

Exhibit No.:
Issue: Weather Normalization,
HVAC
Witness: Patricia A. Krieger
Type of Exhibit: Rebuttal Testimony
Sponsoring Party: Laclede Gas Company
Case No.: GR-99-315

FILED
AUG 5 1999
Missouri Public
Service Commission

LACLEDE GAS COMPANY

GR-99-315

REBUTTAL TESTIMONY

OF

PATRICIA A. KRIEGER

Rebuttal Testimony of Patricia A. Krieger

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REBUTTAL TESTIMONY OF PATRICIA A. KRIEGER

1 Q. Please state your name and business address.

2 A. My name is Patricia A. Krieger and my business
3 address is 720 Olive St., St. Louis, Missouri
4 63101.

5 Q. Are you the same Patricia A. Krieger who submit-
6 ted direct testimony previously in this case?

7 A. Yes, I am.

8 Purpose of Testimony

9 Q. What is the purpose of your rebuttal testimony?

10 A. The purpose of my rebuttal testimony is to re-
11 spond to the direct testimonies of Staff witness-
12 es, Steve Qi Hu, Ph.D. (Dr. Hu), Dennis
13 Patterson, James Gray, and Henry Warren, Ph.D.
14 in the matter of weather normalization. In
15 addition, I am providing testimony responding to
16 the Staff's apparent inclusion of net appliance
17 service revenues (HVAC) in revenue requirement
18 in Laclede's current case.

19 Methodology Differences

20 Q. What differences generally exist between the
21 Company's calculated adjustment to revenue re-
22 quirement for weather normalization and Staff's
23 recommended adjustment for weather normalization?

24 A. The weather normalization adjustment of the
25 Company is based on a methodology that has been

1 used for many years by the Company and has in
2 past years been utilized by the Staff in calcu-
3 lating weather normalization adjustments. The
4 Company's adjustment and calculation of normal
5 heating degree days is based on the official
6 temperature data of the National Oceanic and
7 Atmospheric Administration (NOAA). The Compa-
8 ny's methodology assumes a linear relationship
9 between spaceheating usage and heating degree
10 days, and is very simple to understand and ap-
11 ply. First, non-weather sensitive usage is
12 deducted from total usage for the test year.
13 This is accomplished by adjusting summer usage
14 to a level representative of annual baseload.
15 The remaining weather-sensitive usage, that used
16 for spaceheating, is adjusted to the amount that
17 would have occurred if a normal level of heating
18 degree days were applied. The Company's level
19 of normal heating degree days in this case is
20 4,420, based on a 10-year rolling average of
21 official NOAA temperature data for the 10-year
22 period ended December 31, 1998.

23 Q. Please continue by providing a description of
24 Staff's weather normalization methodology uti-
25 lized in this case.

26 A. Staff utilizes linear regression analysis to
27 compute the value of a heating degree day on

1 usage. Like the Company, Staff first estimates
2 water heating usage. It then deducts it from
3 total usage to arrive at spaceheating usage.
4 Staff then normalizes spaceheating usage, as
5 well as the estimated water heating usage that
6 was previously removed. Both of these normaliza-
7 tion adjustments are calculated by utilizing a
8 Staff-created temperature data base that produc-
9 es "normal" heating degree days and "normal"
10 water heating degree days. This Staff-created,
11 temperature data base is for the 30-year period
12 ended December 1990 and was produced by Staff by
13 applying certain adjustments created by Staff
14 consultant, Dr. Hu, which Staff claims are neces-
15 sary to correct for alleged measurement biases
16 in the NOAA official temperature data. Dr. Hu's
17 adjustments to the official NOAA temperature
18 data for such 30-year period change the normal
19 heating degree days from 4,758 to 5,095. (Mr.
20 Dennis Patterson's Direct Testimony filed
21 June 28, 1999, Schedule 1, reflects degree days
22 adjusted to 5,094.6).

23 Revenue Requirement Differences

24 Q. What do the differences between the Company's
25 and Staff's methodology equate to in terms of
26 revenue requirement?

1 A. Staff's filed position results in approximately
2 \$8.5 million in lower revenue requirement, which
3 increases to approximately \$10 million in lower
4 revenue requirement based on a revised revenue
5 requirement calculation made by Staff but not
6 included in its direct case filing. A general
7 reconciliation of the \$10 million difference
8 indicates that about \$4.3 million is due to
9 Staff's calculation of normal heating degree
10 days resulting from the adjustments Dr. Hu makes
11 to the official NOAA temperature data; about
12 \$3.2 million reflects the difference between
13 using a 30-year normal versus a 10-year normal;
14 about \$1.2 million is the difference between the
15 Company's update of the normals period using
16 NOAA official data through 1998 versus Staff's
17 normals period ending in 1990; approximately \$.8
18 million results from Staff's normalization of
19 water heating usage; and about \$.5 million re-
20 sults from minor variations between Staff's
21 regression methodology and the Company's ratio
22 methodology.

