SAG Fuel Conversion Working Group

Illustrative Example Calculations

April 26th, 2021

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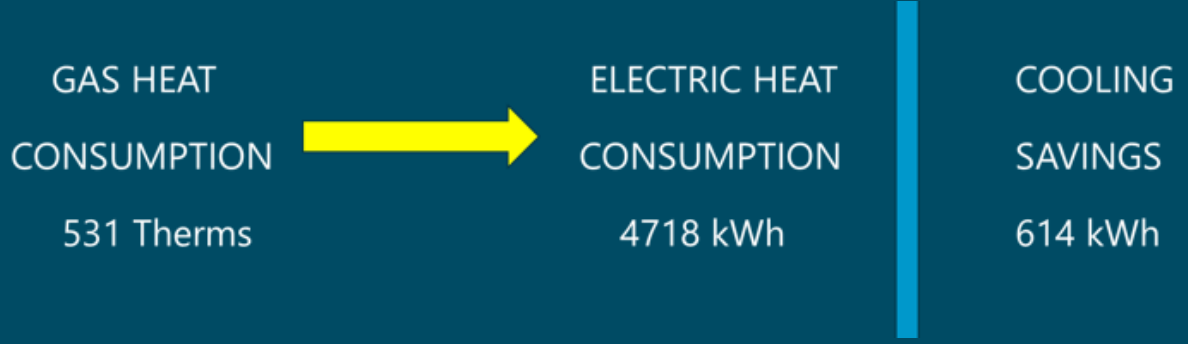
Based on IL TRM v9, 5.3.1 Air Source Heat Pump New Construction Fuel Switch example calculation.

ASHP against a baseline of a gas furnace and central AC.

GAS HEAT CONSUMPTION	ELECTRIC HEAT CONSUMPTION	COOLING SAVINGS
531 Therms	4718 kWh	614 kWh

For illustrative purposes, a Heat Rate of 10,000 Btu/kWh is used.

Is measure eligible?



"Fuel switch measures must produce positive total annual source fuel savings (i.e., reduction in source Btus) in order to qualify."

SourceEnergySavings (MMBTUs) = GasHeatReplaced – ASHPSourceHeatConsumed + ASHPSourceCoolingImpact

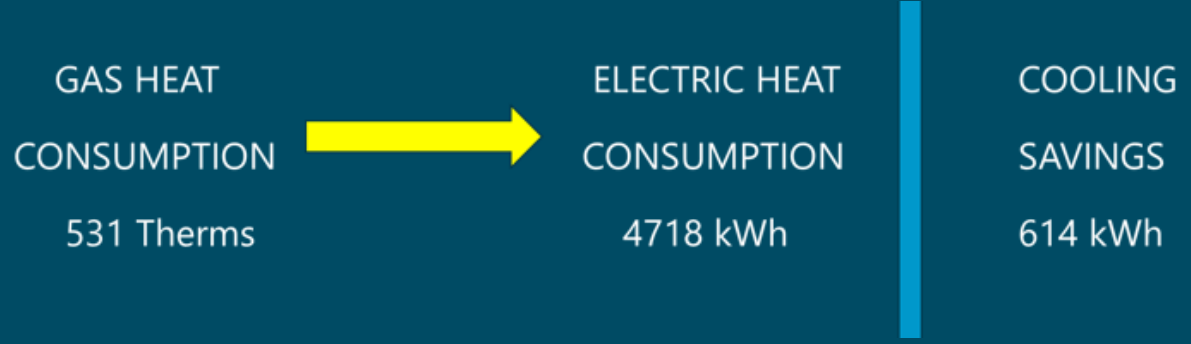
GasHeatReplaced = 531/10 (MMBtu/therm) = 53.1 MMBtu

ASHPSourceHeatConsumed = 4718 * 10,000 (Btu/kWh)/1,000,000 (Btu/MMBtu) = 47.2 MMBtu

ASHPSourceCoolingImpact = 614 * 10,000 (Btu/kWh)/1,000,000 (Btu/MMBtu) = 6.1 MMBtu

SourceEnergySavings (MMBTUs) = 53.1 – 47.2 + 6.1 = <u>12 MMBtu</u>

ELECTRIC UTILITY ONLY



Question: What is 531 Therms equivalent to in kWh?

