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Fact Sheet

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Power and Energy Basics: Calculating Energy Use & Savings

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Introduction

Due to concerns over rising energy prices and the effects of global climate change, interest in energy efficiency is increasing. Even for those that rely on the technical expertise of others to improve energy efficiency, it can be helpful to understand some basic power and energy concepts. This document presents some examples that demonstrate simple electricity and natural gas calculations.

Electricity

Electrical energy use is usually measured in kilowatt-hours (kWh), and it is the mathematical product of electrical power and time. Electric appliances and devices are rated in terms of electrical power. Electrical power, or demand, is the rate of electrical energy consumption, and it is usually measured in kilowatts (kW) or watts (W). **1 kW = 1,000 W**.

In Illinois, the average annual cost of electricity typically varies from $0.06/kWh for larger users to $0.11/kWh for smaller users.

Example:

If a 100 Watt incandescent lamp operates constantly, how much electrical energy does it consume annually? How much does this cost if the average annual cost of electricity is $0.10/kWh?

100 W × 1 kW / 1,000 W = 0.1 kW
8,760 hours/year
0.1 kW × 8,760 hours/year = 876 kWh/year × $0.10/kWh = $87.60/year

This lamp consumes 876 kWh/year at cost of $87.60/year.

If this lamp can be replaced by a 26 Watt compact fluorescent lamp, and its annual operating hours can be reduced to 2,000 hours per year, how much energy and cost will be saved annually?

(100 W – 26 W) × 1 kW / 1,000 W = 0.074 kW reduction

8,760 hours/year – 2,000 hours/year = 6,760 fewer hours per year
0.074 kW × 6,760 hours/year = 500 kWh/year × $0.10/kWh = $50/year

Annual savings will be 500 kWh and $50.

Natural Gas

Natural gas energy use is usually measured in therms, though for larger users it is sometimes measured in MMBtu or dekatherms (dkt or dth). Natural gas-fired appliances and equipment are rated in terms of energy consumption rate, which is often measured in Btu/hour or MMBtu/hour. 1 therm = 100,000 Btu (approx); 1 dekatherm = 10 therms = 1,000,000 Btu (approx); 1 MMBtu = 1,000,000 Btu. In Illinois, the average annual cost of natural gas typically varies from $0.70/therm for larger users and $1.10/therm for smaller users.

Example:

If a stovetop burner rated at 7,000 Btu/hour operates for 3 hours/day and 5 days/week, how much natural gas does it consume annually? How much does this cost if the average annual cost of natural gas is $1.00/therm?

7,000 Btu/hour × 3 hours/day × 5 days/week × 52 weeks/year = 5,460,000 Btu/year
5,460,000 Btu/year × 1 therm / 100,000 Btu = 54.6 therms/year × $1.00/therm = $54.60/year.

This burner consumes 54.6 therms/year at a cost of $54.60/year.

If operations can be consolidated so that the same burner operates only 2 hours/day, how much energy and cost will be saved annually?

7,000 Btu/hour × (3 hours/day – 2 hours/day) × 5 days/week × 52 weeks/year = 1,820,000 Btu/year
1,820,000 Btu/year × 1 therm / 100,000 Btu = 18.2 therms/year × $1.00/therm = $18.2/year.

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