	$ -	$ 11,949
Total Operation and Maintenance Expenses	OMT		$ 101,644	$ 357,701	$ 2,049,440	$ -	$ 115,314
Sub-Total Payroll	LBTOT		$ 43,604	$ 191,830	$ 1,099,084	$ -	$ 80,839

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)						
Maintenance of General Plant						
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	2,711	15,532	2,995	4,399
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	1,353	7,753	1,495	2,283
1.932.0300 Maint General Structures	OM932.03	LBTOT	1,292	7,402	1,427	2,180
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	3,352	19,207	3,704	5,657
Total Maintenance of General Plant			$ 8,708	$ 49,894	$ 9,622	$ 14,519
Total Maintenance Expense	OMTME		$ 29,121	$ 166,851	$ 25,137	$ 122,302
Total Operation and Maintenance Expenses	OMT		$ 447,202	$ 2,562,233	$ 487,078	$ 810,520
Sub-Total Payroll	LBTOT		$ 326,971	$ 1,873,372	$ 361,274	$ 551,703

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)						
Maintenance of General Plant						
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	-	-	41,253	ok
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	2,051	-	22,273	ok
1.932.0300 Maint General Structures	OM932.03	LBTOT	1,958	-	21,263	ok
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	5,082	-	55,176	ok
Total Maintenance of General Plant			$ 9,092	$ -	139,965	ok
Total Maintenance Expense	OMTME		$ 9,092	$ -	542,182	ok
Total Operation and Maintenance Expenses	OMT		$ 1,294,736	$ -	8,727,917	ok
Sub-Total Payroll	LBTOT		$ 495,671	$ -	5,381,576	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector		Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Other Expenses							
Depreciation Expenses							
Total Depreciation Expenses	DEPREX	DEPR	$	3,570,354	-	-	94,504
Taxes Other Than Income Taxes							
Liscense & Privilege Fee	OTRE	PTIS	$	423	-	-	41
Property Taxes	OTPP	PTIS		742,584	-	-	72,407
Payroll Taxes	OTUN	LBTOT		480,841	-	-	31,918
Total Taxes Other Than Income Taxes	OTT		$	1,223,848	$ -	$ -	$ 104,367
Interest Expenses	INT	PTIS	$	3,114,019	-	-	303,639

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Other Expenses							
Depreciation Expenses							
Total Depreciation Expenses	DEPREX	DEPR	-	199,797	1,144,735	-	54,299
Taxes Other Than Income Taxes							
Liscense & Privilege Fee	OTRE	PTIS	-	18	102	-	7
Property Taxes	OTPP	PTIS	-	31,285	179,248	-	11,710
Payroll Taxes	OTUN	LBTOT	3,896	17,140	98,203	-	7,223
Total Taxes Other Than Income Taxes	OTT		$ 3,896	$ 48,443	$ 277,552	$ -	$ 18,940
Interest Expenses	INT	PTIS	-	131,194	751,673	-	49,107

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Other Expenses						
Depreciation Expenses						
Total Depreciation Expenses	DEPREX	DEPR	219,625	1,258,338	242,666	356,388
Taxes Other Than Income Taxes						
Liscense & Privilege Fee	OTRE	PTIS	27	154	30	44
Property Taxes	OTPP	PTIS	47,365	271,376	52,334	76,859
Payroll Taxes	OTUN	LBTOT	29,215	167,385	32,280	49,294
Total Taxes Other Than Income Taxes	OTT		$ 76,607	$ 438,915	$ 84,643	$ 126,198
Interest Expenses	INT	PTIS	198,624	1,138,011	219,462	322,309

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Other Expenses						
Depreciation Expenses						
Total Depreciation Expenses	DEPREX	DEPR	-	-	3,570,354	ok
Taxes Other Than Income Taxes						
Liscense & Privilege Fee	OTRE	PTIS	-	-	423	ok
Property Taxes	OTPP	PTIS	-	-	742,584	ok
Payroll Taxes	OTUN	LBTOT	44,288	-	480,841	ok
Total Taxes Other Than Income Taxes	OTT	$	44,288	$ -	1,223,848	ok
Interest Expenses	INT	PTIS	-	-	3,114,019	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Functional Assignment Vectors						
Gas Supply Demand	F001		1.000000	1.000000	0.000000	0.000000
Gas Supply Commodity	F002		1.000000	0.000000	1.000000	0.000000
Storage Demand	F003		1.000000	0.000000	0.000000	1.000000
Storage Commodity	F004		1.000000	0.000000	0.000000	0.000000
Transmission Demand	F005		1.000000	0.000000	0.000000	0.000000
Transmission Commodity	F006		1.000000	0.000000	0.000000	0.000000
Distribution Expense Commodity	F007		1.000000	0.000000	0.000000	0.000000
Distribution Structures & Equipment	F008		1.000000	0.000000	0.000000	0.000000
Distribution Mains	F009		1.000000	0.000000	0.000000	0.000000
Services	F010		1.000000	0.000000	0.000000	0.000000
Meters	F011		1.000000	0.000000	0.000000	0.000000
Customer Accounts	F012		1.000000	0.000000	0.000000	0.000000
Customer Marketing	F013		1.000000	0.000000	0.000000	0.000000
Transmission & Distribution Mains	TDMSUB		$ 74,031,252	$ -	$ -	$ -

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Functional Assignment Vectors							
Gas Supply Demand	F001		0.000000	0.000000	0.000000	0.000000	0.000000
Gas Supply Commodity	F002		0.000000	0.000000	0.000000	0.000000	0.000000
Storage Demand	F003		0.000000	0.000000	0.000000	0.000000	0.000000
Storage Commodity	F004		1.000000	0.000000	0.000000	0.000000	0.000000
Transmission Demand	F005		0.000000	0.148600	0.851400	0.000000	0.000000
Transmission Commodity	F006		0.000000	0.000000	1.000000	0.000000	0.000000
Distribution Expense Commodity	F007		0.000000	0.000000	0.000000	1.000000	0.000000
Distribution Structures & Equipment	F008		0.000000	0.000000	0.000000	0.000000	1.000000
Distribution Mains	F009		0.000000	0.000000	0.000000	0.000000	0.000000
Services	F010		0.000000	0.000000	0.000000	0.000000	0.000000
Meters	F011		0.000000	0.000000	0.000000	0.000000	0.000000
Customer Accounts	F012		0.000000	0.000000	0.000000	0.000000	0.000000
Customer Marketing	F013		0.000000	0.000000	0.000000	0.000000	0.000000
Transmission & Distribution Mains	TDMSUB		$ -	$ 4,091,293	$ 23,440,961	$ -	$ -

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Functional Assignment Vectors						
Gas Supply Demand	F001		0.000000	0.000000	0.000000	0.000000
Gas Supply Commodity	F002		0.000000	0.000000	0.000000	0.000000
Storage Demand	F003		0.000000	0.000000	0.000000	0.000000
Storage Commodity	F004		0.000000	0.000000	0.000000	0.000000
Transmission Demand	F005		0.000000	0.000000	0.000000	0.000000
Transmission Commodity	F006		0.000000	0.000000	0.000000	0.000000
Distribution Expense Commodity	F007		0.000000	0.000000	0.000000	0.000000
Distribution Structures & Equipment	F008		0.000000	0.000000	0.000000	0.000000
Distribution Mains	F009		0.148600	0.851400	0.000000	0.000000
Services	F010		0.000000	0.000000	1.000000	0.000000
Meters	F011		0.000000	0.000000	0.000000	1.000000
Customer Accounts	F012		0.000000	0.000000	0.000000	0.000000
Customer Marketing	F013		0.000000	0.000000	0.000000	0.000000
Transmission & Distribution Mains	TDMSUB		$ 6,909,751	$ 39,589,247	$ -	$ -

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Functional Assignment Vectors						
Gas Supply Demand	F001		0.000000	0.000000	-	ok
Gas Supply Commodity	F002		0.000000	0.000000	1.000000	ok
Storage Demand	F003		0.000000	0.000000	1.000000	ok
Storage Commodity	F004		0.000000	0.000000	1.000000	ok
Transmission Demand	F005		0.000000	0.000000	1.000000	ok
Transmission Commodity	F006		0.000000	0.000000	1.000000	ok
Distribution Expense Commodity	F007		0.000000	0.000000	1.000000	ok
Distribution Structures & Equipment	F008		0.000000	0.000000	1.000000	ok
Distribution Mains	F009		0.000000	0.000000	1.000000	ok
Services	F010		0.000000	0.000000	1.000000	ok
Meters	F011		0.000000	0.000000	1.000000	ok
Customer Accounts	F012		1.000000	0.000000	1.000000	ok
Customer Marketing	F013		0.000000	1.000000	1.000000	ok
Transmission & Distribution Mains	TDMSUB	$	-	$ -	74,031,252	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Internally Generated Functional Vectors						
Sub-Total Distribution Plant		PTDSUB	1.000000	-	-	-
Storage-Transmission-Distribution Subtotal		PTSUB	1.000000	-	-	0.100457
Total Storage Plant		PTST	1.000000	-	-	1.000000
Transmission Plant		PT365	1.000000	-	-	-
General Plant		PT389	1.000000	-	-	0.100457
Total Distribution Plant		PTD	1.000000	-	-	-
Sub-Total CWIP		CWIPST	1.000000	-	-	0.141801
Net Plant in Service		NPTIS	1.000000	-	-	0.125764
Total Operation and Maintenance Expenses		OMT	1.000000	-	-	0.057522
Total Depreciation Reserve		DEPR	1.000000	-	-	0.026469
Transmission -Distribution Plant Subtotal		PTTD	1.000000	-	-	-
Total Labor Expenses		LBTOT	1.000000	-	-	0.066380
Transmission and Distribution Payroll		OM900.01	1.000000	-	-	-
Transmission and Distribution Mains		TDMSUB	1.000000	-	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Customer	Distribution Other Not Used	Distribution Structures & Equipment Demand
Internally Generated Functional Vectors							
Sub-Total Distribution Plant		PTDSUB	-	-	-	-	0.025477
Storage-Transmission-Distribution Subtotal		PTSUB	-	0.038909	0.222929	-	0.016247
Total Storage Plant		PTST	-	-	-	-	-
Transmission Plant		PT365	-	0.851400	0.148600	-	-
General Plant		PT389	-	0.038909	0.222929	-	0.016247
Total Distribution Plant		PTD	-	-	-	-	0.025477
Sub-Total CWIP		CWIPST	-	0.035212	0.201748	-	0.015827
Net Plant in Service		NPTIS	-	0.036629	0.209865	-	0.015993
Total Operation and Maintenance Expenses		OMT	0.011646	0.040984	0.234814	-	0.013212
Total Depreciation Reserve		DEPR	-	0.055960	0.320622	-	0.015208
Transmission -Distribution Plant Subtotal		PTTD	-	0.043254	0.247825	-	0.018061
Total Labor Expenses		LBTOT	0.008103	0.035646	0.204231	-	0.015021
Transmission and Distribution Payroll		OM900.01	-	0.043254	0.247825	-	0.018061
Transmission and Distribution Mains		TDMSUB	-	0.055264	0.316636	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Internally Generated Functional Vectors						
Sub-Total Distribution Plant		PTDSUB	0.103047	0.590404	0.113857	0.167215
Storage-Transmission-Distribution Subtotal		PTSUB	0.065713	0.376503	0.072607	0.106634
Total Storage Plant		PTST	-	-	-	-
Transmission Plant		PT365	-	-	-	-
General Plant		PT389	0.065713	0.376503	0.072607	0.106634
Total Distribution Plant		PTD	0.103047	0.590404	0.113857	0.167215
Sub-Total CWIP		CWIPST	0.064017	0.366782	0.070733	0.103881
Net Plant in Service		NPTIS	0.064687	0.370622	0.071473	0.104968
Total Operation and Maintenance Expenses		OMT	0.051238	0.293568	0.055807	0.092865
Total Depreciation Reserve		DEPR	0.061514	0.352441	0.067967	0.099819
Transmission -Distribution Plant Subtotal		PTTD	0.073052	0.418550	0.080716	0.118542
Total Labor Expenses		LBTOT	0.060757	0.348108	0.067132	0.102517
Transmission and Distribution Payroll		OM900.01	0.073052	0.418550	0.080716	0.118542
Transmission and Distribution Mains		TDMSUB	0.093336	0.534764	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Internally Generated Functional Vectors						
Sub-Total Distribution Plant		PTDSUB	-	-	1.000000	ok
Storage-Transmission-Distribution Subtotal		PTSUB	-	-	1.000000	ok
Total Storage Plant		PTST	-	-	1.000000	ok
Transmission Plant		PT365	-	-	1.000000	ok
General Plant		PT389	-	-	1.000000	ok
Total Distribution Plant		PTD	-	-	1.000000	ok
Sub-Total CWIP		CWIPST	-	-	1.000000	ok
Net Plant in Service		NPTIS	-	-	1.000000	ok
Total Operation and Maintenance Expenses		OMT	0.148344	-	1.000000	ok
Total Depreciation Reserve		DEPR	-	-	1.000000	ok
Transmission -Distribution Plant Subtotal		PTTD	-	-	1.000000	ok
Total Labor Expenses		LBTOT	0.092105	-	1.000000	ok
Transmission and Distribution Payroll		OM900.01	-	-	1.000000	ok
Transmission and Distribution Mains		TDMSUB	-	-	1.000000	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Plant in Service							
Gas Supply							
Demand	PTIS	PTISGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	PTIS	PTISGSC	COM01	-	-	-	-
Total Gas Supply				$ -	$ -	$ -	$ -
Storage							
Demand	PTIS	PTISSD	DEM02	$ 12,071,658	$ 6,330,797	$ 1,621,755	$ 4,119,106
Commodity	PTIS	PTISSC	COM02	-	-	-	-
Total Storage				$ 12,071,658	$ 6,330,797	$ 1,621,755	$ 4,119,106
Transmission							
Demand	PTIS	PTISTD	DEM03	$ 5,215,829	$ 2,380,093	$ 597,673	$ 1,223,968
Customer	PTIS	PTISTC	CUST01	29,883,964	25,754,220	3,397,931	695,067
Total Transmission				$ 35,099,794	$ 28,134,313	$ 3,995,604	$ 1,919,035
Distribution Other							
Commodity	PTIS	PTISDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	PTIS	PTISDSD	DEM04	$ 1,952,324	$ 1,007,770	$ 253,064	$ 518,248

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Plant in Service								
Gas Supply								
Demand	PTIS	PTISGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	PTIS	PTISGSC	COM01	-	-	-	-	ok
Total Gas Supply				$ -	$ -	$ -	$ -	ok
Storage								
Demand	PTIS	PTISSD	DEM02	$ -	$ -	$ -	$ 12,071,658	ok
Commodity	PTIS	PTISSC	COM02	-	-	-	-	ok
Total Storage				$ -	$ -	$ -	$ 12,071,658	ok
Transmission								
Demand	PTIS	PTISTD	DEM03	$ 331,327	$ 385,169	$ 297,599	$ 5,215,829	ok
Customer	PTIS	PTISTC	CUST01	34,402	2,346	-	29,883,964	ok
Total Transmission				$ 365,729	$ 387,514	$ 297,599	$ 35,099,794	ok
Distribution Other								
Commodity	PTIS	PTISDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	PTIS	PTISDSD	DEM04	$ 140,289	$ 32,951	$ -	$ 1,952,324	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Plant in Service (Continued)							
Distribution Mains							
Demand	PTIS	PTISDMD	DEM05	$ 7,896,615	$ 4,076,155	$ 1,023,576	$ 2,096,172
Customer	PTIS	PTISDMC	CUST01	45,243,461	38,991,146	5,144,369	1,052,311
Total Distribution Mains				53,140,076	$ 43,067,302	$ 6,167,946	$ 3,148,483
Services							
Customer	PTIS	PTISSC	CUST02	$ 8,725,049	$ 7,358,256	$ 1,100,808	$ 251,765
Meters							
Customer	PTIS	PTISMC	CUST03	$ 12,813,915	$ 6,118,911	$ 1,056,632	$ 4,130,683
Customer Accounts							
Customer	PTIS	PTISCAC	CUST04	$ -	$ -	$ -	$ -
Other Services							
Customer	PTIS	PTISCSC	CUST05	$ -	$ -	$ -	$ -
Total		PLT		$ 123,802,816	$ 92,017,349	$ 14,195,809	$ 14,087,321

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Plant in Service (Continued)								
Distribution Mains								
Demand	PTIS	PTISDMD	DEM05	$ 567,432	$ 133,280	$ -	$ 7,896,615	ok
Customer	PTIS	PTISDMC	CUST01	52,083	3,551	-	45,243,461	ok
Total Distribution Mains				$ 619,515	$ 136,831	$ -	$ 53,140,076	ok
Services								
Customer	PTIS	PTISSC	CUST02	$ 12,461	$ 1,759	$ -	$ 8,725,049	ok
Meters								
Customer	PTIS	PTISMC	CUST03	$ 1,187,183	$ 234,260	$ 86,246	$ 12,813,915	ok
Customer Accounts								
Customer	PTIS	PTISCAC	CUST04	$ -	$ -	$ -	$ -	ok
Other Services								
Customer	PTIS	PTISCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		PLT		$ 2,325,176	$ 793,316	$ 383,844	$ 123,802,816	ok

DELTA NATURAL GAS COMPANY, INC.

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12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Rate Base							
Gas Supply							
Demand	NCRB	RBGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	NCRB	RBGSC	COM01	-	-	-	-
Total Gas Supply				$ -	$ -	$ -	$ -
Storage							
Demand	NCRB	RBSD	DEM02	$ 793,865	$ 416,330	$ 106,651	$ 270,883
Commodity	NCRB	RBSC	COM02	12,778	6,701	1,717	4,360
Total Storage				$ 806,643	$ 423,032	$ 108,368	$ 275,244
Transmission							
Demand	NCRB	RBTD	DEM03	$ 3,164,221	$ 1,443,901	$ 362,583	$ 742,529
Customer	NCRB	RBTC	CUST01	18,129,324	15,623,984	2,061,379	421,667
Total Transmission				$ 21,293,544	$ 17,067,885	$ 2,423,962	$ 1,164,197
Distribution Other							
Commodity	NCRB	RBDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	NCRB	RBDSD	DEM04	$ 1,377,234	$ 710,915	$ 178,520	$ 365,589

DELTA NATURAL GAS COMPANY, INC.

