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SOAH DOCKET NO. 473-19-3864
PUC DOCKET NO. 49421

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| APPLICATION OF CENTERPOINT | § | BEFORE THE STATE OFFICE |
| ENERGY HOUSTON ELECTRIC, LLC | § | OF |
| FOR AUTHORITY TO CHANGE RATES | § | ADMINISTRATIVE HEARINGS |

**REBUTTAL TESTIMONY**

**OF**

**DR. J. STUART MCMENAMIN**

**ON BEHALF OF**

**CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC**

**June 2019**



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# REBUTTAL TESTIMONY OF J. STEWART MCMENAMIN

## I. INTRODUCTION AND QUALIFICATIONS

**Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND PLACE OF EMPLOYMENT.**

A. My name is John Stuart McMenamin. I am Director of Forecasting at Itron Inc. ("Itron"), 12348 High Bluff Drive, Suite 210, San Diego, CA 92130.

**Q. ON WHOSE BEHALF ARE YOU TESTIFYING?**

A. I am testifying on behalf of CenterPoint Energy Houston Electric, LLC ("CenterPoint Houston" or the "Company"). Information on my background and qualifications can be found in my Direct Testimony.

## II. PURPOSE OF REBUTTAL TESTIMONY

**Q. PLEASE DESCRIBE THE PURPOSE OF YOUR REBUTTAL TESTIMONY.**

A. In the direct testimony of Alicia Maloy on behalf of the Commission Staff, it is argued that normal weather should be defined on a 10-year basis rather than a 20-year basis and that the CenterPoint Houston 20-year weather impacts should be rejected in favor of alternative models and weather impacts calculated by Ms. Maloy. In the direct testimony of Karl Nalepa on behalf of the Office of Public Utility Counsel in section VII.A, pages 41 to 46, Mr. Nalepa recommends the use of a 10-year period for defining normal weather instead of a 20-year period. In response, my rebuttal testimony has four main purposes.

1. First, I comment on the monthly sales model used by Ms. Maloy to calculate an alternative set of weather adjustments.

2. Second, I respond to the criticisms made by Ms. Maloy as reasons to reject the CenterPoint Houston models and model results.

3. Third, I provide the rationale for using 20-year normal weather rather than 30-year normal or 10-year normal weather values.

4. Finally, should the Commission decide to use 10-year normal weather, I provide an alternative set of weather impact estimates and filing schedules based on 10-year normal weather using the CenterPoint Houston daily energy models that are documented in my direct testimony.

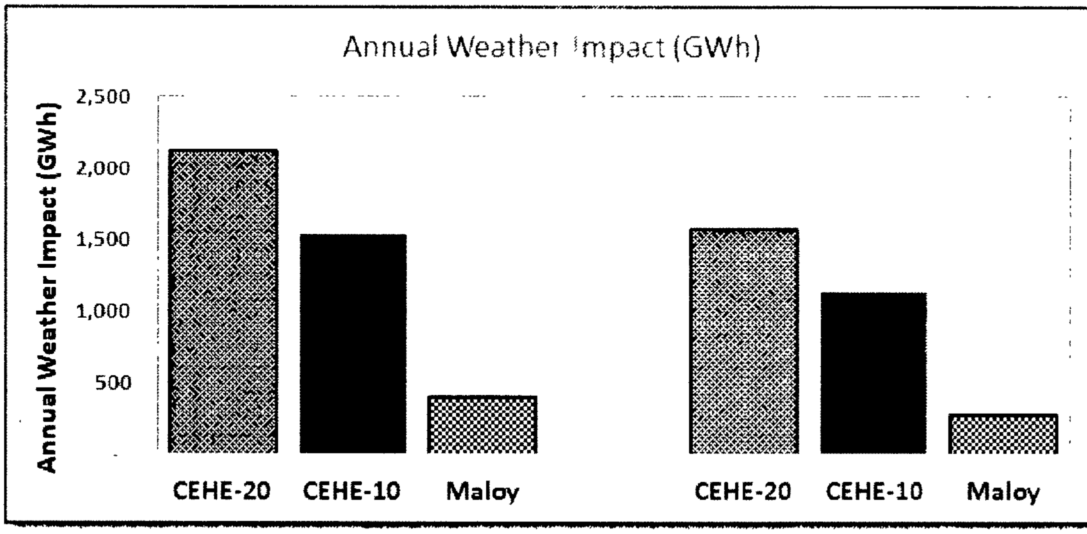
## III. REVIEW OF MS. MALOY MODELS

**Q. HAVE YOU REVIEWED THE WEATHER IMPACT RESULTS PROVIDED BY MS. MALOY IN EXHIBIT AM-5?**

A. Yes, I have reviewed the results and compared them to results from the CenterPoint Houston models using 20-year and 10-year normal weather definitions. The results for all classes combined and for the residential class are provided in the Figure SM-R1.

The CenterPoint Houston 20-year results are taken from Schedule II-H-2.1 which provides weather impacts for billed sales in the test year. The CenterPoint Houston 10-year results are taken from an alternative version of Schedule II-H-2.1 using 10-year normal weather, as described in the final section of this rebuttal testimony. (See JSM Rebuttal Exhibit R-JSM-1, the Company's response to OPUC RFI 1-20, which is being provided electronically). The estimates for the monthly models introduced by Ms. Maloy are taken from Exhibit AM-5 attached to Ms. Maloy's direct testimony.

**Figure SM-R1: Comparison of Annual Weather Impacts**




The bars on the left show the estimated impacts summed across all classes. Ms. Maloy's estimate (406 GWh) is about 26% of the comparable CenterPoint Houston estimate using 10-year normal weather (1,532 GWh). The bars on the right show the estimated impacts for the residential class . Ms. Maloy's estimate (272 GWh) is about 24% of the comparable CenterPoint Houston estimate using 10-year normal weather (1,140 GWh).

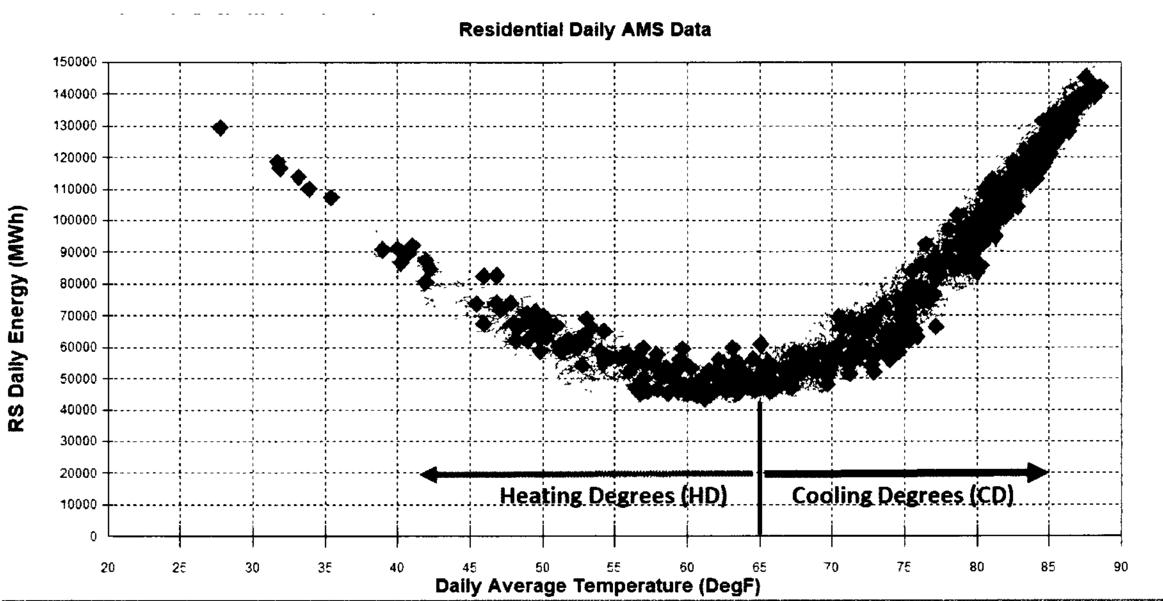
Q. **DO YOU UNDERSTAND WHY THE DIFFERENCES ARE SO LARGE?**

A. Initially, I did not understand these differences. I would not expect differences of this magnitude from reasonable alternative approaches. To understand the differences it was necessary to use daily AMS data to evaluate the specification used by Ms. Maloy. Based on this analysis, I conclude that the differences come mainly from differences in the estimated weather slope parameters. These parameters give the MWh impact of a change in the number of heating degree days and cooling degree days. I believe that the daily AMS data provide a powerful basis for determining what these slopes should be. Based on the AMS data, I conclude that the slopes estimated by Ms. Maloy using the more monthly data are wrong and should not be used.