23 Inconsistency of Staff's Normalization Adjustments

24 Q. Is Staff's approach to weather normalization
25 consistent with its previous approaches to this
26 issue in Laclede cases?

1 A. No. In Case No. GR-92-165, Staff switched from
2 the same ratio methodology that the Company
3 continues to utilize today to using regression
4 analysis to calculate its weather normalization
5 adjustment. Like the Company, Staff continued
6 to utilize official NOAA temperature data for
7 Lambert as its basis for determining normal
8 heating degree days. In Case No. GR-92-165,
9 Staff proposed a 30-year normal based on a sim-
10 ple average of NOAA heating degree days for the
11 30-year period ended 1990. In Case No.
12 GR-94-220 Staff utilized the same methodology,
13 but proposed to use the published NOAA 1990
14 normal which is based on the 1961-1990 NOAA
15 sequential temperature data for Lambert. In
16 Case No. GR-96-193, Staff proposed, as its nor-
17 mal, the NOAA published 1990 normal for the St.
18 Charles, Missouri weather station instead of the
19 Lambert station. Finally, in the Company's
20 previous Case, No. GR-98-374, Staff proposed a
21 normal for the 30 years ended 1990 based on a
22 simple average of NOAA observed temperature
23 data, as adjusted by Dr. Hu to correct for al-
24 leged biases in the observed temperature data at
25 Lambert.

26 Q. Are Staff's results and methods in the current
27 case at least consistent with those advocated by

1 Staff less than a year ago in Laclede Case No.
2 GR-98-374?

3 A. No. Once again, its results and methods are
4 significantly different. In both cases Dr. Hu,
5 through the utilization of double mass analysis,
6 calculated adjustments he claims were necessary
7 to correct for biases that he identified in the
8 NOAA data reported for St. Louis Lambert Air-
9 port. In both cases, it was Staff's position
10 that exposure changes and sensor changes have
11 created biases in the NOAA temperature data.
12 Also, in both cases, as well as in Union Elec-
13 tric Company Case No. EM-96-149, Dr. Hu utilized
14 double mass analysis to generate adjustments to
15 allegedly correct for certain suggested biases.
16 However, that's where the similarities end, and
17 the differences in results and methods begin.
18 In Case Nos. GR-98-374 and EM-96-149, Staff's
19 results indicated a warming bias in January 1978
20 of .3° F and an additional warming bias of .45°
21 F in February 1988. No bias was observed or
22 adjustment calculated for the June 1996 commis-
23 sioning and relocation of the ASOS instrumenta-
24 tion at Lambert (a different weather recording
25 device). These net-warming biases amazingly
26 resulted in a Staff calculation of 118 addition-
27 al normal heating degree days totaling an annual

1 level of 4,976 in Case No. GR-98-374 for the
2 30-year period ended December 1990. NOAA's
3 official normal heating degree days for this
4 same period are 4,758.

5 Q. Please continue.

6 A. In Case No. GR-99-315, just ten months later,
7 Staff, through Dr. Hu, has re-evaluated and
8 performed additional double mass analyses which
9 now indicate a warming bias of .7° F (more than
10 double that previously found) for what is now
11 described as November 1979 change (rather than
12 January 1978), and a warming bias of .783° F
13 (74% more than that previously found) for a
14 February 1988 change. However, contrary to
15 Dr. Hu's finding in Case Nos. GR-98-374 and
16 EM-96-149, these increased warming biases are
17 now offset by a cooling bias of 1.875° F in June
18 1996 related to the commissioning and relocation
19 of the ASOS instrumentation at Lambert. These
20 significantly different adjustments are apparent-
21 ly necessary to re-correct for the same condi-
22 tions Dr. Hu was previously confronted with in
23 Case No. GR-98-374; however, his results this
24 time indicate an overall cooling bias rather
25 than a warming bias. Staff's application of
26 these adjustments for this net cooling bias (in-
27 stead of a warming bias) results in yet a higher

1 normal degree day level of 5,095 annual heating
2 degree days. Dr. Hu's direct testimony is abso-
3 lutely silent on these changes in result from
4 those he offered under affidavit approximately
5 ten months ago.