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Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Rate Base								
Gas Supply								
Demand	NCRB	RBGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	NCRB	RBGSC	COM01	-	-	-	-	ok
Total Gas Supply				$ -	$ -	$ -	$ -	ok
Storage								
Demand	NCRB	RBSD	DEM02	$ -	$ -	$ -	$ 793,865	ok
Commodity	NCRB	RBSC	COM02	-	-	-	12,778	ok
Total Storage				$ -	$ -	$ -	$ 806,643	ok
Transmission								
Demand	NCRB	RBTD	DEM03	$ 201,002	$ 233,665	$ 180,540	$ 3,164,221	ok
Customer	NCRB	RBTC	CUST01	20,870	1,423	-	18,129,324	ok
Total Transmission				$ 221,872	$ 235,088	$ 180,540	$ 21,293,544	ok
Distribution Other								
Commodity	NCRB	RBDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	NCRB	RBDSD	DEM04	$ 98,965	$ 23,245	$ -	$ 1,377,234	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Rate Base (Continued)							
Distribution Mains							
Demand	NCRB	RBDMD	DEM05	$ 5,535,418	$ 2,857,328	$ 717,513	$ 1,469,388
Customer	NCRB	RBDMC	CUST01	31,715,037	27,332,251	3,606,131	737,655
Total Distribution Mains				37,250,454	$ 30,189,580	$ 4,323,644	$ 2,207,043
Services							
Customer	NCRB	RBSC	CUST02	$ 6,151,385	$ 5,187,760	$ 776,098	$ 177,501
Meters							
Customer	NCRB	RBMC	CUST03	$ 9,046,107	$ 4,319,704	$ 745,940	$ 2,916,096
Customer Accounts							
Customer	NCRB	RBCAC	CUST04	$ 162,771	$ 128,955	$ 17,014	$ 13,921
Other Services							
Customer	NCRB	RBCSC	CUST05	$ -	$ -	$ -	$ -
Total		RBT		$ 76,088,138	$ 58,027,830	$ 8,573,545	$ 7,119,591

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Rate Base (Continued)								
Distribution Mains								
Demand	NCRB	RBDMD	DEM05	$ 397,762	$ 93,427	$ -	$ 5,535,418	ok
Customer	NCRB	RBDMC	CUST01	36,509	2,489	-	31,715,037	ok
Total Distribution Mains				$ 434,271	$ 95,916	$ -	$ 37,250,454	ok
Services								
Customer	NCRB	RBSC	CUST02	$ 8,785	$ 1,240	$ -	$ 6,151,385	ok
Meters								
Customer	NCRB	RBMC	CUST03	$ 838,103	$ 165,378	$ 60,886	$ 9,046,107	ok
Customer Accounts								
Customer	NCRB	RBCAC	CUST04	$ 689	$ 78	$ 2,114	$ 162,771	ok
Other Services								
Customer	NCRB	RBCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		RBT		$ 1,602,685	$ 520,947	$ 243,540	$ 76,088,138	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Operation and Maintenance Expenses							
Gas Supply							
Demand	OMT	OMGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	OMT	OMGSC	COM01	-	-	-	-
Total Gas Supply		OMGST		$ -	$ -	$ -	$ -
Storage							
Demand	OMT	OMSD	DEM02	$ 502,048	$ 263,291	$ 67,447	$ 171,309
Commodity	OMT	OMSC	COM02	101,644	53,306	13,655	34,683
Total Storage		OMST		$ 603,692	$ 316,597	$ 81,102	$ 205,992
Transmission							
Demand	OMT	OMTD	DEM03	$ 357,701	$ 163,227	$ 40,988	$ 83,940
Customer	OMT	OMTC	CUST01	2,049,440	1,766,223	233,030	47,668
Total Transmission		OMTT		$ 2,407,141	$ 1,929,449	$ 274,018	$ 131,607
Distribution Other							
Commodity	OMT	OMDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	OMT	OMDSD	DEM04	$ 115,314	$ 59,524	$ 14,947	$ 30,610

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Operation and Maintenance Expenses								
Gas Supply								
Demand	OMT	OMGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	OMT	OMGSC	COM01	-	-	-	-	ok
Total Gas Supply		OMGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	OMT	OMSD	DEM02	$ -	$ -	$ -	$ 502,048	ok
Commodity	OMT	OMSC	COM02	-	-	-	101,644	ok
Total Storage		OMST		$ -	$ -	$ -	$ 603,692	ok
Transmission								
Demand	OMT	OMTD	DEM03	$ 22,722	$ 26,415	$ 20,409	$ 357,701	ok
Customer	OMT	OMTC	CUST01	2,359	161	-	2,049,440	ok
Total Transmission		OMTT		$ 25,082	$ 26,576	$ 20,409	$ 2,407,141	ok
Distribution Other								
Commodity	OMT	OMDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	OMT	OMDSD	DEM04	$ 8,286	$ 1,946	$ -	$ 115,314	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Operation and Maintenance Expenses (Continued)							
Distribution Mains							
Demand	OMT	OMDMD	DEM05	$ 447,202	$ 230,841	$ 57,967	$ 118,711
Customer	OMT	OMDMC	CUST01	2,562,233	2,208,151	291,337	59,595
Total Distribution Mains				3,009,435	$ 2,438,993	$ 349,304	$ 178,305
Services							
Customer	OMT	OMSC	CUST02	$ 487,078	$ 410,777	$ 61,453	$ 14,055
Meters							
Customer	OMT	OMMC	CUST03	$ 810,520	$ 387,040	$ 66,835	$ 261,279
Customer Accounts							
Customer	OMT	OMCAC	CUST04	$ 1,294,736	$ 1,025,750	$ 135,334	$ 110,734
Other Services							
Customer	OMT	OMCSC	CUST05	$ -	$ -	$ -	$ -
Total		OMTT		$ 8,727,917	$ 6,568,129	$ 982,994	$ 932,582

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Operation and Maintenance Expenses (Continued)								
Distribution Mains								
Demand	OMT	OMDMD	DEM05	$ 32,135	$ 7,548	$ -	$ 447,202	ok
Customer	OMT	OMDMC	CUST01	2,950	201	-	2,562,233	ok
Total Distribution Mains				$ 35,084	$ 7,749	$ -	$ 3,009,435	ok
Services								
Customer	OMT	OMSC	CUST02	$ 696	$ 98	$ -	$ 487,078	ok
Meters								
Customer	OMT	OMMC	CUST03	$ 75,093	$ 14,818	$ 5,455	$ 810,520	ok
Customer Accounts								
Customer	OMT	OMCAC	CUST04	$ 5,481	$ 623	$ 16,816	$ 1,294,736	ok
Other Services								
Customer	OMT	OMCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		OMTT		$ 149,722	$ 51,810	$ 42,680	$ 8,727,917	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Payroll Expenses							
Gas Supply							
Demand	LBTOT	LBGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	LBTOT	LBGSC	COM01	-	-	-	-
Total Gas Supply		LBGST		$ -	$ -	$ -	$ -
Storage							
Demand	LBTOT	LBSD	DEM02	$ 357,228	$ 187,343	$ 47,991	$ 121,894
Commodity	LBTOT	LBSC	COM02	43,604	22,868	5,858	14,879
Total Storage		LBST		$ 400,832	$ 210,210	$ 53,849	$ 136,772
Transmission							
Demand	LBTOT	LBTD	DEM03	$ 191,830	$ 87,536	$ 21,981	$ 45,016
Customer	LBTOT	LBTC	CUST01	1,099,084	947,199	124,970	25,563
Total Transmission		LBTT		$ 1,290,914	$ 1,034,735	$ 146,952	$ 70,579
Distribution Other							
Commodity	LBTOT	LBDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	LBTOT	LBDSD	DEM04	$ 80,839	$ 41,728	$ 10,479	$ 21,459

DELTA NATURAL GAS COMPANY, INC.

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Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Payroll Expenses								
Gas Supply								
Demand	LBTOT	LBGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	LBTOT	LBGSC	COM01	-	-	-	-	ok
Total Gas Supply		LBGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	LBTOT	LBSD	DEM02	$ -	$ -	$ -	$ 357,228	ok
Commodity	LBTOT	LBSC	COM02	-	-	-	43,604	ok
Total Storage		LBST		$ -	$ -	$ -	$ 400,832	ok
Transmission								
Demand	LBTOT	LBTD	DEM03	$ 12,186	$ 14,166	$ 10,945	$ 191,830	ok
Customer	LBTOT	LBTC	CUST01	1,265	86	-	1,099,084	ok
Total Transmission		LBTT		$ 13,451	$ 14,252	$ 10,945	$ 1,290,914	ok
Distribution Other								
Commodity	LBTOT	LBDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	LBTOT	LBDSD	DEM04	$ 5,809	$ 1,364	$ -	$ 80,839	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Payroll Expenses (Continued)							
Distribution Mains							
Demand	LBTOT	LBDMD	DEM05	$ 326,971	$ 168,779	$ 42,383	$ 86,795
Customer	LBTOT	LBDMC	CUST01	1,873,372	1,614,486	213,010	43,572
Total Distribution Mains				2,200,343	$ 1,783,265	$ 255,393	$ 130,368
Services							
Customer	LBTOT	LBSC	CUST02	$ 361,274	$ 304,679	$ 45,581	$ 10,425
Meters							
Customer	LBTOT	LBMC	CUST03	$ 551,703	$ 263,449	$ 45,493	$ 177,846
Customer Accounts							
Customer	LBTOT	LBCAC	CUST04	$ 495,671	$ 392,694	$ 51,811	$ 42,393
Other Services							
Customer	LBTOT	LBCSC	CUST05	$ -	$ -	$ -	$ -
Total		LBTT		$ 5,381,576	$ 4,030,761	$ 609,557	$ 589,842

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
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Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Payroll Expenses (Continued)								
Distribution Mains								
Demand	LBTOT	LBDMD	DEM05	$ 23,495	$ 5,519	$ -	$ 326,971	ok
Customer	LBTOT	LBDMC	CUST01	2,157	147	-	1,873,372	ok
Total Distribution Mains				$ 25,652	$ 5,666	$ -	$ 2,200,343	ok
Services								
Customer	LBTOT	LBSC	CUST02	$ 516	$ 73	$ -	$ 361,274	ok
Meters								
Customer	LBTOT	LBMC	CUST03	$ 51,114	$ 10,086	$ 3,713	$ 551,703	ok
Customer Accounts								
Customer	LBTOT	LBCAC	CUST04	$ 2,098	$ 238	$ 6,438	$ 495,671	ok
Other Services								
Customer	LBTOT	LBCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		LBTT		$ 98,640	$ 31,680	$ 21,096	$ 5,381,576	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Depreciation Expenses							
Gas Supply							
Demand	DEPREX	DEGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	DEPREX	DEGSC	COM01	-	-	-	-
Total Gas Supply		DEGST		$ -	$ -	$ -	$ -
Storage							
Demand	DEPREX	DESD	DEM02	$ 94,504	$ 49,561	$ 12,696	$ 32,247
Commodity	DEPREX	DESC	COM02	-	-	-	-
Total Storage		DEST		$ 94,504	$ 49,561	$ 12,696	$ 32,247
Transmission							
Demand	DEPREX	DETD	DEM03	$ 199,797	$ 91,172	$ 22,894	$ 46,885
Customer	DEPREX	DETC	CUST01	1,144,735	986,541	130,161	26,625
Total Transmission		DETT		$ 1,344,532	$ 1,077,713	$ 153,056	$ 73,511
Distribution Other							
Commodity	DEPREX	DEDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	DEPREX	DEDSD	DEM04	$ 54,299	$ 28,029	$ 7,038	$ 14,414

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Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Depreciation Expenses								
Gas Supply								
Demand	DEPREX	DEGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	DEPREX	DEGSC	COM01	-	-	-	-	ok
Total Gas Supply		DEGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	DEPREX	DESD	DEM02	$ -	$ -	$ -	$ 94,504	ok
Commodity	DEPREX	DESC	COM02	-	-	-	-	ok
Total Storage		DEST		$ -	$ -	$ -	$ 94,504	ok
Transmission								
Demand	DEPREX	DETD	DEM03	$ 12,692	$ 14,754	$ 11,400	$ 199,797	ok
Customer	DEPREX	DETC	CUST01	1,318	90	-	1,144,735	ok
Total Transmission		DETT		$ 14,010	$ 14,844	$ 11,400	$ 1,344,532	ok
Distribution Other								
Commodity	DEPREX	DEDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	DEPREX	DEDSD	DEM04	$ 3,902	$ 916	$ -	$ 54,299	ok

DELTA NATURAL GAS COMPANY, INC.

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Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Depreciation Expenses (Continued)							
Distribution Mains							
Demand	DEPREX	DEDMD	DEM05	$ 219,625	$ 113,368	$ 28,468	$ 58,300
Customer	DEPREX	DEDMC	CUST01	1,258,338	1,084,445	143,078	29,268
Total Distribution Mains				1,477,963	$ 1,197,813	$ 171,547	$ 87,567
Services							
Customer	DEPREX	DESC	CUST02	$ 242,666	$ 204,652	$ 30,616	$ 7,002
Meters							
Customer	DEPREX	DEMC	CUST03	$ 356,388	$ 170,183	$ 29,388	$ 114,885
Customer Accounts							
Customer	DEPREX	DECAC	CUST04	$ -	$ -	$ -	$ -
Other Services							
Customer	DEPREX	DECSC	CUST05	$ -	$ -	$ -	$ -
Total		DET		$ 3,570,354	$ 2,727,951	$ 404,341	$ 329,626

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Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Depreciation Expenses (Continued)								
Distribution Mains								
Demand	DEPREX	DEDMD	DEM05	$ 15,782	$ 3,707	$ -	$ 219,625	ok
Customer	DEPREX	DEDMC	CUST01	1,449	99	-	1,258,338	ok
Total Distribution Mains				$ 17,230	$ 3,806	$ -	$ 1,477,963	ok
Services								
Customer	DEPREX	DESC	CUST02	$ 347	$ 49	$ -	$ 242,666	ok
Meters								
Customer	DEPREX	DEMC	CUST03	$ 33,019	$ 6,515	$ 2,399	$ 356,388	ok
Customer Accounts								
Customer	DEPREX	DECAC	CUST04	$ -	$ -	$ -	$ -	ok
Other Services								
Customer	DEPREX	DECSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		DET		$ 68,507	$ 26,131	$ 13,799	$ 3,570,354	ok

DELTA NATURAL GAS COMPANY, INC.

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12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Other Taxes							
Gas Supply							
Demand	OTT	OTTGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	OTT	OTTGSC	COM01	-	-	-	-
Total Gas Supply		OTTGST		$ -	$ -	$ -	$ -
Storage							
Demand	OTT	OTTSD	DEM02	$ 104,367	$ 54,733	$ 14,021	$ 35,612
Commodity	OTT	OTTSC	COM02	3,896	2,043	523	1,329
Total Storage		OTTST		$ 108,263	$ 56,777	$ 14,544	$ 36,942
Transmission							
Demand	OTT	OTTTD	DEM03	$ 48,443	$ 22,106	$ 5,551	$ 11,368
Customer	OTT	OTTTC	CUST01	277,552	239,197	31,559	6,456
Total Transmission		OTTTT		$ 325,995	$ 261,302	$ 37,110	$ 17,823
Distribution Other							
Commodity	OTT	OTTDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	OTT	OTTDSD	DEM04	$ 18,940	$ 9,777	$ 2,455	$ 5,028

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Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Other Taxes								
Gas Supply								
Demand	OTT	OTTGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	OTT	OTTGSC	COM01	-	-	-	-	ok
Total Gas Supply		OTTGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	OTT	OTTSD	DEM02	$ -	$ -	$ -	$ 104,367	ok
Commodity	OTT	OTTSC	COM02	-	-	-	3,896	ok
Total Storage		OTTST		$ -	$ -	$ -	$ 108,263	ok
Transmission								
Demand	OTT	OTTTD	DEM03	$ 3,077	$ 3,577	$ 2,764	$ 48,443	ok
Customer	OTT	OTTTC	CUST01	320	22	-	277,552	ok
Total Transmission		OTTTT		$ 3,397	$ 3,599	$ 2,764	$ 325,995	ok
Distribution Other								
Commodity	OTT	OTTDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	OTT	OTTDSD	DEM04	$ 1,361	$ 320	$ -	$ 18,940	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Other Taxes (Continued)							
Distribution Mains							
Demand	OTT	OTTDMD	DEM05	$ 76,607	$ 39,544	$ 9,930	$ 20,335
Customer	OTT	OTTDMC	CUST01	438,915	378,260	49,906	10,209
Total Distribution Mains				515,522	$ 417,804	$ 59,836	$ 30,544
Services							
Customer	OTT	OTTSC	CUST02	$ 84,643	$ 71,384	$ 10,679	$ 2,442
Meters							
Customer	OTT	OTTMC	CUST03	$ 126,198	$ 60,262	$ 10,406	$ 40,681
Customer Accounts							
Customer	OTT	OTTCAC	CUST04	$ 44,288	$ 35,087	$ 4,629	$ 3,788
Other Services							
Customer	OTT	OTTCSC	CUST05	$ -	$ -	$ -	$ -
Total		OTTT		$ 1,223,848	$ 912,392	$ 139,660	$ 137,248

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Other Taxes (Continued)								
Distribution Mains								
Demand	OTT	OTTDMD	DEM05	$ 5,505	$ 1,293	$ -	$ 76,607	ok
Customer	OTT	OTTDMC	CUST01	505	34	-	438,915	ok
Total Distribution Mains				$ 6,010	$ 1,327	$ -	$ 515,522	ok
Services								
Customer	OTT	OTTSC	CUST02	$ 121	$ 17	$ -	$ 84,643	ok
Meters								
Customer	OTT	OTTMC	CUST03	$ 11,692	$ 2,307	$ 849	$ 126,198	ok
Customer Accounts								
Customer	OTT	OTTCAC	CUST04	$ 187	$ 21	$ 575	$ 44,288	ok
Other Services								
Customer	OTT	OTTCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		OTTT		$ 22,768	$ 7,592	$ 4,189	$ 1,223,848	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Interest Expenses							
Gas Supply							
Demand	INT	INTGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	INT	INTGSC	COM01	-	-	-	-
Total Gas Supply		INTGST		$ -	$ -	$ -	$ -
Storage							
Demand	INT	INTSD	DEM02	$ 303,639	$ 159,239	$ 40,792	$ 103,608
Commodity	INT	INTSC	COM02	-	-	-	-
Total Storage		INTST		$ 303,639	$ 159,239	$ 40,792	$ 103,608
Transmission							
Demand	INT	INTTD	DEM03	$ 131,194	$ 59,867	$ 15,033	$ 30,787
Customer	INT	INTTC	CUST01	751,673	647,797	85,468	17,483
Total Transmission		INTTT		$ 882,867	$ 707,664	$ 100,502	$ 48,270
Distribution Other							
Commodity	INT	INTDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	INT	INTDSD	DEM04	$ 49,107	$ 25,349	$ 6,365	$ 13,036