**Q. PLEASE EXPLAIN HOW THE DAILY AMS DATA CAN BE USED TO EVALUATE THE MONTHLY MODEL COEFFICIENTS.**

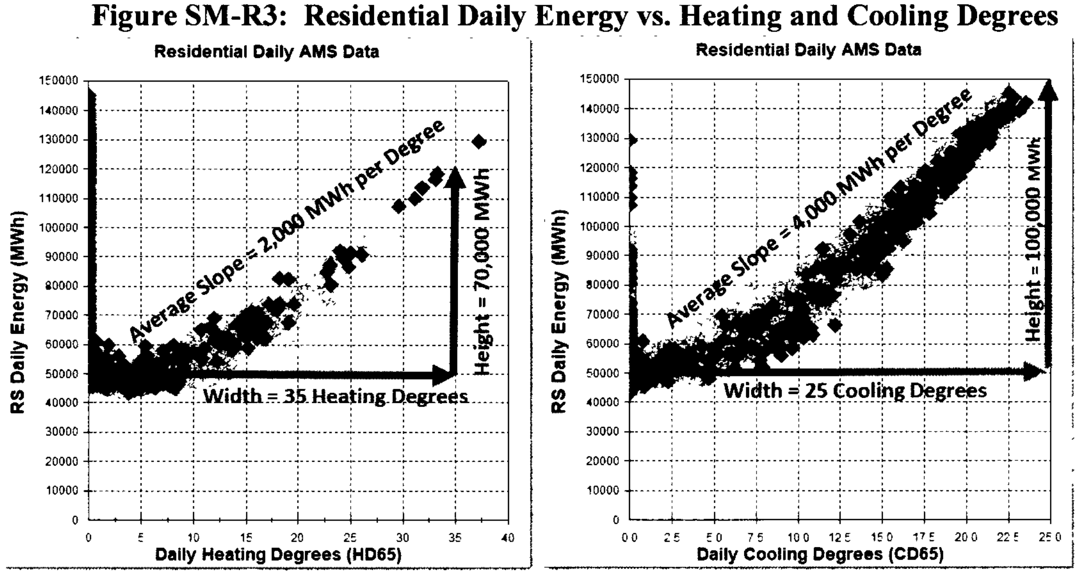
A. I will explain the process using AMS data for the Residential class. Based on the CenterPoint Houston models, this class accounts for about 72% of the weather impact for annual sales. Figure SM-R2 shows the daily data for 2015 through 2018. Each day is one point, and there are a total of 1,461 daily observations. The 365 days in 2018 are highlighted in red diamond symbols for days with cooling degrees (average temperature above 65) and are highlighted in blue diamond symbols for days with heating degrees (average temperature below 65). The daily data for years other than 2018 are shown in empty grey circles.

**Figure SM-R2: Residential Daily AMS Data (2015 to 2018)**



As described in my direct testimony, the daily AMS data provide a powerful picture of the relative strength of heating and cooling degrees on daily energy outcomes. Figure SM-R3 shows how this picture can be segmented into two parts, a heating side and a cooling side. This alternative view represents how the daily AMS data would appear to the simple models used by Ms. Maloy. The left-hand chart shows daily energy plotted against daily heating degrees (degrees below 65). The right-hand chart shows daily energy plotted against daily cooling degrees (degrees above 65). As before, daily data are shown for all days in 2015 through 2018, and the days in 2018 are shaded with solid diamond symbols. The days in 2015 through 2017 are plotted as empty circles.

**Figure SM-R3: Residential Daily Energy vs. Heating and Cooling Degrees**




These charts set our expectations for model slope coefficients. Focusing on the cooling degree plot, the width of the triangle is 25 degrees (from 65 degrees to 90 degrees). The resulting increase in load is about 100,000 MWh (150,000 MWh – 50,000 MWh). The average slope for this 25 degree span is therefore about 4,000 MWh per degree (computed as 100,000/25).

Focusing on the heating side, the width of the triangle is 35 heating degrees. The resulting increase in load is about 70,000 MWh (120,000 MWh – 50,000 MWh). The average for this 35 degree span is therefore about 2,000 MWh per degree (computed as 70,000/35).

**Q. DO YOU EXPECT THESE AVERAGE SLOPES TO APPLY IN ALL MONTHS?**

A. No. As the charts show, the early degrees are low powered, meaning they produce a relatively weak change in energy usage. For example, on the cooling side, the slope for the first 5 degrees (65 to 70) and the second 5 degrees (75 to 80) are well below the average. These are low-powered degrees. Months like March with most days in this low-powered range will appear to have smaller than average slopes (about 2,000 MWh per degree). Cooling degrees above 15 are high-powered degrees, and appear to have a much bigger impact. Months like July and August with most days in the high-powered range will have larger than average slopes (about 5,000 MWh per degree).

Similar conclusions apply to the heating degree side. In fact, the first 5 heating degrees do not appear to have any slope at all, suggesting that 65 degrees is the wrong base for the heating side. The CenterPoint Houston models presented in my direct testimony, informed by the daily AMS data, had low-powered degrees starting at 60 instead of 65. For purposes of the rebuttal testimony, I will stick with the 65-degree base to be as consistent as possible with Ms. Maloy's models.

**Q. DID YOU USE THE DAILY AMS DATA TO ESTIMATE SIMPLE DEGREE-DAY MODELS LIKE MS. MALOY'S MODELS?**

A. Yes. For the residential class I estimated a model with the daily AMS data using a simple degree-day model. I will refer to this as the Daily AMS model or the Rebuttal model. This model is like Ms. Maloy's models with the following exceptions.

First, Ms. Maloy uses 10 years of monthly data for a total of 120 observations. This means that each month has only 10 observations to support estimation of the degree-day slope for that month. My Rebuttal model uses 4 years of daily AMS data for a total of 1,461 observations. Each month has about 120 daily observations, which is twelve times as many as Ms. Maloy's model, to support estimation of a degree-day slope for that month.

Second, Ms. Maloy removes variables that are insignificant from her model. As a result, many months do not have estimated slopes. My Rebuttal model includes slopes for all months that have non-zero heating-degree or cooling-degree values. Slopes are estimated for all 12 months for cooling degrees, and are estimated for 7 months for heating degrees (the remaining 5 months had no heating degree days).

Third, Ms. Maloy's model includes a single constant term that is shared by all months. For reasons that I will explain later, I believe it is necessary to include separate constant terms for each month, and my Rebuttal model includes a separate constant term for each month.

**Q. WHAT DO THE REBUTTAL MODELS TELL YOU ABOUT COOLING SLOPES?**

A. Figure SM-R4 shows the estimated cooling slopes from the Rebuttal model estimated with daily AMS data. It also shows the estimated coefficients from the two versions of Ms. Maloy's models. The first version (labeled Maloy-1) is the static residential model that does not include a lagged sales variable. The second version (labeled Maloy-2) is from the autoregressive residential model that does include a lagged sales variable. In Maloy-2, the sales level in the prior month is used as an additional explanatory variable for sales in the current month.

**Figure SM-R4: Estimated Cooling Degree Slope Coefficients**

| | Daily AMS Model | | | Maloy Model 1 | | Maloy Model 2 | |
|---|---|---|---|---|---|---|---|
| Variable | Coef | Std Error | T Stat | Coef | T Stat | Coef | T Stat |
| Jan CD65 | 1,759 | 347 | 5.07 | 0 | | 0 | |
| Feb CD65 | 1,733 | 162 | 10.73 | 0 | | 0 | |
| Mar CD65 | 2,279 | 130 | 17.51 | 0 | | 0 | |
| Apr CD65 | 2,509 | 108 | 23.15 | 0 | | 0 | |
| May CD65 | 3,761 | 112 | 33.70 | 366 | 1.50 | 769 | 3.39 |
| Jun CD65 | 4,956 | 154 | 32.09 | 1,634 | 9.65 | 1,728 | 11.51 |
| Jul CD65 | 5,464 | 199 | 27.43 | 2,671 | 17.24 | 2,296 | 15.18 |
| Aug CD65 | 5,528 | 134 | 41.27 | 2,942 | 18.68 | 2,148 | 10.96 |
| Sep CD65 | 4,324 | 143 | 30.14 | 3,671 | 17.35 | 2,471 | 8.82 |
| Oct CD65 | 3,355 | 81 | 41.58 | 3,701 | 10.03 | 1,872 | 4.11 |
| Nov CD65 | 2,293 | 103 | 22.25 | 0 | | 0 | |
| Dec CD65 | 1,947 | 165 | 11.79 | 0 | | 0 | |

As the figure shows, the estimated cooling coefficients in the AMS model follow the expected pattern, with slopes near 2,000 MWh per degree in the winter months and with slopes near 5,000 MWh per degree in the summer months. All estimated slopes are strongly significant with T-statistics ranging from 5 to 40. This is consistent with the slopes that are visually obvious in the plots of the daily AMS data in Figure SM-R3. I believe that these are the correct slopes for a simple degree day model, whether it is estimated with daily or with monthly data.

