

Additional Credits Requirement for Fossil Fuel Path

- Additional credits required for the fossil fuel path are based on site energy using a heat pump baseline.
- Site energy ignores all upstream losses associated with fuel extraction, generating losses and transmission and distribution losses.
 - These losses are approximately 1/2 when considering all sources of electricity, including renewables, and about 2/3rds when considering only the marginal resources in the NWPP.
- If additional credits for fossil fuels is to be compared to a heat pump baseline, it should be done on a source energy basis.

Example from Washington State Commercial Building Energy Modeling Analysis (prepared by 2050 Partners)

Apartment-Midrise

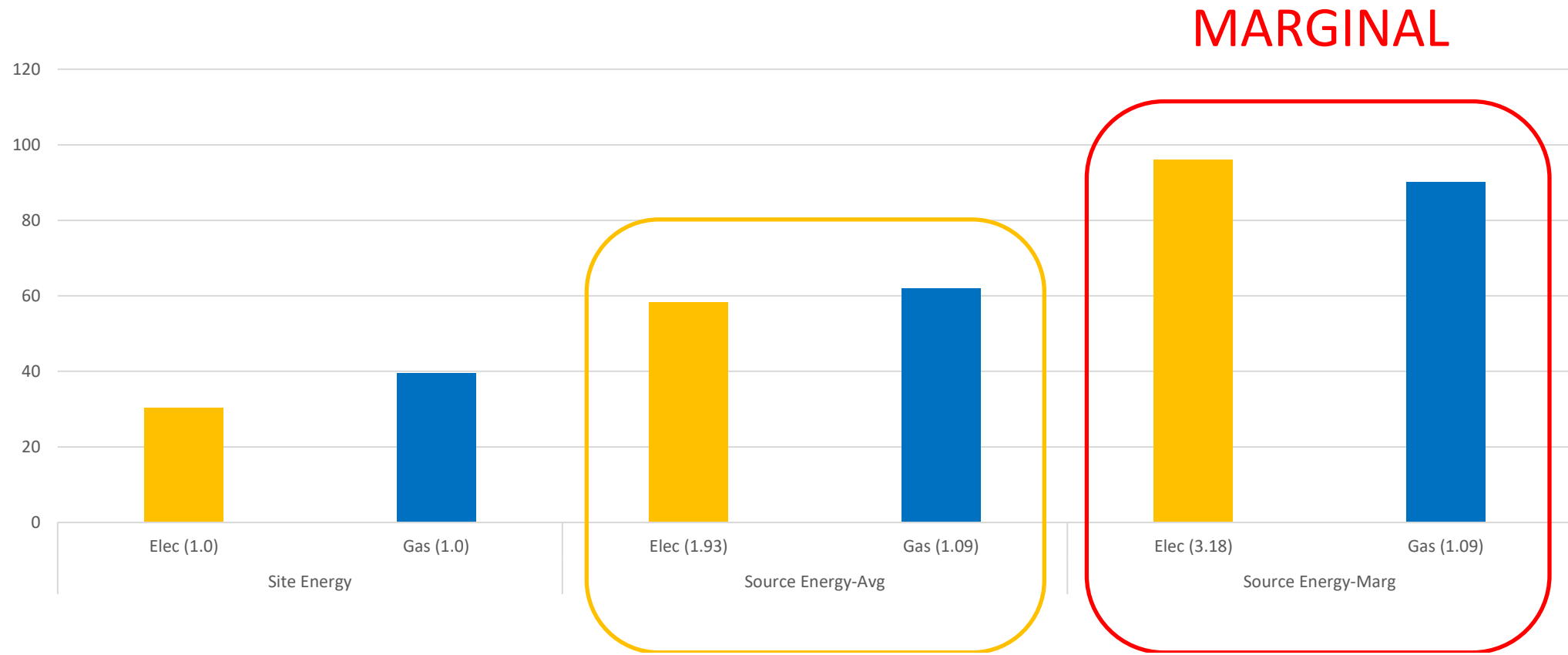
| | | multifamily-midrise | | | | multifamily-midrise | | | |
|-----------------------|----------------|---------------------|-------------------|-------------------------|--------------------|---------------------|-------------------|-------------------------|--------------------|
| | | CZ4C | CZ4C | | | CZ5B | CZ5B | | |
| | | gas | hp | Site Savings (%) | Site Savings EUJ | gas | hp | Site Savings (%) | Site Savings EUJ |
| Equipment Int. | <i>kBtu/sf</i> | 13.5 | 13.5 | 0% | 0.0 | 13.5 | 13.5 | 0% | 0.0 |
| Equipment Ext. | <i>kBtu/sf</i> | 0.0 | 0.0 | 0% | 0.0 | 0.0 | 0.0 | 0% | 0.0 |
| Equipment Refrig. | <i>kBtu/sf</i> | 0.0 | 0.0 | 0% | 0.0 | 0.0 | 0.0 | 0% | 0.0 |
| Lighting Int. | <i>kBtu/sf</i> | 3.6 | 3.6 | 0% | 0.0 | 3.6 | 3.6 | 0% | 0.0 |
| Lighting Ext. | <i>kBtu/sf</i> | 0.7 | 0.7 | 0% | 0.0 | 0.7 | 0.7 | 0% | 0.0 |
| Fans | <i>kBtu/sf</i> | 2.2 | 2.2 | -1% | 0.0 | 2.4 | 2.8 | -13% | 0.3 |
| Pumps* | <i>kBtu/sf</i> | 0.0 | 0.0 | 0% | 0.0 | 0.0 | 0.0 | 0% | 0.0 |
| Cooling | <i>kBtu/sf</i> | 2.5 | 2.2 | 13% | -0.3 | 2.8 | 2.5 | 10% | -0.3 |
| Space Heat, Gas | <i>kBtu/sf</i> | 1.3 | 0.0 | 100% | -1.3 | 4.3 | 0.0 | 100% | -4.3 |
| Space Heat, Elec | <i>kBtu/sf</i> | 0.0 | 0.6 | 0% | 0.6 | 0.0 | 2.3 | 0% | 2.3 |
| DHW, Gas | <i>kBtu/sf</i> | 15.8 | 0.0 | 100% | -15.8 | 15.8 | 0.0 | 100% | -15.8 |
| DHW, Elec | <i>kBtu/sf</i> | 0.0 | 7.4 | 0% | 7.4 | 0.0 | 8.9 | 0% | 8.9 |
| BACK CHECK EUJ | | 39.6 | 30.3 | 24% | -9.3 | 43.1 | 34.3 | 20% | -8.8 |
| TOTAL | | 39.6 | 30.2 | 24% | -9.3 | 43.1 | 34.3 | 20% | -8.8 |
| | | Site Energy: Gas | Site Energy: Elec | Energy Savings (% site) | Additional Credits | Site Energy: Gas | Site Energy: Elec | Energy Savings (% site) | Additional Credits |
| Equipment | <i>kBtu/sf</i> | 13.5 | 13.5 | | | 13.5 | 13.5 | | |
| Lighting | <i>kBtu/sf</i> | 4.3 | 4.3 | | | 4.3 | 4.3 | | |
| Space Heating | <i>kBtu/sf</i> | 1.3 | 0.6 | 1.7% | 17 | 4.3 | 2.3 | 4.5% | 45 |
| DHW (+ HVAC) | <i>kBtu/sf</i> | 20.5 | 11.8 | 21.9% | 219 | 21.0 | 14.2 | 15.9% | 159 |
| | | 39.59 | 30.25 | | | 43.11 | 34.29 | | |
| | | | 23.6% | | | | 20.5% | | |

