Threshold Temperature Analysis

Updated: 2012-06-18

Objective

The threshold temperatures are the reference temperatures used to calculate degree hours. The objective of the analysis is to determine the appropriate threshold temperatures for calculating heating degree hours and cooling degree hours for both the residential and commercial classes for use in our regression models.

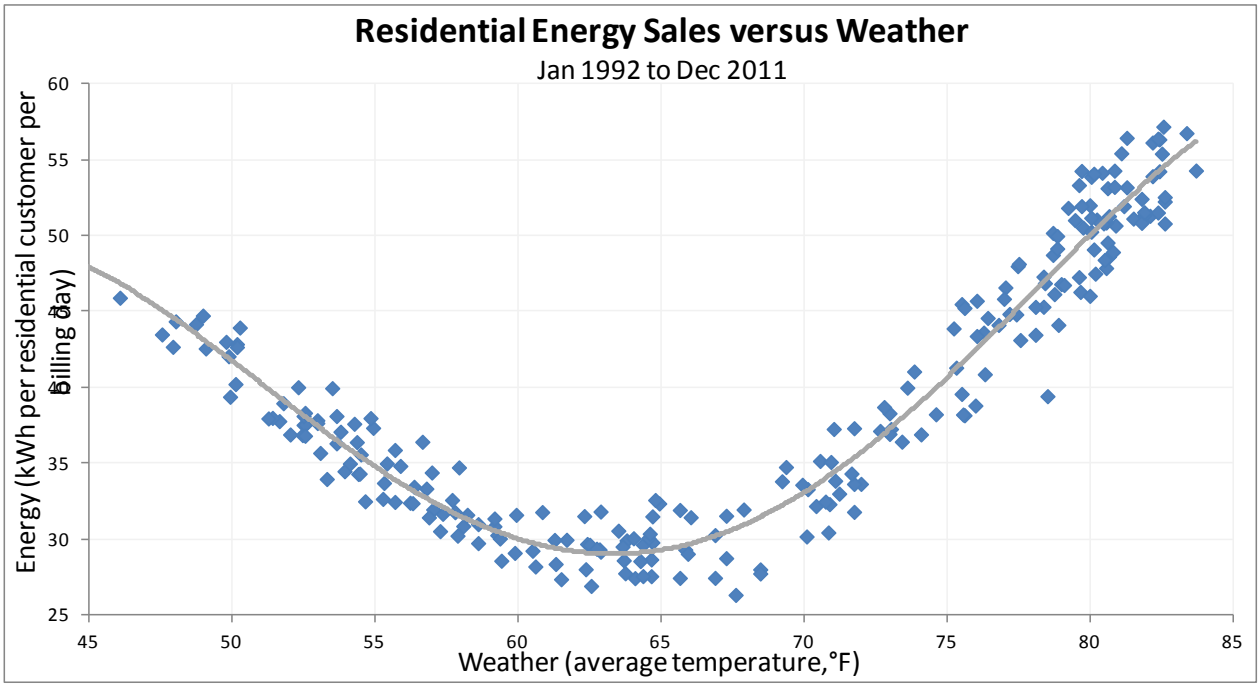
Recommendations

The recommended threshold temperatures are shown in the table below:

	Proposed		Current	
	Cooling	Heating	Cooling	Heating
Residential	67	59	70	65
Large Commercial	63	54	62	54
Small Commercial	67	59	62	54

Background & Assumptions

Electricity sales to Gulf Power's residential and commercial customers respond to changes in weather and dry bulb temperature is an appropriate weather variable. Energy sales respond to both low temperatures and high temperatures, as shown in the following scatter plot:



The temperature ranges for weather response and the strength of weather response will differ between the residential and commercial classes. The appropriate threshold temperatures are those which produce degree hours with the best explanatory power in the existing regression models.

