Before the Public Service Commission of Utah

Docket No. 17-057-20

IN THE MATTER OF THE PASS-THROUGH APPLICATION OF DOMINION ENERGY UTAH FOR AN ADJUSTMENT IN RATES AND CHARGES FOR NATURAL GAS SERVICE IN UTAH

Surrebuttal Testimony of

Kenneth H. Ditzel

DPU Exhibit 3.0 SR

On Behalf of the

Utah Division of Public Utilities

May 31, 2018

Introduction and Background

Q. Please state your name and business address.

A. My name is Kenneth H. Ditzel. I am with FTI Consulting, Inc. (FTI), and my business address is 8251 Greensboro Dr. – Suite 1111, McLean, VA 22102.

Q. Please state your current position with FTI Consulting.

A. I am a Managing Director in the Economic and Financial Consulting segment at FTI.

Q. Are you the same Kenneth Ditzel who filed direct testimony in this docket?

A. Yes

Q. What is the purpose of your surrebuttal testimony in this proceeding?

A. The purpose of my surrebuttal testimony is to address the rebuttal testimony of Dominion Energy Utah ("DEU" or "Company") witness David C. Landward submitted on May 9, 2018.

Q. Can you briefly restate your concerns regarding the input assumptions for the Design Peak Day model?

A. In my direct testimony, I outlined a number of concerns I have regarding the Design Peak Day model assumptions as described by Mr. Landward. One of the main concerns that I addressed is the reasonableness of the three primary Design Peak Day input assumptions of 70 HDDs, mean wind speed of 26 mph, and maximum wind speed of 47 mph. Each of these three input assumptions independently represent a near worst-case situation. DEU does not consider the likelihood of these input assumptions occurring simultaneously (i.e., "joint-probability"), ignoring their degree of correlation. Analyzing empirical observations and correlations between the HDD, mean wind speed, and maximum wind speed variables led me to conclude that independently choosing the peak historical values for maximum wind speed, mean wind speed, and HDDs without consideration of the correlation between the variables was not appropriate, and would likely lead to overestimation of demand for a peak demand day.

Office of Consumer Services witness Mr. Jerome D. Mierzwa shared this concern in his direct testimony. In response to the question of "Are the Design Day weather conditions that DEU uses for upstream pipeline capacity planning purposes reasonable," Mr. Mierzwa states "No… ….the

coldest days, as measured by HDDs, are not the days that are anticipated to have the highest maximum daily windspeeds or highest average daily windspeeds."[1]

Q. Does Mr. Landward's rebuttal adequately address the joint-probability of the Design Peak Day input assumptions occurring simultaneously?

A. No. In his rebuttal, Mr. Landward disagrees with my assessment that the joint probability of the three primary Design Peak Day input assumptions (70 HDDs, mean wind speed of 26 mph, and maximum wind speed of 47 mph) is much less than 5%. However, Mr. Landward provides no statistical analysis to support his position. In my direct testimony, I stated that the joint probability of the Design Peak Day assumptions occurring simultaneously is, in my belief, much lower than 5%. This belief is based on the probability of the HDD count independently occurring as being 5%, as Mr. Landward has surmised, and that imposing five more conditions (Maximum Wind Speed = 49 mph; Mean Wind Speed = 26 mph; the day is not a holiday; the day in Monday, Tuesday, Wednesday, or Thursday; and the prior day demand was 882,609 Mcf) would only lower the joint probability, which, by definition, must be equal to or lower than 5%. Practically, and based upon the analysis provided in my direct testimony, I believe the joint-probability is likely significantly lower. Mr. Mierzwa shares the same concern about the Design Peak Day assumptions' infeasibility when he states, correctly, that the Company's design day weather criteria "entails reliance on an extreme set of circumstances that does not have a reasonable likelihood of occurrence."[2] Mr. Landward even states in a data request response when asked about the joint-probability of the Design Peak Day assumptions that, "without a complete set of probability of data on all variables at those points in time, a reliable computation is not possible".[3] In this statement, Mr. Landward admits that DEU has done no joint-probability analysis.

[1] Docket No. 17-057-20; Direct Testimony of Jerome D. Mierzwa for the Office of Consumer Services, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", lines 136-138.

