



Surrebuttal Testimony of  
Michael S. Proctor

1           A. My surrebuttal testimony will address the rebuttal testimony of Union Electric  
2 Company (UE) witnesses Allen Dutcher, Richard A. Voytas and Donald E. Brandt  
3 related to the issue of weather normalization.

4           **Q. SPECIFICALLY, WHAT ISSUES WILL YOU ADDRESS THAT**  
5 **WERE RAISED BY THESE THREE WITNESSES?**

6           A. Throughout his rebuttal testimony, Mr. Dutcher characterizes the Staff  
7 methodological approach to making current and past weather consistent as a “novel”  
8 approach, one in which the Staff would have “Ameren realign the reams of historical data  
9 maintained from January 1, 1961 through May 15, 1996.” [Dutcher Rebuttal; p. 3, lines  
10 11-13] Mr. Voytas uses similar words to characterize the Staff’s methodological  
11 approach. [Voytas Rebuttal, p. 8, line 17] In addition, Mr. Voytas and Mr. Brandt claim  
12 that the Staff’s adjustment violates the Stipulation and Agreement in Case No. EM-96-  
13 149. [Voytas Rebuttal, pp. 21-25 and Brandt Rebuttal, pp. 38-41]

14           One of my duties is to supervise the work done on weather normalization. In that  
15 role it is my responsibility to make decisions regarding methodological approach, as well  
16 as whether or not the Staff needs to make a weather adjustment in a specific case.  
17 Therefore, I will respond to each of these issues.

18           **Q. DO YOU AGREE WITH UE’S CHARACTERIZATION OF THE**  
19 **STAFF’S APPROACH TO DETERMINING WEATHER NORMALS?**

20           A. No, I do not. The Staff has never taken a “novel” approach to determining  
21 weather normals. Since being on the Staff, from 1977, I have been involved in the issue  
22 of weather normalization. Prior to the summer of 1992, the Staff’s methodological  
23 approach to weather normalization was similar to that used by UE. In this approach, the

Surrebuttal Testimony of  
Michael S. Proctor

1 longest data set available from the weather station of choice was averaged to determine  
2 the normals. In June 1992 I received a letter and memorandum from Dr. Wayne L.  
3 Decker, Professor in the Department of Atmospheric Science at the University of  
4 Missouri-Columbia and the State Climatologist. That letter and memorandum are  
5 attached to my surrebuttal testimony as Schedule 1. I had asked Dr. Decker to review the  
6 work, which the Staff was using as the basis for its methodological approach. In brief,  
7 Dr. Decker informed me that because of "discontinuities" in the weather records at the St.  
8 Louis Lambert International Airport (Lambert International Airport) station, the  
9 methodological approach being used by the Staff should change. From that point  
10 forward, the Staff's methodological approach to determining weather normals has been,  
11 and will continue to be, determined in accordance with advice that the Staff receives from  
12 climatological experts. In general, that advice with respect to methodological approach  
13 has been to:

- 14 (1) in our calculation of normal weather, adjust historical readings to be  
15 consistent with current readings (i.e., correct historical data for discontinuities  
16 in the weather records); and
- 17 (2) to use the thirty-year normal period specified by the National Oceanographic  
18 and Atmospheric Administration (NOAA.).

19 This is not a novel approach because NOAA uses the same methodological approach  
20 when it makes adjustments to its published weather normals every ten years. Let me  
21 reiterate that the Staff's methodological approach to determining weather normals has not  
22 been one without precedent, as characterized by Mr. Voytas in his rebuttal testimony, nor

1 has it been one that the Staff developed internally without consultation with individuals  
2 who are experts in the field of climatology.

3 **Q. IF NOAA MAKES ADJUSTMENTS TO THE THIRTY-YEAR**  
4 **HISTORY FOR PURPOSES OF REVISING NORMALS, WHY DOES THE**  
5 **STAFF HAVE TO MAKE ANY ADDITIONAL ADJUSTMENTS?**

6 A. Most of the time, the Staff does not have to make any additional adjustments.  
7 However, if there is an observational change such as a movement of a measurement  
8 instrument, or a change in the type of measurement instrument that has occurred  
9 subsequent to the revision in normals made by NOAA, then the Staff believes that it is  
10 important to make the change in order to keep the normals consistent with the current  
11 readings. Because of the May 1996 exposure changes at the Lambert International  
12 Airport station, we consulted with Dr. Steve Qi Hu, who at that time was the state  
13 climatologist, to make whatever changes he believed were necessary to make the thirty-  
14 year normal period from 1961 to 1990 consistent with readings occurring after the May  
15 1996 changes at the Lambert International Airport station.