6 Q. What effect did Dr. Hu's adjustments have on
7 revenue requirement in Case Nos. GR-98-374 and
8 GR-99-315?

9 A. In both cases, the weather normalization adjust-
10 ment reduced revenue requirement. It appears
11 that regardless of whether net warming or net
12 cooling biases are detected by Dr. Hu, normal
13 degree days increase and Laclede's revenue re-
14 quirement goes down.

15 Reasonableness of Result

16 Q. Does it seem reasonable that normal heating
17 degree days should be increasing?

18 A. No. Given the on-going international concern
19 and study of global warming issues, the growing
20 urbanization effect recognized at Lambert and
21 other metropolitan areas, and the many record-
22 warm years reported during the past fifteen year
23 period in the St. Louis, Missouri area, it seems
24 counter-intuitive that normal heating degree
25 days should be on the rise. The last fiscal
26 year in which the Company experienced annual
27 heating degree days in excess of the Staff's

1 latest recommended normal of 5,095 was nearly
2 fifteen years ago in fiscal 1984, based on offi-
3 cial Lambert heating degree days. Actual degree
4 day levels reported by Lambert since 1985 have
5 averaged 12% less than Staff's recommended nor-
6 mal in this case.

7 Reliability Concerns

8 Q. What concerns do you have regarding the reliabil-
9 ity of Dr. Hu's study upon which the Staff re-
10 lied?

11 A. There is little, if any, explanation in Dr. Hu's
12 filed testimony from which to understand the
13 process and standards utilized in his double
14 mass analyses. A review of his workpapers and
15 data request responses have raised several ques-
16 tions regarding his methodologies and results.
17 I will describe, generally, my concerns. Many
18 of these same issues are discussed, in more
19 technical terms, in the rebuttal testimony of
20 the Company's consultant, Witness Jay R. Turner,
21 D.Sc.

22 Q. Please continue.

23 A. First I would like to raise the concern that
24 such significantly different results, as those
25 described beginning on page 6, could exist be-
26 tween two studies submitted within a one-year
27 timeframe. Furthermore, I hesitate to rely on

1 results that appear to be continually evolving
2 with each application of the double mass analy-
3 sis. Secondly, there are flaws in the applica-
4 tion of the double mass analysis.

5 Q. What do you perceive as flaws in the analysis?

6 A. The double mass analysis relies on using other
7 nearby weather stations as reference points to
8 judge the correctness of data observed at a
9 target weather station, in this case Lambert.
10 Needless-to-say, the selection of appropriate
11 reference stations is vital to the results of
12 the analysis. Dr. Hu did not study the entire
13 30-year period using the same data set. In-
14 stead, he compared data for short periods of
15 time -- the five year period around his suspect-
16 ed timeframe of bias. This analysis was per-
17 formed with piece-meal data with only two refer-
18 ence stations utilized for each period ana-
19 lyzed. The reference stations used in the analy-
20 ses offered in Case No. GR-99-315 are completely
21 different than those used in the analyses of-
22 fered in Case No. GR-98-374. The double mass
23 analyses employed by Dr. Hu in this case pro-
24 duced results and adjustments substantially
25 greater than those produced in Case No.
26 GR-98-374 for the 1978/1979 and 1988 biases, as
27 well as identifying for the first time a 1996

1 bias not identified in Dr. Hu's 1998 analysis.
2 More importantly the results also produced, in
3 some instances, a wide variation in slope chang-
4 es between the two reference stations utilized
5 in this case. For this type of analysis to be
6 valid, one would expect the adjustment indicated
7 by each double mass analysis to be fairly consis-
8 tent at all reference stations used. Dr. Hu's
9 adjustments are not consistent in this regard.
10 For example, the slopes changes calculated by
11 Dr. Hu for the Union - Lambert analysis are
12 quite different than those calculated for the
13 Elsberry - Lambert analysis for the 1988 change.

14 Q. Do you think Staff's choice of reference sta-
15 tions in this case was appropriate?

16 A. No. Staff performed its 1979 and 1988 adjust-
17 ments based on the Elsberry, MO Co-op Station.
18 Staff workpapers indicate that Union, MO was the
19 other Co-op reference station chosen for these
20 same periods (as opposed to Unionville, MO as
21 stated in Dr. Hu's direct testimony in this
22 case). Staff's 1996 adjustment was based on
23 analysis using Elsberry, MO and the Jerseyville,
24 IL Co-op stations. All of these reference sta-
25 tions are quite different from Lambert in terms
26 of environment, sensor type, and urbanization
27 impacts. In addition, a simple review of the