[2] Docket No. 17-057-20; Direct Testimony of Jerome D. Mierzwa for the Office of Consumer Services, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah," lines 167-168

[3] Response to Discovery DPU 2. 47..

Q. Should the Company undertake a trend analysis of mean temperatures to determine whether the Design Peak Day temperature should be adjusted?

A. If the Company truly seeks to be prudent in constructing and applying its modeling methodology, it should undertake a trend analysis of mean temperatures. In Mr. Landward's rebuttal testimony, he states that the Company should not undertake a trend analysis of mean temperatures in recent history and increase the Design Peak Day temperature to account for what may appear to be a recent warming trend.[4] He attempts to justify this position by stating, "The Company is not aware of any scientific research that would support this approach."[5]The Intergovernmental Panel on Climate Change (IPCC), an international body established to assess climate change which includes 195 countries are Members, including the United States, would be a good source for the Company to start its research. In its Climate Change 2014 Synthesis Report, the IPCC states, "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia."[6] Figure 1[7] shows a map of observed changes in surface temperature from the same report, as derived from temperature trends on observed data estimated by linear regression.

[4] Docket No. 17-057-20; Direct Testimony of Jerome D. Mierzwa for the Office of Consumer Services, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah," lines 212-215.

[5] Docket No. 17-057-20; Direct Testimony of Jerome D. Mierzwa for the Office of Consumer Services, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", lines 218-219.

[6] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, Page 2.

[7] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, Page 41.

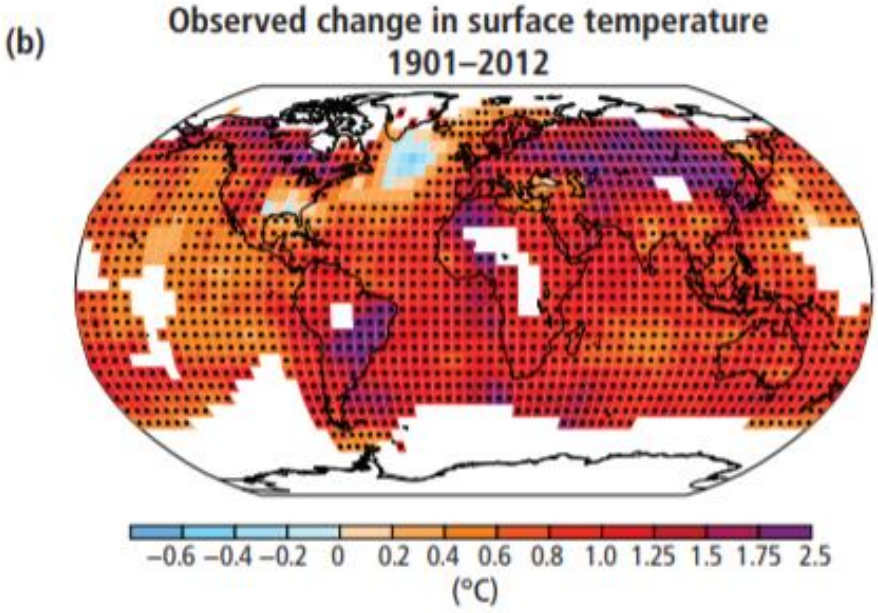

Figure 1

This method can also be used to test the warming trend assumption on more local data, from Salt Lake City. Using temperature data provided by the National Centers for Environmental Information, National Oceanic and Atmospheric Administration ("NOAA")[8], I ran a simple linear regression on daily temperature data from January 1, 1948 (the beginning of the dataset after which there are complete observations) to December 31,2017, with average daily temperatures as the dependent variable, and a time-trend, starting at a value of one and increasing by one unit per day as the independent variable. The results of the regression indicate that the time trend is a statistically significant explanatory variable, with a t-statistic of 9.62 (and a p-value well-below the 0.1% level). The estimated coefficient on the time trend suggests that mean temperatures in Salt Lake City have risen an average 0.055 degrees Fahrenheit for each 365 day period. I also utilized an interactive, publicly available, tool developed by NOAA to restrict the analysis to only the winter months of November through March. The graphical output is provided below in Figure 2[9]. Here, you will see that the trend line suggests an average warming

[8] Data for Station USW00024127, "SALT LAKE CITY INTERNATIONAL AIRPORT, UT US", obtained from National Centers for Environmental Information, National Oceanic and Atmospheric Administration.

