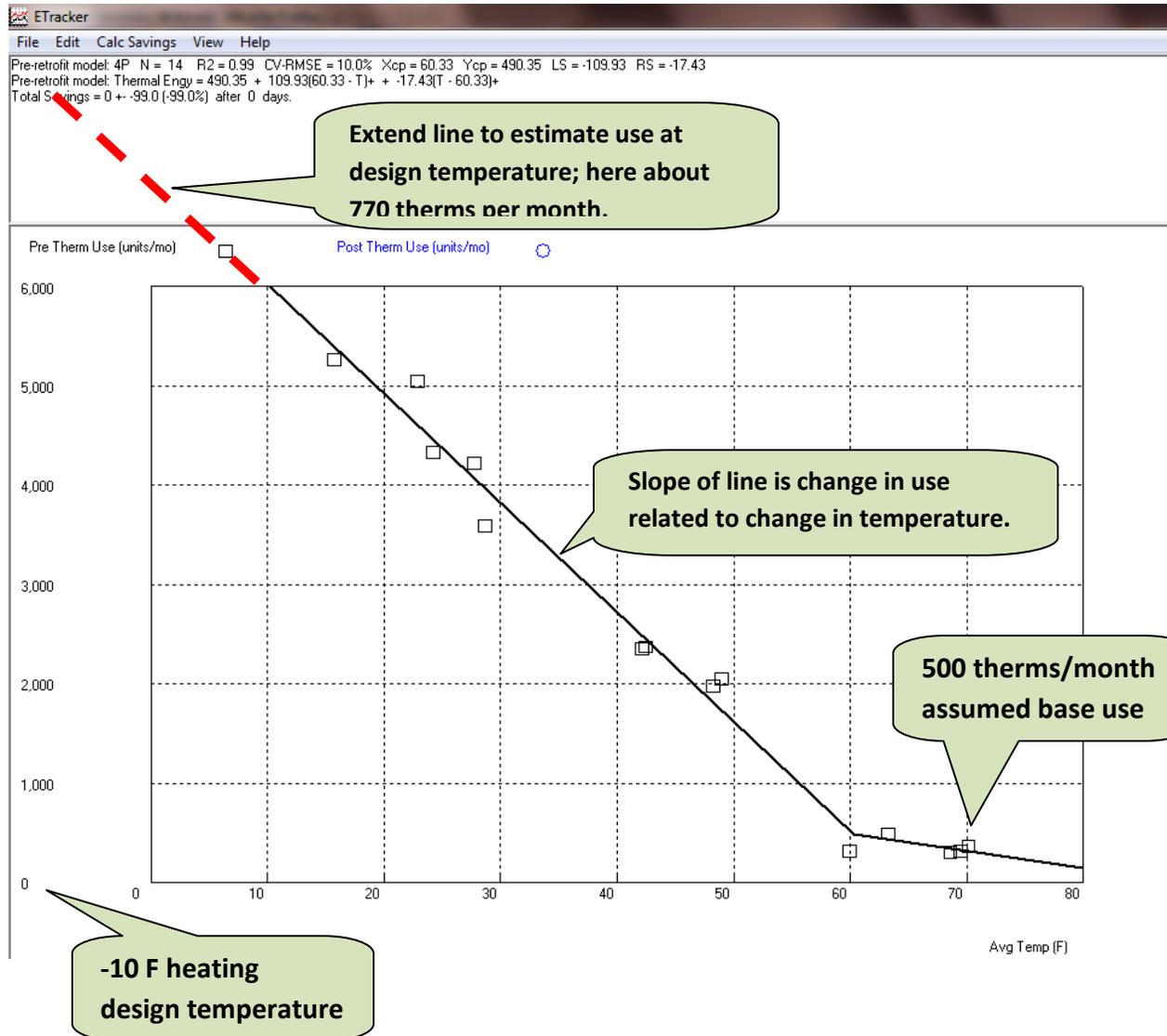


Method to Infer Heating Energy Use at Design Temperature



Graph of natural gas use shows:

- Strong correlation to weather (R2=0.99),
- Characteristic increase in consumption with decreased temperature,
- Likely temperature at which boiler begins to heat building is 60F,
- Reasonable summer "base" gas use,

Graphical Estimate of Design Load

1. Graph monthly metered use against the average temperature during the month. The attached graph is for natural gas use. Average temperature is taken from daily temperatures by [Etracker](#), which generates the graph above. Billing is monthly +/- one or two days.
2. Observe the “**base use**” – take the average of summer use. About **500 therms per billing period**
3. Observe the slope of line for weather-related use, and extend this line to the “heating design” temperature (-10 F.). Also extend “Y” axis figures. Estimate what the **consumption at design temperature** would be. **About 7,700 therms.**
4. Subtract the base use (2) from the total use at design temperature. **7,200 therms**
5. Divide the remainder by hours during billing period (24/day x 30 days). This is the gas rate to the comfort heating equipment at the heating design temperature. **$7,200 \times 100 / 720 = 1,000$ kBTUh, or **1,000,000 BTUh****
6. Assume an efficiency for the heating equipment under design conditions. If properly sized, should be close to steady state efficiency. Multiply (5) by this efficiency to estimate building loss at design conditions. Assuming 80% efficiency during design conditions, **building load** would be **$1,000,000 \times 0.8 = 800,000$ BTUh**
7. For purposes of sizing equipment, divide (6) by the efficiency of equipment at rated output. The result may be used to select input. Assume heating **equipment rated at 95%** thermal efficiency will be installed. The **input rating to match load** would be **$800,000 / 0.95 = 842,000$ BTUh**

Note that base use generally trends upward with decreased temperature, for instance, entry temperature for DHW is lower, so the amount of base use may be higher at design temperature than when not heating. This will tend to overstate heating use. On the other hand, increased heating capacity will be required if temperature set-back is maintained during design load conditions.

An advantage of this method to predict load and equipment capacity is that pattern of metered utility use is “real data” while load calculation involves many assumptions about the performance of individual elements of the building.