

## Appendix 2-A

# Definitions of Energy and Energy Efficiency

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### Energy

Btu: British thermal unit, the amount of heat needed to raise the temperature of one pound of water 1 degree F.<sup>1</sup> Equivalent to 252 calories.

Quad: 1 quadrillion, or  $10^{15}$ , Btus.

kWh: Kilowatthour, the amount of energy contained in 1,000 watts consumed for one hour. Usually used for electricity. For example, a 100-watt light bulb burning 10 hours will use 1 kWh of electricity.

### Efficiency

Efficiency is a useful way to think about energy technologies, but there are numerous ways to define it. Here some of the common measures used to measure the efficiency of energy-using devices found in buildings are defined.

AFUE: Annual fuel utilization efficiency. The fraction of the energy content in the incoming fuel (typically natural gas) consumed that is converted into useful heat. No units, usually expressed as a percent. A typical new natural gas furnace has an AFUE of about 78 percent, and the most efficient commercially available furnaces achieve an AFUE of 97 percent.

COP: Coefficient of performance. The number of Btus a device can supply to or remove from the conditioned space per Btu of energy consumed (where electricity is converted to Btus at 3.412 Btus per watthour). No units. Typical values are 2.0 to 3.0, equivalent to an efficiency of 200 to **300** percent.

EER: Energy efficiency ratio. Used to measure the cooling performance of heat pumps and room air conditioners. The number of Btus of heat removed from the conditioned space per watthour of electricity consumed. Units are Btus per watthour. Typical values for room air conditioners are 8.0 to 12.0 Btus per watthour,

HSPF: Heating seasonal performance factor. Used to measure the seasonal heating efficiency of heat pumps. Incorporates performance under varying outdoor temperatures, losses due to cycling, defrosting, and backup resistance heat. The number of Btus of heat added to the conditioned space per watthour of electricity consumed. Units are Btus per watthour. Typical values are 7.0 to 9.0 Btus per watthour,

SEER: Seasonal energy efficiency ratio. Used to measure the seasonal cooling efficiency of heat pumps. Similar to EER, except it incorporates performance under varying outdoor temperatures and losses due to cycling. The number of Btus of heat removed from the conditioned space per watthour of electricity consumed. Units are Btus per watthour; typical values are 9.0 to 12.0 Btus per watthour.

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<sup>1</sup>At 39.1 degrees F.