16 **Q. FROM A METHODOLOGY PERSPECTIVE, PLEASE ADDRESS MR.**  
17 **DUTCHER'S TESTIMONY RESPECTING HOW OBSERVATIONAL**  
18 **CHANGES SHOULD BE MADE?**

19 A. On pages 7 and 8 of Mr. Dutcher's rebuttal testimony, he affirms the change  
20 that UE's engineers made of 2 degrees Fahrenheit (F) to current temperature readings for  
21 the May 1996 changes in location and type of sensor at the Lambert International Airport  
22 station. Therefore, Mr. Dutcher's testimony affirms the need to make adjustments for  
23 observational changes. If UE's engineers had made this same change in January 1978

1 and February 1988, when observational changes occurred at the Lambert International  
2 Airport station in St. Louis, there would be no issue between Staff and UE over  
3 methodological approach. Instead the issue would focus on the level of the adjustments  
4 required for each of those changes.

5 **Q. DO ANY OF UE'S WITNESSES DENY THAT THERE WERE**  
6 **OBSERVATIONAL CHANGES AT THE LAMBERT INTERNATIONAL**  
7 **AIRPORT STATION PRIOR TO THOSE THAT OCCURRED IN 1996?**

8 A. No, in fact Mr. Dutcher's appears to believe that there were "at least five  
9 distinct slope changes within the 1961-1978 time period" that would be associated with  
10 some unspecified changes. [Dutcher Rebuttal, p. 13, line 1] According to the rebuttal  
11 testimony of Mr. Voytas, he believes that the temperature measuring devices at the  
12 Lambert International Airport station "have, in fact been moved or changed on several  
13 occasions in the past thirty years." [Voytas Rebuttal, p. 8, lines 12-13] Nowhere in  
14 either Mr. Dutcher's or Mr. Voytas' testimonies did they find that the observational  
15 changes in 1978 and 1988, for which Staff climatological witness Steve Hu made  
16 adjustments, were not valid.

17 **Q. WHAT THEN IS THE DISAGREEMENT ON METHODOLOGICAL**  
18 **APPROACH BETWEEN STAFF AND UE?**

19 A. What has happened is that significant changes occurred in May 1996 when the  
20 measurement instruments were changed and moved in their location at the Lambert  
21 International Airport station. According to Dr. Hu, these changes involved both a move  
22 in location and change in the type of the sensor. Robert E. Willen, who was at that time  
23 responsible for weather normalization at UE, became aware of the problem and made an

Surrebuttal Testimony of  
Michael S. Proctor

1 adjustment to account for these observational changes. However, UE has been unwilling  
2 to even consider making adjustments for observational changes prior to the ones that  
3 occurred in May 1996. In Mr. Voytas' rebuttal testimony, he states that when the Staff  
4 met with UE respecting this question of observational changes, that the Staff "then raised  
5 a totally unprecedented alternative – realigning all the weather data for the past 38 years."  
6 [Voytas Rebuttal, p. 8, lines 9-14] As stated earlier, from the Staff's perspective,  
7 changing normals to be consistent with current weather observations is not  
8 "unprecedented," rather to not make such changes is an inconsistency in methodological  
9 approach, which the Staff believes should be corrected.

10 **Q. WHAT IS YOUR UNDERSTANDING OF WHY UE IS UNWILLING**  
11 **TO CORRECT FOR OTHER OBSERVATIONAL CHANGES IN THE**  
12 **WEATHER AT THE LAMBERT INTERNATIONAL AIRPORT STATION?**

13 A. To put the problem in perspective, it is important to realize that for purposes  
14 of weather normals, UE's analysts have been using an unadjusted temperature series  
15 dating back to the 1930's. (As I stated earlier, this is the same methodological approach  
16 used by Staff prior to 1992.) After several years of use of the weather normals based on  
17 this series, the UE analysts' perspective of what should be the level of normal sales has  
18 become accustomed to the levels of sales that this version of normal weather produces.  
19 Any change in the level of sales brought about by an alternative version of normal  
20 weather will appear to be "abnormal" because it involves a change. I found Mr. Voytas  
21 to be resistant to changing the weather normal because such a change would in fact  
22 produce results that appeared to him to be "abnormal." For example, at one of the  
23 meetings with UE on weather normalization, Mr. Voytas informed me that UE had

Surrebuttal Testimony of  
Michael S. Proctor

1 considered using the level of normal sales that would be consistent with NOAA's  
2 published thirty-year normals. Based on preliminary trials, Mr. Voytas concluded that  
3 the level of normalized sales produced by using NOAA's normal weather was not  
4 correct. When what one uses over a long period of time becomes an intuitive standard, it  
5 is difficult to accept change.

