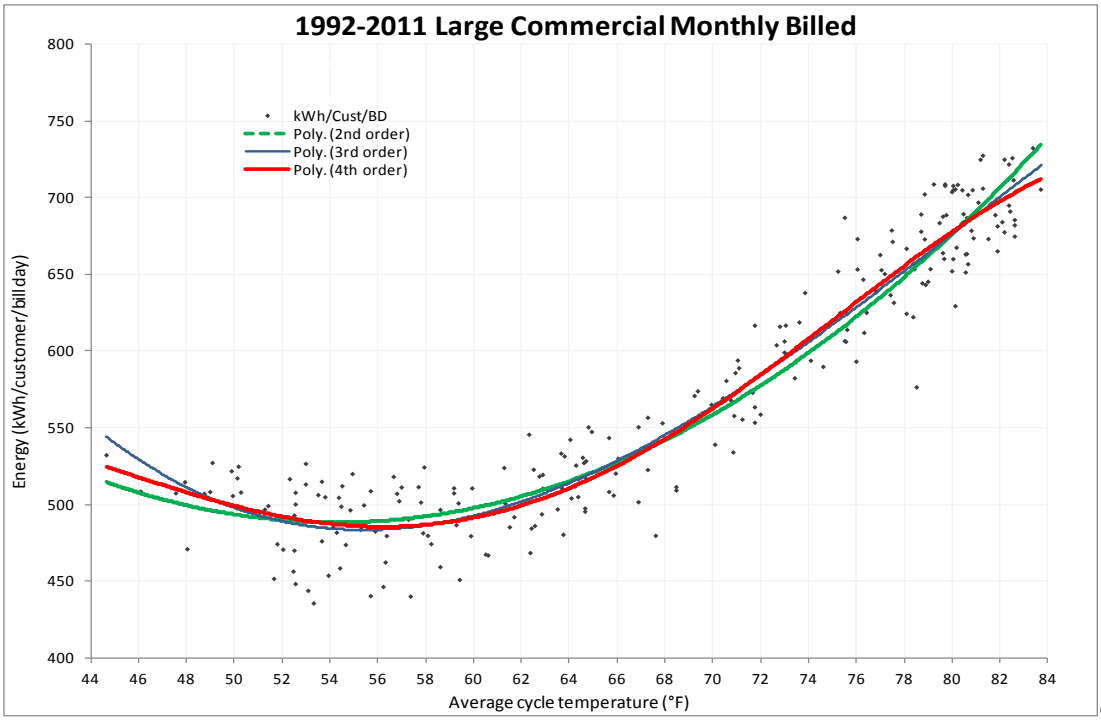
Weather Response Analysis for Gulf Power's Large Commercial Customers
Updated: 2012-07-11

Overview

The threshold temperatures used to calculate degree hours for both residential and large commercial classes were reviewed prior to the B2013 forecast. The analysis provided conclusive results for residential cooling, residential heating, and large commercial cooling thresholds. However, the analysis did not provide conclusive results for the large commercial heating threshold. The results of the analysis indicated lower threshold temperatures produced higher adjusted R^2 and candidate threshold temperatures were evaluated down to 46 °F. But the general climate of NW FL does not support the use of a heating degree threshold temperature at such a low level because of the generally warm climate as well as indications that there appears to be a heating response prior to 46°F. An alternative method was needed to establish the heating degree threshold temperature for large commercial customers.

The proposed alternative method is to calculate the temperature where heating load begins and this temperature can be determined using a trendline fit through the available energy and weather data scatterplot. The actual scatterplot used in the analysis is shown below:



Graph 1

3 different trendlines were fitted to the data (2nd order, 3rd order, and 4th order equations). The equations for each of the trendlines were used to calculate the temperature where the slope of the line is zero. The point where the slope is equal to zero is the temperature where there is no weather response; therefore, temperatures below this threshold will result in higher energy usage. This heating response corresponds to the heating degree hour calculation, which results in greater heating degree hours as actual temperatures fall below the threshold temperature.

The following table shows the threshold temperatures for each of the 3 trendlines:

Table 1

2^{nd} order equation = 54.5 °F

3^{rd} order equation = 55.5 °F

4^{th} order equation = 56.0 °F

These results show that the indicated heating response begins somewhere between 54-56°F. A review of Graph 1 shows that all of the 3 trendlines produce reasonable results. Some slight differences in the trendlines do appear at the extreme temperatures. The 4^{th} order equation suggests the presence of both heating and cooling load saturation but subjectively, the data does not appear to support this. It is possible that the flattening of the 4^{th} order trendline at the extreme temperatures may be due to overfitting of the curve. The 2^{nd} and 3^{rd} order trendlines do suggest slightly different load responses at extreme temperatures but the general patterns appear to be similar to the 4^{th} order trendline.

The weather response patterns are generally similar and reasonable regardless of which trendline is used. Also, the threshold temperatures where heating load begins are generally consistent. Therefore, the most reasonable conclusion would be to use the heating degree threshold temperature which is compatible with all trendlines. This temperature is 54°F.