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Interest Expenses								
Gas Supply								
Demand	INT	INTGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	INT	INTGSC	COM01	-	-	-	-	ok
Total Gas Supply		INTGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	INT	INTSD	DEM02	$ -	$ -	$ -	$ 303,639	ok
Commodity	INT	INTSC	COM02	-	-	-	-	ok
Total Storage		INTST		$ -	$ -	$ -	$ 303,639	ok
Transmission								
Demand	INT	INTTD	DEM03	$ 8,334	$ 9,688	$ 7,486	$ 131,194	ok
Customer	INT	INTTC	CUST01	865	59	-	751,673	ok
Total Transmission		INTTT		$ 9,199	$ 9,747	$ 7,486	$ 882,867	ok
Distribution Other								
Commodity	INT	INTDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	INT	INTDSD	DEM04	$ 3,529	$ 829	$ -	$ 49,107	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Interest Expenses (Continued)							
Distribution Mains							
Demand	INT	INTDMD	DEM05	$ 198,624	$ 102,528	$ 25,746	$ 52,725
Customer	INT	INTDMC	CUST01	1,138,011	980,746	129,397	26,469
Total Distribution Mains				1,336,635	$ 1,083,274	$ 155,143	$ 79,194
Services							
Customer	INT	INTSC	CUST02	$ 219,462	$ 185,083	$ 27,689	$ 6,333
Meters							
Customer	INT	INTMC	CUST03	$ 322,309	$ 153,909	$ 26,578	$ 103,899
Customer Accounts							
Customer	INT	INTCAC	CUST04	$ -	$ -	$ -	$ -
Other Services							
Customer	INT	INTCSC	CUST05	$ -	$ -	$ -	$ -
Total		INTT		$ 3,114,019	$ 2,314,517	$ 357,068	$ 354,339

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Interest Expenses (Continued)								
Distribution Mains								
Demand	INT	INTDMD	DEM05	$ 14,273	$ 3,352	$ -	$ 198,624	ok
Customer	INT	INTDMC	CUST01	1,310	89	-	1,138,011	ok
Total Distribution Mains				$ 15,583	$ 3,442	$ -	$ 1,336,635	ok
Services								
Customer	INT	INTSC	CUST02	$ 313	$ 44	$ -	$ 219,462	ok
Meters								
Customer	INT	INTMC	CUST03	$ 29,861	$ 5,892	$ 2,169	$ 322,309	ok
Customer Accounts								
Customer	INT	INTCAC	CUST04	$ -	$ -	$ -	$ -	ok
Other Services								
Customer	INT	INTCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		INTT		$ 58,485	$ 19,954	$ 9,655	$ 3,114,019	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Net Operating Income -- Adjusted Test Period							
Operating Revenues							
Sales and Transportation		REVUC	R01	$ 20,523,105	10,109,997	2,764,469	4,542,780
Miscellaneous Service Revenue		REVMSR	REVUC	152,009	74,882	20,476	33,647
Total Operating Revenues		TOR		$ 20,675,114	$ 10,184,879	$ 2,784,945	$ 4,576,427
Expenses							
Operation and Maintenance Expenses				$ 8,727,917	$ 6,568,129	$ 982,994	$ 932,582
Depreciation and Amortization Expenses				3,570,354	2,727,951	404,341	329,626
Other Taxes				1,223,848	912,392	139,660	137,248
Total Operating Expenses		TOE		$ 13,522,119	$ 10,208,473	$ 1,526,995	$ 1,399,456
Expense Adjustments							
Year-End Adjustment		EXADJ1	YREND	$ 54,498	32,873	18,161	473
Eliminate Canada Mountain O&M Expenses		EXADJ2	OMST	(120,120)	(62,995)	(16,137)	(40,987)
Eliminate Canada Mountain Depr Expenses		EXADJ3	DEST	(20,212)	(10,600)	(2,715)	(6,897)
OT Expenses		EXADJ4	OTTT	(38,210)	(28,486)	(4,360)	(4,285)
Payroll Expenses		EXADJ5	LBTT	116,199	93,140	13,228	6,353
Payroll Other Taxes		EXADJ6	OTTT	-	-	-	-
Rate Case Expense		EXADJ7	TOR	29,000	14,286	3,906	6,419
Eliminate Test-Year Expenses		EXADJ8	OMTT	(142,711)	(114,390)	(16,246)	(7,803)
Customer Deposits		EXADJ9	OMTT	35,692	28,609	4,063	1,951
Medical Adjustment		EXADJ10	OMTT	77,561	62,169	8,829	4,241
Total Expense Adjustments		ADJTOT		$ (8,303)	$ 14,605	$ 8,729	$ (40,535)

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Net Operating Income -- Adjusted Test Period								
Operating Revenues								
Sales and Transportation		REVUC	R01	2,021,345	632,524	451,990	20,523,105	ok
Miscellaneous Service Revenue		REVMSR	REVUC	14,972	4,685	3,348	152,009	ok
Total Operating Revenues		TOR		$ 2,036,317	$ 637,209	$ 455,338	$ 20,675,114	ok
Expenses								
Operation and Maintenance Expenses				$ 149,722	$ 51,810	$ 42,680	$ 8,727,917	ok
Depreciation and Amortization Expenses				68,507	26,131	13,799	3,570,354	ok
Other Taxes				22,768	7,592	4,189	1,223,848	ok
Total Operating Expenses		TOE		$ 240,997	$ 85,532	$ 60,667	$ 13,522,119	ok
Expense Adjustments								
Year-End Adjustment		EXADJ1	YREND	-	2,991	-	54,498	ok
Eliminate Canada Mountain O&M Expenses		EXADJ2	OMST	-	-	-	(120,120)	ok
Eliminate Canada Mountain Depr Expenses		EXADJ3	DEST	-	-	-	(20,212)	ok
OT Expenses		EXADJ4	OTTT	(711)	(237)	(131)	(38,210)	ok
Payroll Expenses		EXADJ5	LBTT	1,211	1,283	985	116,199	ok
Payroll Other Taxes		EXADJ6	OTTT	-	-	-	-	ok
Rate Case Expense		EXADJ7	TOR	2,856	894	639	29,000	ok
Eliminate Test-Year Expenses		EXADJ8	OMTT	(1,487)	(1,576)	(1,210)	(142,711)	ok
Customer Deposits		EXADJ9	OMTT	372	394	303	35,692	ok
Medical Adjustment		EXADJ10	OMTT	808	856	658	77,561	ok
Total Expense Adjustments		ADJTOT		$ 3,049	$ 4,605	$ 1,243	(8,303)	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Net Operating Income -- Adjusted Test Period (Continued)							
Net Income Before Income Taxes				$ 7,161,298	$ (38,199)	$ 1,249,221	$ 3,217,506
Income Taxes			TXINC	$ 1,596,449	(928,029)	351,910	1,129,376
Net Operating Income		TOM		$ 5,564,849	$ 889,830	$ 897,311	$ 2,088,130
Net Cost Rate Base				$ 76,088,138	$ 58,027,830	$ 8,573,545	$ 7,119,591
Rate of Return -- Actual				7.31%	1.53%	10.47%	29.33%

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Net Operating Income -- Adjusted Test Period (Continued)								
Net Income Before Income Taxes				$ 1,792,271	$ 547,072	$ 393,427	$ 7,161,298	ok
Income Taxes			TXINC	683,892	207,922	151,379	1,596,449	ok
Net Operating Income		TOM		$ 1,108,379	$ 339,150	$ 242,048	$ 5,564,849	ok
Net Cost Rate Base				$ 1,602,685	$ 520,947	$ 243,540	$ 76,088,138	ok
Rate of Return -- Actual				69.16%	65.10%	99.39%		

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Net Operating Income -- Adjusted For Increase							
Test Year Operating Income				$ 5,564,849	$ 889,830	$ 897,311	$ 2,088,130
Proposed Increase				$ 2,510,901	$ 1,954,816	418,957	242,481
Income Taxes (@39.445)				990,425	771,077	165,258	95,647
Net Operating Income Adjusted for Increase				7,085,325	2,073,569	1,151,011	2,234,964
Net Cost Rate Base (Same as Actual)				$ 76,088,138	$ 58,027,830	$ 8,573,545	$ 7,119,591
Rate of Return -- Proposed				9.31%	3.57%	13.43%	31.39%

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Net Operating Income -- Adjusted For Increase								
Test Year Operating Income				$ 1,108,379	$ 339,150	$ 242,048	$ 5,564,849	ok
Proposed Increase				(105,353)	-	-	$ 2,510,901	ok
Income Taxes (@39.445)				(41,556)	-	-	$ 990,425	ok
Net Operating Income Adjusted for Increase				1,044,583	339,150	242,048	7,085,325	ok
Net Cost Rate Base (Same as Actual)				$ 1,602,685	$ 520,947	$ 243,540	$ 76,088,138	ok
Rate of Return -- Proposed				65.18%	65.10%	99.39%		

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Allocation Factors							
Commodity							
Gas Supply		COM01		9,765,801	2,581,793	682,889	1,842,984
Storage		COM02		2,924,112	1,533,506	392,837	997,769
Transmission		COM03		9,765,801	2,581,793	682,889	1,842,984
Distribution		COM04		6,911,381	2,581,793	682,889	1,842,984
Demand							
Gas Supply		DEM01		67,424	30,767	7,726	15,822
Storage (November-March)		DEM02		2,924,112	1,533,506	392,837	997,769
Transmission		DEM03		67,424	30,767	7,726	15,822
Distribution Structures		DEM04		59,604	30,767	7,726	15,822
Distribution Mains		DEM05		59,604	30,767	7,726	15,822
Customer							
Distribution Mains		CUST01		38,222	32,940	4,346	889
Services		CUST02		5,322,514	4,488,734	671,522	153,584
Meters		CUST03		3,913,309	1,868,686	322,691	1,261,491
Customer Count				38,224	32,940	4,346	889
Customer Accounts		CUST04		41,578	32,940	4,346	3,556
Other Services		CUST05		38,224	32,940	4,346	889

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Allocation Factors								
Commodity								
Gas Supply		COM01		1,436,748	1,817,276	1,404,111	9,765,801	ok
Storage		COM02					2,924,112	ok
Transmission		COM03		1,436,748	1,817,276	1,404,111	9,765,801	ok
Distribution		COM04		1,436,748	366,967		6,911,381	ok
Demand								
Gas Supply		DEM01		4,283	4,979	3,847	67,424	ok
Storage (November-March)		DEM02					2,924,112	ok
Transmission		DEM03		4,283	4,979	3,847	67,424	ok
Distribution Structures		DEM04		4,283	1,006	-	59,604	ok
Distribution Mains		DEM05		4,283	1,006	-	59,604	ok
Customer								
Distribution Mains		CUST01		44	3		38,222	ok
Services		CUST02		7,601	1,073	-	5,322,514	ok
Meters		CUST03		362,560	71,542	26,339	3,913,309	ok
Customer Count				44	5		38,224	ok
Customer Accounts		CUST04		176	20	540	41,578	ok
Other Services		CUST05		44	5		38,224	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Allocation Factors (Continued)							
Taxable Income							
Net Income Before Income Tax		NIBIT		$ 7,161,298	$ (38,199)	$ 1,249,221	$ 3,217,506
Less: Interest Expense				$ 3,114,019	$ 2,314,517	$ 357,068	$ 354,339
Taxable Income		TXINC		$ 4,047,279	$ (2,352,716)	$ 892,153	$ 2,863,166
Meters Allocation Factor							
Number of Customers				38,226	32,940	4,346	889
Average Cost Per Meter					57	74	1,419
Meter Cost				3,913,309	1,868,686	322,691	1,261,491
Services Allocation Factor							
Number of Customers				38,224	32,940	4,346	889
Average Cost Per Service					136.27	154.515	172.76
Meter Cost				5,322,514	4,488,734	671,522	153,584
Year-End Adjustment		YREND		304,119	183,444	101,346	2,640

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Allocation Factors (Continued)								
Taxable Income								
Net Income Before Income Tax		NIBIT		$ 1,792,271	$ 547,072	$ 393,427	$ 7,161,298	ok
Less: Interest Expense				$ 58,485	$ 19,954	$ 9,655	$ 3,114,019	ok
Taxable Income		TXINC		$ 1,733,786	$ 527,118	$ 383,772	$ 4,047,279	ok
Meters Allocation Factor								
Number of Customers				44	5	2	38,226	ok
Average Cost Per Meter				8,240	14,308			
Meter Cost				362,560	71,542	26,339	3,913,309	ok
Services Allocation Factor								
Number of Customers				44	5	-	38,224	ok
Average Cost Per Service				172.76	214.63			
Meter Cost				7,601	1,073	-	5,322,514	ok
Year-End Adjustment		YREND			16,689		304,119	ok

MINIMUM SYSTEM METHODOLOGY

Delta Natural Gas Company, Inc.

Minumum System Analysis
Account 376 -- Distribution Mains

December 31, 1998

Cost of 2" Mains	Net Cost of Plant	Quantity (Feet)	Unit Cost ($ per Foot)
Installed Cost of 2" Plastic	18,188,528.24	3,625,826	$ 5.01638
Installed Cost of 2" Steel	570,319.60	429,630	1.32747
Total Cost of 2" Mains	18,758,847.84	4,055,456	$ 4.62558

Plant Classification

Total Number of Units		6,478,911
Minimum Size Mains (2" Pipe)		4.62558
Minimum System Cost	$	29,968,740
Total Cost of Sample	$	35,197,648
Percentage of Total		0.851441545
Percentage Classified as Customer-Related		85.14%
Percentage Classified as Demand-Related		14.86%

5. a. What is the computed Durbin-Watson statistic? (If the Durbin-Watson statistic has not been calculated, then calculate and submit.)

b. (1) What other tests for serial correlation, if any, were performed?

(2) Provide the results for each test performed.

(3) If no other tests were performed, why not?

RESPONSE:

a. The calculated Durbin-Watson d-statistic for the unweighted regression was 1.608, which is contained in Attachment 1. The calculated Durbin-Watson d-statistic for the weighted regression was 1.346, which is contained in Attachment 2. At the 95% level of significance the values for d_L and d_U, the critical values for the Durbin-Watson Test with n=11 and k=1, are $d_L = 0.927$ and $d_U = 1.331$. Thus, the Durbin-Watson Test for both the unweighted regression and the weighted regression indicate that autocorrelation is not present in either case.

b(1). None.

b(2). None.

b(c). The Durbin-Watson Test, which is a standard test for autocorrelation, indicated no autocorrelation was present in either case. If the results were in the gray area between d_L and d_U , where you can neither accept nor reject the null hypothesis of no autocorrelation, further examination and testing may have been warranted. However, the Durbin-Watson Test in both cases indicated that the null hypothesis of no autocorrelation could be accepted. This would indicate that no additional tests were necessary.

WITNESS: Steve Seelye

Regression

Attachment 1
Durbin-Watson for Unweighted Regression

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	SIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: AVGCOST

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.595[a]	.354	.282	2.3476	1.608

a. Predictors: (Constant), SIZE

b. Dependent Variable: AVGCOST

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	27.166	1	27.166	4.929	.054[a]
	Residual	49.600	9	5.511		
	Total	76.767	10			

a. Predictors: (Constant), SIZE

b. Dependent Variable: AVGCOST

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.809	1.475		1.226	.251
	SIZE	.771	.347	.595	2.220	.054

a. Dependent Variable: AVGCOST

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.9662	7.9787	4.6838	1.6482	11
Residual	-2.8420	4.3075	1.211E-16	2.2271	11
Std. Predicted Value	-1.042	1.999	.000	1.000	11
Std. Residual	-1.211	1.835	.000	.949	11

a. Dependent Variable: AVGCOST

Regression

Attachment 2
Durbin-Watson for Weighted Regression

Descriptive Statistics[b]

	Mean[a]	Root Mean Square	N
WCOST	3104.5787	4456.8492	11
WSIZE	1917.0436	2273.2983	11
SQRTFEET	603.8995	767.4581	11

a. The observed mean is printed

b. Coefficients have been calculated through the origin.

Correlations[a]

		WCOST	WSIZE	SQRTFEET
Std. Cross-product	WCOST	1.000	.925	.935
	WSIZE	.925	1.000	.900
	SQRTFEET	.935	.900	1.000
Sig. (1-tailed)	WCOST	.	.000	.000
	WSIZE	.000	.	.000
	SQRTFEET	.000	.000	.
N	WCOST	11	11	11
	WSIZE	11	11	11
	SQRTFEET	11	11	11

a. Coefficients have been calculated through the origin.

Variables Entered/Removed[b,c]

Model	Variables Entered	Variables Removed	Method
1	SQRTFEET, WSIZE[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: WCOST

c. Linear Regression through the Origin

Model Summary[c,d]

Model	R	R Square[a]	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.955[b]	.912	.892	1463.4795	1.346

a. For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.

b. Predictors: SQRTFEET, WSIZE

c. Dependent Variable: WCOST

d. Linear Regression through the Origin

ANOVA[c,d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.99E+08	2	99611301	46.509	.000[a]
	Residual	19275950	9	2141772		
	Total	2.18E+08[b]	11			

a. Predictors: SQRTFEET, WSIZE

b. This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.

c. Dependent Variable: WCOST

d. Linear Regression through the Origin

Coefficients[a,b]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	WSIZE	.860	.445	.439	1.933	.085	.190	5.249
	SQRTFEET	3.141	1.317	.541	2.384	.041	.190	5.249

a. Dependent Variable: WCOST

b. Linear Regression through the Origin

Collinearity Diagnostics[a,b]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions	
				WSIZE	SQRTFEET
1	1	1.900	1.000	.05	.05
	2	.100	4.353	.95	.95

a. Dependent Variable: WCOST

b. Linear Regression through the Origin

Residuals Statistics[a,b]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1357.4512	9255.6943	3545.2593	2469.1112	11
Residual	-2315.95	2721.4336	-440.6807	1309.1889	11
Std. Predicted Value	-.886	2.313	.000	1.000	11
Std. Residual	-1.582	1.860	-.301	.895	11

a. Dependent Variable: WCOST

b. Linear Regression through the Origin

6. During the hearing on Delta Natural Gas Company's application, Mr. Seelye testified that the Canada Mountain Storage Field had been removed from consideration in his cost-of-service study and that inclusion of this asset would require modifications to his cost-of-service study. Provide a revised cost-of-service study that includes Canada Mountain.

RESPONSE:

The attached cost of service study includes Canada Mountain. Canada Mountain costs are functionally assigned as storage-related costs and allocated on the same basis as Delta's other storage-related costs.

The following table compares the class rates of return from Delta's original cost of service study with the class rates of return from the revised cost of service study which includes Canada Mountain and reflects the revised rates shown in Delta's response to item 5 of the Commission's Order dated September 14, 1999:

Customer Class	Actual ROR at Current Rates		ROR at Proposed Rates	
	Original Study	Revised Study	Original Study	Revised Study
Residential (GS)	3.97%	3.31%	6.48%	7.04%
Commercial Small (GS)	10.11%	8.11%	13.01%	12.58%
Large Commercial & Industrial (GS)	11.43%	8.01%	12.52%	10.80%
Interruptible (IS)	27.37%	27.60%	25.52%	25.76%
Special Contracts	9.44%	9.69%	9.44%	9.69%
Off-System Sales (OS)	10.70%	10.95%	10.70%	10.95%
Total System	7.31%	6.01%	9.31%	9.29%

Note: The overall actual rate of return at current rates in the Revised Study is lower than the overall actual rate of return in the Original Study because base rate revenues remain unchanged in the two studies while operating expenses and rate base are increased in the Revised Study.

