Exhibit No.:	
Issue:	*Weather Normalization*
Witness:	*Jose R. Perez*
Sponsoring Party:	*MoPSC Staff*
Type of Exhibit:	*Rebuttal Testimony*
Case No.:	*GR-2018-0013*
Date Testimony Prepared:	*April 13, 2018*

MISSOURI PUBLIC SERVICE COMMISSION

COMMISSION STAFF DIVISION

OPERATIONAL ANALYSIS DEPARTMENT

REBUTTAL TESTIMONY

OF

JOSE R. PEREZ

LIBERTY UTILITIES (MIDSTATES NATURAL GAS) CORP.,

d/b/a LIBERTY UTILITIES

CASE NO. GR-2018-0013

Jefferson City, Missouri
April 2018

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CASE NO. GR-2018-0013

Q. Please state your name and business address.

A. My name is Jose R. Perez and my business address is Missouri Public Service Commission, P. O. Box 360, Jefferson City, Missouri 65102.

Q. Who is your employer and what is your present position?

A. I am employed by the Missouri Public Service Commission ("Commission") and my title is Regulatory Economist I in the Tariff/Rate Design Unit of the Operational Analysis Department, Commission Staff Division.

Q. Are you the same Jose R. Perez who prepared the Weather Normalization section of Staff's Cost of Service Report ("Staff Report")?

A. Yes, I am.

EXECUTIVE SUMMARY

Q. What is the purpose of your rebuttal testimony?

A. The purpose of my rebuttal testimony is to address several concerns that Staff has in regard to the weather normalization adjustments that Liberty Midstates - MO witness Mr. Charlie Evans calculated in his Direct Testimony.

Q. Which aspects of the weather normalization adjustments calculated by Mr. Evans are you going to address?

A. Staff has five concerns which I will address in my testimony: (1) Liberty Midstates – MO uses number of customers as a variable in its regression model to forecast the relationship between gas consumption and customer usage; (2) the Company based its regression analysis on ten years of weather and usage data; (3) the Company combines Small General Service and Medium General Service as a single class; (4) the Company weather normalizes Large General Service; and (5) Liberty Midstates – MO's model is overly complicated.

WEATHER NORMALIZATION MODEL

Q. Does Liberty Midstates – MO utilize number of customers as a variable within its weather normalization model?

A. Yes it does.

Q. Is the number of customers an appropriate variable to include in the regression model?

A. No. Including the number of customers as a variable in the regression model provides an unreasonable forecast of gas consumption because doing so implies that if there are zero customers there would still be some recorded usage. For example, NEMO Residential usage in June 2016 had 1 HDD. If the number of customers for June were 0, the forecasted usage would be -180,553.04 Mcf.[1] The result is clearly unreasonable because there is a forecasted

[1]The company's model for NEMO Residential usage is: Usage (measured in Mcf) = -117035 + 0 (January) + 5424.69 (February) + 2218.85 (March) - 35827 (April) - 60951 (May) - 63583 (June) - 66165 (July) - 67880 (August) - 75877 (September) - 101055 (October) - 98650 (November) - 57627 (December) + 3488.34 (leap year) - 9678.7 (bad data) + 130.618 (Actual HDD) + 12.7061 (Residential Customers).

usage that is not zero. If there are zero customers, the forecasted usage should also be zero. While it is unlikely that there would be zero customers in a month, this example reveals a flaw in the model. Since there is a level of usage the model cannot reasonably forecast, the entire model is compromised.

Q. Why does Staff have concerns with the Company using 10 years of actual weather data for its weather normalization regression analysis?

A. Typically it is a good thing to base an analysis on more data than less. However, doing so with weather normalization is troublesome. Recorded temperature has steadily increased over the last few years. A regression analysis based on ten years of data does not accurately capture the upward trend that temperature will likely show in the upcoming years, because weather data from earlier years are given equal weight as weather data from more current years. Since the weather data from earlier years do not show the same trend with more recent data, the Company's model will not forecast the relationship between weather conditions and customer usage accurately. Staff's regression analysis is based on 12 months of test year of data. Since the data Staff used is over only one year, it captures the most recent changes in temperature and thereby provides a more reliable forecast of weather.

Q. Does Staff agree with Liberty Midstates – MO's methodology of combining its Small General Service and Medium General Service Classes in its weatherization model?

