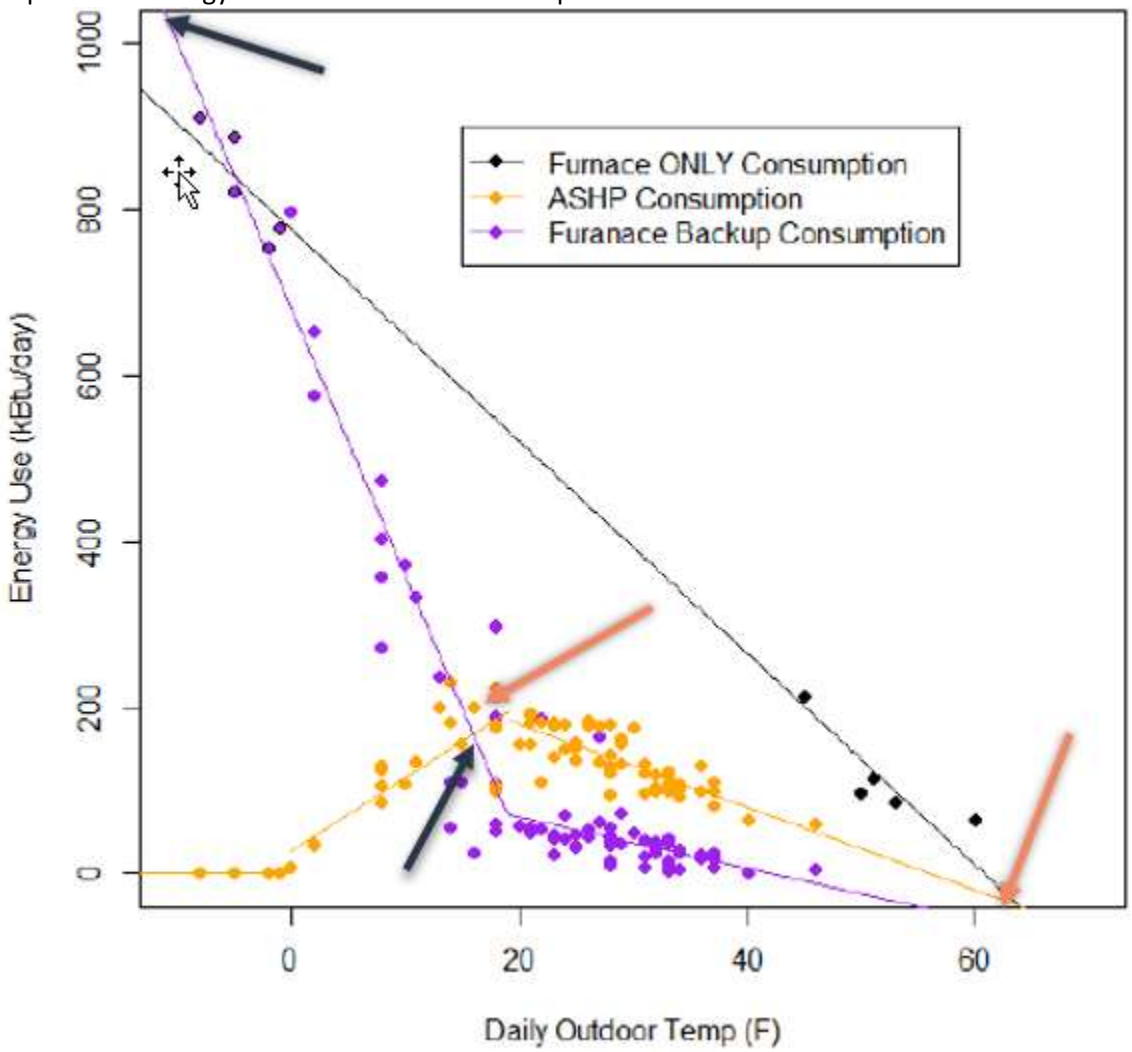
The American Council for an Energy-Efficient Economy "Field Assessment of Cold Climate Air Source Heat Pumps (ccASHP)" (https://aceee.org/files/proceedings/2016/data/papers/1_700.pdf).

Figure 2: Example of the energy use versus outdoor air temperature method from ASHP Site 2



Key Points

The inflection points in the ASHP consumption and Furnace backup consumption data at 20 deg. F indicate that air source heat pumps are much less efficient below that point. Also note that below 0 deg. F that air source heat pumps do not provide any heat.

Projected ASHP Energy Use

I assumed that the ASHP would use energy per the yellow best fit line above 15 deg F (between the red arrows) and the backup furnace would use the purple best fit line below 15 deg F (between the black arrows)

ASHP Energy Use (kBtu/dy) = -4.8 * Ambient Temperature + 290

Furnace Backup Energy Use (kBtu/dy) = -30 * Ambient Temperature + 670

Caveat: I crudely digitized the lines on this graph and used these data to do a first-cut approximation to see if there could be a peak load problem. These data are from a single test site and may not represent average conditions well.