RESPONDING WITNESS: Steve Seelye

REVISED COST OF SERVICE STUDY

TO INCLUDE CANADA MOUNTAIN

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Plant in Service							
Storage Plant							
350-357	Storage Plant	PT350	F003	$ 10,563,026	-	-	10,563,026
Total Storage Plant		PTST		$ 10,563,026	$ -	$ -	$ 10,563,026
Transmission and Gathering Plant							
325-371	Transmission	PT365	F005	$ 27,532,254	-	-	-
Distribution Plant							
374.00	Land and Land Rights	PT374	F008	$ 248,478	-	-	-
375.00	Structures & Improvements	PT375	F008	103,373	-	-	-
376.00	Mains	PT376	F009	46,498,998	-	-	-
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	965,592	-	-	-
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	390,893	-	-	-
380.00	Services	PT380	F010	7,634,653	-	-	-
381.00	Meters	PT381	F011	5,454,418	-	-	-
382.00	Meter Installations	PT382	F011	2,365,154	-	-	-
383.00	House Regulators	PT383	F011	2,190,578	-	-	-
384.00	House Regulator Installations	PT384	F011	-	-	-	-
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	1,202,371	-	-	-
Sub-Total Distribution Plant		PTDSUB		67,054,508	-	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Plant in Service								
Storage Plant								
350-357	Storage Plant	PT350	F003	-	-	-	-	-
Total Storage Plant		PTST		$ -	$ -	$ -	$ -	$ -
Transmission and Gathering Plant								
325-371	Transmission	PT365	F005	-	27,532,254	-	-	-
Distribution Plant								
374.00	Land and Land Rights	PT374	F008	-	-	-	-	248,478
375.00	Structures & Improvements	PT375	F008	-	-	-	-	103,373
376.00	Mains	PT376	F009	-	-	-	-	-
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	-	-	-	-	965,592
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	-	-	-	-	390,893
380.00	Services	PT380	F010	-	-	-	-	-
381.00	Meters	PT381	F011	-	-	-	-	-
382.00	Meter Installations	PT382	F011	-	-	-	-	-
383.00	House Regulators	PT383	F011	-	-	-	-	-
384.00	House Regulator Installations	PT384	F011	-	-	-	-	-
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	-	-	-	-	-
Sub-Total Distribution Plant		PTDSUB		-	-	-	-	1,708,336

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Plant in Service							
Storage Plant							
350-357	Storage Plant	PT350	F003	-	-	-	-
Total Storage Plant		PTST		$ -	$ -	$ -	$ -
Transmission and Gathering Plant							
325-371	Transmission	PT365	F005	-	-	-	-
Distribution Plant							
374.00	Land and Land Rights	PT374	F008	-	-	-	-
375.00	Structures & Improvements	PT375	F008	-	-	-	-
376.00	Mains	PT376	F009	19,613,277	26,885,721	-	-
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	-	-	-	-
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	-	-	-	-
380.00	Services	PT380	F010	-	-	7,634,653	-
381.00	Meters	PT381	F011	-	-	-	5,454,418
382.00	Meter Installations	PT382	F011	-	-	-	2,365,154
383.00	House Regulators	PT383	F011	-	-	-	2,190,578
384.00	House Regulator Installations	PT384	F011	-	-	-	-
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	-	-	-	1,202,371
Sub-Total Distribution Plant		PTDSUB		19,613,277	26,885,721	7,634,653	11,212,521

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Plant in Service							
Storage Plant							
350-357	Storage Plant	PT350	F003	-	-	10,563,026	ok
Total Storage Plant		PTST		$ -	$ -	10,563,026	ok
Transmission and Gathering Plant							
325-371	Transmission	PT365	F005	-	-	27,532,254	ok
Distribution Plant							
374.00	Land and Land Rights	PT374	F008	-	-	248,478	ok
375.00	Structures & Improvements	PT375	F008	-	-	103,373	ok
376.00	Mains	PT376	F009	-	-	46,498,998	ok
378.00	Meas. & Reg. Sta. Equip. - General	PT378	F008	-	-	965,592	ok
379.00	Meas. & Reg. Sta. Equip. - City Gate	PT379	F008	-	-	390,893	ok
380.00	Services	PT380	F010	-	-	7,634,653	ok
381.00	Meters	PT381	F011	-	-	5,454,418	ok
382.00	Meter Installations	PT382	F011	-	-	2,365,154	ok
383.00	House Regulators	PT383	F011	-	-	2,190,578	ok
384.00	House Regulator Installations	PT384	F011	-	-	-	ok
385.00	Industrial Meas. & Reg. Equip.	PT385	F011	-	-	1,202,371	ok
Sub-Total Distribution Plant		PTDSUB		-	-	67,054,508	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Plant in Service (Continued)							
Distribution Plant (Continued)							
387.00	Other Equipment	PT387	PTDSUB	-	-	-	-
Total Distribution Plant		PTD		$ 67,054,508	$ -	$ -	$ -
Transmission-Distribution Subtotal		PTTD		$ 94,586,762	$ -	$ -	$ -
Storage-Transmission-Distribution Subtotal		PTSUB		$ 105,149,788	$ -	$ -	$ 10,563,026
Other Plant in Service							
301-303	Intangible Plant	PT301	PTSUB	54,937	-	-	5,519
389-399	General Plant	PT389	PTSUB	14,553,800	-	-	1,462,030
Total Other Plant in Service		PTOPIS		14,608,737	-	-	1,467,549
Adjustments							
Tranex Plant 367-371			F005	$ 4,605,527	$ -	$ -	$ -
Tranex Acquisition Adjustment			F005	(970,198)	-	-	-
Circle R			PTSUB	408,962	-	-	41,083
Total Adjustments				$ 4,044,291	$ -	$ -	$ 41,083
Total Plant in Service		PTIS		$ 123,802,816	$ -	$ -	$ 12,071,658

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Plant in Service (Continued)							
Distribution Plant (Continued)							
387.00 Other Equipment	PT387	PTDSUB	-	-	-	-	-
Total Distribution Plant	PTD		$ -	$ -	$ -	$ -	$ 1,708,336
Transmission-Distribution Subtotal	PTTD		$ -	$ 27,532,254	$ -	$ -	$ 1,708,336
Storage-Transmission-Distribution Subtotal	PTSUB		$ -	$ 27,532,254	$ -	$ -	$ 1,708,336
Other Plant in Service							
301-303 Intangible Plant	PT301	PTSUB	-	14,385	-	-	893
389-399 General Plant	PT389	PTSUB	-	3,810,744	-	-	236,451
Total Other Plant in Service	PTOPIS		-	3,825,129	-	-	237,344
Adjustments							
Tranex Plant 367-371		F005	$ -	$ 4,605,527	$ -	$ -	$ -
Tranex Acquisition Adjustment		F005	-	(970,198)	-	-	-
Circle R		PTSUB	-	107,082	-	-	6,644
Total Adjustments			$ -	$ 3,742,411	$ -	$ -	$ 6,644
Total Plant in Service	PTIS		$ -	$ 35,099,794	$ -	$ -	$ 1,952,324

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Plant in Service (Continued)						
Distribution Plant (Continued)						
387.00 Other Equipment	PT387	PTDSUB	-	-	-	-
Total Distribution Plant	PTD		$ 19,613,277	$ 26,885,721	$ 7,634,653	$ 11,212,521
Transmission-Distribution Subtotal	PTTD		$ 19,613,277	$ 26,885,721	$ 7,634,653	$ 11,212,521
Storage-Transmission-Distribution Subtotal	PTSUB		$ 19,613,277	$ 26,885,721	$ 7,634,653	$ 11,212,521
Other Plant in Service						
301-303 Intangible Plant	PT301	PTSUB	10,247	14,047	3,989	5,858
389-399 General Plant	PT389	PTSUB	2,714,677	3,721,257	1,056,714	1,551,927
Total Other Plant in Service	PTOPIS		2,724,924	3,735,304	1,060,702	1,557,785
Adjustments						
Tranex Plant 367-371		F005	$ -	$ -	$ -	$ -
Tranex Acquisition Adjustment		F005	-	-	-	-
Circle R		PTSUB	76,282	104,567	29,694	43,609
Total Adjustments			$ 76,282	$ 104,567	$ 29,694	$ 43,609
Total Plant in Service	PTIS		$ 22,414,484	$ 30,725,592	$ 8,725,049	$ 12,813,915

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Plant in Service (Continued)						
Distribution Plant (Continued)						
387.00 Other Equipment	PT387	PTDSUB	-	-	-	ok
Total Distribution Plant	PTD		$ -	$ -	67,054,508	ok
Transmission-Distribution Subtotal	PTTD		$ -	$ -	94,586,762	ok
Storage-Transmission-Distribution Subtotal	PTSUB		$ -	$ -	105,149,788	ok
Other Plant in Service						
301-303 Intangible Plant	PT301	PTSUB	-	-	54,937	ok
389-399 General Plant	PT389	PTSUB	-	-	14,553,800	ok
Total Other Plant in Service	PTOPIS		-	-	14,608,737	ok
Adjustments						
Tranex Plant 367-371		F005	$ -	$ -	$ 4,605,527	ok
Tranex Acquisition Adjustment		F005	-	-	(970,198)	ok
Circle R		PTSUB	-	-	408,962	ok
Total Adjustments			$ -	$ -	4,044,291	ok
Total Plant in Service	PTIS		$ -	$ -	123,802,816	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Net Plant in Service						
Total Gas Utility Plant in Service			$ 123,802,816	$ -	$ -	$ 12,071,658
Less:						
Reserve for Depreciation						
Storage	DEPRUS	PTST	$ 911,302	-	-	911,302
Tranex		PT365	2,488,848	-	-	-
Tranex		PT389	6,000	-	-	603
Canada Mountain	DEPCM	PTST	(742,254)	-	-	(742,254)
Non-Utility Property		PT389	18,592	-	-	1,868
Transmission	DEPRTR	PT365	8,788,496	-	-	-
Distribution	DEPRDI	PTD	16,184,415	-	-	-
General	DEPRGE	PT389	7,575,547	-	-	761,016
Total Depreciation Reserve	DEPR		$ 35,230,946	$ -	$ -	$ 932,535
Net Plant in Service	NPTIS		$ 88,571,870	$ -	$ -	$ 11,139,123

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Net Plant in Service							
Total Gas Utility Plant in Service			$ -	$ 35,099,794	$ -	$ -	$ 1,952,324
Less:							
Reserve for Depreciation							
Storage	DEPRUS	PTST	-	-	-	-	-
Tranex		PT365	-	2,488,848	-	-	-
Tranex		PT389	-	1,571	-	-	97
Canada Mountain	DEPCM	PTST	-	-	-	-	-
Non-Utility Property		PT389	-	4,868	-	-	302
Transmission	DEPRTR	PT365	-	8,788,496	-	-	-
Distribution	DEPRDI	PTD	-	-	-	-	412,328
General	DEPRGE	PT389	-	1,983,569	-	-	123,078
Total Depreciation Reserve	DEPR		$ -	$ 13,267,352	$ -	$ -	$ 535,805
Net Plant in Service	NPTIS		$ -	$ 21,832,441	$ -	$ -	$ 1,416,519

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Net Plant in Service						
Total Gas Utility Plant in Service			$ 22,414,484	$ 30,725,592	$ 8,725,049	$ 12,813,915
Less:						
Reserve for Depreciation						
Storage	DEPRUS	PTST	-	-	-	-
Tranex		PT365	-	-	-	-
Tranex		PT389	1,119	1,534	436	640
Canada Mountain	DEPCM	PTST	-	-	-	-
Non-Utility Property		PT389	3,468	4,754	1,350	1,983
Transmission	DEPRTR	PT365	-	-	-	-
Distribution	DEPRDI	PTD	4,733,901	6,489,193	1,842,716	2,706,277
General	DEPRGE	PT389	1,413,044	1,936,990	550,041	807,809
Total Depreciation Reserve	DEPR		$ 6,151,533	$ 8,432,471	$ 2,394,542	$ 3,516,709
Net Plant in Service	NPTIS		$ 16,262,952	$ 22,293,121	$ 6,330,507	$ 9,297,206

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Net Plant in Service						
Total Gas Utility Plant in Service			$ -	$ -	123,802,816	ok
Less:						
Reserve for Depreciation						
Storage	DEPRUS	PTST	-	-	911,302	ok
Tranex		PT365	-	-	2,488,848	ok
Tranex		PT389	-	-	6,000	ok
Canada Mountain	DEPCM	PTST	-	-	(742,254)	ok
Non-Utility Property		PT389	-	-	18,592	ok
Transmission	DEPRTR	PT365	-	-	8,788,496	ok
Distribution	DEPRDI	PTD	-	-	16,184,415	ok
General	DEPRGE	PT389	-	-	7,575,547	ok
Total Depreciation Reserve	DEPR		$ -	$ -	35,230,946	ok
Net Plant in Service	NPTIS		$ -	$ -	88,571,870	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Net Utility Plant						
Net Plant in Service			$ 88,571,870	$ -	$ -	$ 11,139,123
Construction Work In Progress						
Storage	CWIPUS	PTST	$ 213,713	-	-	213,713
Tranex	CWIPCM	PTST	38,502	-	-	38,502
Transmission	CWIPTR	PT365	391,747	-	-	-
Distribution	CWIPMA	PTD	1,042,470	-	-	-
General	CWIPCO	PT389	316,310	-	-	31,776
Sub-Total CWIP	CWIPST		2,002,743	-	-	283,991
Administrative & Engineering Overhead	CWIPOH	CWIPST	(581,482)	-	-	(82,455)
Total Constr. Work In Progress	CWIP		$ 1,421,261	$ -	$ -	$ 201,536
Gas Stored Underground Non-Current	CWIP117	PTST	328,092	-	-	328,092
Adjustments						
Remove Canada Mountain		PTST	$ (10,605,135)	-	-	(10,605,135)
Non-Utility		PT389	18,592	-	-	1,868
Total Adjustments			$ (10,586,543)	$ -	$ -	$ (10,603,267)
Total Net Utility Plant	TNP		$ 79,734,680	$ -	$ -	$ 1,065,484

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Net Utility Plant							
Net Plant in Service			$ -	$ 21,832,441	$ -	$ -	$ 1,416,519
Construction Work In Progress							
Storage	CWIPUS	PTST	-	-	-	-	-
Tranex	CWIPCM	PTST	-	-	-	-	-
Transmission	CWIPTR	PT365	-	391,747	-	-	-
Distribution	CWIPMA	PTD	-	-	-	-	26,559
General	CWIPCO	PT389	-	82,822	-	-	5,139
Sub-Total CWIP	CWIPST		-	474,570	-	-	31,698
Administrative & Engineering Overhead	CWIPOH	CWIPST	-	(137,788)	-	-	(9,203)
Total Constr. Work In Progress	CWIP		$ -	$ 336,782	$ -	$ -	$ 22,495
Gas Stored Underground Non-Current	CWIP117	PTST	-	-	-	-	-
Adjustments							
Remove Canada Mountain		PTST	-	-	-	-	-
Non-Utility		PT389	-	4,868	-	-	302
Total Adjustments			$ -	$ 4,868	$ -	$ -	$ 302
Total Net Utility Plant	TNP		$ -	$ 22,174,091	$ -	$ -	$ 1,439,316

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Net Utility Plant						
Net Plant in Service			$ 16,262,952	$ 22,293,121	$ 6,330,507	$ 9,297,206
Construction Work In Progress						
Storage	CWIPUS	PTST	-	-	-	-
Tranex	CWIPCM	PTST	-	-	-	-
Transmission	CWIPTR	PT365	-	-	-	-
Distribution	CWIPMA	PTD	304,920	417,982	118,693	174,317
General	CWIPCO	PT389	59,000	80,877	22,966	33,729
Sub-Total CWIP	CWIPST		363,920	498,859	141,659	208,046
Administrative & Engineering Overhead	CWIPOH	CWIPST	(105,662)	(144,840)	(41,130)	(60,405)
Total Constr. Work In Progress	CWIP		$ 258,259	$ 354,019	$ 100,530	$ 147,641
Gas Stored Underground Non-Current	CWIP117	PTST	-	-	-	-
Adjustments						
Remove Canada Mountain		PTST	-	-	-	-
Non-Utility		PT389	3,468	4,754	1,350	1,983
Total Adjustments			$ 3,468	$ 4,754	$ 1,350	$ 1,983
Total Net Utility Plant	TNP		$ 16,524,678	$ 22,651,894	$ 6,432,387	$ 9,446,830

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Net Utility Plant						
Net Plant in Service		$	-	$ -	88,571,870	ok
Construction Work In Progress						
Storage	CWIPUS	PTST	-	-	213,713	ok
Tranex	CWIPCM	PTST	-	-	38,502	ok
Transmission	CWIPTR	PT365	-	-	391,747	ok
Distribution	CWIPMA	PTD	-	-	1,042,470	ok
General	CWIPCO	PT389	-	-	316,310	ok
Sub-Total CWIP	CWIPST		-	-	2,002,743	ok
Administrative & Engineering Overhead	CWIPOH	CWIPST	-	-	(581,482)	ok
Total Constr. Work In Progress	CWIP	$	-	$ -	2,002,743	ok
Gas Stored Underground Non-Current	CWIP117	PTST	-	-	328,092	ok
Adjustments						
Remove Canada Mountain		PTST	-	-	(10,605,135)	ok
Non-Utility		PT389	-	-	18,592	ok
Total Adjustments		$	-	$ -	(10,586,543)	ok
Total Net Utility Plant	TNP	$	-	$ -	79,734,680	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Net Cost Rate Base						
Total Net Utility Plant			$ 79,734,680	$ -	$ -	$ 1,065,484
Less:						
Accum. Deferred Income Taxes	DIT	NPTIS	$ 8,436,725	-	-	1,061,033
Investment Tax Credit	ITC	NPTIS	-	-	-	-
Plus:						
Materials and Supplies	MSP	NPTIS	$ 451,812	-	-	56,822
Prepayments	PPY	NPTIS	106,884	-	-	13,442
Gas Stored Underground	GSU	F003	265,579	-	-	265,579
Cash Working Capital	CWC	OMT	1,097,255	-	-	63,116
Adjustments:						
Unamortized Debt		NPTIS	$ 3,108,925	-	-	390,990
Adjustment to Include Canada Mountain		PTST	13714018	-	-	13,714,018
Advances for Construction		PT376	(220,060)	-	-	-
Depreciation Adjustment		DEPR	(20,212)	-	-	(535)
Net Cost Rate Base	NCRB		$ 89,802,156	$ -	$ -	$ 14,507,883