6 **Q. IN YOUR OPINION, WOULD THE STIPULATION AND**  
7 **AGREEMENT PRECLUDE THE CHANGE IN WEATHER NORMALIZATION**  
8 **RECOMMENDED BY THE STAFF?**

9 A. According to the testimonies of Mr. Brandt and Mr. Voytas, the Stipulation  
10 and Agreement in Case No. EM-96-149 does not allow for any changes unless those  
11 changes are "incorporated prospectively from the effective date of the change," (c.f.,  
12 Attachment A to the Stipulation and Agreement in Case No. EM-96-149, at page 2 of 6).  
13 [Voytas Rebuttal, p. 22, lines 4-9 and Brandt Rebuttal, p. 39, lines 8-17] In this case, the  
14 effective date of the change in weather normalization is May 16, 1996. If the Stipulation  
15 and Agreement were to be applied in the way suggested by Mr. Brandt and Mr. Voytas,  
16 then the Staff's changes to weather normalization from June 1, 1995 through May 15,  
17 1996 would not be allowed. However, changes to weather normalization subsequent to  
18 May 16, 1996 proposed by the Staff would be prospective from the time at which UE  
19 believed there was a need to make the change and therefore would be allowed by the  
20 Stipulation and Agreement.

21 **Q. DOES THIS MEAN THAT YOU AGREE WITH MR. BRANDT'S AND**  
22 **MR. VOYTAS' APPLICATION OF THE STIPULATION AND AGREEMENT?**

Surrebuttal Testimony of  
Michael S. Proctor

1           A. It does not. First, what Mr. Brandt and Mr. Voytas fail to say in their rebuttal  
2 testimony is that the Stipulation and Agreement does not address a situation in which the  
3 parties to the Stipulation and Agreement disagree as to how prospective changes should  
4 be carried out. The Staff was informed of the possible change in August 1996. As  
5 indicated in Mr. Voytas testimony, the Staff proposed at that August meeting a change in  
6 the specification of normals. Thus, UE was well aware of a potential disagreement with  
7 the Staff over how the change should be made.

8           In his rebuttal testimony, Mr. Voytas states: "Since ASOS was installed in May  
9 1996, it was imperative that both the Staff and the Company agree on the appropriate  
10 temperature adjustment to account for ASOS in order to develop accurate weather  
11 response functions for the HELM model." At that time I recognized UE's need to go  
12 forward with some type of correction, but I disagreed that UE and the Staff needed to  
13 agree on an appropriate permanent change to be made at that time.

14           While Mr. Voytas seems to testify that the Staff had agreed with UE's proposed  
15 adjustment, there are two important qualifiers that Mr. Voytas has correctly included in  
16 his testimony. [Voytas Rebuttal, pp. 9-11] First, UE's discussions were with Lena  
17 Mantle, "who follows HELM issues for the Staff." Ms. Mantle is not responsible for  
18 weather data, actual or normals. This is the responsibility of Mr. Dennis Patterson, and  
19 Mr. Voytas is well aware of that fact.

20           Second, Mr. Voytas stated that the discussion were in connection with UE's rate  
21 design case, EO-96-15. At no time in those discussions was the question of corrections  
22 for purposes of the Stipulation and Agreement in Case No. EM-96-149 discussed. It  
23 appeared to me that a resolution that would be agreeable between UE and the Staff was



1 impossible. Yet, we needed to go forward on the rate design case. Thus, for purposes of  
2 the rate design case, I agreed to go forward with the adjustment that UE had already  
3 introduced into the HELM modeling procedure.

4 **Q. WHY DID YOU AGREE TO GO FORWARD WITH UE'S WEATHER**  
5 **ADJUSTMENTS FOR PURPOSES OF THE RATE DESIGN CASE, EO-96-15?**

6 A. In the rate design case, revenues recovered from current rates and proposed  
7 rates are based on the same levels of weather normalized usage. In essence, in the rate  
8 design case, the results are revenue neutral, and UE would not over or under collect  
9 revenues.