SOURCE: 531 therms = $\frac{531 * 100{,}000 \text{ (Btu/therm)}}{10{,}000 \text{ (Btu/kWh)}}$

= 5,310 kWh

Therefore, Heat Savings = 5,310 – 4,718 = 592 kWh

Total Measure Savings = 592 + 614

= 1,206 kWh

Note 1,206 kWh is equivalent of 12 MMBtu at Source:
1206 * 10,000/1,000,000

ELECTRIC UTILITY ONLY

GAS HEAT CONSUMPTION	→	ELECTRIC HEAT CONSUMPTION	COOLING SAVINGS
531 Therms		4718 kWh	614 kWh

Question: What is 531 Therms equivalent to in kWh?

SITE: 531 therms = $\frac{531 * 100{,}000 \text{ (Btu/therm)}}{3412 \text{ (Btu/kWh)}}$

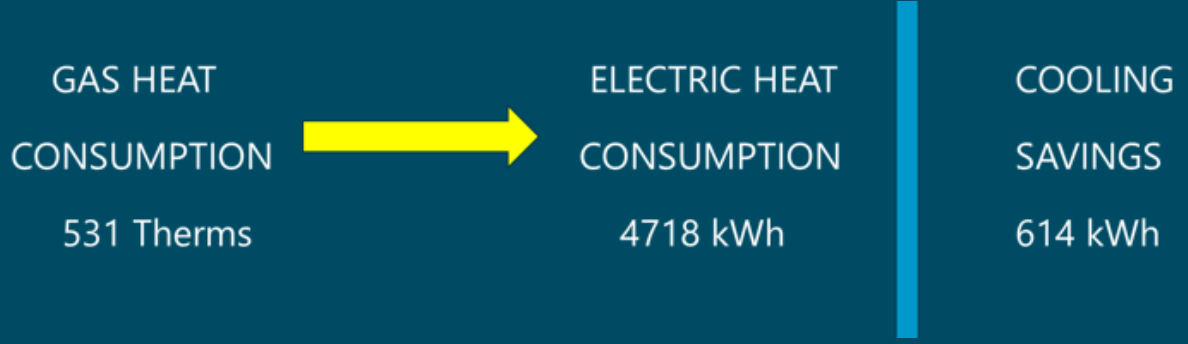
= 15,563 kWh

Therefore, Heat Savings = 15,563 – 4,718 = 10,845 kWh

Total Measure Savings = 10,845 + 614

= 11,459 kWh

GAS UTILITY ONLY



Question: What is the total electric impact equivalent to in therms?

SOURCE: 4718 - 614 = 4104kWh = $\frac{4104 * 10{,}000 \text{ (Btu/kWh)}}{100{,}000 \text{ (Btu/therm)}}$

= 410.4 therms

Total Measure Savings = 531 – 410.4

= 120.6 Therms

Note 120.6 therms is equivalent of 12 MMBtu "at Source": 120.6 / 10

GAS UTILITY ONLY

GAS HEAT CONSUMPTION	→	ELECTRIC HEAT CONSUMPTION	COOLING SAVINGS
531 Therms		4718 kWh	614 kWh

Question: What is the total electric impact equivalent to in therms?