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Net Cost Rate Base							
Total Net Utility Plant			$ -	$ 22,174,091	$ -	$ -	$ 1,439,316
Less:							
Accum. Deferred Income Taxes	DIT	NPTIS	-	2,079,603	-	-	134,928
Investment Tax Credit	ITC	NPTIS	-	-	-	-	-
Plus:							
Materials and Supplies	MSP	NPTIS	-	111,369	-	-	7,226
Prepayments	PPY	NPTIS	-	26,346	-	-	1,709
Gas Stored Underground	GSU	F003	-	-	-	-	-
Cash Working Capital	CWC	OMT	12,778	302,621	-	-	14,497
Adjustments:							
Unamortized Debt		NPTIS	-	766,332	-	-	49,721
Adjustment to Include Canada Mountain		PTST	-	-	-	-	-
Advances for Construction		PT376	-	-	-	-	-
Depreciation Adjustment		DEPR	-	(7,611)	-	-	(307)
Net Cost Rate Base	NCRB		$ 12,778	$ 21,293,544	$ -	$ -	$ 1,377,234

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Net Cost Rate Base						
Total Net Utility Plant			$ 16,524,678	$ 22,651,894	$ 6,432,387	$ 9,446,830
Less:						
Accum. Deferred Income Taxes	DIT	NPTIS	1,549,093	2,123,484	602,999	885,586
Investment Tax Credit	ITC	NPTIS	-	-	-	-
Plus:						
Materials and Supplies	MSP	NPTIS	82,959	113,719	32,292	47,426
Prepayments	PPY	NPTIS	19,625	26,902	7,639	11,219
Gas Stored Underground	GSU	F003	-	-	-	-
Cash Working Capital	CWC	OMT	159,584	218,756	61,234	101,897
Adjustments:						
Unamortized Debt		NPTIS	570,839	782,502	222,205	326,337
Adjustment to Include Canada Mountain		PTST	-	-	-	-
Advances for Construction		PT376	(92,821)	(127,239)	-	-
Depreciation Adjustment		DEPR	(3,529)	(4,838)	(1,374)	(2,018)
Net Cost Rate Base	NCRB		$ 15,712,242	$ 21,538,213	$ 6,151,385	$ 9,046,107

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Net Cost Rate Base						
Total Net Utility Plant		$	-	$ -	79,734,680	ok
Less:						
Accum. Deferred Income Taxes	DIT	NPTIS	-	-	8,436,725	ok
Investment Tax Credit	ITC	NPTIS	-	-	-	ok
Plus:						
Materials and Supplies	MSP	NPTIS	-	-	451,812	ok
Prepayments	PPY	NPTIS	-	-	106,884	ok
Gas Stored Underground	GSU	F003	-	-	265,579	ok
Cash Working Capital	CWC	OMT	162,771	-	1,097,255	ok
Adjustments:						
Unamortized Debt		NPTIS	-	-	3,108,925	ok
Adjustment to Include Canada Mountain		PTST	-	-	13,714,018	ok
Advances for Construction		PT376	-	-	(220,060)	ok
Depreciation Adjustment		DEPR	-	-	(20,212)	ok
Net Cost Rate Base	NCRB	$	162,771	$ -	13,714,018	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses							
Operation Expenses							
Operation Expenses -- Labor							
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	$ 13,903	-	-	-
1.754.0100	Compressor Station Payroll	OM754.01	F004	41,071	-	-	-
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	22,516	-	-	22,516
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	17,191	-	-	17,191
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	1,761	-	-	1,761
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	2,210,003	-	-	-
1.903.0100	Cashering Payroll	OM903.01	F012	495,671	-	-	-
1.920.0100	Administrative Payroll	OM920.01	NPTIS	2,006,502	-	-	252,345
1.926.0100	Time Off Payroll	OM926.01	NPTIS	454,147	-	-	57,115
Total Labor		OMLBOE		$ 5,262,766	$ -	$ -	$ 350,929

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses								
Operation Expenses								
Operation Expenses -- Labor								
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	-	13,903	-	-	-
1.754.0100	Compressor Station Payroll	OM754.01	F004	41,071	-	-	-	-
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	-	-	-	-	-
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	-	-	-	-	-
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	-	-	-	-	-
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	-	643,286	-	-	39,915
1.903.0100	Cashering Payroll	OM903.01	F012	-	-	-	-	-
1.920.0100	Administrative Payroll	OM920.01	NPTIS	-	494,591	-	-	32,090
1.926.0100	Time Off Payroll	OM926.01	NPTIS	-	111,945	-	-	7,263
Total Labor		OMLBOE		$ 41,071	$ 1,263,725	$ -	$ -	$ 79,268

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses							
Operation Expenses							
Operation Expenses -- Labor							
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	-	-	-	-
1.754.0100	Compressor Station Payroll	OM754.01	F004	-	-	-	-
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	-	-	-	-
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	-	-	-	-
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	-	-	-	-
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	458,261	628,180	178,382	261,979
1.903.0100	Cashering Payroll	OM903.01	F012	-	-	-	-
1.920.0100	Administrative Payroll	OM920.01	NPTIS	368,420	505,027	143,411	210,618
1.926.0100	Time Off Payroll	OM926.01	NPTIS	83,387	114,307	32,459	47,671
Total Labor		OMLBOE		$ 910,068	$ 1,247,514	$ 354,253	$ 520,268

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses							
Operation Expenses							
Operation Expenses -- Labor							
1.753.0100	Wells & Gathering Payroll	OM753.01	F005	-	-	13,903	ok
1.754.0100	Compressor Station Payroll	OM754.01	F004	-	-	41,071	ok
1.816.0100	CM Wells Expenses - Payroll	OM816.01	F003	-	-	22,516	ok
1.818.0100	CM Compressor Station Exp - Payroll	OM818.01	F003	-	-	17,191	ok
1.821.0000	CM Purification of Natural Gas	OM821.00	F003	-	-	1,761	ok
1.900.0100	Trans & Dist. Payroll	OM900.01	PTTD	-	-	2,210,003	ok
1.903.0100	Cashering Payroll	OM903.01	F012	495,671	-	495,671	ok
1.920.0100	Administrative Payroll	OM920.01	NPTIS	-	-	2,006,502	ok
1.926.0100	Time Off Payroll	OM926.01	NPTIS	-	-	454,147	ok
Total Labor		OMLBOE		$ 495,671	$ -	5,262,766	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Transmission and Distribution							
1.900.0200	Operation Transportation Exp	OM900.02	F005	$ 538,911	-	-	-
1.920.0200	Adm Transportation Exp	OM920.02	F005	90,000	-	-	-
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	78,673	-	-	5,222
1.880.0200	Operations Office Utility	OM880.02	LBTOT	44,599	-	-	2,960
1.880.0300	Operation Office Misc	OM880.03	LBTOT	99,132	-	-	6,580
1.880.0400	Fees Training School	OM880.04	LBTOT	14,173	-	-	941
1.880.0500	Uniforms	OM880.05	OM900.01	49,153	-	-	-
1.880.0600	Welding Supplies	OM880.06	PTTD	7,770	-	-	-
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	3,654	-	-	367
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	14,520	-	-	1,459
1.871.0000	Telemetry Costs	OM871.00	PTSUB	35,141	-	-	3,530
1.753.0200	Wells & Gathering Misc	OM753.02	F005	(1,399)	-	-	-
1.754.0200	Compressor Station Misc	OM754.02	F004	21,773	-	-	-
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	2,374	-	-	2,374
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	9,485	-	-	9,485
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	5,484	-	-	5,484
1.825.0000	CM Storage Well Royalties	OM825.00	F003	54,064	-	-	54,064
1.856.0000	Right of Way Clearing	OM856.00	PTTD	54,869	-	-	-
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	53,056	-	-	5,330
Total Transmission and Distribution Oper Exp				$ 1,175,431	$ -	$ -	$ 97,796

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)								
Operation Expense -- Transmission and Distribution								
1.900.0200	Operation Transportation Exp	OM900.02	F005	-	538,911	-	-	-
1.920.0200	Adm Transportation Exp	OM920.02	F005	-	90,000	-	-	-
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	637	18,872	-	-	1,182
1.880.0200	Operations Office Utility	OM880.02	LBTOT	361	10,698	-	-	670
1.880.0300	Operation Office Misc	OM880.03	LBTOT	803	23,780	-	-	1,489
1.880.0400	Fees Training School	OM880.04	LBTOT	115	3,400	-	-	213
1.880.0500	Uniforms	OM880.05	OM900.01	-	14,307	-	-	888
1.880.0600	Welding Supplies	OM880.06	PTTD	-	2,262	-	-	140
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	-	957	-	-	59
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	-	3,802	-	-	236
1.871.0000	Telemetry Costs	OM871.00	PTSUB	-	9,201	-	-	571
1.753.0200	Wells & Gathering Misc	OM753.02	F005	-	(1,399)	-	-	-
1.754.0200	Compressor Station Misc	OM754.02	F004	21,773	-	-	-	-
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	-	-	-	-	-
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	-	-	-	-	-
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	-	-	-	-	-
1.825.0000	CM Storage Well Royalties	OM825.00	F003	-	-	-	-	-
1.856.0000	Right of Way Clearing	OM856.00	PTTD	-	15,971	-	-	991
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	-	13,892	-	-	862
Total Transmission and Distribution Oper Exp				$ 23,690	$ 744,654	$ -	$ -	$ 7,301

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Transmission and Distribution							
1.900.0200	Operation Transportation Exp	OM900.02	F005	-	-	-	-
1.920.0200	Adm Transportation Exp	OM920.02	F005	-	-	-	-
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	13,568	18,599	5,281	8,065
1.880.0200	Operations Office Utility	OM880.02	LBTOT	7,691	10,543	2,994	4,572
1.880.0300	Operation Office Misc	OM880.03	LBTOT	17,096	23,435	6,655	10,163
1.880.0400	Fees Training School	OM880.04	LBTOT	2,444	3,351	951	1,453
1.880.0500	Uniforms	OM880.05	OM900.01	10,192	13,971	3,967	5,827
1.880.0600	Welding Supplies	OM880.06	PTTD	1,611	2,209	627	921
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	682	934	265	390
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	2,708	3,712	1,054	1,548
1.871.0000	Telemetry Costs	OM871.00	PTSUB	6,555	8,985	2,551	3,747
1.753.0200	Wells & Gathering Misc	OM753.02	F005	-	-	-	-
1.754.0200	Compressor Station Misc	OM754.02	F004	-	-	-	-
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	-	-	-	-
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	-	-	-	-
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	-	-	-	-
1.825.0000	CM Storage Well Royalties	OM825.00	F003	-	-	-	-
1.856.0000	Right of Way Clearing	OM856.00	PTTD	11,378	15,596	4,429	6,504
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	9,896	13,566	3,852	5,658
Total Transmission and Distribution Oper Exp				$ 83,822	$ 114,902	$ 32,628	$ 48,848

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Transmission and Distribution							
1.900.0200	Operation Transportation Exp	OM900.02	F005	-	-	538,911	ok
1.920.0200	Adm Transportation Exp	OM920.02	F005	-	-	90,000	ok
1.880.0100	Operations Office Telephone Expenses	OM880.01	LBTOT	7,246	-	78,673	ok
1.880.0200	Operations Office Utility	OM880.02	LBTOT	4,108	-	44,599	ok
1.880.0300	Operation Office Misc	OM880.03	LBTOT	9,131	-	99,132	ok
1.880.0400	Fees Training School	OM880.04	LBTOT	1,305	-	14,173	ok
1.880.0500	Uniforms	OM880.05	OM900.01	-	-	49,153	ok
1.880.0600	Welding Supplies	OM880.06	PTTD	-	-	7,770	ok
1.881.0100	Rent Operating Offices	OM881.01	PTSUB	-	-	3,654	ok
1.881.0200	Rent Land & Land Rights	OM881.02	PTSUB	-	-	14,520	ok
1.871.0000	Telemetry Costs	OM871.00	PTSUB	-	-	35,141	ok
1.753.0200	Wells & Gathering Misc	OM753.02	F005	-	-	(1,399)	ok
1.754.0200	Compressor Station Misc	OM754.02	F004	-	-	21,773	ok
1.816.0200	CM Wells Expenses - Misc	OM816.02	F003	-	-	2,374	ok
1.818.0200	CM Compressor Station - Misc	OM818.02	F003	-	-	9,485	ok
1.824.0200	CM Other Undergroung Storage - Misc	OM824.02	F003	-	-	5,484	ok
1.825.0000	CM Storage Well Royalties	OM825.00	F003	-	-	54,064	ok
1.856.0000	Right of Way Clearing	OM856.00	PTTD	-	-	54,869	ok
1.900.0300	Small Tools & Work Equipment	OM900.03	PTSUB	-	-	53,056	ok
Total Transmission and Distribution Oper Exp				$ 21,790	$ -	1,175,431	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)						
Operation Expense -- Customer Accounts						
1.903.0200 Customer Collections & Billing	OM903.02	F012	$ 214,271	-	-	-
1.904.0000 Uncollectible Accounts	OM904.00	F012	345,870	-	-	-
Total Customer Accounts			$ 560,141	$ -	$ -	$ -
Operation Expense -- Administrative & General						
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	$ 553,713	-	-	36,755
1.923.0000 Outside Services	OM923.00	LBTOT	343,946	-	-	22,831
1.924.0000 Insurance	OM924.00	NPTIS	419,058	-	-	52,702
1.926.0200 Employee Benefits	OM926.02	LBTOT	1,361,086	-	-	90,349
1.913.0000 Advertising	OM913.00	NPTIS	10,775	-	-	1,355
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	104,940	-	-	13,198
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	440,458	-	-	55,394
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	(2,046,578)	-	-	(257,385)
Total Administrative and General	OMTAG		$ 1,187,397	$ -	$ -	$ 15,198
Total Operation Expense	OMTEO		$ 8,185,735	$ -	$ -	$ 463,924

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)							
Operation Expense -- Customer Accounts							
1.903.0200 Customer Collections & Billing	OM903.02	F012	-	-	-	-	-
1.904.0000 Uncollectible Accounts	OM904.00	F012	-	-	-	-	-
Total Customer Accounts			$ -	$ -	$ -	$ -	$ -
Operation Expense -- Administrative & General							
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	4,486	132,823	-	-	8,318
1.923.0000 Outside Services	OM923.00	LBTOT	2,787	82,505	-	-	5,167
1.924.0000 Insurance	OM924.00	NPTIS	-	103,295	-	-	6,702
1.926.0200 Employee Benefits	OM926.02	LBTOT	11,028	326,493	-	-	20,445
1.913.0000 Advertising	OM913.00	NPTIS	-	2,656	-	-	172
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	-	25,867	-	-	1,678
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	-	108,570	-	-	7,044
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	-	(504,469)	-	-	(32,731)
Total Administrative and General	OMTAG		$ 18,302	$ 277,739	$ -	$ -	$ 16,796
Total Operation Expense	OMTEO		$ 83,062	$ 2,286,117	$ -	$ -	$ 103,364

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)						
Operation Expense -- Customer Accounts						
1.903.0200 Customer Collections & Billing	OM903.02	F012	-	-	-	-
1.904.0000 Uncollectible Accounts	OM904.00	F012	-	-	-	-
Total Customer Accounts			$ -	$ -	$ -	$ -
Operation Expense -- Administrative & General						
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	95,493	130,901	37,172	56,765
1.923.0000 Outside Services	OM923.00	LBTOT	59,317	81,311	23,090	35,260
1.924.0000 Insurance	OM924.00	NPTIS	76,944	105,475	29,951	43,988
1.926.0200 Employee Benefits	OM926.02	LBTOT	234,732	321,769	91,372	139,534
1.913.0000 Advertising	OM913.00	NPTIS	1,978	2,712	770	1,131
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	19,268	26,413	7,500	11,015
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	80,874	110,861	31,481	46,234
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	(375,779)	(515,114)	(146,275)	(214,825)
Total Administrative and General	OMTAG		$ 192,829	$ 264,328	$ 75,060	$ 119,102
Total Operation Expense	OMTEO		$ 1,186,719	$ 1,626,744	$ 461,941	$ 688,218

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)						
Operation Expense -- Customer Accounts						
1.903.0200 Customer Collections & Billing	OM903.02	F012	214,271	-	214,271	ok
1.904.0000 Uncollectible Accounts	OM904.00	F012	345,870	-	345,870	ok
Total Customer Accounts			$ 560,141	$ -	560,141	ok
Operation Expense -- Administrative & General						
1.921.0000 Office Supplies & Expenses	OM921.00	LBTOT	51,000	-	553,713	ok
1.923.0000 Outside Services	OM923.00	LBTOT	31,679	-	343,946	ok
1.924.0000 Insurance	OM924.00	NPTIS	-	-	419,058	ok
1.926.0200 Employee Benefits	OM926.02	LBTOT	125,363	-	1,361,086	ok
1.913.0000 Advertising	OM913.00	NPTIS	-	-	10,775	ok
1.928.0000 Regulatory Commission Expense	OM928.00	NPTIS	-	-	104,940	ok
1.930.0000 Misc. General Expenses	OM930.00	NPTIS	-	-	440,458	ok
1.922.0000 Expenses Transferred - CR	OM922.00	NPTIS	-	-	(2,046,578)	ok
Total Administrative and General	OMTAG		$ 208,042	$ -	1,187,397	ok
Total Operation Expense	OMTEO		$ 1,285,645	$ -	8,185,735	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector		Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)								
Maintenance Expense								
Maintenance Expense -- Labor								
1.764.0100	Maint Well & Gathering - Payroll	OM764.01	F005	$	1,870	-	-	-
1.765.0100	Maint Compressor Station - Payroll	OM765.01	F004		2,533	-	-	-
1.887.0100	Maint Trans & Dist - Payroll	OM887.01	PTTD		74,033	-	-	-
1.835.0100	CM Maint of Meas & Regulators - Payro	OM835.01	F003		1,870	-	-	1,870
1.834.0100	CM Maint of Compressors - Payroll	OM834.01	F003		1,481	-	-	1,481
1.832.0100	CM Maint of Resevoirs	OM832.01	F003		1,501	-	-	1,501
1.893.0100	Maint of Meters & Regulators - Payroll	OM893.01	F011		21,123	-	-	-
1.894.0100	Mant of Other Equipment - Payroll	OM894.01	PTSUB		14,397	-	-	1,446
Total Maintenance Labor		OMLBME		$	118,810	$ -	$ -	$ 6,299

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)								
Maintenance Expense								
Maintenance Expense -- Labor								
1.764.0100	Maint Well & Gathering - Payroll	OM764.01	F005	-	1,870	-	-	-
1.765.0100	Maint Compressor Station - Payroll	OM765.01	F004	2,533	-	-	-	-
1.887.0100	Maint Trans & Dist - Payroll	OM887.01	PTTD	-	21,550	-	-	1,337
1.835.0100	CM Maint of Meas & Regulators - Payro	OM835.01	F003	-	-	-	-	-
1.834.0100	CM Maint of Compressors - Payroll	OM834.01	F003	-	-	-	-	-
1.832.0100	CM Maint of Resevoirs	OM832.01	F003	-	-	-	-	-
1.893.0100	Maint of Meters & Regulators - Payroll	OM893.01	F011	-	-	-	-	-
1.894.0100	Mant of Other Equipment - Payroll	OM894.01	PTSUB	-	3,770	-	-	234
Total Maintenance Labor		OMLBME		$ 2,533	$ 27,189	$ -	$ -	$ 1,571