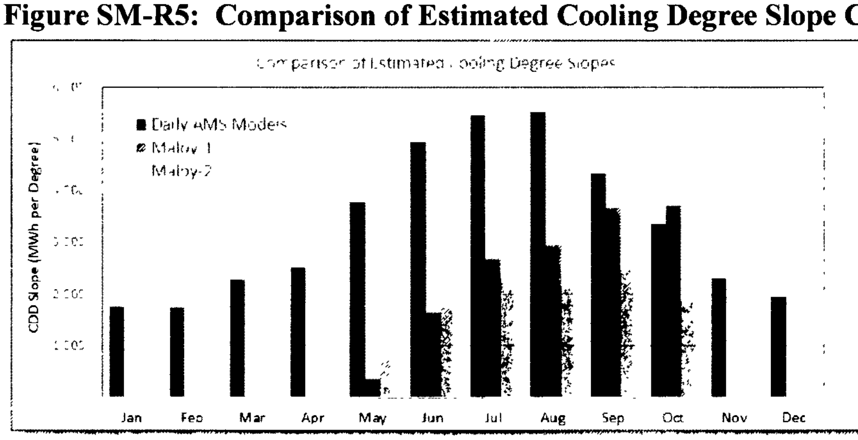
**Q. DO THE ESTIMATED COOLING SLOPES IN THE AMS MODEL AGREE WITH THE ESTIMATED COOLING SLOPES IN MS. MALOY'S MODELS?**

A. No. Ms. Maloy's slopes are surprisingly far from the daily AMS model estimates. The estimated values are summarized graphically in Figure SM-R5.

First, Ms. Maloy's models have zero slopes for January, February, March, April, November, and December. The Rebuttal model using daily AMS data has slopes in the expected range between 1,700 and 2,500 MWh per degree for these months. These AMS model coefficients are consistent with expectations, and are strongly statistically significant, with T-statistics between 5 and 23. If we tested the statistical hypothesis that these coefficients are zero (as imposed in Ms. Maloy's model), this hypothesis would be soundly rejected.

While the profile of the slopes from the AMS model follow a smooth and sensible pattern, the profile of Ms. Maloy's slopes do not. For example, the cooling degree slope for May is one tenth of the cooling degree slope in October in Ms. Maloy's Model 1 and is less than half the slope in October in Model 2. These coefficients are not consistent with the pattern estimated from the daily AMS data.

**Figure SM-R5: Comparison of Estimated Cooling Degree Slope Coefficients**



**Q. WHAT DO YOUR REBUTTAL MODELS TELL YOU ABOUT HEATING SLOPES?**

A. Figure SM-R6 shows the estimated heating slopes from the models that I estimated using daily AMS data. It also shows the estimated coefficients from the two versions of Ms. Maloy's models.

As the figure shows, the estimated heating coefficients in the AMS model show the strongest response to heating in the winter months (December, January, February), with slopes between 1,600 and 2,200 MWh per degree. These coefficients are extremely well defined. For example, the coefficient for January is 2,158 MWh per degree and has a T-statistic over 38. The estimated standard error for this coefficient is 57. Using a 2-standard error range, the 95% confidence interval for this slope is 2045 to 2271. This implies that any value outside this range is unlikely.

Slopes for the remaining months are below 1,500 MWh per degree and the smallest slopes occur in April and October at about 900 MWh per degree. The coefficients for March, October and November are well defined (have small standard errors) and are strongly significant with T statistics between 8 and 20. The coefficients for May and October are not statistically significant at the 95% level, with T-statistics of 1.57 and 1.72. However, these coefficients are sensible and, in my opinion, they should be left in the model because they are a better estimate of the true slope than a value of zero. I believe that these are the correct slopes for a simple degree day model, whether it is estimated with daily or with monthly data.

**Figure SM-R6: Estimated Heating Degree Slope Coefficients**

| | Daily AMS Model | | | Maloy Model 1 | | Maloy Model 2 | |
|---|---|---|---|---|---|---|---|
| Variable | Coef | Std Error | T Stat | Coef | T Stat | Coef | T Stat |
| Jan CD65 | 2,158 | 57 | 38.20 | 859 | 3.63 | 1,214 | 5.46 |
| Feb CD65 | 1,685 | 85 | 19.92 | 0 | | 0 | |
| Mar CD65 | 1,449 | 166 | 8.73 | 0 | | 0 | |
| Apr CD65 | 970 | 616 | 1.57 | 0 | | 0 | |
| May CD65 | 0 | 0 | 0.00 | 0 | | 0 | |
| Jun CD65 | 0 | 0 | 0.00 | 0 | | 0 | |
| Jul CD65 | 0 | 0 | 0.00 | 0 | | 0 | |
| Aug CD65 | 0 | 0 | 0.00 | 0 | | 0 | |
| Sep CD65 | 0 | 0 | 0.00 | 0 | | 0 | |
| Oct CD65 | 872 | 506 | 1.72 | 0 | | 0 | |
| Nov CD65 | 1,495 | 112 | 13.39 | 0 | | 0 | |
| Dec CD65 | 1,644 | 82 | 20.09 | 0 | | 0 | |

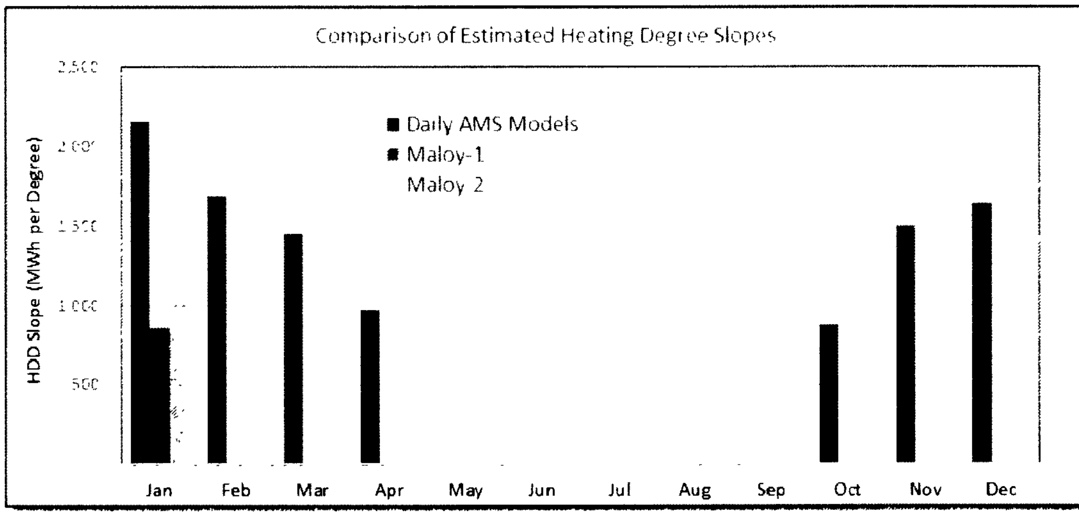
Q. **DO YOUR ESTIMATED HEATING SLOPES AGREE WITH MS. MALOY'S ESTIMATED HEATING SLOPES?**

A. No. Ms. Maloy's estimated heating slopes are not consistent with estimates from the daily AMS model. The estimated values are summarized in Figure SM-R7. The profile of the heating slopes from the daily AMS model follow a smooth and sensible pattern that is consistent with the daily AMS data.

For the two Maloy models, the only month with an estimated heating slope is January. Ms. Maloy's slopes for January are well below the January heating slope from the AMS model. In statistical terms, these values are 23 standard errors (Maloy-1) and 17 standard errors (Maloy-2) below the estimated January slope from the daily AMS models. Based on the AMS data, the probability that Ms. Maloy's estimated slopes are correct is approximately zero.

Ms. Maloy's models also impose zero slopes in all months other than January. This assumption is clearly rejected by the estimates from the daily AMS data. For example, there was abnormally cold weather in November of 2018 with 6 days where the average temperature was below 50 degrees. The coldest day had an average temperature below 40 degrees. I believe it is reasonable and necessary to adjust for these abnormally cold days with a slope of 1,500 MWh or more.

**Figure SM-R7: Comparison of Estimated Heating Degree Slope Coefficients**




**Q. WHAT DO THE REBUTTAL MODELS TELL US ABOUT CONSTANT TERMS?**

A. As mentioned above, the two versions of Ms. Maloy's models include a single constant term. The second set of Ms. Maloy's models (Maloy-2) also includes a lagged dependent variable (prior month sales), which adds the most to the constant term in the higher energy months of summer. In contrast, my Rebuttal model included a separate constant term for each month and there are no autoregressive terms. The estimated coefficients are shown below.

