



Technical Interpretation

Standard: [BPI-2400-S-2015 v.2 Standard Practice for Standardized Qualification of Whole-House Energy Savings Predictions by Calibration to Energy Use History](#)

Edition: 2015 v.2

Paragraph/Figure/Table: Section 4.3

Subject: DM-STC technical interpretation regarding the use of a program-defined Energy Factor in the BPI-2400 Total Equivalent Energy Savings Calculation (part of a proposed future version of BPI-2400)

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Section 4.3 of BPI-2400 defines the manner in which site energy consumption using different fuels shall be summed to calculate a new value defined as *Equivalent Electric Energy* [kWh_{eq}]. In this calculation, fossil fuel energy multiplied by an *Equivalence Factor* (EF), with a default value of 0.4, is divided by 3412 to convert from Btu to kWh. This Equivalence Factor was set at the value of 0.4 in the original development of the BPI-2400 standard.

This equation and EF were based on 2014 ANSI/RESNET/ICC 301 Standard for Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings Using an Energy Rating Index,¹ Equation 4.1-3. The intent was to account for production, transmission, and delivery losses associated with electricity use. This technical interpretation allows for the Equivalence Factor to be set at a value other than 0.4 by a program utilizing the BPI-2400 standard. This approach provides freedom to energy savings programs to establish their own value.

The program-determined Equivalence Factor is intended to be set at a fixed value for any given energy savings program that utilizes this calculation. The intention is for the EF value to remain consistent for all fossil fuel uses within each energy savings program. The valid range for an EF is $1 \geq EF > 0$, and a program should document their rationale for assigning the value they select. Utilizing a value of 1 would combine electric consumption and fossil fuel consumption without any inclusion of the off-site energy-related impacts. By contrast, utilizing a value of 0.33 would have the effect of making electricity consumption and savings three times as impactful as fossil fuel consumption and savings. As a point of reference, the ENERGY STAR Portfolio Manager tool currently uses a national average value of 0.36 for grid-purchased electricity (August 2023).²

The tables below illustrate how two example kWh equivalence factors, 0.4 and 1, affect savings percentages on two different modeled homes with insulation and HVAC upgrades.

¹ ANSI/RESNET/ICC 301-2014: *Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings Using an Energy Rating Index*. Residential Energy Services Network and International Code Council, 2014. "4. Home Energy Rating Calculation Procedures." ICC Digital Codes.

<https://codes.iccsafe.org/content/RESNET3012014P1/4-home-energy-rating-calculation-procedures>

² United States Environmental Protection Agency. *Source Energy: Technical Reference*. ENERGY STAR Portfolio Manager, Aug. 2023.

<https://portfoliomanager.energystar.gov/pdf/reference/Source%20Energy.pdf>



Scenario Comparison	House ID	Description	kWh Savings	NG Savings Mbtu	Factor 1 kWh Eq Savings	Factor 2 kWh Eq Savings	Factor 1 kWh Eq Savings %	Factor 2 kWh Eq Savings %	Observations
1 to 2	1	House 1 Insulation Upgrade	1,842.6	0.0	1,842.6	1,842.6	14%	14%	No impact when only one energy source is used.
3 to 4	2	House 2 Insulation Upgrade with NG Furnace	974.8	24.1	3,805.2	8,050.7	23%	25%	Factors less than 1 reduce the relative savings of fossil fuel reductions.
3 to 5	2	House 2 ASHP Upgrade from Furnace	-5,981.2	78.2	3,190.4	16,947.8	19%	52%	The impact is particularly large when fuel switching occurs.
5 to 6	2	House 2 Insulation Upgrade after ASHP Upgrade	2,969.2	0.0	2,969.6	2,970.1	22%	19%	Even when there are no fossil fuel savings, the factor impacts the total equivalent energy use and thus the relative savings of the electric energy reductions.

	kWh Equivalent Savings Factors
Factor 1	0.4
Factor 2	1

Scenario	House ID	Description	Electricity Mbtu	Electricity kWh	NG Mbtu	Factor 1 kWh Equivalent	Factor 2 kWh Equivalent
1	1	ASHP Base	45.7	13,380.1	0.0	13,380.1	13,380.1
2	1	ASHP Insulation Upgrade	39.4	11,537.5	0.0	11,537.5	11,537.5
3	2	NG Furnace Base	20.4	5,984.5	91.3	16,688.0	32,743.3
4	2	NG Furnace Insulation Upgrade	17.1	5,009.7	67.2	12,882.8	24,692.6
5	2	ASHP Upgrade	40.8	11,965.7	13.1	13,497.6	15,795.4
6	2	ASHP Plus Insulation Upgrade	30.7	8,996.5	13.1	10,528.0	12,825.3