Site vs Source Energy Factors

- Using ASHRAE Std. 105-2021:
 - SEF for natural gas = 1.09 (91% efficient)
 - SEF for electricity based on all resources = 1.93 (52% efficient)
 - SEF for electricity based on marginal resources = 3.18 (31% efficient)
- Energy Use Intensities (kBtu/sf)

| Site Energy | | Source Energy-avg | | Source Energy-Marg | |
|-------------|-----------|-------------------|------------|--------------------|------------|
| Elec (1.0) | Gas (1.0) | Elec (1.93) | Gas (1.09) | Elec (3.18) | Gas (1.09) |
| 30.2 | 39.6 | 58.3 | 62.1 | 96.0 | 90.2 |

Site vs Source Energy Comparisons



Additional Credits Comparison

- Site energy additional credits = 236 (17 for Space and 219 for Water)
- Source (avg) energy additional credits = 61
- Source (marginal) energy additional credits = -65
 - Electric building would require 65 additional credits

Other Building Examples – Group B

(from Kocher August 2023 presentation)

- Example, Group B. Required points = $42 + 27 + 101 = 170$ Credits
 - High Performance DOAS = 27 credits
 - + 20% reduced lighting control = 31 credits
 - + Renewable Energy Credits = 102 credits (80% of 128)
 - + Heat Trace System = 10 credits
 - Total = 170 Credits
- Renewable energy credits would require 75-80 kW additional solar PV in addition to the 50 kW required for a 100,000 SF Office Bldg.
 - Ballpark cost: \$100-\$150K
 - Does not include costs associated with Heat Trace System

Conclusion/Recommendation

- Using site energy as the basis for calculating additional credits ignores upstream losses and does not fairly compare electric and gas space and water heating (apples and oranges)
- To have a truly fair comparison, recalculate the additional credits using source energy as the basis.
- Further, for new construction, the new electrical load affects only the additional energy required from marginal resources and does not affect base-loaded and wind or solar resources.
- Therefore, a source energy factor for electricity should be based on marginal resources (3.18)