[9] NOAA National Centers for Environmental information, Climate at a Glance: City Time Series, published May 2018, retrieved on May 25, 2018 from http://www.ncdc.noaa.gov/cag/.

of 0.5 degrees Fahrenheit per decade, specifically for Salt Lake City, over the winter months.

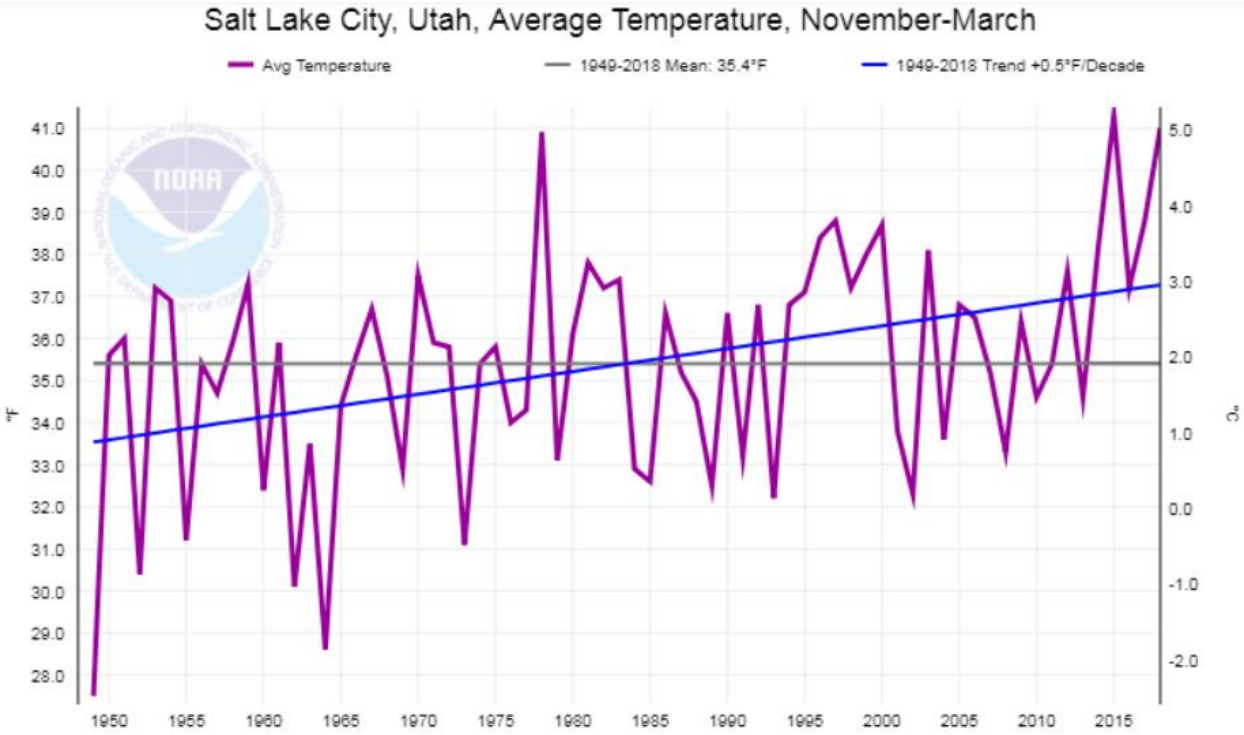

Figure 2

Q. Is Mr. Landward's assessment of the likelihood of back-to-back design day events reasonable?

A. Mr. Landward does not assess the likelihood of back-to-back design day events occurring. Instead he simply asserts that there have been two occurrences of mean daily temperatures falling at or below negative 5 degrees Fahrenheit, both occurring in 1932. I am unable to verify the accuracy of this assertion, as I do not have access to the AccuWeather[10] dataset used by the Company, and NOAA data is not available for 1932. However, even if Mr. Landward's statement is accurate, it falls far short of being adequate justification for his "Back-to-Back Design-Day Events" scenario. Mr. Landward states, "Yes. The data show that this back-to-back scenario has happened before"[11] in response to the question as to whether his Back-to-Back Design-Day

[10] Response to Discovery DPU 13.04.