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)							
Maintenance Expense							
Maintenance Expense -- Labor							
1.764.0100	Maint Well & Gathering - Payroll	OM764.01	F005	-	-	-	-
1.765.0100	Maint Compressor Station - Payroll	OM765.01	F004	-	-	-	-
1.887.0100	Maint Trans & Dist - Payroll	OM887.01	PTTD	15,351	21,044	5,976	8,776
1.835.0100	CM Maint of Meas & Regulators - Payro	OM835.01	F003	-	-	-	-
1.834.0100	CM Maint of Compressors - Payroll	OM834.01	F003	-	-	-	-
1.832.0100	CM Maint of Resevoirs	OM832.01	F003	-	-	-	-
1.893.0100	Maint of Meters & Regulators - Payroll	OM893.01	F011	-	-	-	21,123
1.894.0100	Mant of Other Equipment - Payroll	OM894.01	PTSUB	2,685	3,681	1,045	1,535
Total Maintenance Labor		OMLBME		$ 18,037	$ 24,725	$ 7,021	$ 31,435

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)							
Maintenance Expense							
Maintenance Expense -- Labor							
1.764.0100	Maint Well & Gathering - Payroll	OM764.01	F005	-	-	1,870	ok
1.765.0100	Maint Compressor Station - Payroll	OM765.01	F004	-	-	2,533	ok
1.887.0100	Maint Trans & Dist - Payroll	OM887.01	PTTD	-	-	74,033	ok
1.835.0100	CM Maint of Meas & Regulators - Payro	OM835.01	F003	-	-	1,870	ok
1.834.0100	CM Maint of Compressors - Payroll	OM834.01	F003	-	-	1,481	ok
1.832.0100	CM Maint of Resevoirs	OM832.01	F003	-	-	1,501	ok
1.893.0100	Maint of Meters & Regulators - Payroll	OM893.01	F011	-	-	21,123	ok
1.894.0100	Mant of Other Equipment - Payroll	OM894.01	PTSUB	-	-	14,397	ok
Total Maintenance Labor		OMLBME		$ -	$ -	118,810	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector		Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)								
Maintenance Expense -- Transmission and Distribution								
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	$	31,246	-	-	3,139
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB		13,523	-	-	1,358
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB		68,262	-	-	-
1.893.0200	Maint of Meters & Regulators	OM893.02	F011		63,874	-	-	-
1.764.0200	Maint Wells & Gathering	OM764.02	F005		3,337	-	-	-
1.765.0200	Maint Compressor Station	OM765.02	F004		15,248	-	-	-
1.831.0200	CM Maint Structures	OM831.02	F003		609	-	-	609
1.832.0200	CM Maint Resevoirs	OM832.02	F003		47	-	-	47
1.833.0200	CM Maint of Lines	OM833.02	F003		110	-	-	110
1.834.0200	CM Maint of Compressors	OM834.02	F003		5,725	-	-	5,725
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003		1,834	-	-	1,834
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003		1,052	-	-	1,052
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008		2,103	-	-	-
1.889.0000	Maint Station Trans & Distr	OM889.00	F008		4,222	-	-	-
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB		72,217	-	-	7,255
Total Transmission & Distribution Maintenance				$	283,408	$ -	$ -	$ 21,129

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)								
Maintenance Expense -- Transmission and Distribution								
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	-	8,181	-	-	508
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB	-	3,541	-	-	220
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB	-	25,386	-	-	-
1.893.0200	Maint of Meters & Regulators	OM893.02	F011	-	-	-	-	-
1.764.0200	Maint Wells & Gathering	OM764.02	F005	-	3,337	-	-	-
1.765.0200	Maint Compressor Station	OM765.02	F004	15,248	-	-	-	-
1.831.0200	CM Maint Structures	OM831.02	F003	-	-	-	-	-
1.832.0200	CM Maint Resevoirs	OM832.02	F003	-	-	-	-	-
1.833.0200	CM Maint of Lines	OM833.02	F003	-	-	-	-	-
1.834.0200	CM Maint of Compressors	OM834.02	F003	-	-	-	-	-
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003	-	-	-	-	-
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003	-	-	-	-	-
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008	-	-	-	-	2,103
1.889.0000	Maint Station Trans & Distr	OM889.00	F008	-	-	-	-	4,222
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB	-	18,909	-	-	1,173
Total Transmission & Distribution Maintenance				$ 15,248	$ 59,355	$ -	$ -	$ 8,225

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)							
Maintenance Expense -- Transmission and Distribution							
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	5,828	7,989	2,269	3,332
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB	2,522	3,458	982	1,442
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB	18,085	24,790	-	-
1.893.0200	Maint of Meters & Regulators	OM893.02	F011	-	-	-	63,874
1.764.0200	Maint Wells & Gathering	OM764.02	F005	-	-	-	-
1.765.0200	Maint Compressor Station	OM765.02	F004	-	-	-	-
1.831.0200	CM Maint Structures	OM831.02	F003	-	-	-	-
1.832.0200	CM Maint Resevoirs	OM832.02	F003	-	-	-	-
1.833.0200	CM Maint of Lines	OM833.02	F003	-	-	-	-
1.834.0200	CM Maint of Compressors	OM834.02	F003	-	-	-	-
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003	-	-	-	-
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003	-	-	-	-
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008	-	-	-	-
1.889.0000	Maint Station Trans & Distr	OM889.00	F008	-	-	-	-
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB	13,470	18,465	5,243	7,701
Total Transmission & Distribution Maintenance				$ 39,906	$ 54,702	$ 8,494	$ 76,349

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description		Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)							
Maintenance Expense -- Transmission and Distribution							
1.898.0100	Maint Transportion Equipment	OM898.01	PTSUB	-	-	31,246	ok
1.898.0200	Maint Power Operated Equipment	OM898.02	PTSUB	-	-	13,523	ok
1.887.0200	Maint Trans & Distribution Mains	OM887.02	TDMSUB	-	-	68,262	ok
1.893.0200	Maint of Meters & Regulators	OM893.02	F011	-	-	63,874	ok
1.764.0200	Maint Wells & Gathering	OM764.02	F005	-	-	3,337	ok
1.765.0200	Maint Compressor Station	OM765.02	F004	-	-	15,248	ok
1.831.0200	CM Maint Structures	OM831.02	F003	-	-	609	ok
1.832.0200	CM Maint Resevoirs	OM832.02	F003	-	-	47	ok
1.833.0200	CM Maint of Lines	OM833.02	F003	-	-	110	ok
1.834.0200	CM Maint of Compressors	OM834.02	F003	-	-	5,725	ok
1.835.0200	CM Maint of Measuring Equipment	OM835.02	F003	-	-	1,834	ok
1.837.0200	CM Maintenance of Other Equipment	OM837.02	F003	-	-	1,052	ok
1.886.0000	Maint Structures - Trans & Distr	OM886.00	F008	-	-	2,103	ok
1.889.0000	Maint Station Trans & Distr	OM889.00	F008	-	-	4,222	ok
1.894.0200	Maint of Other Equipment	OM894.02	PTSUB	-	-	72,217	ok
Total Transmission & Distribution Maintenance				$ -	$ -	283,408	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Operation and Maintenance Expenses (Continued)						
Maintenance of General Plant						
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	$ 41,253	-	-	4,144
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	22,273	-	-	1,478
1.932.0300 Maint General Structures	OM932.03	LBTOT	21,263	-	-	1,411
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	55,176	-	-	3,663
Total Maintenance of General Plant			$ 139,965	$ -	$ -	$ 10,697
Total Maintenance Expense	OMTME		$ 542,182	$ -	$ -	$ 38,124
Total Operation and Maintenance Expenses	OMT		$ 8,727,917	$ -	$ -	$ 502,048
Sub-Total Payroll	LBTOT		$ 5,381,576	$ -	$ -	$ 357,228

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Operation and Maintenance Expenses (Continued)							
Maintenance of General Plant							
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	-	10,802	-	-	670
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	180	5,343	-	-	335
1.932.0300 Maint General Structures	OM932.03	LBTOT	172	5,101	-	-	319
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	447	13,236	-	-	829
Total Maintenance of General Plant			$ 800	$ 34,480	$ -	$ -	$ 2,153
Total Maintenance Expense	OMTME		$ 18,581	$ 121,024	$ -	$ -	$ 11,949
Total Operation and Maintenance Expenses	OMT		$ 101,644	$ 2,407,141	$ -	$ -	$ 115,314
Sub-Total Payroll	LBTOT		$ 43,604	$ 1,290,914	$ -	$ -	$ 80,839

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Operation and Maintenance Expenses (Continued)						
Maintenance of General Plant						
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	7,695	10,548	2,995	4,399
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	3,841	5,265	1,495	2,283
1.932.0300 Maint General Structures	OM932.03	LBTOT	3,667	5,027	1,427	2,180
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	9,516	13,044	3,704	5,657
Total Maintenance of General Plant			$ 24,719	$ 33,884	$ 9,622	$ 14,519
Total Maintenance Expense	OMTME		$ 82,661	$ 113,311	$ 25,137	$ 122,302
Total Operation and Maintenance Expenses	OMT		$ 1,269,380	$ 1,740,055	$ 487,078	$ 810,520
Sub-Total Payroll	LBTOT		$ 928,105	$ 1,272,238	$ 361,274	$ 551,703

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Operation and Maintenance Expenses (Continued)						
Maintenance of General Plant						
1.932.0100 Maint Communication Equip	OM932.01	PTSUB	-	-	41,253	ok
1.932.0200 Maint Office Equipment	OM932.02	LBTOT	2,051	-	22,273	ok
1.932.0300 Maint General Structures	OM932.03	LBTOT	1,958	-	21,263	ok
1.932.0500 Maint Computer Equipment	OM932.05	LBTOT	5,082	-	55,176	ok
Total Maintenance of General Plant			$ 9,092	$ -	139,965	ok
Total Maintenance Expense	OMTME		$ 9,092	$ -	542,182	ok
Total Operation and Maintenance Expenses	OMT		$ 1,294,736	$ -	8,727,917	ok
Sub-Total Payroll	LBTOT		$ 495,671	$ -	5,381,576	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector		Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Other Expenses							
Depreciation Expenses							
Total Depreciation Expenses	DEPREX	DEPR	$	3,570,354	-	-	94,504
Taxes Other Than Income Taxes							
Liscense & Privilege Fee	OTRE	PTIS	$	423	-	-	41
Property Taxes	OTPP	PTIS		742,584	-	-	72,407
Payroll Taxes	OTUN	LBTOT		480,841	-	-	31,918
Total Taxes Other Than Income Taxes	OTT		$	1,223,848	$ -	$ -	$ 104,367
Interest Expenses	INT	PTIS	$	3,665,200	-	-	357,383

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Other Expenses							
Depreciation Expenses							
Total Depreciation Expenses	DEPREX	DEPR	-	1,344,532	-	-	54,299
Taxes Other Than Income Taxes							
Liscense & Privilege Fee	OTRE	PTIS	-	120	-	-	7
Property Taxes	OTPP	PTIS	-	210,533	-	-	11,710
Payroll Taxes	OTUN	LBTOT	3,896	115,343	-	-	7,223
Total Taxes Other Than Income Taxes	OTT		$ 3,896	$ 325,995	$ -	$ -	$ 18,940
Interest Expenses	INT	PTIS	-	1,039,134	-	-	57,799

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Other Expenses						
Depreciation Expenses						
Total Depreciation Expenses	DEPREX	DEPR	623,405	854,558	242,666	356,388
Taxes Other Than Income Taxes						
Liscense & Privilege Fee	OTRE	PTIS	77	105	30	44
Property Taxes	OTPP	PTIS	134,445	184,296	52,334	76,859
Payroll Taxes	OTUN	LBTOT	82,926	113,674	32,280	49,294
Total Taxes Other Than Income Taxes	OTT		$ 217,447	$ 298,075	$ 84,643	$ 126,198
Interest Expenses	INT	PTIS	663,584	909,636	258,306	379,358

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Other Expenses						
Depreciation Expenses						
Total Depreciation Expenses	DEPREX	DEPR	-	-	3,570,354	ok
Taxes Other Than Income Taxes						
Liscense & Privilege Fee	OTRE	PTIS	-	-	423	ok
Property Taxes	OTPP	PTIS	-	-	742,584	ok
Payroll Taxes	OTUN	LBTOT	44,288	-	480,841	ok
Total Taxes Other Than Income Taxes	OTT	$	$ 44,288	$ -	1,223,848	ok
Interest Expenses	INT	PTIS	-	-	3,665,200	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Functional Assignment Vectors						
Gas Supply Demand	F001		1.000000	1.000000	0.000000	0.000000
Gas Supply Commodity	F002		1.000000	0.000000	1.000000	0.000000
Storage Demand	F003		1.000000	0.000000	0.000000	1.000000
Storage Commodity	F004		1.000000	0.000000	0.000000	0.000000
Transmission Demand	F005		1.000000	0.000000	0.000000	0.000000
Transmission Commodity	F006		1.000000	0.000000	0.000000	0.000000
Distribution Expense Commodity	F007		1.000000	0.000000	0.000000	0.000000
Distribution Structures & Equipment	F008		1.000000	0.000000	0.000000	0.000000
Distribution Mains	F009		1.000000	0.000000	0.000000	0.000000
Services	F010		1.000000	0.000000	0.000000	0.000000
Meters	F011		1.000000	0.000000	0.000000	0.000000
Customer Accounts	F012		1.000000	0.000000	0.000000	0.000000
Customer Marketing	F013		1.000000	0.000000	0.000000	0.000000
Transmission & Distribution Mains	TDMSUB		$ 74,031,252	$ -	$ -	$ -

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Functional Assignment Vectors							
Gas Supply Demand	F001		0.000000	0.000000	0.000000	0.000000	0.000000
Gas Supply Commodity	F002		0.000000	0.000000	0.000000	0.000000	0.000000
Storage Demand	F003		0.000000	0.000000	0.000000	0.000000	0.000000
Storage Commodity	F004		1.000000	0.000000	0.000000	0.000000	0.000000
Transmission Demand	F005		0.000000	1.000000	0.000000	0.000000	0.000000
Transmission Commodity	F006		0.000000	0.000000	1.000000	0.000000	0.000000
Distribution Expense Commodity	F007		0.000000	0.000000	0.000000	1.000000	0.000000
Distribution Structures & Equipment	F008		0.000000	0.000000	0.000000	0.000000	1.000000
Distribution Mains	F009		0.000000	0.000000	0.000000	0.000000	0.000000
Services	F010		0.000000	0.000000	0.000000	0.000000	0.000000
Meters	F011		0.000000	0.000000	0.000000	0.000000	0.000000
Customer Accounts	F012		0.000000	0.000000	0.000000	0.000000	0.000000
Customer Marketing	F013		0.000000	0.000000	0.000000	0.000000	0.000000
Transmission & Distribution Mains	TDMSUB		$ -	$ 27,532,254	$ -	$ -	$ -

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Functional Assignment Vectors						
Gas Supply Demand	F001		0.000000	0.000000	0.000000	0.000000
Gas Supply Commodity	F002		0.000000	0.000000	0.000000	0.000000
Storage Demand	F003		0.000000	0.000000	0.000000	0.000000
Storage Commodity	F004		0.000000	0.000000	0.000000	0.000000
Transmission Demand	F005		0.000000	0.000000	0.000000	0.000000
Transmission Commodity	F006		0.000000	0.000000	0.000000	0.000000
Distribution Expense Commodity	F007		0.000000	0.000000	0.000000	0.000000
Distribution Structures & Equipment	F008		0.000000	0.000000	0.000000	0.000000
Distribution Mains	F009		0.421800	0.578200	0.000000	0.000000
Services	F010		0.000000	0.000000	1.000000	0.000000
Meters	F011		0.000000	0.000000	0.000000	1.000000
Customer Accounts	F012		0.000000	0.000000	0.000000	0.000000
Customer Marketing	F013		0.000000	0.000000	0.000000	0.000000
Transmission & Distribution Mains	TDMSUB		$ 19,613,277	$ 26,885,721	$ -	$ -

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Functional Assignment Vectors						
Gas Supply Demand	F001		0.000000	0.000000	-	ok
Gas Supply Commodity	F002		0.000000	0.000000	1.000000	ok
Storage Demand	F003		0.000000	0.000000	1.000000	ok
Storage Commodity	F004		0.000000	0.000000	1.000000	ok
Transmission Demand	F005		0.000000	0.000000	1.000000	ok
Transmission Commodity	F006		0.000000	0.000000	1.000000	ok
Distribution Expense Commodity	F007		0.000000	0.000000	1.000000	ok
Distribution Structures & Equipment	F008		0.000000	0.000000	1.000000	ok
Distribution Mains	F009		0.000000	0.000000	1.000000	ok
Services	F010		0.000000	0.000000	1.000000	ok
Meters	F011		0.000000	0.000000	1.000000	ok
Customer Accounts	F012		1.000000	0.000000	1.000000	ok
Customer Marketing	F013		0.000000	1.000000	1.000000	ok
Transmission & Distribution Mains	TDMSUB	$	-	$ -	74,031,252	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Total Company	Gas Supply Demand	Gas Supply Commodity	Storage Demand
Internally Generated Functional Vectors						
Sub-Total Distribution Plant		PTDSUB	1.000000	-	-	-
Storage-Transmission-Distribution Subtotal		PTSUB	1.000000	-	-	0.100457
Total Storage Plant		PTST	1.000000	-	-	1.000000
Transmission Plant		PT365	1.000000	-	-	-
General Plant		PT389	1.000000	-	-	0.100457
Total Distribution Plant		PTD	1.000000	-	-	-
Sub-Total CWIP		CWIPST	1.000000	-	-	0.141801
Net Plant in Service		NPTIS	1.000000	-	-	0.125764
Total Operation and Maintenance Expenses		OMT	1.000000	-	-	0.057522
Total Depreciation Reserve		DEPR	1.000000	-	-	0.026469
Transmission -Distribution Plant Subtotal		PTTD	1.000000	-	-	-
Total Labor Expenses		LBTOT	1.000000	-	-	0.066380
Transmission and Distribution Payroll		OM900.01	1.000000	-	-	-
Transmission and Distribution Mains		TDMSUB	1.000000	-	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Storage Commodity	Transmission Demand	Transmission Commodity	Distribution Other Not Used	Distribution Structures & Equipment Demand
Internally Generated Functional Vectors							
Sub-Total Distribution Plant		PTDSUB	-	-	-	-	0.025477
Storage-Transmission-Distribution Subtotal		PTSUB	-	0.261838	-	-	0.016247
Total Storage Plant		PTST	-	-	-	-	-
Transmission Plant		PT365	-	1.000000	-	-	-
General Plant		PT389	-	0.261838	-	-	0.016247
Total Distribution Plant		PTD	-	-	-	-	0.025477
Sub-Total CWIP		CWIPST	-	0.236960	-	-	0.015827
Net Plant in Service		NPTIS	-	0.246494	-	-	0.015993
Total Operation and Maintenance Expenses		OMT	0.011646	0.275798	-	-	0.013212
Total Depreciation Reserve		DEPR	-	0.376582	-	-	0.015208
Transmission -Distribution Plant Subtotal		PTTD	-	0.291079	-	-	0.018061
Total Labor Expenses		LBTOT	0.008103	0.239877	-	-	0.015021
Transmission and Distribution Payroll		OM900.01	-	0.291079	-	-	0.018061
Transmission and Distribution Mains		TDMSUB	-	0.371900	-	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Distribution Mains Demand	Distribution Mains Customer	Services Customer	Meters Customer
Internally Generated Functional Vectors						
Sub-Total Distribution Plant		PTDSUB	0.292498	0.400953	0.113857	0.167215
Storage-Transmission-Distribution Subtotal		PTSUB	0.186527	0.255690	0.072607	0.106634
Total Storage Plant		PTST	-	-	-	-
Transmission Plant		PT365	-	-	-	-
General Plant		PT389	0.186527	0.255690	0.072607	0.106634
Total Distribution Plant		PTD	0.292498	0.400953	0.113857	0.167215
Sub-Total CWIP		CWIPST	0.181711	0.249088	0.070733	0.103881
Net Plant in Service		NPTIS	0.183613	0.251695	0.071473	0.104968
Total Operation and Maintenance Expenses		OMT	0.145439	0.199367	0.055807	0.092865
Total Depreciation Reserve		DEPR	0.174606	0.239348	0.067967	0.099819
Transmission -Distribution Plant Subtotal		PTTD	0.207358	0.284244	0.080716	0.118542
Total Labor Expenses		LBTOT	0.172460	0.236406	0.067132	0.102517
Transmission and Distribution Payroll		OM900.01	0.207358	0.284244	0.080716	0.118542
Transmission and Distribution Mains		TDMSUB	0.264932	0.363167	-	-