A. No. Gas consumption among Liberty Midstates – MO's Small General Service and Medium General Service classes differs greatly. According to Staff's analysis, the model's coefficient and constant terms vary widely between the Small General Service and Medium

General Service classes, implying that the respective classes have a different relationship of gas usage to HDD. The following table shows the difference.[2]

Region	SGS		MGS	
	Coefficient	Constant	Coefficient	Constant
NEMO	**0.25**	**0.57**	**1.55**	**14.20**
SEMO	**0.25**	**0.58**	**1.42**	**12.48**
WEMO	**0.25**	**0.42**	**2.31**	**11.25**

Staff models gas consumption as: Usage/Customer/Day = Constant + Coefficient (HDD/Day). The constant term refers to how much gas would be consumed if HDD/Day is zero. The coefficient term refers to how much the gas consumption would change with each additional HDD/day. Since both the constant and coefficient terms differ and therefore have different patterns of usage, Small General Service and Medium General Service should not be combined.

Q. Does Staff agree with the Company that the Large General Service (LGS) classes should be weather normalized?

A. No. The table below lists the R^2 of Staff's model for LGS in each district. [3]

Region	R^2
NEMO	0.11
SEMO	0.41
WEMO	0.49

R^2 measures the goodness of fit in a model - how well the model fits the provided data points. An R^2 of 1 implies a perfect fit. Smaller R^2 suggest a poorer fit.

[2] Figures have been rounded to two decimal places.
[3] The R^2 is rounded to two decimal places.

Staff processes the data provided by Liberty Midstates - MO to figure out the usage/customer/day as well as the HDD/day. Staff will then use regression analysis to estimate a precise relationship between usage/customer/day and HDD/day. The regression analysis effectively finds the relationship between gas consumption and weather by drawing a straight line that best fits the data. Since a higher R^2 implies the model (the straight line) fits the data better, and the data being fitted to the model relates usage/customer/day and HDD/day, a higher R^2 also implies a strong relationship between usage/customer/day and HDD/day (i.e. they're weather sensitive). The R^2 of the Residential, Small General Service, and Medium General Service Classes for each region ranges roughly from .65 to .95. This indicates a strong goodness of fit implying these service classes are weather sensitive. Conversely, the R^2 of the LGS classes for each district are all less than .50. This indicates that the LGS Classes are not weather sensitive, and thus should not be weather normalized.

Q. Does Staff have any other concerns with Liberty Midstates – MO's weather normalization model?

A. Yes. The Company's model is unnecessarily complicated because the Company's model includes 16 variables, 14 of which are dummy variables.[4] It's atypical to include so many dummy variables in one model, especially when those dummy variables are related. In this case, the variables for each month imply something about each other. If the value of the variable January is 1, then the values of other variables relating to the month (i.e. February, March, etc.) are implied to be zero.

[4] A dummy variable is a variable that assumes only one of two possible values: 1 or 0. Dummy variables are meant to help measure the effect of categorical traits that do not lend themselves to be measured. Examples of dummy variables include: gender, geographic location, or in this case month. Say that there's a model that forecasts the lifespan of a person and the model uses female as a variable. The value female assumes the value 1 when a particular datum refers to a woman in which case the coefficient for female would take effect.

CONCLUSION

Q. What is the conclusion of Staff's rebuttal testimony?

A. The model utilized by the Company contains a number of flaws, as described above. It is Staff's opinion that these flaws compromise the validity of Liberty Midstates - MO's model, and therefore, the Commission should adopt Staff's weather normalization analysis.

Q. Does this conclude your rebuttal testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of Liberty Utilities (Midstates Natural Gas) Corp. d/b/a Liberty Utilities' Tariff Revisions Designed to Implement a General Rate Increase for Natural Gas Service in the Missouri Service Areas of the Company	))))))	Case No. GR-2018-0013

AFFIDAVIT OF JOSE R. PEREZ

STATE OF MISSOURI)
) ss.
COUNTY OF COLE)

COMES NOW JOSE R. PEREZ and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing Rebuttal Testimony and that the same is true and correct according to his best knowledge and belief.

Further the Affiant sayeth not.

JOSE R. PEREZ

JURAT

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 11th day of April 2018.

D. SUZIE MANKIN
Notary Public - Notary Seal
State of Missouri
Commissioned for Cole County
My Commission Expires: December 12, 2020
Commission Number: 12412070

Notary Public