[11] Docket No. 17-057-20; Rebuttal Testimony of David C. Landward for Dominion Energy Utah, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", line 128

Events assumptions are reasonable.[12]This answer once again shows a level of carelessness that has been demonstrated by DEU many times throughout my testimony. The Company's Design Day assumes more than just HDD count. It also assumes mean and maximum wind speed variables, as well as days of the week. Showing that there have been two instances of HDDs meeting or exceeding 70 (-5 degrees Fahrenheit) on two consecutive days over the past 87 years does not provide any evidence that it is reasonable to assume that the full set of Design Day assumptions could occur on consecutive days, or that they ever have. Mr. Landward has already stated that the Company does not have wind data prior to 1950[13]. As such, it is impossible for Mr. Landward to make the claim that assuming two back-to-back Design-Day events is a reasonable thing to do, as the only occurrences of back to back HDD counts meeting or exceeding 70 occur for a year in which the Company has no wind data.

Q. Is Mr. Landward's assertion reasonable that it is acceptable to use prior-day demand as an input assumption for the Design Peak Day model?

A. I found Mr. Landward's use of the Vitullo et al. 2009 academic paper[14] ("Vitullo 2009") to support his inclusion of a prior-day demand variable to be misleading, and taken out of context. Mr. Landward states in his rebuttal, "Prior-day demand is an important explanatory variable in demand analysis"[15], citing the journal article as a source. This is not an appropriate justification for including the measure in a model to predict Demand Peak Day requirements, however. The article that Mr. Landward cites states, under the sub-heading of "3.3 Previous day demand", that "Typically, the load forecasts are made for the coming day before the current day's gas day is complete. Thus, the current day's demand is not known. However, yesterday is over, so the flow for that day may be known. Adding this and earlier daily flows as inputs to the forecast model, making it autoregressive, can reduce forecast error significantly."[16] This reference is to

[12] Docket No. 17-057-20; Rebuttal Testimony of David C. Landward for Dominion Energy Utah, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", lines 127-128.
[13] Response to Discovery DPU 1.16.
[14] Vitullo, S. R., Brown, R. H., Corliss, G. F., & Marx, B. M. (2009). Mathematical Models for Natural Gas Forecasting. *Canadian Applied Mathematics Quarterly*.
[15] Docket No. 17-057-20; Rebuttal Testimony of David C. Landward for Dominion Energy Utah, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", line 87.
[16] Vitullo, S. R., Brown, R. H., Corliss, G. F., & Marx, B. M. (2009). Mathematical Models for Natural Gas Forecasting. *Canadian Applied Mathematics Quarterly*. Page 814.

use lagged values of demand with known quantities. The Company, however, uses an unsupported methodology to estimate prior day demand for the Design Peak Day, which I have raised concerns about. The Company is unquestionably not using lagged, known, demand data in its estimation of Design Peak Day demand. In my direct testimony, I showed that my replication of the Company's methodology for forecasting prior day weather conditions resulted in an average error of 28% for estimating maximum wind speed and 21% for estimating prior day mean wind speed, for the days preceding the highest observations of each per year, respectively, over the period of 2004 – 2018. Mr. Landward does not address this high degree of inaccuracy in his rebuttal testimony, nor does he provide any further support for his methodology for calculating prior day temperatures or wind speeds.

Q. Is Mr. Landward's assessment reasonable that it is not necessary to use cooling degree days (CDD) as an independent variable in the Company's model?