1 NOAA station history information available on
2 the Internet, indicates that station changes
3 occurred at both Elsberry, MO and Union, MO
4 during 1988. Discussions with observers during
5 site visits supported that sensor changes had
6 occurred in Elsberry in 1988. There is no evi-
7 dence that a double mass analysis was performed
8 by Dr. Hu between the reference stations to
9 establish correlation. Given the difference in
10 bias results of 1.88° F at Elsberry versus .11°
11 F at Union in the minimum temperature analysis,
12 and essentially no change at Elsberry versus
13 1.14° F at Union in the maximum temperature
14 analysis, it is more likely that any bias intro-
15 duced during 1988 was at one or both of the
16 reference stations rather than at Lambert.

17 Q. Do you have other concerns regarding the quality
18 of the study?

19 A. Yes, I do. I would like to point out that sever-
20 al inconsistencies exist throughout the study,
21 all of which raise questions as to the validity
22 of the results.

23 • The data points plotted in the double mass
24 analyses are not consistent for the minimum and
25 maximum temperatures in all cases, and the num-
26 ber of months analyzed for each period vary.

1 • In three instances, some data points dur-
2 ing the period are missing.

3 • Although it appears that the temperature
4 data utilized was previously adjusted by NOAA
5 for biases resulting from time of observation
6 between Lambert and the reference stations,
7 additional concerns exist as to the comparabili-
8 ty of this data as applied in double mass analy-
9 sis.

10 All of these concerns are described more
11 fully by Company Witness, Dr. Turner.

12 Departure from NOAA Practices

13 Q. Are there any other methodology matters regard-
14 ing degree days that you wish to discuss?

15 A. Yes. Aside from the reliability of the Dr. Hu
16 created temperature adjustments applied to the
17 NOAA official data by Staff, Mr. Patterson has
18 also deviated from NOAA methodology in calculat-
19 ing the normal heating degree days derived from
20 the Dr. Hu adjusted temperature data.

21 Mr. Patterson employs a simple arithmetic aver-
22 age of 30-years of adjusted temperatures in
23 calculating his normal. The NOAA methodology
24 employs statistical formulae developed by
25 H.C.S. Thom (referred to as the Thom Statistic)
26 in calculating normal heating degree days from
27 average mean daily temperature data. The Thom

1 methodology considers the standard deviation of
2 ranges of temperature variability and results in
3 normal heating degree days in the spring and
4 fall months that are lower than those developed
5 by Staff's utilization of a simple arithmetic
6 average. Staff's deviation from NOAA methodolo-
7 gy results in lower revenue requirement for the
8 Company of approximately \$.5 million.

9 Q. Is Staff's intention to adjust for data inconsis-
10 tencies well-founded?

11 A. I have no quarrel with adjusting for data incon-
12 sistency, but any attempt to provide improvement
13 to historical data should be left to the discre-
14 tion of NOAA and its resources. While NOAA
15 provides 30-year normals for the Co-op stations
16 used by Staff as reference stations, NOAA Publi-
17 cation Climatology of the United States No. 81
18 narrative, a document Staff relies on for method-
19 ology, states that exposure changes were not
20 adjusted for at Co-op stations due to a lack of
21 adequate computerized station history informa-
22 tion. Nevertheless, Staff attempts to adjust
23 NOAA's observed Lambert data based on NOAA's
24 unadjusted Co-op reference station data. While
25 Staff attempts to account for selected instances
26 of exposure changes at Lambert, there is no way
27 that history can be adjusted for every variable

1 that can enter into actual observations at that
2 station. In attempting to correct the data it
3 is quite possible and, in fact, given the issues
4 that are raised in my testimony, I should say -
5 quite probable to introduce a greater degree of
6 error than what might exist in the observed
7 data. At the end of the day, the point is that
8 NOAA has the expertise and data availability to
9 calculate appropriate adjustments. Staff does
10 not.

11 Q. Is Staff utilizing NOAA techniques in taking on
12 such a huge task?

13 A. No. The NOAA methodology employed for the deter-
14 mination of NOAA's 1990 normals is described in
15 a 1987 published article. (See Karl and Wil-
16 liams, An Approach to Adjusting Climatological
17 Time Series for Discontinuous Inhomogeneities,
18 26 Journal of Climate and Applied Methodology
19 (Dec. 1987)). This article describes NOAA's
20 standards for calculating exposure adjustments
21 as well as standards for establishing thresholds
22 as to when the findings of such studies should
23 result in adjustments to the observed historical
24 data. Staff's methodology, the double mass
25 analysis, is a statistical method that has been
26 in existence but not employed by NOAA in such
27 calculations.

