

Wind Generation Analysis

Introduction:

This lesson will provide students with the opportunity to learn about wind generation and to identify and apply wind data analysis.

Objectives:

- Interpreting data
- Data analysis
- Understand the concept of wind generation in the Midwest
- Identify daily and seasonal wind patterns

Before the Lesson:

To begin the lesson it would be helpful to have students read the information provided about wind generation in the Midwest ISO region. This information can be found at mmpa.org on the historical and current wind energy generation pages.

Household Electricity Consumption:

According to the U.S. Department of Energy, "On average, a typical household in the United States uses 920 kWh of electricity per month." This results in 11,040 kWh per year in electrical consumption.

When calculating the number of homes powered by wind energy generation use the following information:

Calculating kWh and MWh: $1,000 \text{ kWh} = 1 \text{ MWh}$

Example:

- * Wind energy generation: 100 MWh
- * $100 \text{ MWh} = 100,000 \text{ kWh}$ ($100 \times 1,000$)
- * The average home uses 920 kWh/Month (11,040 kWh/Year)
- * Therefore 108 homes could be powered during one month using the 100 MWh of wind energy generation or 9 homes could be powered for one year
($100,000 \text{ kWh} / 920 \text{ kWh} = 108 \text{ homes}$) or ($100,000 \text{ kWh} / 11,040 \text{ kWh} = 9 \text{ homes}$)

Lesson:

1. Go to mmpa.org
2. Use the historical and current wind energy generation pages to complete the lesson
3. Hand out "Energy Education for Students" Worksheet

Energy Education for Students

Wind Generation Worksheet

Historical Wind Energy Generation

(Use the [Click here](#) option for historical monthly wind energy generation over the last twelve months in the Midwest ISO region to complete the following)

1. Which month produced the highest output?
2. How many homes were powered during the month with the highest output?
3. Which month produced the lowest output?
4. What time of year produces the highest output levels: Spring, Summer, Fall or Winter?
5. Using an estimate of 15,000,000 MWh, how many homes were powered in 2009?
5. Describe any wind energy output patterns that occur throughout the year.

Current Wind Energy Generation

(Use the Midwest ISO wind generation graph for the last 24 hours to complete the following)

1. Over the past 24 hours what was the highest output (MWh)?
2. What time of day did the highest output occur?
3. What was the lowest output (MWh) over the past 24 hours?
4. What time of day did the lowest output occur?
5. What time of day is the windiest (morning/afternoon/night)?
6. Describe any wind energy output patterns that occur throughout the day.