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Functional Assignment and Classification

Description	Name	Vector	Customer Accounts Customer	Other Services Not Used	Total Check	Status
Internally Generated Functional Vectors						
Sub-Total Distribution Plant		PTDSUB	-	-	1.000000	ok
Storage-Transmission-Distribution Subtotal		PTSUB	-	-	1.000000	ok
Total Storage Plant		PTST	-	-	1.000000	ok
Transmission Plant		PT365	-	-	1.000000	ok
General Plant		PT389	-	-	1.000000	ok
Total Distribution Plant		PTD	-	-	1.000000	ok
Sub-Total CWIP		CWIPST	-	-	1.000000	ok
Net Plant in Service		NPTIS	-	-	1.000000	ok
Total Operation and Maintenance Expenses		OMT	0.148344	-	1.000000	ok
Total Depreciation Reserve		DEPR	-	-	1.000000	ok
Transmission -Distribution Plant Subtotal		PTTD	-	-	1.000000	ok
Total Labor Expenses		LBTOT	0.092105	-	1.000000	ok
Transmission and Distribution Payroll		OM900.01	-	-	1.000000	ok
Transmission and Distribution Mains		TDMSUB	-	-	1.000000	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Plant in Service							
Gas Supply							
Demand	PTIS	PTISGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	PTIS	PTISGSC	COM01	-	-	-	-
Total Gas Supply				$ -	$ -	$ -	$ -
Storage							
Demand	PTIS	PTISSD	DEM02	$ 12,071,658	$ 6,330,797	$ 1,621,755	$ 4,119,106
Commodity	PTIS	PTISSC	COM02	-	-	-	-
Total Storage				$ 12,071,658	$ 6,330,797	$ 1,621,755	$ 4,119,106
Transmission							
Demand	PTIS	PTISTD	DEM03	$ 35,099,794	$ 16,016,780	$ 4,022,025	$ 8,236,665
Commodity	PTIS	PTISTC	COM03	-	-	-	-
Total Transmission				$ 35,099,794	$ 16,016,780	$ 4,022,025	$ 8,236,665
Distribution Other							
Commodity	PTIS	PTISDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	PTIS	PTISDSD	DEM04	$ 1,952,324	$ 1,007,770	$ 253,064	$ 518,248

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Plant in Service								
Gas Supply								
Demand	PTIS	PTISGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	PTIS	PTISGSC	COM01	-	-	-	-	ok
Total Gas Supply				$ -	$ -	$ -	$ -	ok
Storage								
Demand	PTIS	PTISSD	DEM02	$ -	$ -	$ -	$ 12,071,658	ok
Commodity	PTIS	PTISSC	COM02	-	-	-	-	ok
Total Storage				$ -	$ -	$ -	$ 12,071,658	ok
Transmission								
Demand	PTIS	PTISTD	DEM03	$ 2,229,657	$ 2,591,983	$ 2,002,683	$ 35,099,794	ok
Commodity	PTIS	PTISTC	COM03	-	-	-	-	ok
Total Transmission				$ 2,229,657	$ 2,591,983	$ 2,002,683	$ 35,099,794	ok
Distribution Other								
Commodity	PTIS	PTISDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	PTIS	PTISDSD	DEM04	$ 140,289	$ 32,951	$ -	$ 1,952,324	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Plant in Service (Continued)							
Distribution Mains							
Demand	PTIS	PTISDMD	DEM05	$ 22,414,484	$ 11,570,137	$ 2,905,414	$ 5,949,969
Customer	PTIS	PTISDMC	CUST01	30,725,592	26,479,541	3,493,627	714,642
Total Distribution Mains				53,140,076	$ 38,049,677	$ 6,399,041	$ 6,664,611
Services							
Customer	PTIS	PTISSC	CUST02	$ 8,725,049	$ 7,358,256	$ 1,100,808	$ 251,765
Meters							
Customer	PTIS	PTISMC	CUST03	$ 12,813,915	$ 6,118,911	$ 1,056,632	$ 4,130,683
Customer Accounts							
Customer	PTIS	PTISCAC	CUST04	$ -	$ -	$ -	$ -
Other Services							
Customer	PTIS	PTISCSC	CUST05	$ -	$ -	$ -	$ -
Total		PLT		$ 123,802,816	$ 74,882,191	$ 14,453,326	$ 23,921,079

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Plant in Service (Continued)								
Distribution Mains								
Demand	PTIS	PTISDMD	DEM05	$ 1,610,651	$ 378,313	$ -	$ 22,414,484	ok
Customer	PTIS	PTISDMC	CUST01	35,370	2,412	-	30,725,592	ok
Total Distribution Mains				$ 1,646,021	$ 380,725	$ -	$ 53,140,076	ok
Services								
Customer	PTIS	PTISSC	CUST02	$ 12,461	$ 1,759	$ -	$ 8,725,049	ok
Meters								
Customer	PTIS	PTISMC	CUST03	$ 1,187,183	$ 234,260	$ 86,246	$ 12,813,915	ok
Customer Accounts								
Customer	PTIS	PTISCAC	CUST04	$ -	$ -	$ -	$ -	ok
Other Services								
Customer	PTIS	PTISCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		PLT		$ 5,215,612	$ 3,241,679	$ 2,088,929	$ 123,802,816	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Rate Base							
Gas Supply							
Demand	NCRB	RBGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	NCRB	RBGSC	COM01	-	-	-	-
Total Gas Supply				$ -	$ -	$ -	$ -
Storage							
Demand	NCRB	RBSD	DEM02	$ 14,507,883	$ 7,608,438	$ 1,949,047	$ 4,950,397
Commodity	NCRB	RBSC	COM02	12,778	6,701	1,717	4,360
Total Storage				$ 14,520,661	$ 7,615,140	$ 1,950,764	$ 4,954,757
Transmission							
Demand	NCRB	RBTD	DEM03	$ 21,293,544	$ 9,716,695	$ 2,439,991	$ 4,996,833
Commodity	NCRB	RBTC	COM03	-	-	-	-
Total Transmission				$ 21,293,544	$ 9,716,695	$ 2,439,991	$ 4,996,833
Distribution Other							
Commodity	NCRB	RBDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	NCRB	RBDSD	DEM04	$ 1,377,234	$ 710,915	$ 178,520	$ 365,589

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Rate Base								
Gas Supply								
Demand	NCRB	RBGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	NCRB	RBGSC	COM01	-	-	-	-	ok
Total Gas Supply				$ -	$ -	$ -	$ -	ok
Storage								
Demand	NCRB	RBSD	DEM02	$ -	$ -	$ -	$ 14,507,883	ok
Commodity	NCRB	RBSC	COM02	-	-	-	12,778	ok
Total Storage				$ -	$ -	$ -	$ 14,520,661	ok
Transmission								
Demand	NCRB	RBTD	DEM03	$ 1,352,638	$ 1,572,445	$ 1,214,942	$ 21,293,544	ok
Commodity	NCRB	RBTC	COM03	-	-	-	-	ok
Total Transmission				$ 1,352,638	$ 1,572,445	$ 1,214,942	$ 21,293,544	ok
Distribution Other								
Commodity	NCRB	RBDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	NCRB	RBDSD	DEM04	$ 98,965	$ 23,245	$ -	$ 1,377,234	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Rate Base (Continued)							
Distribution Mains							
Demand	NCRB	RBDMD	DEM05	$ 15,712,242	$ 8,110,505	$ 2,036,655	$ 4,170,846
Customer	NCRB	RBDMC	CUST01	21,538,213	18,561,790	2,448,984	500,954
Total Distribution Mains				37,250,454	$ 26,672,295	$ 4,485,639	$ 4,671,800
Services							
Customer	NCRB	RBSC	CUST02	$ 6,151,385	$ 5,187,760	$ 776,098	$ 177,501
Meters							
Customer	NCRB	RBMC	CUST03	$ 9,046,107	$ 4,319,704	$ 745,940	$ 2,916,096
Customer Accounts							
Customer	NCRB	RBCAC	CUST04	$ 162,771	$ 128,955	$ 17,014	$ 13,921
Other Services							
Customer	NCRB	RBCSC	CUST05	$ -	$ -	$ -	$ -
Total		RBT		$ 89,802,156	$ 54,351,464	$ 10,593,965	$ 18,096,497

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Rate Base (Continued)								
Distribution Mains								
Demand	NCRB	RBDMD	DEM05	$ 1,129,044	$ 265,192	$ -	$ 15,712,242	ok
Customer	NCRB	RBDMC	CUST01	24,794	1,691	-	21,538,213	ok
Total Distribution Mains				$ 1,153,838	$ 266,883	$ -	$ 37,250,454	ok
Services								
Customer	NCRB	RBSC	CUST02	$ 8,785	$ 1,240	$ -	$ 6,151,385	ok
Meters								
Customer	NCRB	RBMC	CUST03	$ 838,103	$ 165,378	$ 60,886	$ 9,046,107	ok
Customer Accounts								
Customer	NCRB	RBCAC	CUST04	$ 689	$ 78	$ 2,114	$ 162,771	ok
Other Services								
Customer	NCRB	RBCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		RBT		$ 3,453,018	$ 2,029,270	$ 1,277,942	$ 89,802,156	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Operation and Maintenance Expenses							
Gas Supply							
Demand	OMT	OMGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	OMT	OMGSC	COM01	-	-	-	-
Total Gas Supply		OMGST		$ -	$ -	$ -	$ -
Storage							
Demand	OMT	OMSD	DEM02	$ 502,048	$ 263,291	$ 67,447	$ 171,309
Commodity	OMT	OMSC	COM02	101,644	53,306	13,655	34,683
Total Storage		OMST		$ 603,692	$ 316,597	$ 81,102	$ 205,992
Transmission							
Demand	OMT	OMTD	DEM03	$ 2,407,141	$ 1,098,430	$ 275,830	$ 564,870
Commodity	OMT	OMTC	COM03	-	-	-	-
Total Transmission		OMTT		$ 2,407,141	$ 1,098,430	$ 275,830	$ 564,870
Distribution Other							
Commodity	OMT	OMDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	OMT	OMDSD	DEM04	$ 115,314	$ 59,524	$ 14,947	$ 30,610

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Operation and Maintenance Expenses								
Gas Supply								
Demand	OMT	OMGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	OMT	OMGSC	COM01	-	-	-	-	ok
Total Gas Supply		OMGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	OMT	OMSD	DEM02	$ -	$ -	$ -	$ 502,048	ok
Commodity	OMT	OMSC	COM02	-	-	-	101,644	ok
Total Storage		OMST		$ -	$ -	$ -	$ 603,692	ok
Transmission								
Demand	OMT	OMTD	DEM03	$ 152,910	$ 177,758	$ 137,344	$ 2,407,141	ok
Commodity	OMT	OMTC	COM03	-	-	-	-	ok
Total Transmission		OMTT		$ 152,910	$ 177,758	$ 137,344	$ 2,407,141	ok
Distribution Other								
Commodity	OMT	OMDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	OMT	OMDSD	DEM04	$ 8,286	$ 1,946	$ -	$ 115,314	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector		Total System		Residential (GS)		Commercial Small (GS)		Large Commercial and Industrial (GS)
Operation and Maintenance Expenses (Continued)											
Distribution Mains											
Demand	OMT	OMDMD	DEM05	$	1,269,380	$	655,241	$	164,540	$	336,959
Customer	OMT	OMDMC	CUST01		1,740,055		1,499,593		197,852		40,472
Total Distribution Mains					3,009,435	$	2,154,834	$	362,391	$	377,431
Services											
Customer	OMT	OMSC	CUST02	$	487,078	$	410,777	$	61,453	$	14,055
Meters											
Customer	OMT	OMMC	CUST03	$	810,520	$	387,040	$	66,835	$	261,279
Customer Accounts											
Customer	OMT	OMCAC	CUST04	$	1,294,736	$	1,025,750	$	135,334	$	110,734
Other Services											
Customer	OMT	OMCSC	CUST05	$	-	$	-	$	-	$	-
Total		OMTT		$	8,727,917	$	5,452,951	$	997,894	$	1,564,971

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Operation and Maintenance Expenses (Continued)								
Distribution Mains								
Demand	OMT	OMDMD	DEM05	$ 91,215	$ 21,425	$ -	$ 1,269,380	ok
Customer	OMT	OMDMC	CUST01	2,003	137	-	1,740,055	ok
Total Distribution Mains				$ 93,218	$ 21,561	$ -	$ 3,009,435	ok
Services								
Customer	OMT	OMSC	CUST02	$ 696	$ 98	$ -	$ 487,078	ok
Meters								
Customer	OMT	OMMC	CUST03	$ 75,093	$ 14,818	$ 5,455	$ 810,520	ok
Customer Accounts								
Customer	OMT	OMCAC	CUST04	$ 5,481	$ 623	$ 16,816	$ 1,294,736	ok
Other Services								
Customer	OMT	OMCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		OMTT		$ 335,683	$ 216,804	$ 159,615	$ 8,727,917	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Payroll Expenses							
Gas Supply							
Demand	LBTOT	LBGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	LBTOT	LBGSC	COM01	-	-	-	-
Total Gas Supply		LBGST		$ -	$ -	$ -	$ -
Storage							
Demand	LBTOT	LBSD	DEM02	$ 357,228	$ 187,343	$ 47,991	$ 121,894
Commodity	LBTOT	LBSC	COM02	43,604	22,868	5,858	14,879
Total Storage		LBST		$ 400,832	$ 210,210	$ 53,849	$ 136,772
Transmission							
Demand	LBTOT	LBTD	DEM03	$ 1,290,914	$ 589,071	$ 147,924	$ 302,931
Commodity	LBTOT	LBTC	COM03	-	-	-	-
Total Transmission		LBTT		$ 1,290,914	$ 589,071	$ 147,924	$ 302,931
Distribution Other							
Commodity	LBTOT	LBDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	LBTOT	LBDSD	DEM04	$ 80,839	$ 41,728	$ 10,479	$ 21,459

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Payroll Expenses								
Gas Supply								
Demand	LBTOT	LBGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	LBTOT	LBGSC	COM01	-	-	-	-	ok
Total Gas Supply		LBGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	LBTOT	LBSD	DEM02	$ -	$ -	$ -	$ 357,228	ok
Commodity	LBTOT	LBSC	COM02	-	-	-	43,604	ok
Total Storage		LBST		$ -	$ -	$ -	$ 400,832	ok
Transmission								
Demand	LBTOT	LBTD	DEM03	$ 82,003	$ 95,329	$ 73,655	$ 1,290,914	ok
Commodity	LBTOT	LBTC	COM03	-	-	-	-	ok
Total Transmission		LBTT		$ 82,003	$ 95,329	$ 73,655	$ 1,290,914	ok
Distribution Other								
Commodity	LBTOT	LBDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	LBTOT	LBDSD	DEM04	$ 5,809	$ 1,364	$ -	$ 80,839	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Payroll Expenses (Continued)							
Distribution Mains							
Demand	LBTOT	LBDMD	DEM05	$ 928,105	$ 479,079	$ 120,303	$ 246,367
Customer	LBTOT	LBDMC	CUST01	1,272,238	1,096,424	144,659	29,591
Total Distribution Mains				2,200,343	$ 1,575,503	$ 264,962	$ 275,958
Services							
Customer	LBTOT	LBSC	CUST02	$ 361,274	$ 304,679	$ 45,581	$ 10,425
Meters							
Customer	LBTOT	LBMC	CUST03	$ 551,703	$ 263,449	$ 45,493	$ 177,846
Customer Accounts							
Customer	LBTOT	LBCAC	CUST04	$ 495,671	$ 392,694	$ 51,811	$ 42,393
Other Services							
Customer	LBTOT	LBCSC	CUST05	$ -	$ -	$ -	$ -
Total		LBTT		$ 5,381,576	$ 3,377,336	$ 620,098	$ 967,785

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Payroll Expenses (Continued)								
Distribution Mains								
Demand	LBTOT	LBDMD	DEM05	$ 66,691	$ 15,665	$ -	$ 928,105	ok
Customer	LBTOT	LBDMC	CUST01	1,465	100	-	1,272,238	ok
Total Distribution Mains				$ 68,156	$ 15,764	$ -	$ 2,200,343	ok
Services								
Customer	LBTOT	LBSC	CUST02	$ 516	$ 73	$ -	$ 361,274	ok
Meters								
Customer	LBTOT	LBMC	CUST03	$ 51,114	$ 10,086	$ 3,713	$ 551,703	ok
Customer Accounts								
Customer	LBTOT	LBCAC	CUST04	$ 2,098	$ 238	$ 6,438	$ 495,671	ok
Other Services								
Customer	LBTOT	LBCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		LBTT		$ 209,696	$ 122,855	$ 83,806	$ 5,381,576	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Depreciation Expenses							
Gas Supply							
Demand	DEPREX	DEGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	DEPREX	DEGSC	COM01	-	-	-	-
Total Gas Supply		DEGST		$ -	$ -	$ -	$ -
Storage							
Demand	DEPREX	DESD	DEM02	$ 94,504	$ 49,561	$ 12,696	$ 32,247
Commodity	DEPREX	DESC	COM02	-	-	-	-
Total Storage		DEST		$ 94,504	$ 49,561	$ 12,696	$ 32,247
Transmission							
Demand	DEPREX	DETD	DEM03	$ 1,344,532	$ 613,539	$ 154,068	$ 315,514
Commodity	DEPREX	DETC	COM03	-	-	-	-
Total Transmission		DETT		$ 1,344,532	$ 613,539	$ 154,068	$ 315,514
Distribution Other							
Commodity	DEPREX	DEDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	DEPREX	DEDSD	DEM04	$ 54,299	$ 28,029	$ 7,038	$ 14,414