1 Staff's findings through double mass analy-
2 sis, when applied under much less stringent
3 conditions than those required by the Karl and
4 Williams methodology, result in direct adjust-
5 ments to the official observed temperature data
6 with no defined standards for how and when to
7 utilize this methodology. Such methodology, if
8 carried out accurately, may provide some knowl-
9 edge and understanding of events with regard to
10 direction and magnitude of the range of the
11 impacts in certain instances; but, in my opinion
12 should not necessarily be relied on to make
13 absolute adjustments to the official data.
14 Dr. Hu's adjustments are calculated to the thou-
15 sandths of a degree Fahrenheit, yet NOAA offi-
16 cial temperature data is recorded in whole de-
17 grees based on sensor readings that have error
18 tolerance levels greater than some of Dr. Hu's
19 adjustments.

20 Q. Is Staff proposing a NOAA normal?

21 A. No. Staff is proposing to continue to hold fast
22 to the NOAA concept of utilizing 30 years, or
23 three decades, of data as a baseline. Staff is
24 also utilizing the NOAA temperature data as its
25 basis for double mass analysis. However, in its
26 apparent desire to improve the data, Staff has
27 in fact manipulated the NOAA data to create its

1 own temperature data base. This data base is no
2 longer one which has been developed by an ex-
3 pert, objective third-party, such as NOAA; but
4 rather one which is subjective and open to fur-
5 ther adjustment by anyone performing statistical
6 analysis. It is one which can change every time
7 a different study is performed or different
8 reference stations are selected. It is one that
9 theoretically could and/or should change with
10 each and every exposure change, be it instrumen-
11 tation changes or a tree growing taller.

12 Q. Please continue.

13 A. As acknowledged by Mr. Patterson on page 7, line
14 17, of his direct testimony, Staff has in this
15 case discarded NOAA's January 1978 adjustment
16 that was inherent in the 1961-1977 data used in
17 NOAA's 1990 published normals and replaced
18 NOAA's adjustment with its own calculation.
19 NOAA's calculation for this event resulted in an
20 average mean temperature adjustment of between
21 .9° F and 1.2° F and appeared to have a seasonal
22 pattern; whereas, Staff's adjustment in this
23 case is for .7° F applied to each month. In
24 addition, Staff is introducing an adjustment to
25 the data for a 1988 change not yet recognized by
26 NOAA in its 1990 normals, nor in its current
27 official station history sheet for Lambert.

1 Furthermore, Staff is making an adjustment for a
2 1996 event, to adjust a normal that ends in
3 1990, for an event that NOAA has provided no
4 indication it will adjust in its next calcula-
5 tion of decadal normals in approximately 2002.

6 Without acknowledging it, Staff has created an
7 alternative data base for use in this case,
8 effectively recommending that the official data
9 reported by NOAA and utilized by the scientific
10 community should be abandoned in favor of
11 Staff's altered data.

12 Q. Do you believe that biases and data inconsisten-
13 cies should be ignored for ratemaking purposes?

14 A. Not necessarily. However, the task of ensuring
15 data continuity is one being performed by NOAA
16 each decade, and the Commission should continue
17 to rely on NOAA's expertise in this area. After
18 all, the primary advantage of using NOAA data is
19 that it is collected and disseminated by an
20 independent, unbiased, reliable and expert
21 source. If the Commission opens the door to
22 permitting adjustments to NOAA data, every party
23 will propose adjustment to manipulate the data
24 in its favor, and the whole reason for the Com-
25 mission's consistent use of NOAA data will be
26 completely undermined. Rate cases involving
27 weather normalization will evolve into costly

1 and time-consuming technical battles to deter-
2 mine which party's adjustments to NOAA are most
3 appropriate -- the very result that the Commis-
4 sion's reliance on NOAA data was designed to
5 avoid.

6 Q. Should the parties ever be permitted to adjust
7 NOAA data between the publication of NOAA nor-
8 mals?

9 A. In my opinion, NOAA data should only be adjusted
10 when the argument to do so is compelling. In
11 the best of circumstances, parties might agree
12 on such adjustments outside the context of a
13 rate case. In a 1992 letter to Staff member,
14 Dr. Michael Proctor, a copy of which was at-
15 tached to Staff's response to Data Request No.
16 28, and also filed as an Exhibit to
17 Dr. Proctor's surrebuttal testimony in Case No.
18 EM-96-149, Dr. Wayne Decker, the Missouri
19 State's Climatologist at that time, recommended
20 that the Commission instigate two studies: one
21 to ascertain the change due to global climate
22 changes and urbanization, and another to study
23 the effect of instrumentation changes at offi-
24 cial weather stations. Although the Staff has
25 vigorously pursued the latter analysis, which
26 has resulted in great part in Dr. Hu's adjust-
27 ments to the NOAA data, it has not even consid-

1 ered the effect of global climate changes and
2 urbanization on weather normals.

3 Q. At page 8, line 5 of his direct testimony, Staff
4 Witness Patterson claims that Staff approach to
5 deriving a weather normal in this case is consis-
6 tent with the approach taken by Staff and ap-
7 proved by the Commission in Missouri Gas Ener-
8 gy's last rate case proceedings, Case No.
9 GR-96-285. Is Staff's position consistent with
10 the principles in that case?

11 A. No. Staff's approach is fundamentally inconsis-
12 tent with both the approach approved by the
13 Commission in the MGE case as well as the rea-
14 sons given by the Commission for taking that
15 approach. It is clear from the passage cited by
16 Staff that the Commission used a 30-year NOAA
17 normal as the more appropriate benchmark be-
18 cause, as the Commission stated, it believed
19 "such data had gone through the processes of
20 NOAA to ensure the best data possible." Rather
21 than use NOAA data in this case, however, the
22 Staff has used a Staff-created data base that
23 bears little or no resemblance to NOAA's offi-
24 cial data base. Moreover, Staff has substantial-
25 ly revised this data base through adjustments to
26 the NOAA data, that in stark contrast to the 30

1 year data set approved in the MGE case, rely on
2 weather data sets of three years or less.

3 Appropriate Normals Period

4 Q. What time period should be used for developing
5 meaningful normals?

6 A. Dr. Hu's position is that 30-year data be used
7 to develop normals to minimize the impacts of
8 natural climate variability. This rationale is
9 discussed in his direct testimony beginning on
10 Page 7, line 17. Staff has chosen the 30-year
11 period ended 1990.

12 Q. Do you agree with this position?

13 A. No, I do not. First, what are "meaningful nor-
14 mals?" NOAA's 30-year normals are published as
15 a baseline of historical data. They are simply
16 intended to show where we have been and are not
17 intended to be an indicator of future condi-
18 tions. For predictions of future near-term
19 weather conditions, NOAA publishes optimal cli-
20 mate normals that are based on ten years of
21 historical data. In my opinion, therefore,
22 30-year normals are not "meaningful" if the
23 intention is to use these normals as a benchmark
24 to establish rates for the future. The normals
25 used in ratemaking should be the number of heat-
26 ing degree days most likely to result in a level-
27 ing out of weather variations so as not to im-

1 pact severely either the Company or the ratepay-
2 er over a relatively near-term span of years.
3 It is not economically feasible for the Company
4 or the ratepayer to suffer through extended peri-
5 ods of one-sided weather variations. Given that
6 rate cases are filed on a relatively frequent
7 basis, the opportunity exists to incorporate
8 recent weather experience into the ratemaking
9 process, protecting both the Company and the
10 ratepayer. Certainly, increasing evidence of
11 global warming and recognized urbanization and
12 heat island impacts on weather stations in dense-
13 ly populated areas would suggest that only more
14 recent historical data is relevant for future
15 periods when rates being set in this case are in
16 effect. While Staff attributes a large part of
17 the warming trend observed at Lambert to sensor
18 and exposure changes, the scientific community
19 continues to suggest that similar warming trends
20 being observed across the county are in some way
21 attributable to the effects of global warming
22 and urbanization. While there will continue to
23 be extremely cold heating seasons, actual experi-
24 ence will more often result in heating seasons
25 warmer than the 30-year normal.

26 Q. Why is a 10-year normal more appropriate in this
27 instance?

1 A. At the most fundamental level, it would be appro-
2 prium to incorporate the most recent data.
3 NOAA normals are calculated after the end of
4 each decade and include the past three decades.
5 Currently, the most recently published NOAA
6 normals include 1961-1990 data, the same period
7 upon which Staff based its normal. However,
8 setting a normal on this period in 1999 excludes
9 nine years of available data that include five
10 of the warmest years of the century. The
11 Staff's proposed 30-year normal includes experi-
12 ence through 1990. Omission of this data also
13 ignores incorporating trends such as urbaniza-
14 tion and environmental differences.