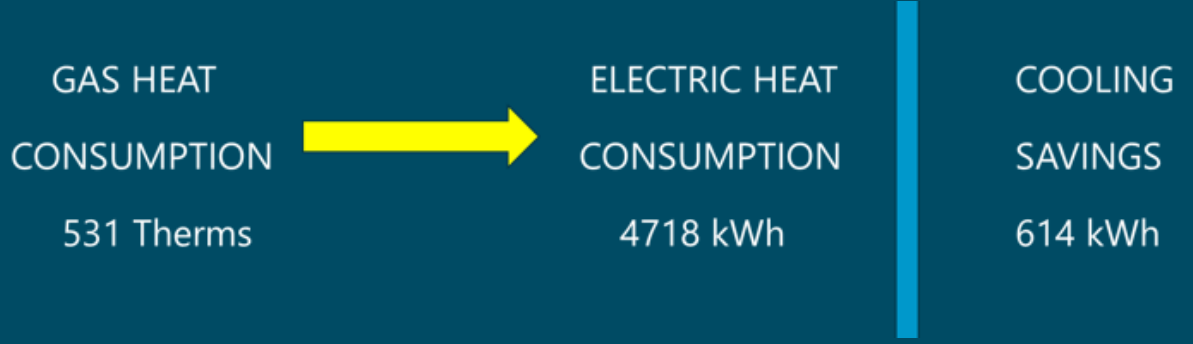
SITE: 4718 - 614 = 4104kWh = $\frac{4104 * 3{,}412 \text{ (Btu/kWh)}}{100{,}000 \text{ (Btu/therm)}}$

= 140 therms

Total Measure Savings = 531 - 140

= 391 Therms

ELECTRIC AND GAS UTILITY



ELECTRIC UTILITY: Heat savings from Baseline ASHP (5759kWh) to Efficient ASHP + Cooling Savings

Electric Utility Savings = (5759 – 4718) + 614

= 1,655kWh

GAS UTILITY: Heat savings from Gas Furnace to Baseline ASHP

Question: What is the baseline ASHP electric heat consumption equivalent to in therms?

SOURCE: 5759 kWh = $\frac{5{,}759 * 10{,}000 \text{ (Btu/kWh)}}{100{,}000 \text{ (Btu/therm)}}$

= 575.9 therms

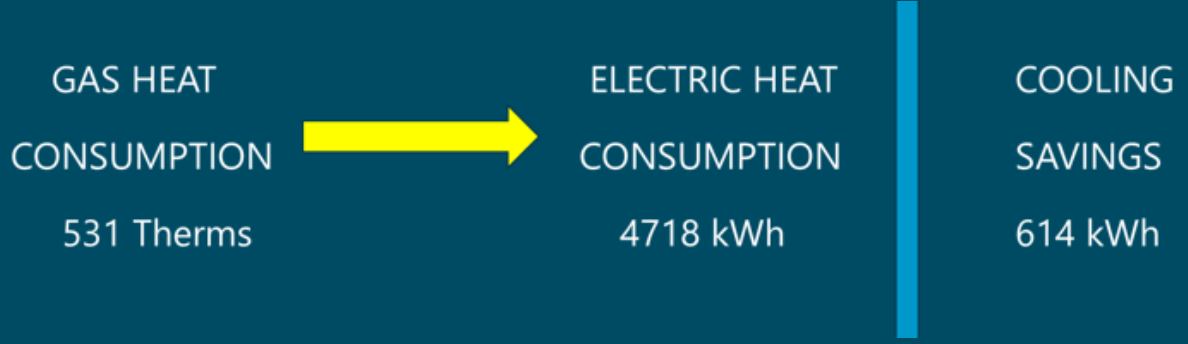
Gas Utility Savings = 531 – 575.9

= -45 Therms

Note 1655 kWh and -45 therms is equivalent of 12 MMBtu "at Source":

(1655 * 10,000/1,000,000) - (45 / 10)

ELECTRIC AND GAS UTILITY



ELECTRIC UTILITY: Heat savings from Baseline ASHP (5759kWh) to Efficient ASHP + Cooling Savings

Electric Utility Savings = (5759 – 4718) + 614

= 1,655kWh

GAS UTILITY: Heat savings from Gas Furnace to Baseline ASHP

Question: What is the baseline ASHP electric heat consumption equivalent to in therms?

SITE: 5759 kWh = $\frac{5{,}759 * 3412 \text{ (Btu/kWh)}}{100{,}000 \text{ (Btu/therm)}}$

= 196 therms

Gas Utility Savings = 531 – 196

= 335 Therms

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