Methods

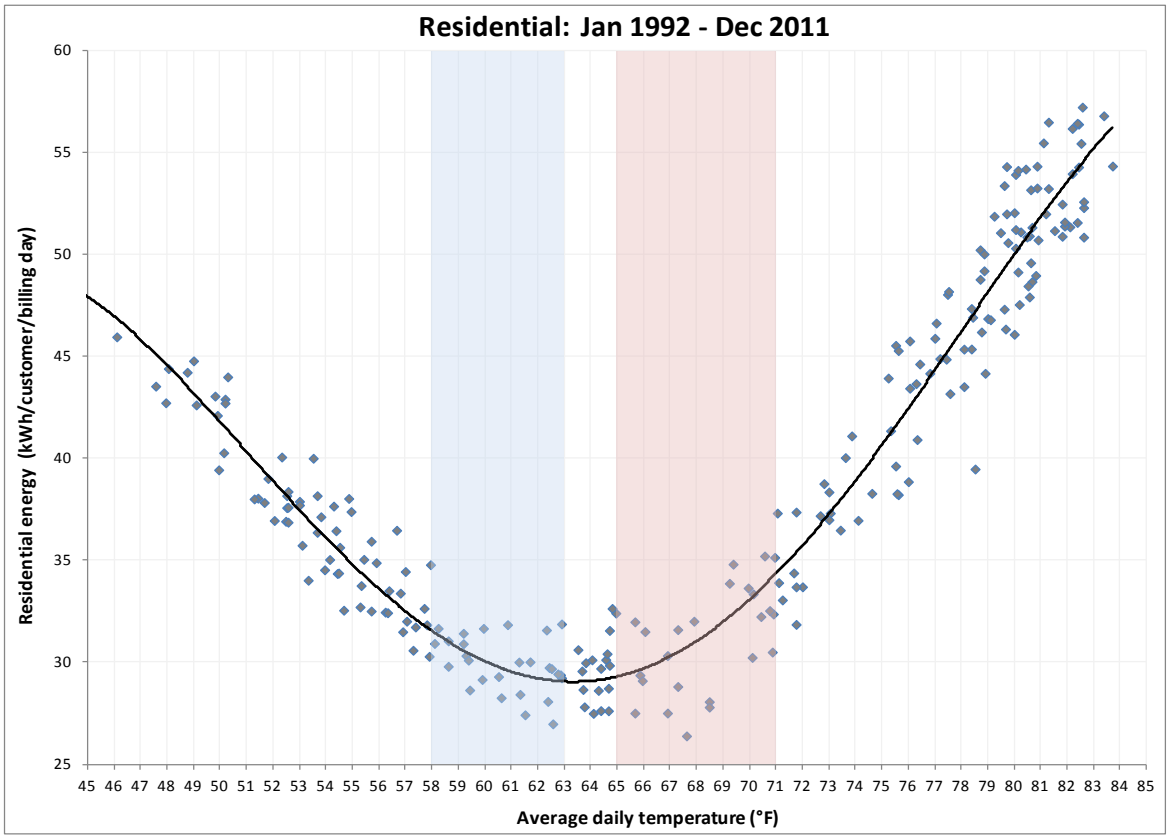
No method has yet been identified to determine explicitly the most appropriate threshold temperatures. An alternative method available is to identify a pool of possible candidates, test all candidates in the pool, and choose the best candidate. Possible candidates were chosen by creating scatter plots similar to the one previously shown and from that plot, identify the temperature ranges where the energy response appears to become significant. The degree hours for each candidate threshold temperature were calculated. The calculated degree hours were then run through the most recent regression models. The best candidate was the degree hour data stream which resulted in the highest adjusted R^2. For each of the three regression models, this process was done once for heating degree hours and once for cooling degree hours.

