**Additional Information for April 26th Fuel Conversion Working Group Meeting**

**ASHP**

Baselines

* NC – determined via EM&V and therefore likely to include mix of both electric and fuel baseline. Electric baseline is ASHP meeting federal standard, Fuel baseline is federal standard furnace/Central AC.
* TOS – equivalent federal standard replacement system of same type as unit replaced.
* Early Replacement – existing equipment.

Fuel switch eligibility:

* Must *“produce positive total annual source fuel savings (i.e., reduction in source Btus) in order to qualify.”*
* SourceEnergySavings (MMBTUs)              =  GasHeatReplaced – ASHPSourceHeatConsumed + ASHPSourceCoolingImpact
  + Notes: GasHeatReplaced does not account for any gas distribution losses (something we will look at this year).
  + ASHP heat consumed and cooling savings are converted to *source* using the heat rate of the grid (HGrid).

Fuel switch savings claim:

* Dependent on which utilities are supporting measure.
* Algorithm split in to 3 sections (actual algorithms provided below table):
  + ΔkWhFuelSwitch is the heat consumption of a baseline ASHP
  + ΔkWhEfficiencyImprovement is the electric savings from the measure… including cooling impact (between Central AC and ASHP, or if no existing cooling this would be a ‘negative savings’ as we are adding cooling load) and heating savings from a baseline ASHP to an efficient ASHP.
  + ΔThermFuelSwitch  is the heat consumption of the baseline (or existing) gas system.

* Savings claim is then calculated as follows (I’ve added notes in green below):

|  |  |  |
| --- | --- | --- |
| **Measure supported by:** | **Electric Utility claims:** | **Gas Utility claims:** |
| Electric utility only | ΔkWhEfficiencyImprovement– ΔkWhFuelSwitch + (ΔThermFuelSwitch/kWhtoTherm)  *Fuel switch – Savings is the difference between the Increase in kWh due to efficient ASHP  and the source kWh equivalent of the gas unit consumption* | N/A |
| Electric and gas utility | ΔkWhEfficiencyImprovement  *Cooling savings and heating electric savings between base and efficient ASHP (not fuel switch)* | ΔThermFuelSwitch– (ΔkWhFuelSwitch  \* kWhtoTherm)  *Fuel switch - fuel heat consumption minus therm equivalent of baseline ASHP source kWh* |
| Gas utility only | N/A | ΔThermsFuelSwitch– (ΔkWhFuelSwitch  \* kWhtoTherm) + (ΔkWhEfficiencyImprovement\* kWhtoTherm)  *Fuel switch - fuel heat consumption minus therm equivalent of efficient ASHP source kWh* |

ΔkWhFuelSwitch                    = [Heat consumption of baseline ASHP]

                                                         = [(FLHheat \* Capacity\_heating \* 1/(HSPFbaseASHP\* (1 – DeratingHeatBase)))/1000]

ΔkWhEfficiencyImprovement= [Cooling Savings] + [Heat Savings from Baseline ASHP to Efficient ASHP]

= ((FLH\_cooling \* Capacity\_cooling \* (1/(SEER\_base \* (1 – DeratingCoolBase)) - 1/(SEER\_ee \* SEERadj \* (1 – DeratingCoolEff)))) / 1000) + ((FLH\_heat \* Capacity\_heating \* (1/(HSPF\_baseASHP \* (1 – DeratingHeatBase)) - 1/(HSPF\_ee \* HSPFadj \* (1 – DeratingHeatEff)))) / 1000)

ΔThermFuelSwitch                 = [Heat consumption of baseline gas system]

= [(FLHheat \* Capacity\_heating \* 1/AFUEbase) / 100,000]

kWhtoTherm                   = Conversion between kWh at source/generation and Therms

                                                          = Hgrid / 100000

                                           Hgrid= Heat rate of the grid in btu/kWh

                                                          ≈ 10,000