**Figure SM-R8: Estimated Constant Terms**

| | Daily AMS Model | | | Maloy Model 1 | | Maloy Model 2 | |
|---|---|---|---|---|---|---|---|
| | Coef | Std Error | T Stat | Coef | T Stat | Coef | T Stat |
| Constant | | | | 1,690,000 | 44.77 | 984,000 | 4 72 |
| Lag Sales | | | | | | 0.357 | 5.73 |
| Jan | 45,903 | 704 | 65.22 | | | | |
| Feb | 46,113 | 697 | 66.13 | | | | |
| Mar | 45,381 | 699 | 64.88 | | | | |
| Apr | 47,801 | 801 | 59 70 | | | | |
| May | 40,633 | 1,393 | 29.17 | | | | |
| Jun | 25,351 | 2,678 | 9.47 | | | | |
| Jul | 16,909 | 3,987 | 4.24 | | | | |
| Aug | 15,048 | 2,535 | 5.94 | | | | |
| Sep | 34,872 | 2,192 | 15.91 | | | | |
| Oct | 45,733 | 844 | 54.18 | | | | |
| Nov | 47,639 | 645 | 73.86 | | | | |
| Dec | 50,789 | 725 | 70.10 | | | | |

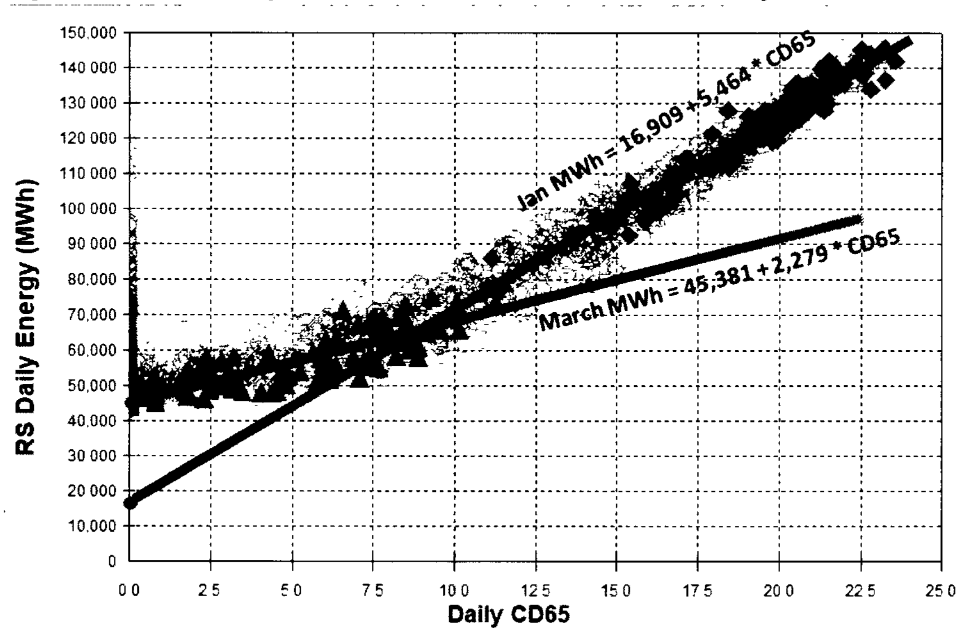
The monthly constants from the daily AMS model show a strong pattern. In the winter months, these values are in the 45,000 to 50,000 range. In the summer months, they are in the 15,000 to 25,000 range. These constant terms are very well defined with small standard errors and T-statistics ranging from 4 to 70.

The daily AMS model can be used to test the hypothesis that the constant terms are all the same for all months. This is done by comparing the sum of squared errors with unequal constant terms to the restricted sum of squared errors with the constants constrained to be equal. The test is based on an F-statistic, and the computed F value is 32.59, which has a probability of approximately zero. In other words, the daily AMS model firmly rejects the hypothesis that the constant terms are equal.

**Q. CAN YOU EXPLAIN WHY THE CONSTANT TERMS SHOULD BE DIFFERENT FOR DIFFERENT MONTHS?**

A. Yes. It is relatively easy to see when we look at the daily AMS data. For cooling degrees the following chart shows all four years of daily data with days in July highlighted in red diamonds and days in April highlighted with green triangles. The lines show the estimated equations for these months from the Rebuttal model using the estimated cooling degree slopes shown in Figure SM-R4 and the estimated constant terms shown in Figure SM-R8.

**Figure SM-R9: Daily AMS Models for March and January**




To make the model residuals small, the green line for March needs to go through the green triangles for March. Most of the days in March have low cooling degree values, mostly less than 10. The constant needs to be close to where the green triangles hit the Y-axis (about 45,000 MWh). From that starting point, the slope needs to be about 2,000 degrees per MWh to go through the middle of the March observations.

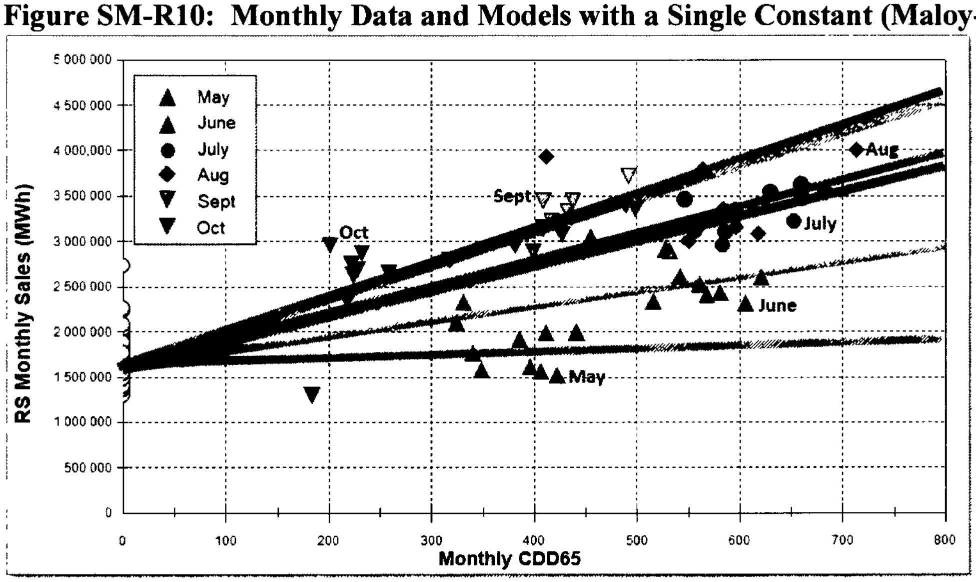
In contrast, the July days mostly have cooling degrees greater than 15. These are more powerful degrees, and therefore the red line needs to have a slope over 5,000 MWh per degree to fit well with the red diamonds. Extending that line back to the Y-axis, the red line hits at about 17,000 MWh.

The only way the red line can go through the red diamonds for the July days with an appropriate slope for high powered degrees and the green line can go through the green triangles for March with an appropriate slope for low powered degrees is for the two lines to have different constant terms (the values where the lines intersect the Y-axis). If we force the two constant terms to be equal, we will end up with slopes that are wrong for both months.

Q. **CAN YOU SHOW US HOW THIS LOOKS FOR THE MONTHLY DATA USED BY MS. MALOY?**

A. Yes. I took the monthly data for sales and cooling degrees that was provided in Ms. Maloy's Exhibit AM-3. These data are presented in Figure SM-R10, which shows a scatter plot that has monthly cooling degree days on the X-axis and monthly sales on the Y-axis. Each point is one month and the symbols are color coded by month. Also included are the estimated regression lines for each month from the Maloy-1 model, all of which have the same constant term intercepting the Y-axis at 1,690 GWh.

**Figure SM-R10: Monthly Data and Models with a Single Constant (Maloy-1)**



Looking at the data for any individual month, it is hard to see much of a relationship between monthly CDD values and monthly sales values. For example for the blue triangles representing the values for May in the 10 years used by Ms. Maloy, the two May points with the lowest monthly CDD values have the highest sales values, implying that sales go down as the weather gets hotter. The relationship also looks negative for the June monthly values (green triangles) and for the August monthly values (red diamonds).

These apparent negative slopes are not what I expected to see in the monthly scatter plot. I have worked with monthly sales data for dozens of utilities, and there is normally a much stronger visual relationship between billing cycle degree days and monthly sales. This may reflect the fact that Ms. Maloy chose to exclude from her models important explanatory variables, like the number of billing cycles included in monthly sales, the number of billing days in the cycles for a month, and the number of customers, which has grown significantly over the 10-year estimation period..

**Q. SHOULD THE MONTHLY MODELS BE SPECIFIED TO INCLUDE SEPARATE CONSTANT TERMS FOR EACH MONTH?**

A. Yes. The analysis of the daily AMS data powerfully rejects the assumption of a common constant term. Monthly data for each billing cycle is just a sum of daily data, so what is true for the daily models with daily cooling degrees (CD) and daily heating degrees (HD) is equally true for monthly models with monthly degree-day variables (CDD and HDD).

As mentioned earlier, we used the data from Ms. Maloy's Exhibit AM-3 to reproduce the monthly model coefficients, standard errors, and T-statistics. These are the same monthly data that are shown above in Figure SM-R10. Using these data, I extended Ms. Maloy's monthly models for the residential class to include separate constant terms for each of the seven months that have a degree day variable and an additional constant term for the remaining five months. The results are shown in Figure SM-R11 below.

**Figure SM-R11: Maloy Models with Separate Constants for Each Month**

| | Maloy Model 1 With Monthly Constants | | | Maloy Model 2 With Monthly Constants | | |
|---|---|---|---|---|---|---|
| **Variable** | **Coef** | **Std Error** | **T Stat** | **Coef** | **Std Error** | **T Stat** |
| Jan Constant | 1,736,760 | 292,880 | 5.93 | 1,141,742 | 281,844 | 4.05 |
| May Constant | 2,742,108 | 787,377 | 3.48 | 1,960,427 | 705,315 | 2.78 |
| June Constant | 4,506,406 | 993,440 | 4.54 | 3,213,610 | 902,282 | 3.56 |
| July Constant | 1,694,062 | 1,166,748 | 1.45 | 838,446 | 1,035,843 | 0.81 |
| Aug Constant | 3,545,052 | 630,102 | 5.63 | 2,499,400 | 583,850 | 4.28 |
| Sept Constant | 1,566,537 | 1,002,945 | 1.56 | 994,304 | 886,603 | 1.12 |
| Oct Constant | 1,625,953 | 365,314 | 4.45 | 429,794 | 385,163 | 1.12 |
| Other Months | 1,675,770 | 36,487 | 45.93 | 992,062 | 125,988 | 7.87 |
| Prior Month Sales | | | | 0.350 | 0.062 | 5.61 |
| Jan HDD65 | 740 | 745 | 0.99 | 862 | 654 | 1.32 |
| May CDD65 | -2,374 | 2,058 | -1.15 | -1,740 | 1,811 | -0.96 |
| June CDD65 | -3,448 | 1,797 | -1.92 | -2,268 | 1,592 | -1.43 |
| July CDD65 | 2,661 | 1,931 | 1.38 | 2,568 | 1,695 | 1.52 |
| Aug CDD65 | -159 | 1,061 | -0.15 | -341 | 932 | -0.37 |
| Sept CDD65 | 3,945 | 2,267 | 1.74 | 2,506 | 2,007 | 1.25 |
| Oct CDD65 | 3,940 | 1,445 | 2.73 | 4,103 | 1,269 | 3.23 |

As the results show, when separate monthly constants are added, both of Ms. Maloy's models have negative estimated slopes for May, June and August. This is consistent with what we see visually in the monthly scatter plot of Ms. Maloy's data in Figure SM-R10. Obviously, we cannot use these estimated negative slopes for weather adjustment calculations, especially given the evidence from the daily AMS data of powerful and well defined positive slopes for all months.

Also, notice that with the separate constant terms, the only significant weather slope in both monthly specifications is for cooling degrees in October (T-statistic over 3). Following Ms. Maloy's logic of dropping all coefficients with T-statistics under 1.96 we would have only one weather slope left, the October cooling degree slope.

**Q. SHOULD THE MONTHLY MODELS INCLUDE LAGGED SALES VALUES AS AN EXPLANTORY VARIABLE?**

A. Inclusion of a lagged dependent variable (prior month sales) in a monthly weather response model is a bad idea. We already saw in Figure SM-5 that the Model-1 weather slopes were too small, and that inclusion of the lagged dependent values in Model-2 makes these weather slopes even smaller.

The problem is that lagged dependent variables introduce dynamics into the model. For example, suppose hotter weather in June causes June sales to go up by 1,000 MWh. With an estimated lagged dependent coefficient of .357, the higher predicted value in June will cause a 357 MWh increase in the predicted value for July energy. Applying .357 again, the July increase will cause a 127 MWh increase in the predicted value for August energy. And this effect continues at 35.7 percent into the future. Over the long run, the 1,000 MWh impact in June becomes 1,555 MWh over time. We know that is not the way weather impacts work, but that is the implication of inclusion of a lagged dependent variable. I suspect that the weather impact estimates in Ms. Maloy's Exhibit AM-5 exclude these dynamic effects by only including the current month impacts, resulting in a downward bias in the estimated impacts that are based only on the current month effect.

I strongly recommend against inclusion of lagged dependent variables in weather adjustment models.

**Q. WHAT DO YOU CONCLUDE FROM THIS ANALYSIS OF MS. MALOY'S MODELS**

A. I conclude that Ms. Maloy's monthly models should not be used for weather adjustment calculations. They are inconsistent with what the actual, daily AMS data tells us to be true. The estimated monthly slopes appear to be seriously biased downward. And the model specification seems to be incapable of estimating reasonable weather slopes that are consistent with visually obvious facts from the daily AMS data.

## IV. REBUTTAL TO MS. MALOY'S CONCLUSIONS ABOUT CENTERPOINT HOUSTON MODELS

**Q. DID YOU REVIEW THE DIRECT TESTIMONY OF ALICIA MALOY?**

A. Yes I did.

**Q. WHAT WAS THE SCOPE OF MS. MALOY'S ANALYSIS?**

A. Ms. Maloy's testimony includes models and weather impact estimates for six weather sensitive rate classes. This includes energy impact estimates for the Residential (RS) and Small Secondary (SVS) classes, for which energy is a billing determinant. It also includes energy impact estimates for larger customer classes for which energy is not a billing determinant. Ms. Maloy does not provide any models or estimated weather impacts for customer demand or coincident demand, which are the billing determinants for the larger customer classes.

**Q. WHAT WERE MS. MALOY'S RECOMMENDATIONS?**

A. Ms. Maloy's main recommendation was that the CenterPoint Houston models and weather impacts delivered with my direct testimony should be rejected in favor of the results provided by Ms. Maloy. The reasons she provided were:

1. CenterPoint Houston weather impact estimates are based on 20-year normal weather. Ms. Maloy provides models and energy impact estimates based on 10-year normal weather.

2. The CenterPoint Houston models are estimated using 4 years of AMS data. The normal weather data are developed using a 20-year history. She alleges that this difference creates a "mismatch."

3. The CenterPoint Houston models are estimated using data that includes the 2018 test year, which Ms. Maloy rejects as inconsistent with Commission precedent.

4. The CenterPoint Houston models include variables that are not significant at the 95% level, whereas Ms. Maloy includes only variables that are statistically significant.

**Q. WHAT IS YOUR RESPONSE TO MS. MALOY'S ASSERTION THAT NORMAL WEATHER SHOULD BE DEFINED USING 10 YEARS INSTEAD OF 20 YEARS?**

A. I will go into the reasons which led me to recommend using a 20-year normal weather definition in the next section of my rebuttal testimony. Although 20-year normal weather is the most widely used method for forecasting, I recognize that using 10-year weather is also valid.

The CenterPoint Houston models estimated with daily AMS data can be applied to estimate weather impacts using a 10-year normal, just like they can be applied to a 20-year normal. I supplied a full set of estimates using 10-year normal values in an earlier RFI response, and I have provided a full set of Schedules and Working Papers for the 10-year normal as Exhibit R-JSM-1 to this rebuttal testimony.

**Q. WHAT IS YOUR RESPONSE TO THE ASSERTION THAT THERE IS A MISMATCH BETWEEN USING A 20-YEAR NORMAL BUT ONLY 4 YEARS OF REGRESSION DATA FOR ESTIMATING THE IMPACT OF ABNORMAL WEATHER?**

A. I strongly disagree with the assertion that there is a "mismatch." There are two parts to the estimation of weather impacts. One is the estimation of weather response slopes. The other is definition of normal weather. These are two independent tasks.

It is true that the CenterPoint Houston weather impact models are estimated using data for a 4 year period (2015 to 2018). As was seen in Figure SM-R2, these data provide a strong stable picture of how weather works in these recent years. As seen in Figure SM-R4 and SM-R6, these data provide sensible and statistically precise estimates of weather response in MWh per degree for all months. Once the weather response parameters are estimated, they can be applied to 30-year normal, 20-year normal, 15-year normal, or 10-year normal weather values.

The point is that there is no theoretical or practical requirement that the period used to estimate weather slopes be the same as the period used to define normal weather.

**Q. WHAT IS YOUR RESPONSE TO THE ASSERTION THAT IT IS NOT APPROPRIATE TO INCLUDE 2018 IN THE ESTIMATION OF WEATHER RESPONSE COEFFICIENTS FOR A 2018 TEST YEAR?**

A. I strongly disagree with this assertion.

As mentioned above, estimation of weather response coefficients is a separate task from the definition of normal weather. For the definition of normal weather, I did exclude the 2018 data. My 20-year normal was defined using weather data from 1998 to 2017. My 10-year normal weather was defined using weather data from 2008 to 2017. There may be a precedent that test year weather is excluded from the definition of normal weather. If so, the CenterPoint Houston analysis is consistent with that precedent.

Excluding the 2018 load and weather data from weather impact model estimation is an entirely different matter. Our goal in model estimation is to get the weather response parameters that are most appropriate for the test year (2018). If I could have only one year of daily data, the year I would pick is 2018. No other data is more relevant to estimation of weather response in 2018 than the 2018 load and weather data itself. The 2018 data are highlighted in Figures SM-R2 and SM-R3. The data are well behaved, they do not have any apparent abnormalities and they show a weather response pattern that is consistent with the earlier years. I see no reason to exclude these data from model estimation.

There is no theoretical or practical reason to exclude the test year data from estimation of the weather response model that will be applied to that test-year. If this is in fact Commission precedent, I would strongly recommend that this precedent be changed.

**Q. WHAT IS YOUR RESPONSE TO THE CLAIM THAT THE CENTERPOINT HOUSTON MODELS SHOULD BE REJECTED BECAUSE THEY INCLUDE INSIGNIFICANT VARIABLES?**

A. I understand the source of this argument and that there can be conditions when low T-statistics are cause for concern. This is especially true if the variables in question have an impact on the coefficients of interest, which are the weather response slopes. However, the variables in question are things like day of week effects and specific holiday variables, none of which have a strong correlation with daily weather variations.

To address this issue for the Residential model, I re-estimated the CenterPoint Houston model that was submitted with my direct testimony after excluding all insignificant variables. Figure SM-R12 shows the two sets of estimated weather response parameters.

**Figure SM-R12: CenterPoint Houston Residential Model Weather Coefficients**

| | | CEHE Residential Model | | | Restricted CEHE Residential Model | | |
|---|---|---|---|---|---|---|---|
| Type | Variable | Coef | Std Error | T Stat | Coef | Std Error | T Stat |
| Heating | HDSpline | 1.240 | 0.028 | 43.663 | 1.205 | 0.027 | 44.243 |
| Heating | LagHD | 0.341 | 0.024 | 14.394 | 0 321 | 0.023 | 13.847 |
| Heating | WkEndHD | -0.151 | 0.031 | -4.954 | -0.131 | 0.030 | -4.334 |
| Heating | SpringHD | -0.123 | 0.073 | -1 689 | -0 100 | 0.073 | -1.374 |
| Heating | FallHD | -0.232 | 0.062 | -3.710 | -0.195 | 0.061 | -3.218 |
| Cooling | CDSpline | 2.408 | 0.030 | 80 346 | 2.416 | 0.025 | 96.480 |
| Cooling | LagCD | 0.400 | 0.028 | 14.509 | 0.410 | 0.025 | 16.393 |
| Cooling | WkEndCD | 0.041 | 0.017 | 2 403 | 0 057 | 0.017 | 3.443 |
| Cooling | SpringHD | -0.270 | 0.081 | -3.333 | -0.310 | 0.077 | -4.013 |
| Cooling | FallCD | -0.342 | 0.072 | -4.756 | -0.335 | 0.066 | -5.103 |
| ARMA | AR(1) | 0.576 | 0.022 | 26.010 | 0.597 | 0.021 | 27.778 |

Focusing on the main heating variable (HDSpline), the estimated coefficient drops slightly from 1.240 KWh per degree to 1.205 KWh per degree. The main cooling variable (CDSpline) changes from 2.408 kWh per degree to 2.416 KWh per degree. Neither change is statistically significant, even with the tight standard errors for these coefficients. If we used the restricted model coefficients to estimate weather adjustments, heating adjustments would decline slightly and cooling adjustments would increase slightly. Neither change would be meaningful.

In the CenterPoint Houston model there is one weather variable that has a T-statistic less than 1.96 in both versions and that is the SpringHD offset variable.

This variable allows the response to cold weather in spring months to be different than it is in winter months. The estimates are -.123 in the original model and -.100 in the restricted model. Despite having T-statistics under 1.96, I would leave these variables in the model because they allow the SpringHD effect to be about 10% smaller than the winter effect and this is our best estimate of the size of this offset.

My conclusion is that the CenterPoint Houston models should not be rejected because of variables with T-statistics under 1.96. The coefficients that we care about (the weather response slopes) are strong, they are highly significant, and they are not changed significantly by removal of the variables with low T-statistic values.

**Q. THE CENTERPOINT HOUSTON MODELS ARE NOT LIKE THE SIMPLE DEGREE DAY MODELS USED IN EARLIER FIGURES. PLEASE EXPLAIN THE DIFFERENCES.**

A. The simple degree-day variables used in the Rebuttal model are daily HD65 and CD65. These variables relate energy on a day to the cooling degrees and heating degrees on that day. The CenterPoint Houston models from my direct testimony are much richer and stronger.

Also, the CenterPoint Houston models use multi-part spline variables that capture the nonlinear relationship between temperature and load. The estimated slope on these variables summarizes the response of daily energy on a day to average temperatures on that day. Other variables summarize the influence of daily weather on prior days and provide slope offsets for weekend days and for Spring and Fall days.

The CenterPoint Houston models are estimated in use-per-customer form. The estimated slopes are therefore in units of KWh per customer per degree. If you multiply the CenterPoint Houston residential model slopes by 2.2 million customers, you get estimates of the MWh per degree impacts. For example multiplying the CDSpline coefficient (2.40 KWh per degree) by 2.2 million customers, you get an implied slope of 5,280 MWh per high-powered degree. This is consistent with the estimates developed in the Rebuttal model for the summer months where most of the cooling degrees are high powered.

**Q. WHAT IS YOUR CONCLUSION ABOUT MS. MALOY'S CRITICISMS OF THE CENTERPOINT HOUSTON MODELS.**

A. The CenterPoint Houston models define the state of the art for estimation of weather response using powerful daily AMS data. I disagree with Ms. Maloy's assertions about mismatch, about including 2018 data in estimation, and about inclusion of variables with low T-statistics. As I have discussed above, these assertions are either wrong or of no significance.

## V. DISCUSSION OF 20-YEAR VS 10-YEAR NORMAL WEATHER

**Q. WHAT WAS THE REASON FOR USING A 20-YEAR PERIOD TO DEFINE NORMAL WEATHER FOR CALCULATING WEATHER ADJUSTMENTS FOR CENTERPOINT HOUSTON?**

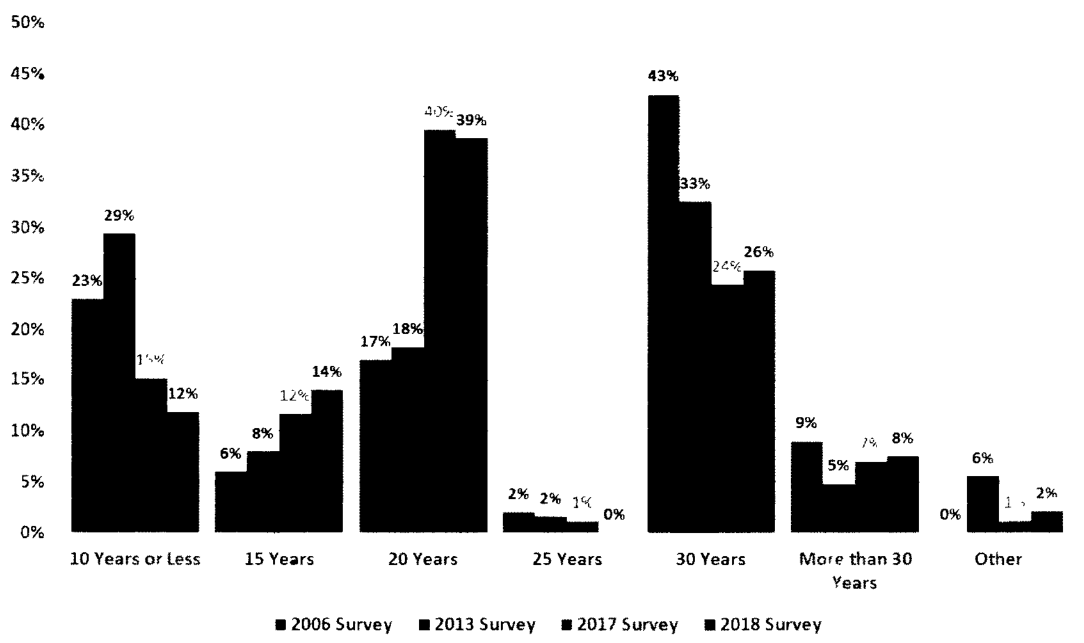
A. At the outset of my work with CenterPoint Houston, it was noted that a 30-year period had been used to compute normal weather in past rate cases. I recommended using a 20-year period for this rate case for two reasons. First, a 20-year period is the dominant practice used for electric utility forecasting. Second, using shorter periods, such as a 10-year normal provides a less stable measure, that can vary significantly depending on the 10-year period that is selected.

**Q. WHAT EVIDENCE DO YOU HAVE THAT A 20-YEAR NORMAL IS THE DOMINANT PRACTICE IN THE ELECTRIC UTILITY INDUSTRY?**

A. At Itron, we run an annual benchmarking survey of electric utilities. The survey focuses on the current outlook for sales growth and forecast accuracy for the prior year. As part of this survey, we sometimes ask about the basis for normal weather that is used in the forecast process. The survey typically has 60 to 80 electric utility respondents. The most recent survey in 2018 had 74 respondents representing over 50% of electricity sales in North America.

Figure SM-R13 shows the results from surveys in 2006, 2013, 2017, and 2018. The percentages are computed directly from the respondent count for each category. The percentages add to 100% in each survey year.

**Figure SM-R13: Survey Responses for Number of Years Used to Define Normal Weather**



In the earliest survey (2006 which is shown in green), the dominant practice was to use a 30-year normal period (43%) followed by 10-years (23%) and 20 years (17%). In the next survey in 2013 (shown in red), there was significant migration away from 30 years, toward shorter frequencies. In this survey, the 10-year period gained the most, moving up to 29%. The next two surveys in 2017 (purple) and 2018 (blue) tell a different story. Focusing on the 2018 results, the 30-year period drops further to 26%. The 10-year period becomes much less frequently used (12%). The majority of these losses move into the 20-year category, which is now the dominant approach (39%).

Also, the 15-year category shows steady gains, moving up to 14%. As an example, ERCOT uses 15-year normal values in its long-term forecasts. (See, 2019 Summer Operations, presentation by Dan Woodfin, ERCOT Board of Directors Meeting, June 11, 2019.)