10 **Q. MR. VOYTAS BELIEVES THAT SINCE THE STAFF WAS AWARE**  
11 **OF HISTORICAL BIASES IN THE TEMPERATURE DATA AT THE LAMBERT**  
12 **INTERNATIONAL AIRPORT STATION AT THE TIME THE STIPULATION**  
13 **AND AGREEMENT WAS SIGNED IT SHOULD HAVE NEGOTIATED THOSE**  
14 **TYPES OF CHANGES AT THAT TIME. DO YOU AGREE?**

15 A. I do not. [Voytas Rebuttal, p. 23, lines 9-15] This statement shows a  
16 misunderstanding of the Stipulation and Agreement. Once a problem is discovered, the  
17 Stipulation and Agreement does not restrict the Staff or any other party from proposing a  
18 method for fixing that problem. The restriction in the Stipulation and Agreement is that a  
19 change must be made on a prospective basis.

20 **Q. MR. VOYTAS ALSO INDICATES THAT SINCE THE STAFF'S**  
21 **APPROACH IS TO ADJUST HISTORICAL WEATHER DATA, SUCH AN**  
22 **ADJUSTMENT IS RETROSPECTIVE AND THEREFORE VIOLATES THE**  
23 **STIPULATION AND AGREEMENT. DO YOU AGREE?**

Surrebuttal Testimony of  
Michael S. Proctor

1           A. I do not agree with this view. [Voytas Rebuttal, p. 23, lines 14-15] My  
2 reading of the Stipulation and Agreement is that prospective and retrospective refers to  
3 the time at which a change in the weather normalization model or inputs to that model are  
4 applied during the three-year sharing period. The fact that data that is being used as an  
5 input to the model is changed because a problem is discovered in that data does not make  
6 the change retrospective if that change is applied on a going forward basis from the time  
7 that the problem is discovered.

8           **Q. WOULD YOU AGREE THAT THE CHANGES MADE BY THE**  
9 **STAFF TO WEATHER NORMALIZATION RESULTS PRIOR TO MAY 16, 1996**  
10 **WERE RETROSPECTIVE CHANGES?**

11           A. Yes, I would agree with that characterization of those changes. UE's  
12 application of the Stipulation and Agreement is that if an inconsistency is found in the  
13 application of its weather normalization process, and even if that inconsistency applies to  
14 work that has already been performed, the Stipulation and Agreement does not allow for  
15 changes to be made to work that has already been performed. If this application of the  
16 Stipulation and Agreement is proper, then it would apply to the period July 1, 1995  
17 through May 15, 1996, and the Staff's adjustments for this period would be disallowed.

18           **Q. IN REFERENCE TO THE PERIOD FROM JULY 1, 1995 THROUGH**  
19 **MAY 15, 1996, DO YOU AGREE WITH UE'S APPLICATION OF THE**  
20 **STIPULATION AND AGREEMENT?**

21           A. I believe that it can be argued that UE's interpretation fits the absolute letter of  
22 the Stipulation and Agreement, but not the spirit. My hope was that UE would see and  
23 understand why what it has been doing in weather normalization is inconsistent and be

Surrebuttal Testimony of  
Michael S. Proctor

1 willing to make the change. If the elimination of the inconsistency had resulted in a  
2 lower level for the weather normalized sharing credits than what UE had calculated for  
3 the period from July 1, 1995 to May 15, 1996, I would have supported lowering the  
4 weather normalized sharing credits even if it meant doing it retroactively. The reason for  
5 this is because it would be the correct thing to do.

6 **Q. DOES THIS COMPLETE YOUR SURREBBUTAL TESTIMONY?**

7 A. Yes, it does, unless there is a need for supplemental surrebuttal. After Steve  
8 Qi Hu, Dennis Patterson and I reviewed UE's rebuttal testimony on weather, data  
9 requests were written and submitted to UE. The Staff has not yet received responses.  
10 Once UE responds, there may be a need to supplement my surrebuttal testimony.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the matter of the Application of Union Electric Company )  
 for an order authorizing: (1) certain merger transactions )  
 involving Union Electric Company; (2) the transfer of )  
 assets, real estate, leased property, easements and ) Case No. EM-96-149  
 contractual agreements to Central Illinois Public )  
 Service Company; and (3) in connection therewith, )  
 certain other related transactions. )

AFFIDAVIT OF MICHAEL S. PROCTOR

STATE OF MISSOURI )  
 ) ss  
 COUNTY OF COLE )

Michael S. Proctor, of lawful age, on his oath states: that he has participated in the preparation of the foregoing written testimony in question and answer form, consisting of 11 pages of testimony to be presented in the above case, that the answers in the attached written testimony were given by him; that he has knowledge of the matters set forth in such answers; and that such matters are true to the best of his knowledge and belief.

Michael S. Proctor  
 Michael S. Proctor

Subscribed and sworn to before me this 19th day of April, 1999.

Joyce C. Neuner  
 Notary Public, State of Missouri  
 County of Osage  
 My Commission Exp. 06/18/2001

Joyce C. Neuner  
 Notary Public

My commission expires \_\_\_\_\_



UNIVERSITY OF MISSOURI-COLUMBIA

The School of Natural Resources

Department of Atmospheric Science

100 Gentry Hall  
Columbia, Missouri 65211  
(314) 882-6591  
FAX (314) 882-5127

May 27, 1992

Mr. Michael Proctor  
Public Service Commission  
Truman State Office Building  
Room 530  
PO Box 360  
Jefferson City, MO 65102

**RECEIVED**

JUN 1 1992

RESEARCH & PLANNING

Dear Mr. Proctor:

I have reviewed the testimony sent to me and I am enclosing my remarks concerning the issues raised. I hope that you will find them useful. If there are questions concerning the comments or should you need further evaluation, please let me know.

If it is your desire to have the content of the report transferred into testimony for the Commission, I would be pleased to make myself available. I should tell you, however, that I will be away from the Campus and out of the State between June 17 and July 1 and between July 10 and July 28.

Very truly yours,

Wayne L. Decker  
Professor and State Climatologist

Preliminary Remarks on the Heating Degree Day Testimony  
Public Service Commission

Professor Wayne L. Decker  
State Climatologist for Missouri  
Department of Atmospheric Science  
University of Missouri-Columbia

Comparison between the Observations at Lambert Field and St. Louis City  
Location:

The techniques for the comparison used in the testimony of Mr. Proctor, Mr. Lei and Mr. Boyle appear to be valid. The 15 year period extending from 1934-35 heating season through the 1948-49 season used to establish the relationship between the City observations and the temperature measurements at Lambert Field does not include the entire period of duplicate observations. The published data from NOAA has comparisons for the period running from the 1930-1931 season through the 1964-65 season for a total of 34 comparisons. The City observing station was not closed until 1969 and the records should be available through the National Climate Data Center, so 38 years of comparison would have been possible.

A quick review of the longer published comparison shows that the difference between the downtown location and the Airport was little less than for the shorter record used in the testimony. The downtown locations had about 5 % fewer degree days for the 15 year period and 3% fewer degree days for the longer period.

The regression equation for the more complete record could quite easily be computed.

Discontinuities in the St Louis Weather Records:

When one interprets climate data over an extended period it is very important to review the history of the weather station locations and the type of instrumentation used. Attached to this report is a summary prepared by NOAA of the Downtown and Lambert Field locations and instrumentation.

The Downtown temperature observations were taken roof-top at about 200 feet above the surface from 1903 onward until the closing of the observing station in 1968. Prior to 1903 the roof-top station was located at about 100 feet above the street.

Unless one carefully reviews the station location descriptions, it would appear that the Lambert Field Station did not experience much of a change since it was established in 1929. There are, however, two discontinuities in the Lambert Field observations requiring analysis.

In November 1943 the site of the temperature measurement was moved from a position away from the building (in an instrument shelter at 5 feet above the ground) to a roof-top location on the second floor of the Administration Building. This position allowed the dark roofing and the vents from the first floor to provide a less than ideal location for documenting the climate of the area. A review of the graphs from Michael Proctor's testimony shows this

period (1943 through September 1957) as one with low heating degree day totals at the Lambert Field Observing Station. The average degree days from the period extending from the 1943-44 season through the 1956-57 season is some 6% lower than the "standing mean" of 4838 reported in the Testimony. It is very likely that the warmer temperatures were, at least in part, due to heat added by the roof exposure.

On April 18, 1958 the system of measuring temperatures employed by the National Weather Service in St. Louis was changed. This change consisted of discontinuing the use of liquid thermometers mounted in the white instrument shelter in favor of electrical thermometers exposed in a reflective cylinder over the grass areas between the runways. The observations from these instruments are recorded on indicators in the National Weather Service Office. This new system was installed at all Airport observing stations of the National Weather Service at about this same time. Since the instruments were located away from the buildings and paved tarmac the temperatures are typically cooler than those previously reported from exposures near the buildings. This system has continued in use for the past three decades. One must note that using the Figures in Mr. Proctor's testimony that the heating degree days in recent years (since 1960) are markedly higher suggesting that the new location is giving a slightly cooler climate for the Lambert Field area. Even when one includes the degree day totals for the warmer most recent decade (through 1990-91 season) the 32 year average (1958-59 through 1990-91) is very close to the value suggested for the "standing mean".

#### Climate Change as a Factor in Considering Heating Requirements

Global Change and the associated temperature trends is a current topic of concern in the scientific community. Indeed, there is not complete agreement between scientist concerning the validity of a suggested temperature change on a global scale, and there have been few attempts to interpret the global aspects in terms of "local" and seasonal temperature changes. However, the fact that there is serious and scientifically documented evidence of temperature change, it is a basis for an argument against using "long-term" averages as a base for operational decisions.

"Greenhouse warming" is a factor in global temperature trends. It is occurring because of the well documented increase in certain trace gases in the atmosphere. These gases include carbon dioxide, methane, chlorofluorocarbons, among others. If the atmosphere world-wide is warming then the effect should also be noted in regional analysis. The fact that these trends are nor detectable when reviewing local records is attributed to the masking of the warming trend by discontinuities in observational techniques and random variabilities.

The "urban heat island" is a well documented phenomenon which notes that the urban temperatures are warmer than the nearby rural temperatures, particularly at night. This temperature difference is related to size of the city (area and population). The center of warming and the extent of warming depends on the configuration of the city. In the case of St Louis there have been some documentation of the urban effect from detailed studies in the 60's.

It appears that the center of development in St. Louis has been away from the river, and the urbanization of the area around Lambert Field is apparent. The opportunity for an urban climate change in the Lambert Field weather records, although not documented, is certainly present.

A Rational Approach to Selection of a "Base -Period" in Climatology

Clearly a period long enough to be "representative" of the climate of the region is required. The period should not be so long that it measures a condition that has already past and no longer valid for the climatological time series. This problem of defining a base period for the "normal" climate has plagued climatologist for many years. The World Meteorological Organization (a UN agency which coordinates National programs in meteorology and climatology) and the National Weather Service in the U.S. have adopted the policy of using the most recent 30 year period as the average for comparison purposes. Under their policy the average is "rolled over" at the beginning of each decade. The newly established "normals" are then used for the next ten years.

It appears that the use of a ninety year average does not account for the known and possible time trends in temperature data series. The equal weighing of reported climate events of nearly a century ago with those of more recent periods, places the Commission in a shaky position at best.

The use of a period as short as a decade for the base of operational calculations is not a good choice. A review of the time series will show that there have been many times during the past 100 years that the temperatures in St. Louis have depart from the normal for periods as long as a decade only to reverse itself in a subsequent decade. The following values can be used as examples of three ten year periods:

1929-30 through 1938-39	4633 degree days
1960-61 through 1969-70	4971 degree days
1980-81 through 1990-91	4633 degree days.

When compared with the with the "standing mean" these departures are -6%, +3% and -4% respectively.

Recommendations for Preparation for the Laclede Gas Hearing

1. The Commission should adopt a policy of using the 30 year period as the "normal" for degree day calculations. It is recommended that the period 1961-62 through 1990-1991 be used for the next ten years and that it be "rolled over" in 2000-01. This would place the Commission in step with the policy of the National Weather Service.
2. If the decision is made to continue the use of the "standing mean", there should be a reanalysis of the relationship between the St. Louis City Records and the Lambert Field Records to include all of the years with overlapping records (1930-1968).



3. The Commission sponsor a study to ascertain the "change" due to global change and urbanization in Missouri and the impacts which such changes have on utility rate policy in the State. Such a study should include (but not be limited to) St. Louis, Kansas City, Springfield and Columbia-Jefferson City.

4. The Commission should instigate a study of the effects of current instrumentation changes at official weather observing points on rate policies. The National Weather Service is (1990 onward) instigating widespread changes in the instrumentation at both Commissioned (Federal professional observers) and Cooperative (non-paid observers) weather stations. In the next decade or so the changes introduced by the new instrumentation system are going to offer many problems and sources of conflict between the Commission and the utility companies. It appears that anticipation of the problem would assist in rational decisions on rate structures in the future.