15 Summarization

16 Q. Please summarize the points you have made regard-
17 ing weather normalization of spaceheating usage.

18 A. Briefly, the following points are:

- 19 1. Dr. Hu's analysis of temperatures biases at
20 the Lambert weather station is flawed and
21 the results are not reliable;
- 22 2. NOAA data and methodologies should be the
23 standard agreed to for calculation of heat-
24 ing degree day normals. Staff should not
25 create alternative data bases by discarding
26 NOAA adjustments or speculatively applying
27 new adjustments prematurely;

- 1 3. A ten year normals period based on official
2 NOAA data should be utilized to more appro-
3 priately recognize urbanization and warming
4 trends apparent at Lambert, thereby increas-
5 ing predictiveness and better serving both
6 the ratepayer and the shareholder; and
7 4. The period selected for normals should
8 include the most current data available.

9 Water Heating Normalization

10 Q. What differences exist between the Company's and
11 Staff's methodologies with regard to "base"
12 usage?

13 A. Customer's "base" usage in winter months exceeds
14 their usage during the summer. This increase is
15 separate from any spaceheating requirement and
16 is not a function of the number of degree days
17 experienced. Rather, it arises in large part
18 from the necessity of heating water from a lower
19 starting temperature during the winter. The
20 seasonal increase in water heating load has been
21 supported over the years by special studies of
22 Laclede's customers wherein monthly usages have
23 been analyzed and patterned to determine an
24 appropriate relationship between seasonal re-
25 quirements. The Company deducts the amount of
26 summer load increased by this predetermined
27 factor to represent annual base usage. The

1 remaining usage is considered weather-sensitive
2 and is normalized.

3 Q. Please continue.

4 A. Staff's methodology uses the same Company study,
5 but rather than using the results of the study
6 to determine the seasonal relationship to be
7 applied to actual usage, Staff uses this informa-
8 tion to create, through regression analysis,
9 incremental water heating requirements derived
10 from the value of water heating "degree days."
11 Staff uses statistical techniques to determine
12 the correlation between ambient temperature and
13 Missouri River water temperature readings. This
14 relationship eventually results in water heating
15 degree days that can be tallied up for a period
16 of time. The incremental value per water heat-
17 ing degree day is used to normalize water heat-
18 ing usage to a normal level of water heating
19 degree days that Staff has determined are repre-
20 sentative of the 30-year period ended December
21 1990.

22 Q. What problems do you perceive with this methodol-
23 ogy?

24 A. Staff's methodology is premised on the following
25 assumptions:

26 1) River water temperature correlated with
27 ambient temperature equates to the tempera-

1 ture of water when entering water heaters
2 throughout the Company's service territory;
3 and

4 2) A desired hot water setting on a water
5 heater of 140° F equates to the actual
6 settings throughout the Company's service
7 territory.

8 Neither of these assumptions can be veri-
9 fied. In many instances, river water travels
10 several miles underground before entering house-
11 holds throughout the Company's service territo-
12 ry. Water pipes are buried below the freeze
13 line. Additionally, it has not been verified
14 that water heating requirements change if either
15 the river water or ambient temperature changes a
16 few degrees. The Company makes the assumption
17 that water heating requirements will be greater
18 in a winter month than in a summer month, but we
19 dare not to quantify the difference in those
20 requirements between temperature reading, for
21 example, at 10° F versus 12° F. While the Compa-
22 ny can establish a reasonable seasonal relation-
23 ship, it is invalid to assume that incremental
24 water heating requirements can be determined for
25 each degree of temperature change. Staff also
26 assumes that its calculation of this incremental
27 value can be applied to customer classifications

1 other than the classification from which such
2 values were derived.

3 Q. On page 3, line 6 of his direct testimony, Mr.
4 Patterson states that "subsequent Staff analysis
5 has shown that Missouri River water temperatures
6 serve as statistically reliable proxy for inlet
7 water temperatures in the St. Louis area." Do
8 you agree with this assessment?

9 A. There has been no subsequent Staff analysis to
10 support that Missouri River water temperatures
11 are comparable to other rivers providing water
12 for various parts of the metropolitan area,
13 namely the Mississippi and Meramec Rivers. The
14 assumption that the Missouri River can be used
15 as a proxy for the Mississippi and Meramec Riv-
16 ers is doubtful, given the differences in the
17 size and depths of these rivers, and the result-
18 ing impacts of each river's response to air
19 temperatures.

20 Q. How are normal water heating degree days deter-
21 mined by Staff for the 1961-1990 period?

22 A. Staff has river water temperature data available
23 since 1986. This data, along with ambient tem-
24 peratures, is used to extrapolate data back to
25 1961. Therefore, Staff's normal water heating
26 degree days are based on estimated data from the
27 1961-1985 period, which is 25 years of the 30-

1 year normals period proposed by Staff. Staff
2 also utilizes its temperature data base, as
3 adjusted for Dr. Hu's calculations, in deriving
4 water heating degree day normals.