**Q. DO YOU KNOW WHY THERE WAS MOVEMENT AWAY FROM THE 10-YEAR NORMAL?**

A. In the survey, we did not ask about reasons for change. However, in group conversations on the topic, the main reason that is consistently reported is that the normal values can change significantly from year to year when the 10-year window is rolled forward. Using a wider window supports a more stable forecast process.

**Q. WHAT BASIS DO MR. NALEPA AND MS. MALOY OFFER FOR THEIR RECOMMENDATION OF A 10-YEAR PERIOD?**

A. With regard to electric utilities, both Mr. Nalepa and Ms. Maloy are relying on recent Commission decisions that used a 10-year period. This appears to be the first time Mr. Nalepa has addressed the appropriate period for normal weather for an electric utility, and he did not perform any study or analysis of the periods used by utilities or regulators in other states. (See OPUC's Response to CenterPoint Houston's Second Request for Information, 2-3 through 2-8, attached as Exhibit R-JSM-2). Similarly, Ms. Maloy references no study or analysis of the appropriate period for normal weather, simply referring to recent Commission precedent.

**Q. IS IT APPROPRIATE SIMPLY TO FOLLOW RECENT COMMISSION PRECEDENT TO DETERMINE THE PROPER PERIOD FOR NORMAL WEATHER?**

A. Not necessarily. Recent Commission precedent follows the trend observed among utilities around the country from 2006-2013 in moving from 30-year periods to 10-year periods to determine normal weather. However, recent decisions do not yet reflect the more recent trend away from 10-year periods toward 20-year periods.

**Q. IS THE 10-YEAR NORMAL VALUE FOR CENTERPOINT HOUSTON STATISTICALLY DIFFERENT FROM THE 20 YEAR VALUE?**

A. The difference between the 10-year and 20-year normal values is not statistically significant at the 90% or 95% levels.

The difference is accurately reported for cooling degree days base 65 and heating degree days base 65 in the testimony of Mr. Nalepa. The normal degree day values and difference are shown in Figure SM-R14. In addition to the 10-year and 20-year results, 15-year normal values are also shown.

**Figure SM-R14: Comparison of 10-Year and 20-Year Normal Weather Values**

| Year Range | Heating Degree Days | | | Cooling Degree Days | | |
|---|---|---|---|---|---|---|
| | HDD65 | Diff from 20 Year | Pct Diff From 20 Yr | CDD65 | Diff from 20 Year | Pct Diff From 20 Yr |
| 20-Year Normal | 1,227 | | | 3,097 | | |
| 15-Year Normal | 1,212 | -15 | -1.2% | 3,115 | 18 | 0.6% |
| 10-Year Normal | 1,220 | -7 | -0.6% | 3,181 | 84 | 2.7% |
| 2018 Actual | 1,271 | 44 | 3.6% | 3,351 | 254 | 8.0% |

Focusing first on the Heating Degree Day values, the table shows that the 10 and 15-year normal are both warmer (less HDD) than the 20-year normal values. The differences and percentage differences are small. In contrast, actual 2018 weather shows 44 degree days more than the 20-year normal (3.6% higher).

Focusing on Cooling Degree Day values, the table shows that the 10-year and 15-year averages are both warmer (more CDD) than the 20-year average. The 15-year and 20-year values are relatively close (a difference of 18 degree days or .6%). The 10-year average is 84 degrees warmer than the 20-year average (2.7%). Finally, the actual 2018 weather is 254 degrees warmer than the 20-year average (8.0%).

From a statistical perspective, it is necessary to understand the variability underlying these numbers to make conclusions about significance. Figure SM-R15 provides the necessary statistics (standard deviation and standard error) treating the 10-year period as a sample of size 10.

**Figure SM-R15: Test Statistics for 20-Year vs 10-Year Normal Degree Days**

| 10 Year Statistics | HDD65 | CDD65 |
|---|---|---|
| Average | 1,220 | 3,181 |
| Standard Deviation | 282 | 217 |
| Standard Error | 89 | 69 |
| Difference for 20-Year | -7 | 84 |
| T = Diff/Standard Error | -0.08 | 1.22 |

The Standard Error is the key number for understanding statistical significance. This value combines the standard deviation (which summarizes how widely dispersed the annual values are) and the sample size, which is 10 in this case. The standard error can be used to compute confidence bands around the 10-year average. The T value is computed as the difference between the 20-year normal and the 10-year normal divided by the standard error. These statistics (-.08 standard errors for the HDD difference and 1.22 standard errors for the CDD difference) indicate that the differences are not statistically significant at the 95% or 90% levels. Stated differently, if we started with the hypothesis that the 20-year normal values are correct, we cannot reject that hypothesis based on the 10-year sample.

Another approach is to test for the difference between the two sample average values using test statistics for the difference between two means. Using the formula for differences in means with unknown variances, the computed T-statistic values are -.07 for HDD and 1.01 for CDD. This indicates that the difference in the average values from the 10-year sample and the 20-year sample are not statistically significant.

## VI. CENTERPOINT HOUSTON ESTIMATES USING 10-YEAR NORMAL WEATHER

**Q. WHEN DID YOU DEVELOP THE 10-YEAR NORMAL WEATHER IMPACT ESTIMATES?**

A. These estimates were developed in response to RFI OPUC 1-20. This RFI asked for weather normalization analysis using 30-year and 10-year normal weather. I responded that I did not perform a 30-year analysis but that I did perform an analysis using 10-year normal. The 10-year normal weather values are developed using weather data for 2008 through 2017, which is the same period used in Ms. Maloy's estimates. As part of the RFI response, a full set of Schedule H forms and Schedule H working papers were provided. I have provided these results electronically with this rebuttal testimony as Exhibit R-JSM-1.

**Q. ARE THESE RESULTS WITH 10-YEAR NORMALS THE RESULTS THAT ARE SHOWN ABOVE IN FIGURE SM-R4?**

A. Yes. These are the same results. The weather adjustment results are calculated using the same models of daily AMS data that were used in my Direct Testimony. The only difference is that weather adjustments were estimated with the 10-year normal values instead of the 20-year normal values.

**Q. DO YOU BELIEVE THAT THESE RESULTS PROVIDE ACCURATE ESTIMATES OF WEATHER ADJUSTMENTS BASED ON 10-YEAR NORMAL WEATHER?**

A. Yes I do.

## VII. CONCLUSIONS

**Q. WHAT ARE YOUR CONCLUSIONS?**

A. First, the monthly weather impact models presented in Ms. Maloy's direct testimony should not be used. The weather slopes from these models are inconsistent with the slopes that are clearly identified by the actual daily AMS data. The weather adjustments are only estimated for one month on the heating side and 6 months on the cooling side. The weather adjustments are only estimated for energy and provide no estimates for customer demand or coincident demands. Because the estimated weather slopes are incomplete and inaccurate, the weather adjustments based on these slopes are incomplete and inaccurate.

Second, the reasons that Ms. Maloy gives for rejecting the CenterPoint Houston models and weather estimates are faulty. There is no reason that the data range used for estimation should be the same as the data range used for computing normal weather. There is no reason for excluding 2018 test year data from the model estimation. If anything, the 2018 data is the most relevant data for estimating weather response parameters for a 2018 test year. Finally, the assertion that the CenterPoint Houston models are flawed because they include non-weather variables with low T-statistics is spurious. These models, based on powerful daily AMS data, clearly identify weather response parameters for all months.

**Q. WHICH MODELS AND WEATHER IMPACTS SHOULD THE COMMISSION USE IN THIS RATE CASE?**

I recommend that estimates based on the CenterPoint Houston models be used for rate case purposes. These estimates are complete for energy, customer demand and coincident demand. The estimates are based on powerful daily AMS data which clearly identifies the impact of variations in weather conditions. The models properly capture the nonlinear relationship between temperature and energy use, allowing the impact of low powered degrees to be different from the impact of high powered degrees. These models are well specified, they are based on strong and clear data and they provide reliable weather response parameters. The impacts estimated using these models are reasonable and have a strong statistical basis.

If the Commission decides that CenterPoint Houston's use of the 20-year normal weather is reasonable, then the CenterPoint Houston estimates filed with my direct testimony should be used.

If the Commission decides that the 10-year normal weather recommended by Mr. Nalepa and Ms. Maloy must be used, then the CenterPoint Houston estimates provided in response to OPUC's RFI and attached to my rebuttal testimony should be used.

**Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**

A. Yes, it does.

**STATE OF CALIFORNIA §**
**§**
**COUNTY OF SAN DIEGO §**

**AFFIDAVIT OF JOHN STUART MCMENAMIN**

BEFORE ME, the undersigned authority, on this day personally appeared John Stuart McMenamin who having been placed under oath by me did depose as follows:

1. "My name is John Stuart McMenamin. I am of sound mind and capable of making this affidavit. The facts stated herein are true and correct based upon my personal knowledge.

2. I have prepared the foregoing Rebuttal Testimony and the information contained in this document is true and correct to the best of my knowledge."

Further affiant sayeth not.

John Stuart McMenamin

SUBSCRIBED AND SWORN TO BEFORE ME on this 18th day of June, 2019.

JUNG RAN CHOI
COMMISSION NO 2243660
NOTARY PUBLIC-CALIFORNIA
SAN DIEGO COUNTY
COMMISSION EXPIRES JUNE 19, 2022
CL51

Notary Public in and for the State of California

My commission expires: June 19, 2022

EXHIBIT R-JSM-1

OPC01-20

ELECTRONIC FILE TABLE OF CONTENTS

The following files are being provided electronically with this rebuttal testimony:

OPC01-20 CompareImpacts.xlsx

| | | |
|---|---|---|
| 1. | Energy | Model Output for energy models |
| 2. | NCP | Model Output for class non-coincident peak demand models |
| 3. | CP | Model Output for coincident peak (CNP system) models |
| 4. | ECP | Model Output for ERCOT coincident peak models |
| 5. | Demand | Model Output for NCP demands (SVL and PVS classes only) |
| 6. | BDemand | Model Output for billing demand models |
| 7. | AMS Demand | Model Output for sum of customer demand models |
| 8. | CycleWthrSales | Model Output for billing month sales |

OPC01-20 H Schedule w 10yr norm.xlsx

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| 2. | II-H-1.1 | Test Year Sales Data |
| 3. | II-H-1.2 | Monthly Sales Data |
| 4. | II-H-1.3 | Unadjusted Test Year Load Data |
| 5. | II-H-1.3.1 | Adjustments to Test Year Load Data |
| 6. | II-H-1.3.1a | Adjustments to Test Year Load Data (explanation) |
| 7. | II-H-1.4 | Adjusted Test Year Load Data |
| 8. | II-H-1.5 | Adjustments to Operating Statistics |
| 9. | II-H-2.1 | Model Information |
| 10. | II-H-2.2 | Model Data |
| 11. | II-H-2.3 | Model Variables |
| 12. | II-H-2.3.-1 | Model Variables (Spline Weights) |
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| 15. | II-H-3.2 | Customer Adjustment Explanation |
| 16. | II-H-3.3 | Customer Adjustment Data |
| 17. | II-H-4 | Revenue Impacts of Adjustments |
| 18. | II-H-4.1.1 | Revenue Impact Data (Unadjusted Test Year Revenue) |
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| 28. II-H-5 | Weather Data |
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| 30. II-H-5.2 | Adjusted Station Data |
| 31. II-H-5.3 | Additional Weather Information |

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| 1. WP H-1.2 | Calculations for adjustments to monthly sales data |
| 2. WP H-1.2 (EEP BD Adjustment) | Energy Efficiency Impacts |
| 3. WP H-1.3 (2015) | Unadjusted Load Data for 2015 |
| 4. WP H-1.3 (2016) | Unadjusted Load Data for 2016 |
| 5. WP H-1.3 (2017) | Unadjusted Load Data for 2017 |
| 6. WP H-1.3 (Sum of Peak Demand) | Model Output for Weather norm for sum of demands |
| 7. WP H-1.3 and 1.4 (2018) | Model Output for demand and energy models |
| 8. WP H-3.1 | Customer Adjustment Calculations |
| 9. WP H-4.1(4) | KVa Weather and customer adjustment calculations |
| 10. WP H-4.1 (Weather Impact) | Billing Demand Weather Model Output |
| 11. WP H-4.1 (Current Rates) | Current rates |
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| 17. WP H-4.1 (YTD Base Rev Comp) | Base revenue components for 2018 |
| 18. Base Rev Monthly Subtotal | Base Revenue components by month for 2018 |
| 19. Proof of Rev Output | Proof of Revenue Report for 2018 |

**SOAH DOCKET NO. 473-19-3974**
**PUC DOCKET NO. 49421**

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|---|---|---|
| **APPLICATION OF CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC FOR AUTHORITY TO CHANGE RATES** | § § § | **BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS** |

**OFFICE OF PUBLIC UTILITY COUNSEL'S RESPONSE TO CENTERPOINT ENERGY HOUSTON ELECTRIC, LLC'S SECOND REQUEST FOR INFORMATION**

The Office of Public Utility Counsel ("OPUC") submits this response to CenterPoint Energy Houston Electric, LLC's ("CenterPoint Houston") Second Request for Information that was received on June 10, 2019. Pursuant to State Office of Administrative Hearings Order No. 2, OPUC's response is timely filed within four calendar days of receipt of CenterPoint Houston's discovery request. OPUC stipulates that all parties may treat this response as if it were filed under oath.

Dated: June 14, 2019

Respectfully submitted,

Lori Cobos
Chief Executive & Public Counsel
State Bar No. 24042276

Cassandra Quinn
Assistant Public Counsel
State Bar No. 24053435
Eleanor D'Ambrosio
Assistant Public Counsel
State Bar No. 24097559

OFFICE OF PUBLIC UTILITY COUNSEL
1701 N. Congress Avenue, Suite 9-180
P.O. Box 12397
Austin, Texas 78711-2397
512-936-7500 (Telephone)
512-936-7525 (Facsimile)
cassandra.quinn@opuc.texas.gov
eleanor.dambrosio@opuc.texas.gov
opuc_eservice@opuc.texas.gov (Service)

**SOAH DOCKET 473-18-4100**
**PUC DOCKET NO. 48439**
**OPUC's Response to CenterPoint Energy Houston Electric LLC's**
**Second Request for Information**

**2-3.** Please refer to Mr. Nalepa's testimony, Appendix A (Statement of Qualifications), Bates page 131 (Areas of Expertise—Regulatory Analysis), in which he states that he has "[a]nalyzed electric utility rate . . . and resource forecast filings." Please identify each instance in which such analysis included the analysis of the period of years used to determine normal weather and, for each such instance, provide any written analysis prepared by Mr. Nalepa (or a reference to any such documents readily available online).

RESPONSE:

Mr. Nalepa addressed weather normalization in PUCT Docket No. 35717, but his analysis did not determine a normal weather period.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

**SOAH DOCKET 473-18-4100**
**PUC DOCKET NO. 48439**
**OPUC's Response to CenterPoint Energy Houston Electric LLC's**
**Second Request for Information**

**2-4.** Please refer to Mr. Nalepa's testimony, Appendix A (Statement of Qualifications), Bates page 131 (Areas of Expertise—Regulatory Analysis), in which he states, "Also assist municipal utilities in preparing and defending requests to change rates and other regulatory matters before the Public Utility Commission." Please identify each instance in which such assistance included the analysis of the period of years used to determine normal weather and, for each such instance, provide any written analysis prepared by Mr. Nalepa (or a reference to any such documents readily available online).

RESPONSE:

The referenced assistance did not include an analysis of the period of years used to determine normal weather.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

**SOAH DOCKET 473-18-4100**
**PUC DOCKET NO. 48439**
**OPUC's Response to CenterPoint Energy Houston Electric LLC's**
**Second Request for Information**

**2-5.** Please refer to Mr. Nalepa's testimony, Appendix A (Statement of Qualifications), Bates page 132 (Areas of Expertise—Econometric Forecasting), in which he states that he "[p]repared econometric forecasts of peak demand and energy for municipal and electric cooperative utilities in support of system planning activities" and [d]eveloped forecasts at the rate class and substation levels." Please identify each instance in which such forecasts included a determination of normal weather and, for each such instance, identify the period (10 years, 20 years, 30 years, or some other period) used by Mr. Nalepa for that purpose and provide any written analysis prepared by Mr. Nalepa (or a reference to any such documents readily available online).

RESPONSE:

Mr. Nalepa performed this work as a consultant with Resource Management International approximately 25 years ago, and does not recall whether his analysis included a determination of normal weather. Mr. Nalepa does not possess any of the analysis or documentation that may have been generated at that time.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

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**OPUC's Response to CenterPoint Energy Houston Electric LLC's**
**Second Request for Information**

**2-6.** Please refer to Mr. Nalepa's testimony, Appendix A (Statement of Qualifications), Bates page 133 (Select Publications, Presentations, and Testimony). Please identify each of the listed publications, presentations, and testimony in which Mr. Nalepa discusses, analyzes, or makes recommendations regarding the proper period for determining normal weather and for each such instance, identify the period (10 years, 20 years, 30 years, or some other period) used or recommended by Mr. Nalepa for that purpose and provide a copy of the publication, presentation, or testimony (or a reference to any such documents readily available online).

RESPONSE:

The select publications, presentations, and testimonies referenced in Appendix A do not address weather normalization.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

**SOAH DOCKET 473-18-4100**
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**2-8.** Has Mr. Nalepa performed any study or analysis of the periods used by utilities or regulators in other states to determine normal weather? If so, please provide a copy of each such study or analysis or, if the results of the study or analysis were not reduced to writing, a description of the study or analysis, for whom it was conducted, how it was conducted, and Mr. Nalepa's conclusions.

RESPONSE:

Mr. Nalepa has not performed a study or analysis of the periods used by utilities or regulators in other states to determine normal weather. Mr. Nalepa has relied on recent PUCT precedent regarding the use of a 10-year weather normalization period for his recommendation.

Prepared By: Karl Nalepa
Sponsored By: Karl Nalepa

**CERTIFICATE OF SERVICE**

I hereby certify that a copy of the foregoing document was served on all parties of record in this proceeding on this 14th day of June 2019, by facsimile, electronic mail, and/or first class, U.S. Mail.

Cassandra Quinn