A. No. Mr. Landward's rebuttal implies that CDDs are not important because neither power generation fluctuations to meeting cooling load nor natural-gas fueled air conditioners "exist in the firm sales demand that the Company is modeling."[17] This shows a fundamental lack of understanding of omitted variable bias. If the omitted variable has an effect on the dependent variable (firm sales demand) and is correlated with an explanatory variable (HDD), the effects of the omitted variable (CDD) to the explanatory variable (HDD), will be mistakenly attributed to the explanatory variable, resulting in omitted variable bias. Mr. Landward indicates that data from the summer months was used to calibrate the Company's regression model, in stating "All rows through the end of February, 2017 were used for modeling the Design-Day demand for the 2017/18 IRP year" when asked which records in OCS 1.03 were used to calibrate multivariate regression model.[18] Therefore, Mr. Landward's statement is once again misleading, as cooling demand does exist in the firm sales demand that the Company is modeling, as the regression equation is calibrated on both summer and winter data. Furthermore, Vitullo 2009, cited by Mr. Landward in his rebuttal testimony, states that, "Adding a cooling degree term CDD k = max (Tk − Tref, 0) can also improve the accuracy of the model"[19], in the context of building a model of

[17] Docket No. 17-057-20; Rebuttal Testimony of David C. Landward for Dominion Energy Utah, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", lines 285-288.

[18] DEU Response to DPU Data Request 13.09

[19] Vitullo, S. R., Brown, R. H., Corliss, G. F., & Marx, B. M. (2009). Mathematical Models for Natural Gas Forecasting. *Canadian Applied Mathematics Quarterly*. Page 813.

natural gas demand. Not only do I agree with this assertion, but I would add further that adding a CDD term is likely necessary if you are using data from the summer months to calibrate your regression model, as the Company has done. Omitted variable bias affects the model parameter estimates themselves, and as such, affects estimates even on days where there are no observed or predicted CDDs.

Q. Is Mr. Landward's use of four polynomial terms of HDDs is appropriate?

A. After reviewing Vitullo 2009, I found no evidence to suggest that including four polynomial terms of HDDs is appropriate. I also found no evidence to suggest that Mr. Landward's treatment of wind speeds within the model was appropriate. In fact, the authors suggest a completely different treatment of wind speeds in the model than that which is used in the Company's model, with the construction of a "Heating Degree Days adjusted for Wind" measure.[20]

Q. Is Mr. Landward's parameterization of wind speeds in the DEU's Design Peak Day model appropriate?

A. I found no evidence to suggest that Mr. Landward's parameterization of wind speeds within the model was appropriate. In fact, Vitullo 2009 suggests a completely different treatment of wind speeds in the model than that used in the Company's model, with the construction of a "Heating Degree Days adjusted for Wind" measure.[21]

Q. Is Mr. Landward's assessment reasonable that it is prudent to use an estimate on the high end of the range of possibilities?

A. No. To emphasize a point from my direct testimony further – while it is important for a utility to plan for peak demand days, a reasonable and responsible cost/benefit analysis cannot be conducted without an informed estimate of the probability that the event in question will occur. Mr. Landward states that "The Company wants to plan for the highest level of gas consumption

[20] Vitullo, S. R., Brown, R. H., Corliss, G. F., & Marx, B. M. (2009). Mathematical Models for Natural Gas Forecasting. *Canadian Applied Mathematics Quarterly*. Page 814.
[21] Vitullo, S. R., Brown, R. H., Corliss, G. F., & Marx, B. M. (2009). Mathematical Models for Natural Gas Forecasting. *Canadian Applied Mathematics Quarterly*. Page 814.

that is possible when the daily mean temperature reaches the Design Peak Day level."[22] Mr. Landward has not, however, shown that the assumptions underlying his Design Day estimate occurring simultaneously are probable, or even possible. He goes on to state that "The Company believes this to be a more prudent planning goal, one that provides a safety buffer and reduces the likelihood of losing service to customers because of inadequate supply acquisition."[23] To this notion, I would suggest that it is judicious to plan for, and spend money on, acquiring supply to ensure resource adequacy only to a certain threshold, where the probability-weighted benefits from taking action exceed the costs. The additional "benefits or costs of being conservative" is not evaluated by Mr. Landward. Therefore, his assertion of being conservative by being prudent, by definition, is not.

Q. Does this conclude your surrebuttal testimony?

A. Yes.

[22] Docket No. 17-057-20; Rebuttal Testimony of David C. Landward for Dominion Energy Utah, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", lines 239-241.

[23] Docket No. 17-057-20; Rebuttal Testimony of David C. Landward for Dominion Energy Utah, "In the Matter of the Passthrough Application of Dominion Energy Utah for an Adjustment in Rates and Charges for Natural Gas Service in Utah", lines 241-243.