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Depreciation Expenses								
Gas Supply								
Demand	DEPREX	DEGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	DEPREX	DEGSC	COM01	-	-	-	-	ok
Total Gas Supply		DEGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	DEPREX	DESD	DEM02	$ -	$ -	$ -	$ 94,504	ok
Commodity	DEPREX	DESC	COM02	-	-	-	-	ok
Total Storage		DEST		$ -	$ -	$ -	$ 94,504	ok
Transmission								
Demand	DEPREX	DETD	DEM03	$ 85,409	$ 99,288	$ 76,715	$ 1,344,532	ok
Commodity	DEPREX	DETC	COM03	-	-	-	-	ok
Total Transmission		DETT		$ 85,409	$ 99,288	$ 76,715	$ 1,344,532	ok
Distribution Other								
Commodity	DEPREX	DEDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	DEPREX	DEDSD	DEM04	$ 3,902	$ 916	$ -	$ 54,299	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Depreciation Expenses (Continued)							
Distribution Mains							
Demand	DEPREX	DEDMD	DEM05	$ 623,405	$ 321,796	$ 80,807	$ 165,484
Customer	DEPREX	DEDMC	CUST01	854,558	736,465	97,167	19,876
Total Distribution Mains				1,477,963	$ 1,058,260	$ 177,974	$ 185,360
Services							
Customer	DEPREX	DESC	CUST02	$ 242,666	$ 204,652	$ 30,616	$ 7,002
Meters							
Customer	DEPREX	DEMC	CUST03	$ 356,388	$ 170,183	$ 29,388	$ 114,885
Customer Accounts							
Customer	DEPREX	DECAC	CUST04	$ -	$ -	$ -	$ -
Other Services							
Customer	DEPREX	DECSC	CUST05	$ -	$ -	$ -	$ -
Total		DET		$ 3,570,354	$ 2,124,224	$ 411,780	$ 669,422

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Depreciation Expenses (Continued)								
Distribution Mains								
Demand	DEPREX	DEDMD	DEM05	$ 44,796	$ 10,522	$ -	$ 623,405	ok
Customer	DEPREX	DEDMC	CUST01	984	67	-	854,558	ok
Total Distribution Mains				$ 45,780	$ 10,589	$ -	$ 1,477,963	ok
Services								
Customer	DEPREX	DESC	CUST02	$ 347	$ 49	$ -	$ 242,666	ok
Meters								
Customer	DEPREX	DEMC	CUST03	$ 33,019	$ 6,515	$ 2,399	$ 356,388	ok
Customer Accounts								
Customer	DEPREX	DECAC	CUST04	$ -	$ -	$ -	$ -	ok
Other Services								
Customer	DEPREX	DECSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		DET		$ 168,456	$ 117,358	$ 79,113	$ 3,570,354	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Other Taxes							
Gas Supply							
Demand	OTT	OTTGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	OTT	OTTGSC	COM01	-	-	-	-
Total Gas Supply		OTTGST		$ -	$ -	$ -	$ -
Storage							
Demand	OTT	OTTSD	DEM02	$ 104,367	$ 54,733	$ 14,021	$ 35,612
Commodity	OTT	OTTSC	COM02	3,896	2,043	523	1,329
Total Storage		OTTST		$ 108,263	$ 56,777	$ 14,544	$ 36,942
Transmission							
Demand	OTT	OTTTD	DEM03	$ 325,995	$ 148,758	$ 37,355	$ 76,499
Commodity	OTT	OTTTC	COM03	-	-	-	-
Total Transmission		OTTTT		$ 325,995	$ 148,758	$ 37,355	$ 76,499
Distribution Other							
Commodity	OTT	OTTDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	OTT	OTTDSD	DEM04	$ 18,940	$ 9,777	$ 2,455	$ 5,028

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Other Taxes								
Gas Supply								
Demand	OTT	OTTGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	OTT	OTTGSC	COM01	-	-	-	-	ok
Total Gas Supply		OTTGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	OTT	OTTSD	DEM02	$ -	$ -	$ -	$ 104,367	ok
Commodity	OTT	OTTSC	COM02	-	-	-	3,896	ok
Total Storage		OTTST		$ -	$ -	$ -	$ 108,263	ok
Transmission								
Demand	OTT	OTTTD	DEM03	$ 20,708	$ 24,073	$ 18,600	$ 325,995	ok
Commodity	OTT	OTTTC	COM03	-	-	-	-	ok
Total Transmission		OTTTT		$ 20,708	$ 24,073	$ 18,600	$ 325,995	ok
Distribution Other								
Commodity	OTT	OTTDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	OTT	OTTDSD	DEM04	$ 1,361	$ 320	$ -	$ 18,940	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Other Taxes (Continued)							
Distribution Mains							
Demand	OTT	OTTDMD	DEM05	$ 217,447	$ 112,244	$ 28,186	$ 57,722
Customer	OTT	OTTDMC	CUST01	298,075	256,883	33,892	6,933
Total Distribution Mains				515,522	$ 369,127	$ 62,078	$ 64,655
Services							
Customer	OTT	OTTSC	CUST02	$ 84,643	$ 71,384	$ 10,679	$ 2,442
Meters							
Customer	OTT	OTTMC	CUST03	$ 126,198	$ 60,262	$ 10,406	$ 40,681
Customer Accounts							
Customer	OTT	OTTCAC	CUST04	$ 44,288	$ 35,087	$ 4,629	$ 3,788
Other Services							
Customer	OTT	OTTCSC	CUST05	$ -	$ -	$ -	$ -
Total		OTTT		$ 1,223,848	$ 751,171	$ 142,148	$ 230,034

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Other Taxes (Continued)								
Distribution Mains								
Demand	OTT	OTTDMD	DEM05	$ 15,625	$ 3,670	$ -	$ 217,447	ok
Customer	OTT	OTTDMC	CUST01	343	23	-	298,075	ok
Total Distribution Mains				$ 15,968	$ 3,693	$ -	$ 515,522	ok
Services								
Customer	OTT	OTTSC	CUST02	$ 121	$ 17	$ -	$ 84,643	ok
Meters								
Customer	OTT	OTTMC	CUST03	$ 11,692	$ 2,307	$ 849	$ 126,198	ok
Customer Accounts								
Customer	OTT	OTTCAC	CUST04	$ 187	$ 21	$ 575	$ 44,288	ok
Other Services								
Customer	OTT	OTTCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		OTTT		$ 50,038	$ 30,432	$ 20,025	$ 1,223,848	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Interest Expenses							
Gas Supply							
Demand	INT	INTGSD	DEM01	$ -	$ -	$ -	$ -
Commodity	INT	INTGSC	COM01	-	-	-	-
Total Gas Supply		INTGST		$ -	$ -	$ -	$ -
Storage							
Demand	INT	INTSD	DEM02	$ 357,383	$ 187,424	$ 48,012	$ 121,947
Commodity	INT	INTSC	COM02	-	-	-	-
Total Storage		INTST		$ 357,383	$ 187,424	$ 48,012	$ 121,947
Transmission							
Demand	INT	INTTD	DEM03	$ 1,039,134	$ 474,179	$ 119,073	$ 243,848
Commodity	INT	INTTC	COM03	-	-	-	-
Total Transmission		INTTT		$ 1,039,134	$ 474,179	$ 119,073	$ 243,848
Distribution Other							
Commodity	INT	INTDEC	COM04	$ -	$ -	$ -	$ -
Distribution Structures & Equipment							
Demand	INT	INTDSD	DEM04	$ 57,799	$ 29,835	$ 7,492	$ 15,343

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Interest Expenses								
Gas Supply								
Demand	INT	INTGSD	DEM01	$ -	$ -	$ -	$ -	ok
Commodity	INT	INTGSC	COM01	-	-	-	-	ok
Total Gas Supply		INTGST		$ -	$ -	$ -	$ -	ok
Storage								
Demand	INT	INTSD	DEM02	$ -	$ -	$ -	$ 357,383	ok
Commodity	INT	INTSC	COM02	-	-	-	-	ok
Total Storage		INTST		$ -	$ -	$ -	$ 357,383	ok
Transmission								
Demand	INT	INTTD	DEM03	$ 66,009	$ 76,736	$ 59,290	$ 1,039,134	ok
Commodity	INT	INTTC	COM03	-	-	-	-	ok
Total Transmission		INTTT		$ 66,009	$ 76,736	$ 59,290	$ 1,039,134	ok
Distribution Other								
Commodity	INT	INTDEC	COM04	$ -	$ -	$ -	$ -	ok
Distribution Structures & Equipment								
Demand	INT	INTDSD	DEM04	$ 4,153	$ 976	$ -	$ 57,799	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector		Total System		Residential (GS)		Commercial Small (GS)		Large Commercial and Industrial (GS)
Interest Expenses (Continued)											
Distribution Mains											
Demand	INT	INTDMD	DEM05	$	663,584	$	342,536	$	86,015	$	176,150
Customer	INT	INTDMC	CUST01		909,636		783,931		103,429		21,157
Total Distribution Mains					1,573,220	$	1,126,466	$	189,445	$	197,307
Services											
Customer	INT	INTSC	CUST02	$	258,306	$	217,842	$	32,590	$	7,454
Meters											
Customer	INT	INTMC	CUST03	$	379,358	$	181,151	$	31,282	$	122,289
Customer Accounts											
Customer	INT	INTCAC	CUST04	$	-	$	-	$	-	$	-
Other Services											
Customer	INT	INTCSC	CUST05	$	-	$	-	$	-	$	-
Total		INTT		$	3,665,200	$	2,216,898	$	427,893	$	708,187

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Interest Expenses (Continued)								
Distribution Mains								
Demand	INT	INTDMD	DEM05	$ 47,684	$ 11,200	$ -	$ 663,584	ok
Customer	INT	INTDMC	CUST01	1,047	71	-	909,636	ok
Total Distribution Mains				$ 48,731	$ 11,271	$ -	$ 1,573,220	ok
Services								
Customer	INT	INTSC	CUST02	$ 369	$ 52	$ -	$ 258,306	ok
Meters								
Customer	INT	INTMC	CUST03	$ 35,147	$ 6,935	$ 2,553	$ 379,358	ok
Customer Accounts								
Customer	INT	INTCAC	CUST04	$ -	$ -	$ -	$ -	ok
Other Services								
Customer	INT	INTCSC	CUST05	$ -	$ -	$ -	$ -	ok
Total		INTT		$ 154,409	$ 95,970	$ 61,843	$ 3,665,200	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Net Operating Income -- Adjusted Test Period							
Operating Revenues							
Sales and Transportation		REVUC	R01	$ 20,523,105	10,109,997	2,764,469	4,542,780
Miscellaneous Service Revenue		REVMSR	REVUC	152,009	74,882	20,476	33,647
Total Operating Revenues		TOR		$ 20,675,114	$ 10,184,879	$ 2,784,945	$ 4,576,427
Expenses							
Operation and Maintenance Expenses				$ 8,727,917	$ 5,452,951	$ 997,894	$ 1,564,971
Depreciation and Amortization Expenses				3,570,354	2,124,224	411,780	669,422
Other Taxes				1,223,848	751,171	142,148	230,034
Total Operating Expenses		TOE		$ 13,522,119	$ 8,328,346	$ 1,551,821	$ 2,464,427
Expense Adjustments							
Year-End Adjustment		EXADJ1	YREND	$ 54,498	32,873	18,161	473
Eliminate Canada Mountain O&M Expenses		EXADJ2	OMST	1,000	524	134	341
Eliminate Canada Mountain Depr Expenses		EXADJ3	DEST	443,498	232,586	59,581	151,331
OT Expenses		EXADJ4	OTTT	8,937	5,485	1,038	1,680
Payroll Expenses		EXADJ5	LBTT	116,199	53,024	13,315	27,268
Payroll Other Taxes		EXADJ6	OTTT	-	-	-	-
Rate Case Expense		EXADJ7	TOR	29,000	14,286	3,906	6,419
Eliminate Test-Year Expenses		EXADJ8	OMTT	(142,711)	(65,122)	(16,353)	(33,489)
Customer Deposits		EXADJ9	OMTT	35,692	16,287	4,090	8,376
Medical Adjustment		EXADJ10	OMTT	77,561	35,393	8,888	18,201
Total Expense Adjustments		ADJTOT		$ 623,674	$ 325,336	$ 92,761	$ 180,599

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Net Operating Income -- Adjusted Test Period								
Operating Revenues								
Sales and Transportation		REVUC	R01	2,021,345	632,524	451,990	20,523,105	ok
Miscellaneous Service Revenue		REVMSR	REVUC	14,972	4,685	3,348	152,009	ok
Total Operating Revenues		TOR		$ 2,036,317	$ 637,209	$ 455,338	$ 20,675,114	ok
Expenses								
Operation and Maintenance Expenses				$ 335,683	$ 216,804	$ 159,615	$ 8,727,917	ok
Depreciation and Amortization Expenses				168,456	117,358	79,113	3,570,354	ok
Other Taxes				50,038	30,432	20,025	1,223,848	ok
Total Operating Expenses		TOE		$ 554,177	$ 364,595	$ 258,753	$ 13,522,119	ok
Expense Adjustments								
Year-End Adjustment		EXADJ1	YREND	-	2,991	-	54,498	ok
Eliminate Canada Mountain O&M Expenses		EXADJ2	OMST	-	-	-	1,000	ok
Eliminate Canada Mountain Depr Expenses		EXADJ3	DEST	-	-	-	443,498	ok
OT Expenses		EXADJ4	OTTT	365	222	146	8,937	ok
Payroll Expenses		EXADJ5	LBTT	7,381	8,581	6,630	116,199	ok
Payroll Other Taxes		EXADJ6	OTTT	-	-	-	-	ok
Rate Case Expense		EXADJ7	TOR	2,856	894	639	29,000	ok
Eliminate Test-Year Expenses		EXADJ8	OMTT	(9,065)	(10,539)	(8,143)	(142,711)	ok
Customer Deposits		EXADJ9	OMTT	2,267	2,636	2,036	35,692	ok
Medical Adjustment		EXADJ10	OMTT	4,927	5,728	4,425	77,561	ok
Total Expense Adjustments		ADJTOT		$ 8,732	$ 10,512	$ 5,734	623,674	ok

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Net Operating Income -- Adjusted Test Period (Continued)							
Net Income Before Income Taxes				$ 6,529,321	$ 1,531,196	$ 1,140,363	$ 1,931,401
Income Taxes			TXINC	$ 1,129,753	(270,475)	281,034	482,497
Net Operating Income		TOM		$ 5,399,568	$ 1,801,671	$ 859,329	$ 1,448,904
Net Cost Rate Base				$ 89,802,156	$ 54,351,464	$ 10,593,965	$ 18,096,497
Rate of Return -- Actual				6.01%	3.31%	8.11%	8.01%

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Net Operating Income -- Adjusted Test Period (Continued)								
Net Income Before Income Taxes				$ 1,473,408	$ 262,102	$ 190,851	$ 6,529,321	ok
Income Taxes			TXINC	520,279	65,531	50,887	1,129,753	ok
Net Operating Income		TOM		$ 953,128	$ 196,571	$ 139,964	$ 5,399,568	ok
Net Cost Rate Base				$ 3,453,018	$ 2,029,270	$ 1,277,942	$ 89,802,156	ok
Rate of Return -- Actual				27.60%	9.69%	10.95%		

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Net Operating Income -- Adjusted For Increase							
Test Year Operating Income				$ 5,399,568	$ 1,801,671	$ 859,329	$ 1,448,904
Proposed Increase				$ 4,855,705	$ 3,343,187	782,602	835,269
Income Taxes (@39.445)				1,915,333	1,318,720	308,697	329,472
Net Operating Income Adjusted for Increase				8,339,940	3,826,138	1,333,234	1,954,701
Net Cost Rate Base (Same as Actual)				$ 89,802,156	$ 54,351,464	$ 10,593,965	$ 18,096,497
Rate of Return -- Proposed				9.29%	7.04%	12.58%	10.80%

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Interruptible (IS)	Special Contracts (SP1)	Off-System Transportation (OS)	Total Check	Status
Net Operating Income -- Adjusted For Increase								
Test Year Operating Income				$ 953,128	$ 196,571	$ 139,964	$ 5,399,568	ok
Proposed Increase				(105,353)	-	-	$ 4,855,705	ok
Income Taxes (@39.445)				(41,556)	-	-	$ 1,915,333	ok
Net Operating Income Adjusted for Increase				889,332	196,571	139,964	8,339,940	ok
Net Cost Rate Base (Same as Actual)				$ 3,453,018	$ 2,029,270	$ 1,277,942	$ 89,802,156	ok
Rate of Return -- Proposed				25.76%	9.69%	10.95%		

DELTA NATURAL GAS COMPANY, INC.

Cost of Service Study
12 Months Ended December 31, 1998

Class Allocation

Description	Ref	Name	Allocation Vector	Total System	Residential (GS)	Commercial Small (GS)	Large Commercial and Industrial (GS)
Allocation Factors							
Commodity							
Gas Supply		COM01		9,765,801	2,581,793	682,889	1,842,984
Storage		COM02		2,924,112	1,533,506	392,837	997,769
Transmission		COM03		9,765,801	2,581,793	682,889	1,842,984
Distribution		COM04		6,911,381	2,581,793	682,889	1,842,984
Demand							
Gas Supply		DEM01		67,424	30,767	7,726	15,822
Storage (November-March)		DEM02		2,924,112	1,533,506	392,837	997,769
Transmission		DEM03		67,424	30,767	7,726	15,822
Distribution Structures		DEM04		59,604	30,767	7,726	15,822
Distribution Mains		DEM05		59,604	30,767	7,726	15,822
Customer							
Distribution Mains		CUST01		38,222	32,940	4,346	889
Services		CUST02		5,322,514	4,488,734	671,522	153,584
Meters		CUST03		3,913,309	1,868,686	322,691	1,261,491
Customer Count				38,224	32,940	4,346	889
Customer Accounts		CUST04		41,578	32,940	4,346	3,556
Other Services		CUST05		38,224	32,940	4,346	889