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ENERGY SPECIALIST CURRICULUM

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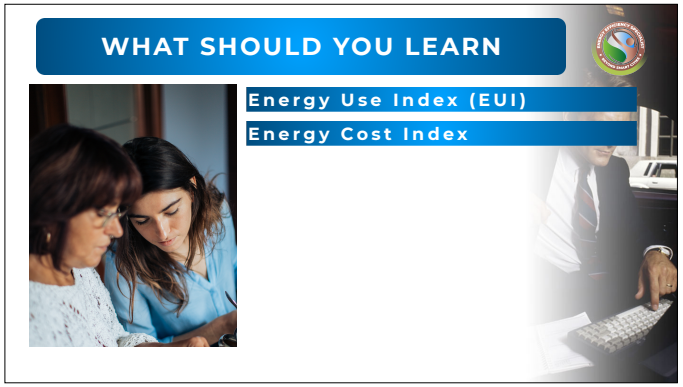
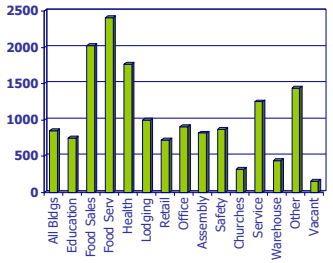

WHAT SHOULD YOU LEARN
Energy Use Index (EUI)
Energy Cost Index

ENERGY USE INDEX (EUI)

- ☑ Basic measure of a facility's energy performance
- ☑ A statement of the number of MJ of energy used annually per square metre of conditioned space
- ☑ To compute the EUI
  - ➡ Identify all the forms of energy used in the facility
  - ➡ Tabulate the total energy in MJ used in the facility
  - ➡ Determine the total number of square metres of conditioned space
- ☑ The Energy Use Index is the ratio of the total MJ used per year to the total number of square metres of conditioned space.
- ☑ A typical office building in the US has an EUI of around 900 MJ/ square metre/year.
- ☑ Food sales and food service facilities in the US have the highest average EUI's of over 2000 MJ/square metre/year. Health care facilities are next at about 1750 MJ/square metre/year.

ENERGY USE INDEX FOR COMMERCIAL BUILDINGS
MJ/SQ METRE/YR



EUI COMPUTATION EXAMPLE

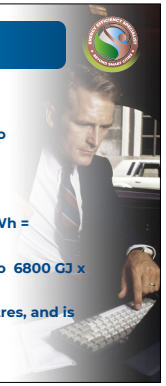
- ☑ An office building has 10,000 square metres of conditioned floor space and uses 2.0 million kWh and 6800 GJ of natural gas in one year.
- ☑ Convert the electric and gas use into MJ by finding the appropriate conversion factor.

Energy Conversion Unit Table

1 kWh	3.6 MJ
1 m^3 natural gas	37 MJ
1 kg #2 fuel oil	42 MJ
1 litre gasoline	35 MJ
1 m^3 #2 fuel oil	39 GJ
1 m^3 propane (LPG)	25.5 GJ
1 kg propane (LPG)	45.65 MJ
1 MJ	1000 kJ
1 GJ	10^6 kJ
1 MW	10^6 watts

EUI COMPUTATION EXAMPLE +

- One kWh electric energy is equal to MJ.
- Thus, 2.0 million kWh is equal to
- One GJ of natural gas is 1000 MJ, so 6800 GJ of gas is equal to
- The EUI is then MJ divided by square metres, and is equal to MJ/square metre/year
- One kWh electric energy is equal to 3.6 MJ.
- Thus, 2.0 million kWh is equal to 3.6 MJ/kWh x 2,000,000 kWh = 7,200,000 MJ
- One GJ of natural gas is 1000 MJ, so 6800 GJ of gas is equal to 6800 GJ x 1000 = 6,800,000 MJ
- The EUI is then 14,000,000 MJ divided by 10,000 square metres, and is equal to 1400 MJ/square metre/year



EUI COMPUTATION EXAMPLE +

This value of MJ/square metre/year is larger than the EUI for an average US building of 850 MJ/square metre/year, and also larger than the average EUI for a US office building of 905 MJ/square metre/year.

US National average information on the Energy Use Index for different types of commercial buildings is shown on the next slide.

CBECS EUI DATA - USA MJ/M2/YR

All Bldgs	850		
Education	750	Vacant	160
Food Sales	2020	Food Service	2410
Health Care	1765	Lodging	1000
Retail Stores	720	Office	905
Assembly	820	Safety	870
Churches	320	Service	1245
Warehouse	440	Other	1440

ENERGY COST INDEX

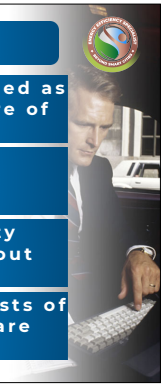
The EUI has some fairly obvious limitations.

Problem with mix of fuel and electricity

Looks only at site energy - not source energy

With site energy, 1 kWh is valued at 3.6 MJ, but back at the thermal power plant, it took around 11 -12 MJ of primary energy to produce the 3.6 MJ value of that 1 kWh

ENERGY COST INDEX +



The Energy Cost Index is sometimes used as a simpler and more meaningful measure of energy efficiency.

- ☑ The Energy Use Index is somewhat misleading since all MJ are not really equal.
- ☑ Electric energy is much higher quality energy than oil or gas, and it costs about three times as much per end use MJ.
- ☑ The Energy Cost Index adds up all costs of energy and divides result by total square metres of conditioned space.

ENERGY COST INDEX EXAMPLE

☑ For the 10,000 square metre office building looked at earlier, the cost of electricity is $153,200 per year, and the cost of gas is $52,500 per year.

The ECI is then $ divided by 10,000 square metres, for an ECI of $ /square metre/year.

☑ The ECI is easy to calculate, and is very useful.

☑ It is another simple benchmark that can be used.

ENERGY COST INDEX EXAMPLE

- For the 10,000 square metre office building looked at earlier, the cost of electricity is $153,200 per year, and the cost of gas is $52,500 per year.
The ECI is then $ 205,700 divided by 10,000 square metres, for an ECI of $ 20.57/square metre/year.

- The ECI is easy to calculate, and is very useful.
- It is another simple benchmark that can be used.