Data Sources

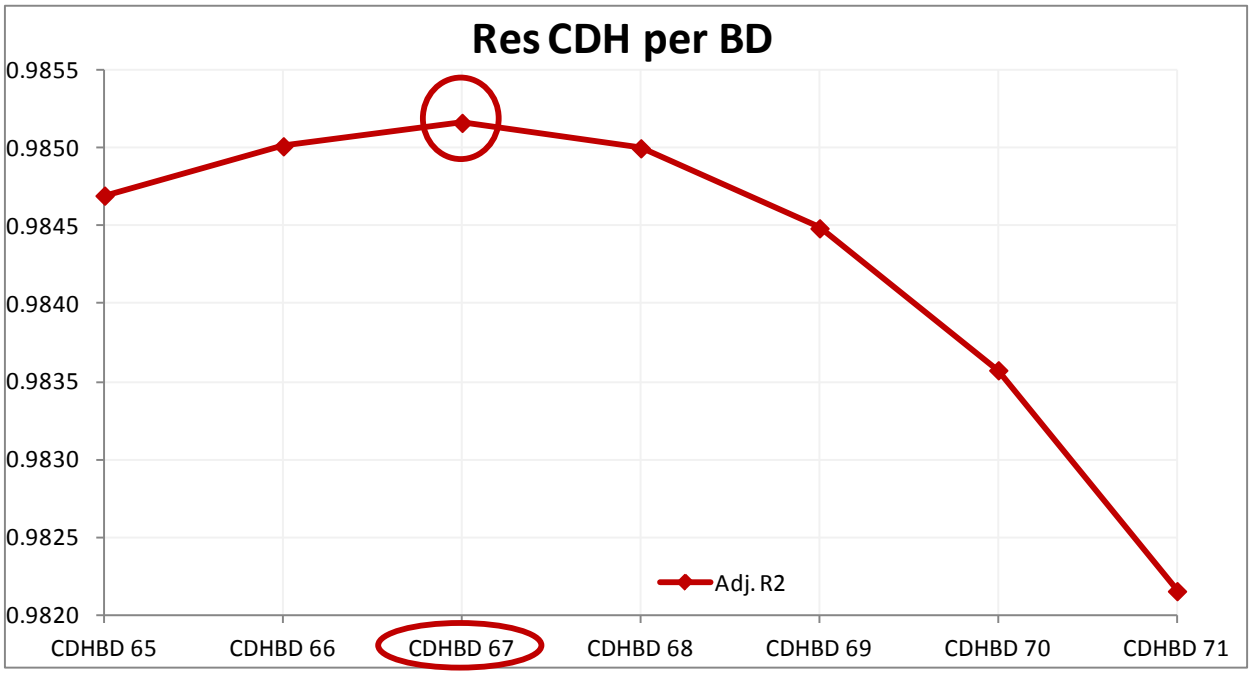
The regression models used in the evaluation process were the most current available (B2012A). The commercial class is modeled using 2 separate regressions, 1 for large commercial customers and 1 for small commercial customers. The small commercial customers are those on the commercial GS and FLAT-GS rates. The large commercial customers are those on all other rates. The dependent variable for each of the regression models are kWh per customer per billing day. The weather data is for the Pensacola weather station and is calculated using the Weather Data Viewer application developed by SCS. The billing cycle schedules used to calculate the cycle degree hours are consistent with the billing cycle schedules used to calculate the kWh per customer per billing day data.

Residential

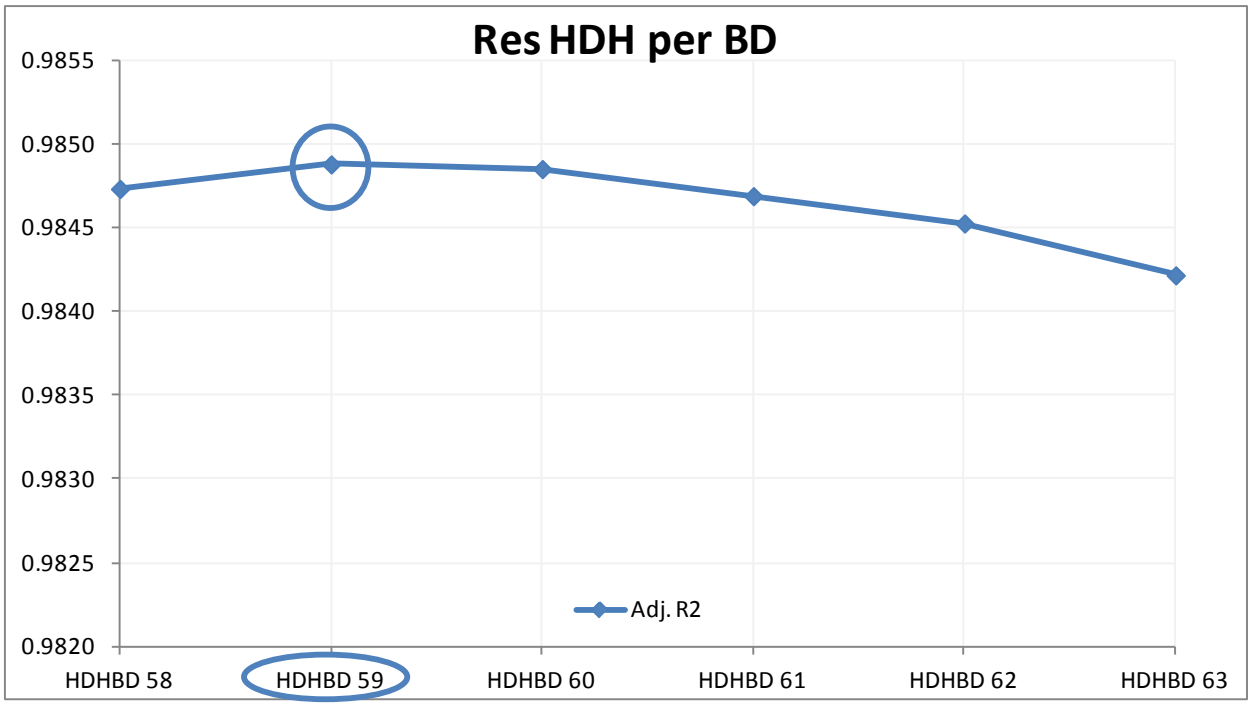
The residential class historical data and the threshold candidates are shown in the scatter plot below:



This next chart shows that a 67 °F threshold temperature for cooling produces the highest adjusted R^2:

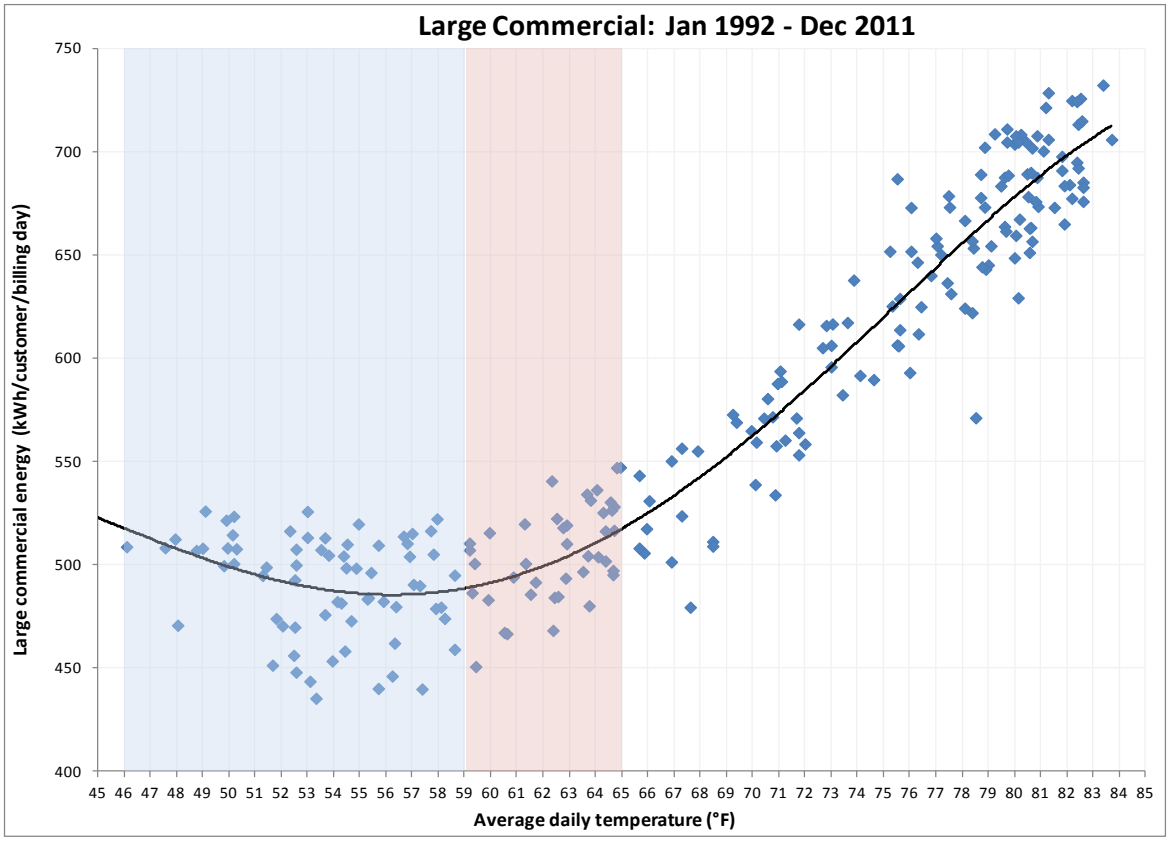


This next chart shows that a 59 °F threshold temperature for heating produces the highest adjusted R^2:

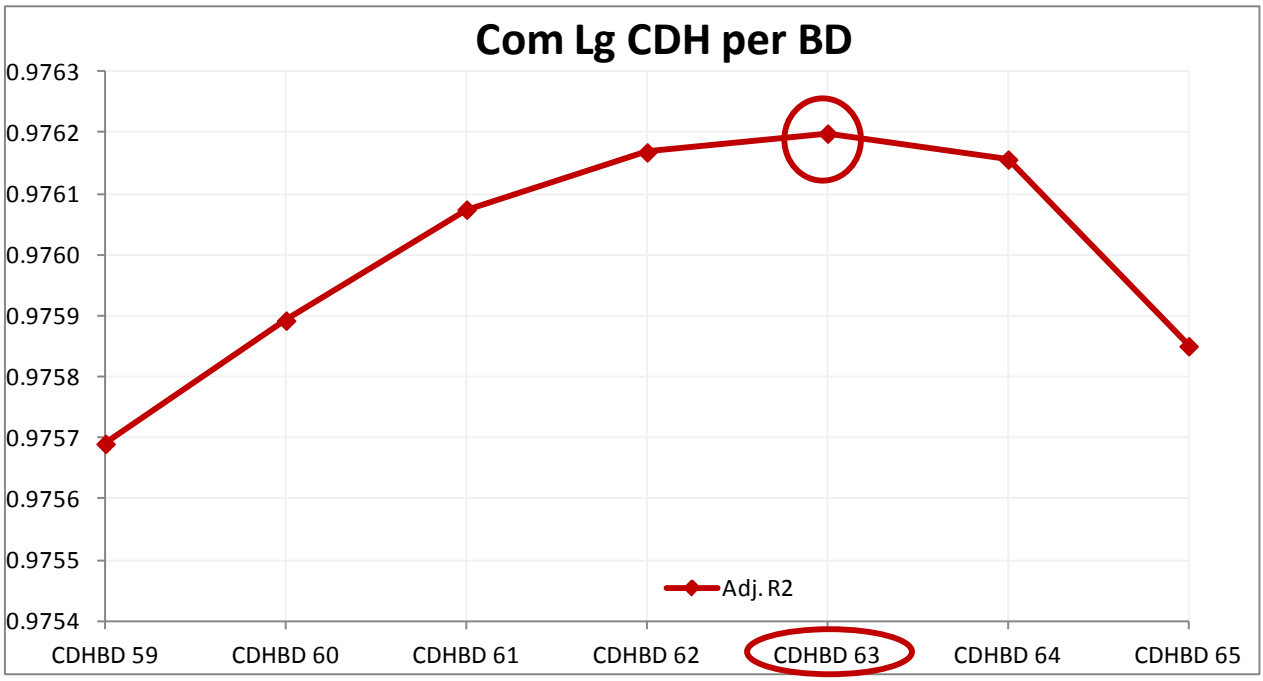


Commercial-Large

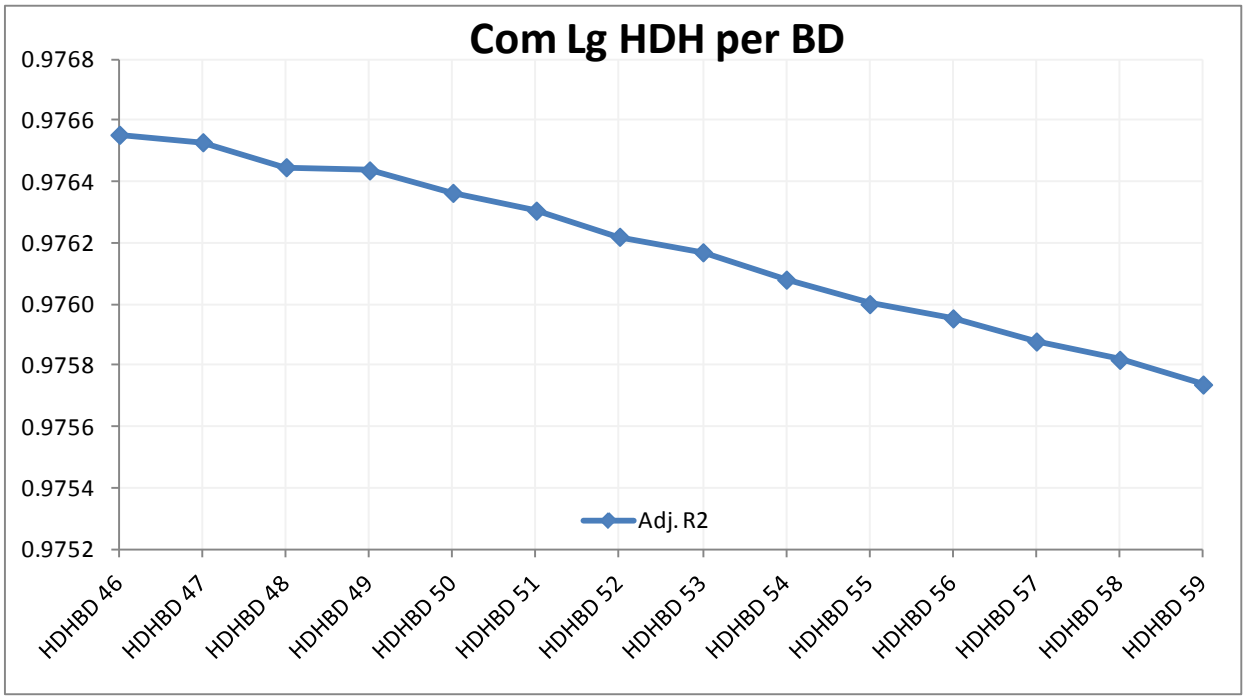
The large commercial historical data and the threshold candidates are shown in the scatter plot below:



This chart shows that a 63°F threshold temperature for cooling produces the highest adjusted R^2:



The results for the large commercial heating threshold were inconclusive, as shown in the chart below:



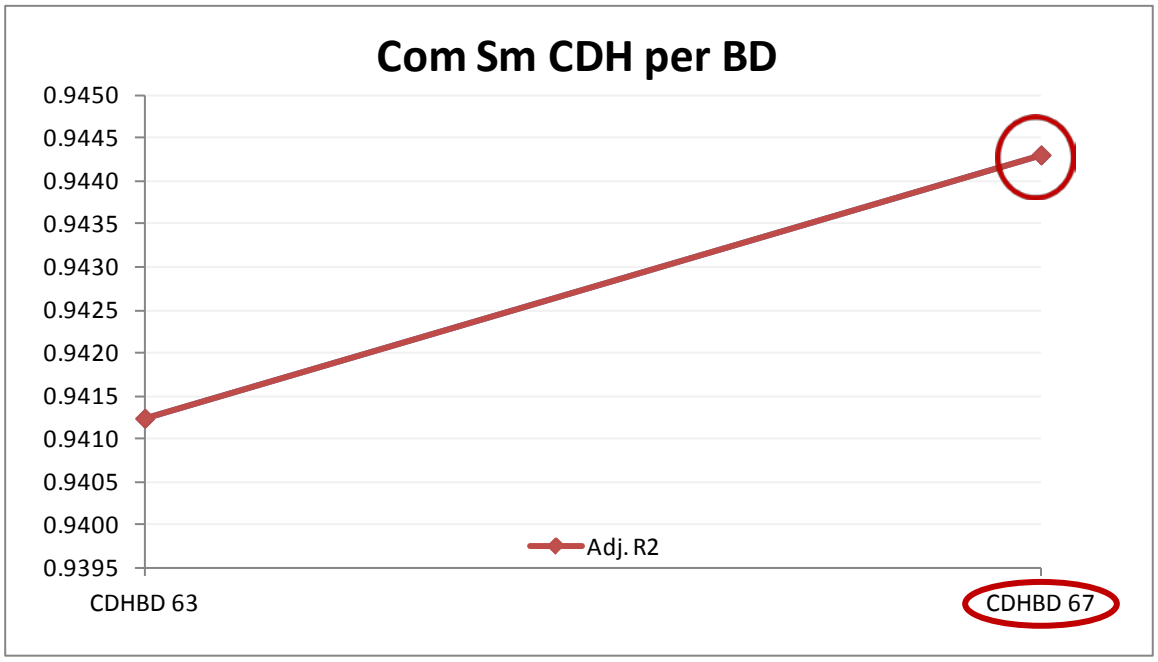
Although the adjusted R^2 does continue to increase as the threshold temperature is lowered, the use of a heating threshold lower than 46°F is not reasonable because: 1) the limited number of historical observations at or below that temperature, as seen in the energy/average temperature scatter plot, 2) the climate in Gulf Power's service territory limits the usefulness of a heating threshold at such a low temperature. The energy/temperature scatter plot does, however, suggest that the large commercial customers do have a heating response, albeit a weak response. But the evidence of even a weak heating response indicates the need for heating degrees hours in the model. The lack of conclusive results suggests maintaining the current threshold of 54°F for large commercial heating degree hours.

Commercial-Small

For small commercial, the threshold temperature candidates included the threshold temperatures identified for residential and large commercial classes. These temperatures were:

	Cooling	Heating
Residential	67	59
Large Commercial	63	54

This chart shows that a 67°F threshold temperature for cooling produces the highest adjusted R^2:



This next chart shows that a 59 °F threshold temperature for heating produces the highest adjusted R^2: