

REMA 2011 Member Services Conference

“Spurred by Savings”

Don't let your electricity bill weigh you down



Save energy, save money!

To reduce your electricity bills by a large margin, switch to compact fluorescent lamps. They last up to ten times longer and generate less heat loss. thereby, saving power for you.

Always look for the number of stars on the BEE label on appliances. Bring home only BEE certified electrical appliances. Rated according to the amount of electricity consumed by them, your savings increase with the number of stars on the label. To know more please log on to: www.bee-india.nic.in

BUREAU OF ENERGY EFFICIENCY
MINISTRY OF POWER, GOVERNMENT OF INDIA
4TH FLOOR, SEWA BHAWNA, KILPURAM, NEW DELHI - 110 066

Bachat Ke Sitarre Dost Hamare.

design: 241036/130000/00112

Experience. Delivery. Results.

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Energy Fundamentals

- ✦ Law of Conservation of Energy
 - Energy can neither be created nor destroyed: it can only be transformed from one state to another



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Energy Fundamentals

☀️ Common Building Fuel Types

- Electricity

- Lights
- Motors (Fans, Process)
- Air Conditioning
- Plug loads
- Heating
- Hot Water

- Natural Gas

- Heating
- Hot Water
- Process
- Back-up



Energy Fundamentals

☀️ Common Building Fuel Types

- Fuel Oil

- Heating
- Hot Water
- Process
- Back-up

- Liquid Propane Gas (LPG)

- Heating
- Hot water
- Natural gas/Oil back-up



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Energy Fundamentals

Common Units of Measurement

- Electricity

kilowatt (kW)= Power

kilowatt-hour(kWh) = Energy

- Fuel Oil

Gallon

- Natural Gas

Therm, cubic foot,
Dekatherm, MMBtu

- LPG

Gallon

Energy Fundamentals

- ! British Thermal Unit Defined:

- ! Common thermal unit in most building energy analyses

- ! *All energy types can be broken down into Btu's



- ! *1 Btu = Heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit*

Energy Fundamentals

Thermal Values

⌘ Natural Gas

- 1 Cubic Foot = 950 to 1150 Btu
- 1 CCF = 100 Cubic Feet
- 1 MCF = 1,000 Cubic Feet
- **1 Therm = 100,000 Btu**
- 1 CCF is approx 1 Therm

Fuel Oil

- Kerosene = 134,000 Btu/Gallon
- **Number 2 = 140,000 Btu/Gallon**
- Number 6 = 152,000 Btu/Gallon

⌘ Propane

- **LPG = 91,600 to 95,000 Btu/Gallon**

⌘ 1 BTU: Heat required to raise the temperature of 1 pound of water by 1 degree Fahrenheit

⌘ Electricity

- 1 kW = 1000 Watts
- **1 kWh = 3413 Btu**

⌘ Steam

- 10 PSIG = 1000 Btu/Lb.
- 100 PSIG = 1100 Btu/Lb.

⌘ Coal

- Lignite = 11,000 Btu/Lb.
- Bituminous = 14,000 Btu/Lb.
- Anthracite = 13,900 Btu/Lb.
- Sub-bituminous = 12,600 Btu/Lb.

⌘ Miscellaneous

- **Wood = 8,500 Btu/Lb**
- $U_{235} = 75,000,000$ Btu/gram

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Energy Fundamentals

$$\frac{Btu\#1Fuel}{Btu\#2Fuel} \times \frac{Eff.\#1System}{Eff.\#2System} \times Cost\#2Fuel = Comparable\#1FuelCost$$

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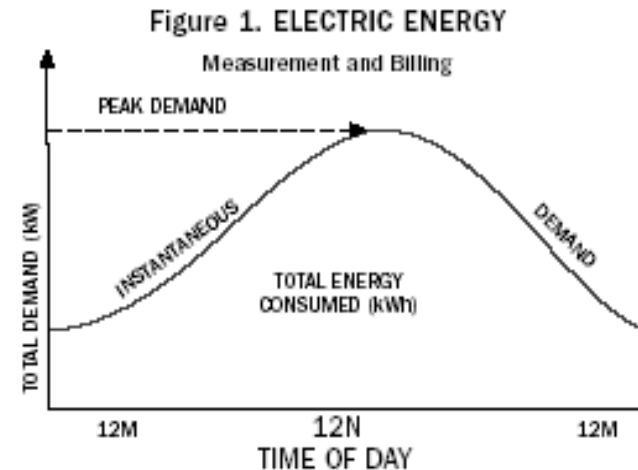
Energy Terminology

☀ Demand

- Instantaneous Energy Usage
 - Like horsepower of car

☀ Consumption

- Total Energy Usage over time
 - Like odometer on car



Energy Units

1 W – LED Flashlight



100 W – Incandescent
Light Bulb



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Energy Units

100 W – 400 W Human Power



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Energy Units

1,500 W = 1.5 kW
Electric Heater



4,000 W = 4 kW
Average House
(w/o electric heat)



Energy Units

100 kW – 5,000 kW Industrial Facility



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Energy Units

1,600 kW = 1.6 MW
Wind Turbine



88 Turbines = 145 MW



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Energy Units

545 MW – Port Washington Gas Fired
Power Plant



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Energy Units

50 Btu/hr– Candle Light
(Heater?)



7,000 Btu/hr – Stove Burner



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Energy Units

50,000 Btu/hr Water Heater
75,000 Btu/hr Furnace



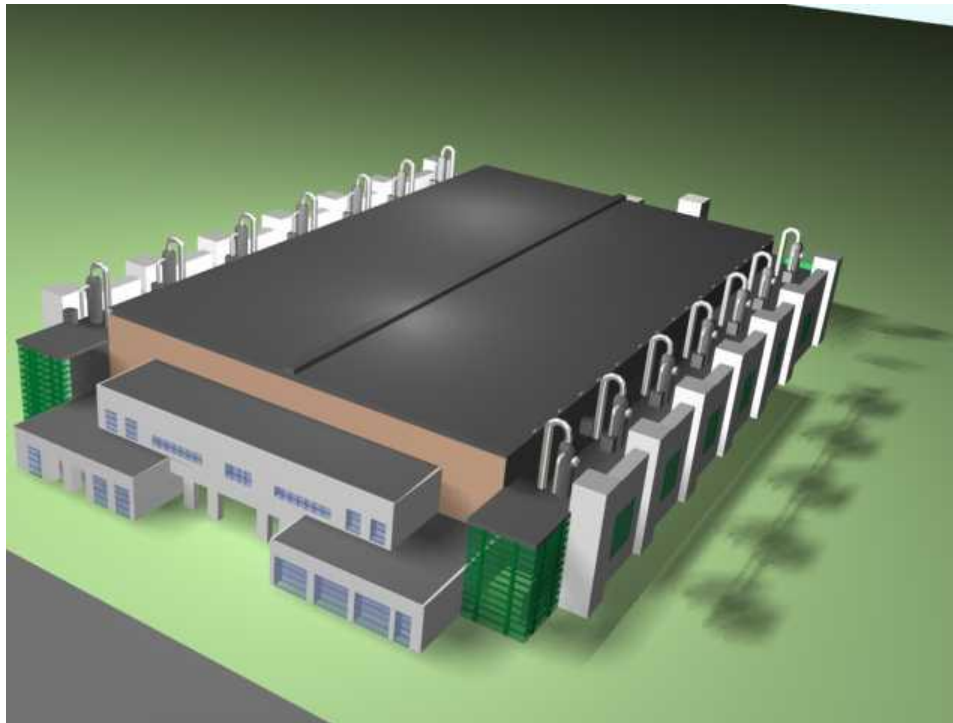
1,000 Therms/yr Average
Home



Experience. Delivery. Results.

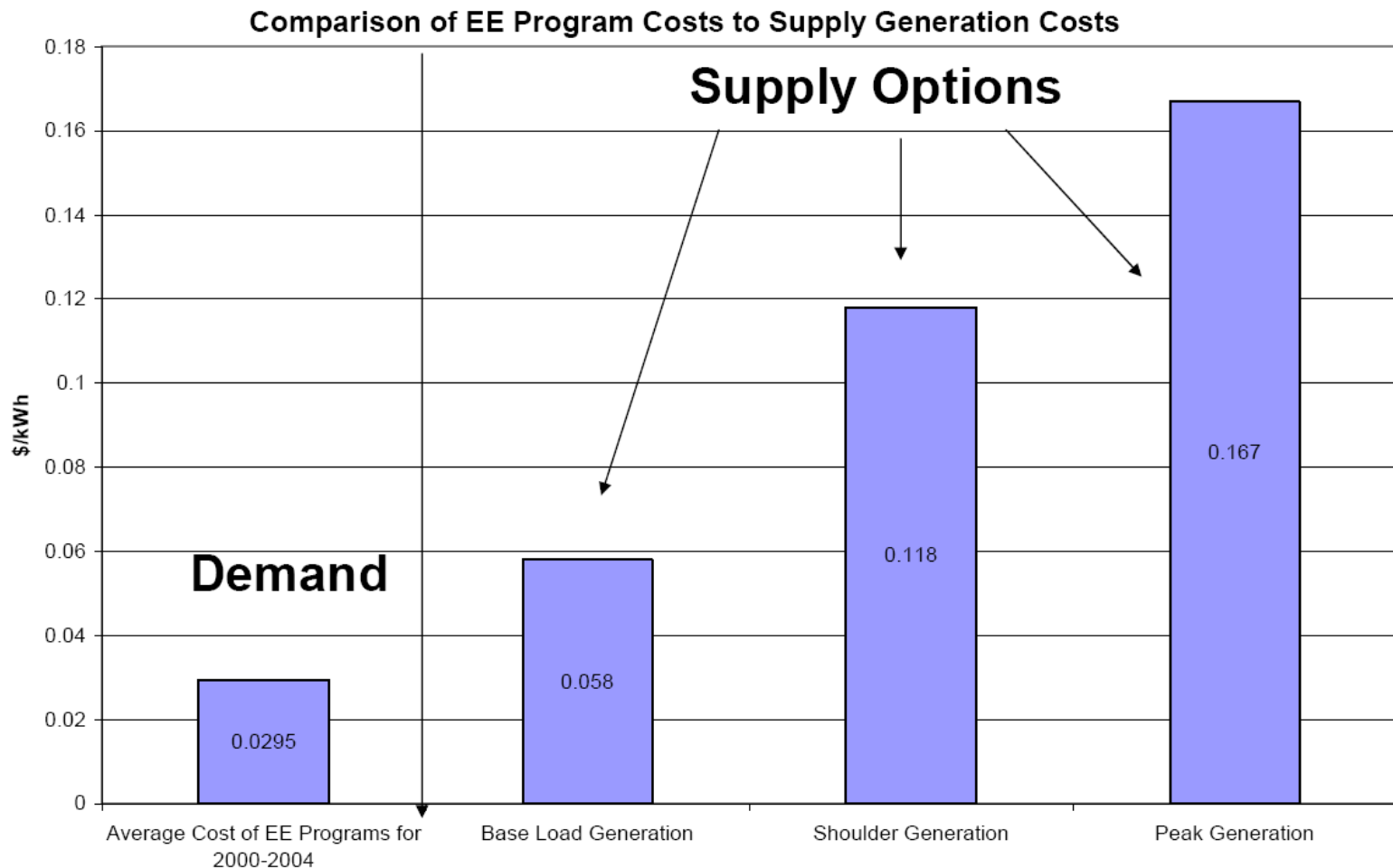
Energy Units

1,000,000 Therms Industrial Facility

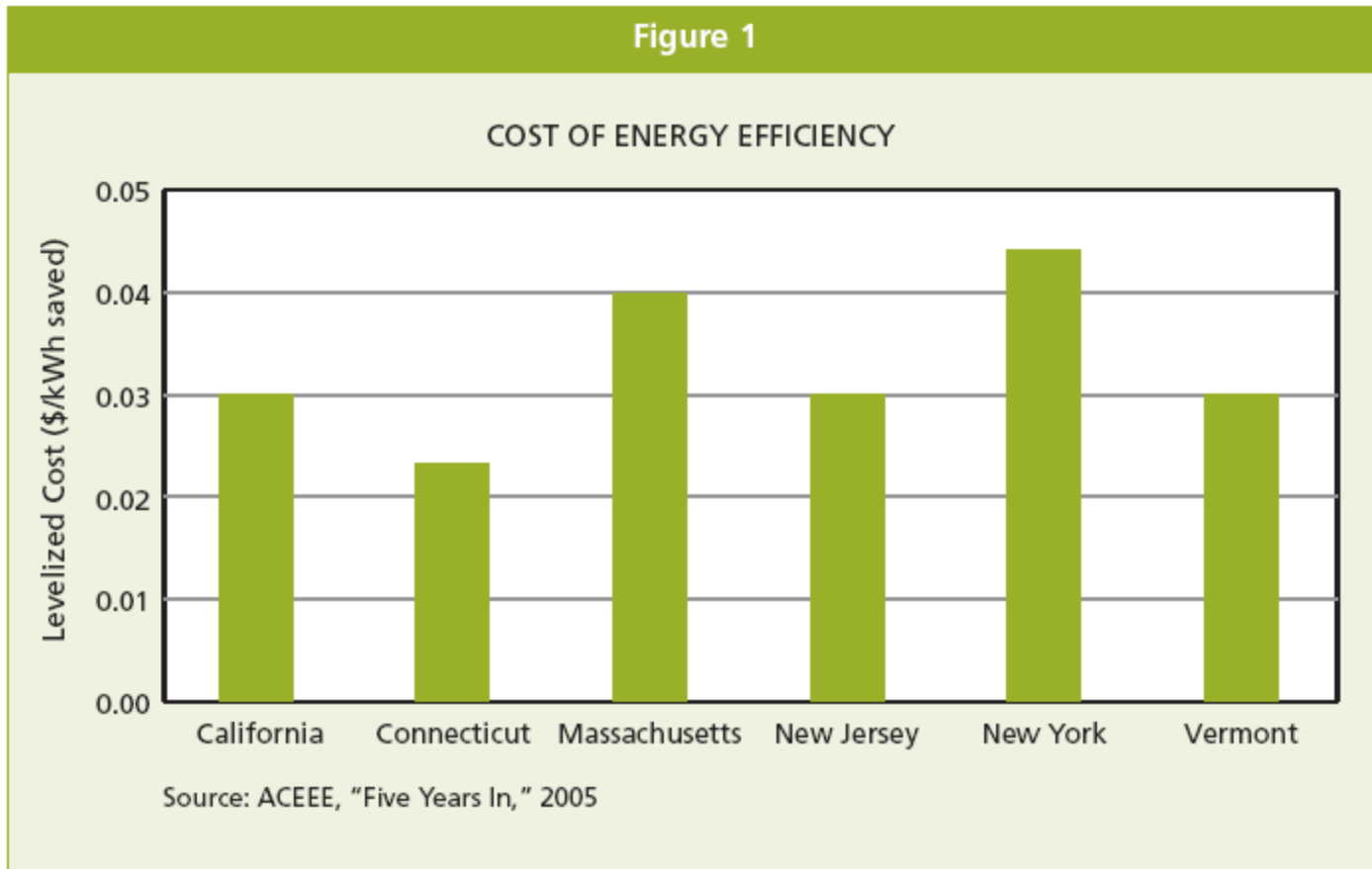


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Energy Cost Effectiveness



Energy Cost Effectiveness



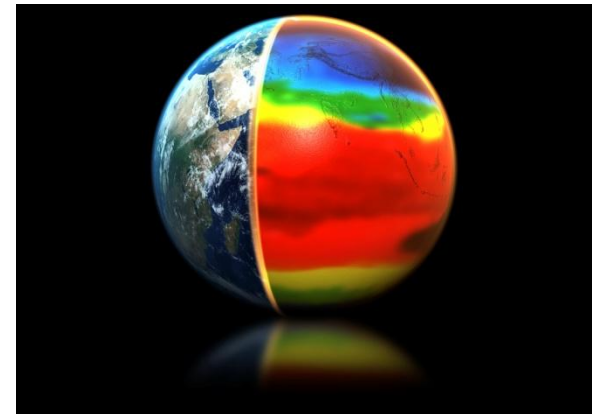
And now
the hard stuff ...



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Important Variables ...

- Weekend Average Temperature
- Operation Hours**
- Equipment Age vs. Leveling Systems
- Level of Effort vs. Reward**



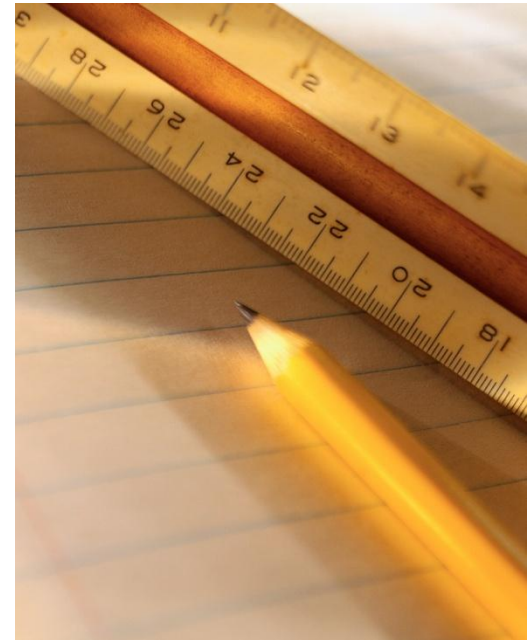
Energy Measurements ...

✦ kW x Hours = _____

✦ Btuh x Hours = _____

✦ Btu / 100,000 = _____

✦ Btu / 3,413 = _____



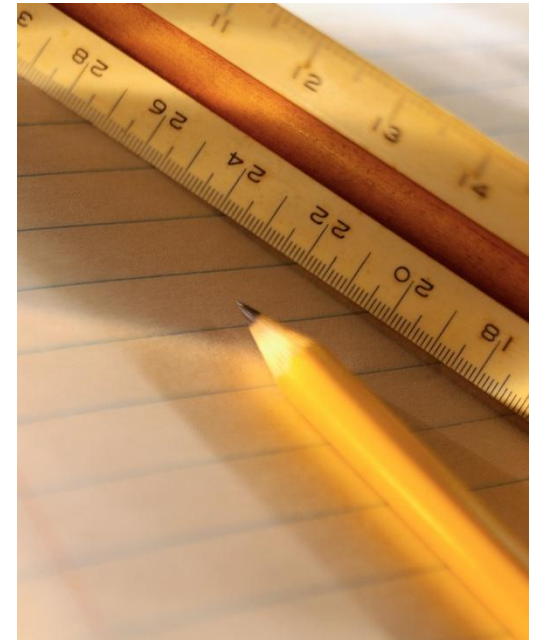
Energy Measurements ...

✦ kW x Hours = kWh

✦ Btuh x Hours = _____

✦ Btu / 100,000 = _____

✦ Btu / 3,413 = _____



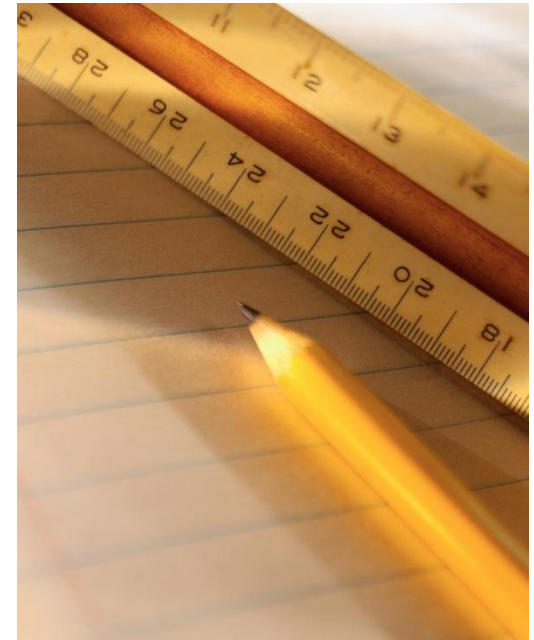
Energy Measurements ...

✦ kW x Hours = kWh

✦ Btuh x Hours = Btu

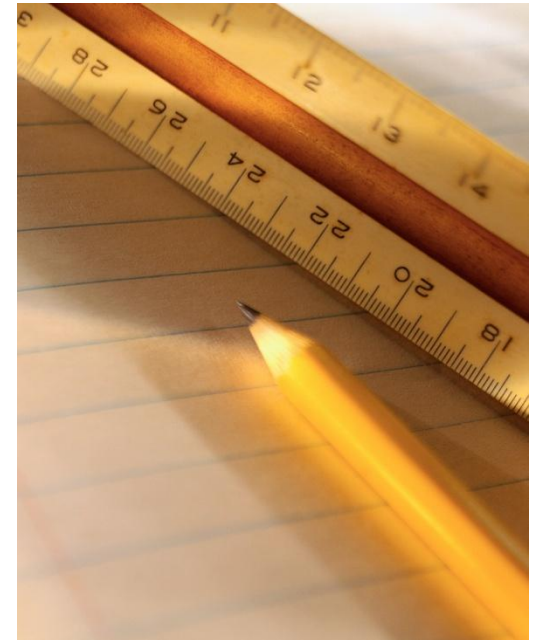
✦ Btu / 100,000 = _____

✦ Btu / 3,413 = _____



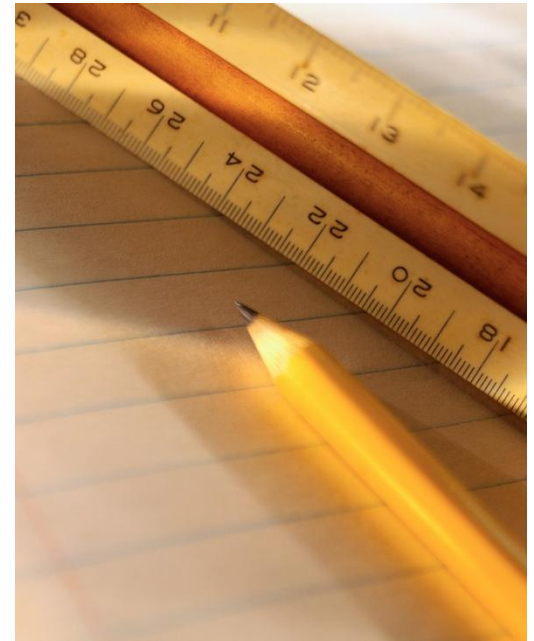
Energy Measurements ...

- ✦ kW x Hours = kWh
- ✦ Btuh x Hours = Btu
- ✦ Btu / 100,000 = therms
- ✦ Btu / 3,413 = _____



Energy Measurements ...

- ✦ kW x Hours = kWh
- ✦ Btuh x Hours = Btu
- ✦ Btu / 100,000 = therms
- ✦ Btu / 3,413 = kWh



Thank you

🌟 Chris Waltz

- Energy Advisor
- Phone 651-434-9282
- cwaltz@franklinenergy.com



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