5 Q. Does this conclude your discussion on water
6 heating?

7 A. Yes. In summary, the Company believes it is not
8 appropriate to weather normalize water heating
9 usage because a supportable methodology does not
10 exist to attempt to quantify these incremental
11 values. It is appropriate only to deduct some
12 reasonable estimate of baseload before normaliz-
13 ing spaceheating requirements.

14 Appliance Service (HVAC) Work

15 Q. Do you have any comments regarding Staff's treat-
16 ment of the costs and revenues relating to appli-
17 ance service work performed by the Company?

18 A. Yes. Unlike the Company, the Staff apparently
19 did not include any adjustment to ensure that
20 the ratemaking treatment given such costs and
21 revenues would be consistent with the require-
22 ment of the HVAC Services Act found at Section
23 386.756 (RSMo. Supp. 1998).

24 Q. What does the HVAC Services Act require in terms
25 of the ratemaking treatment applicable to such
26 costs and revenues?

1 A. Subsection 4 of Section 386.756 specifically
2 prohibits cross-subsidization between a utili-
3 ty's normal utility operations and any HVAC
4 services it may provide. It does so by preclud-
5 ing the utility from providing a cross-subsidy
6 (whether from the utility side of its operations
7 to the HVAC side or vice-versa) that would have
8 the effect of "changing the rates or charges for
9 the utility's regulated services above or below
10 the rates or charges that would be in effect if
11 the utility were not engaged... in such activi-
12 ties."

13 Q. Have you adjusted the costs and revenues associ-
14 ated with the Company's participation in HVAC
15 service work in a manner that satisfies this
16 statutory requirement?

17 A. Yes. Consistent with the statute, my adjustment
18 effectively excludes all of the revenues and all
19 of the costs that would not have been received
20 or incurred by the Company had it not been en-
21 gaged in HVAC service work during the test
22 year. By doing so, I have ensured that the
23 Company's rates have not been increased or de-
24 creased as a result of the Company's participa-
25 tion in these activities.

26 Q. How does your adjustment accomplish this goal?

1 A. Since the revenues generated by these activities
2 exceeded their associated costs by some
3 \$600,000, my adjustment is designed to achieve
4 rate neutrality by removing the \$600,000 excess.

5 Q. By failing to make a similar adjustment, has
6 Staff failed to comply with the requirements of
7 the HVAC Service Act?

8 A. Yes. By failing to remove these excess reve-
9 nues, Staff has effectively proposed that the
10 Company's rates should be decreased by some
11 \$600,000 as a direct result of the Company's
12 participation in HVAC Service Work. This is
13 completely contrary to the clear requirements of
14 the statute.

15 Q. Does the Commission's inclusion of a fully dis-
16 tributed costing approach in the recent rules
17 that were adopted to implement the HVAC Service
18 Act change this result?

19 A. No. Regardless of whether one agrees with the
20 Commission decision, the fact remains that the
21 fully distributed cost standard adopted by the
22 Commission was only applied to those circumstanc-
23 es where a separate affiliate uses the assets of
24 a utility to engage in HVAC services. Since
25 Laclede performs these activities "in house"
26 rather than through a separate affiliate, the
27 Commission decision in the ratemaking docket has

1 no bearing on the issue under consideration in
2 this case.

3 Q. Does this conclude your testimony?

4 A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Laclede Gas Company's)
Tariff to Revise Natural Gas Rate Schedules.)

Case No. GR-99-315

AFFIDAVIT

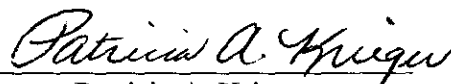
STATE OF MISSOURI)
) SS.
CITY OF ST. LOUIS)

Patricia A. Krieger, of lawful age, being first duly sworn, deposes and states:

1. My name is Patricia A. Krieger. My business address is 720 Olive Street, St. Louis, Missouri 63101; and I am Manager of Accounting for Laclede Gas Company.

2. Attached hereto and made part hereof for all purposes is my rebuttal testimony, consisting of pages 1 to 31, inclusive.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded and correct to the best of my knowledge and belief.


Patricia A. Krieger

Subscribed and sworn to before me this 5TH day of August, 1999.

PATRICIA P. HICKS
Notary Public — Notary Seal
STATE OF MISSOURI
City of St. Louis
My Commission Expires: June 27, 2002

