

**Summary:** Students sequence career titles of those responsible for siting, installing, and maintaining a wind farm.

# Catch That Wind



**Grade Level:** 5–8 (9–12)

## Subject Areas:

Environmental Education, Family and Consumer Science, Science, Technology Education

**Setting:** Classroom

## Time:

**Preparation:** 50 minutes

**Activity:** 50 minutes

**Vocabulary:** See the *Wind Farm Career Cards* for titles and definitions of careers used in this activity.

## Major Concept Areas:

Theme II

- Development of energy resources
- Development of renewable energy resources
  - Wind energy

Theme III

- Quality of life
  - Economic

## Standards Addressed:

Wisconsin Model Academic:

EE: B.12.9, B.12.21

FCS: A.1, C.3

SC: A.12.5, G.12.1, G.12.3, G.12.4, H.12.1, H.12.5

TE: A.12.2, A.12.3, A.12.5, A.12.6, B.12.1, B.12.2, B.12.3, B.12.4, C.12.8, D.12.3, D.12.4, D.12.5

## Objectives

Students will be able to

- organize career titles of people involved in constructing, siting, planning, and maintaining a wind farm;
- describe careers involved in getting electricity from a wind farm; and
- explain that the energy resources they use are made available by the work of many people.

## Rationale

Renewable energy technology development presents future career options for students.

## Materials

- Photographs of wind farms
- A set of *Wind Farm Career Cards* for each group of students.

## Getting Ready

Print photos of wind farms. Copy and cut out the *Wind Farm Career Cards* (laminates them for durability; optional).

## Background

Many occupations, businesses, and public services (such as utilities) result from the development and use of renewable energy resources. From sizing a wind system to performing routine maintenance, it takes skilled people to support renewable energy systems. There are many dealers, manufacturers, auditors, and maintenance people involved.

In general, there are four main areas of careers involved in renewable energy. These include jobs related to system design and manufacturing, siting the location of the system, installing the system, and finally, operating and maintaining the system. The kinds of jobs will vary, depending on the type of energy being used (solar, wind, biomass, etc.) and on the size of the system. A renewable energy consultant will cover many of the jobs, including auditing, siting, and installing. With large scale systems, such as a wind farm owned by

a utility, many professions are involved in making sure the operation runs smoothly. Alternatively, if a home or small business is buying a small system, the owner might count on a consultant in some ways but might also do much of his or her own installation and maintenance. See the *Wind Farm Career Cards* for a listing of the various professions and their roles in siting a wind farm.

## Procedure

### Orientation

Ask students if they have ever seen a wind farm. Show students a picture of a wind farm in Wisconsin. What do they think is involved in setting up a wind farm?

### Steps

1. Show students the *Wind Farm Career Cards* and review the terms to assure student comprehension. Explain that each card contains a career title and description of a job pertaining to constructing, siting, planning, or maintaining a wind farm. Tell students their challenge will be to put the cards in the proper sequence.
2. Divide the class into small groups and give each group a shuffled set of *Wind Farm Career Cards*. Group members can be responsible for certain duties such as the Reader, Discussion Leader, Recorder, and Reporter.
3. Ask each group to arrange the cards in what they think is the best order. Warn students that there are duplicates of some cards because similar jobs are involved at different steps of the production process. If students need more help, provide them with the main titles for each step (System Design and Manufacturing, Siting, Installation, etc.). The most important objective is for students to place the careers under the correct step; the order of careers under each step is not as crucial. Ask each group

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to explain the career pathways and relationships they have devised. Have groups compare their arrangements.

4. Present students with the order given on the **Answer Key**. Ask students to evaluate their own sequencing, making sure the career titles are under the correct step. Make sure students understand that these tasks are not necessarily sequential. Activities of some workers occur simultaneously or may overlap.

### Closure

Have students summarize the steps and careers involved in creating a wind farm. Ask them to think of end uses of other energy resources (e.g., electricity, heating, food production) and contemplate the many careers involved in making this energy available.

### Assessment

#### Formative

- Did students accurately organize career titles?
- Are students able to describe the steps of producing electricity from a wind farm?
- Can students identify the many career professionals needed in the development of an energy resource?

#### Summative

Have students draw a diagram of the steps it takes to create a wind farm. Include drawings of people from different professions working in appropriate settings with appropriate equipment.

### Extension

Assign student groups to research how other energy resources are developed. Have them make cards for each of these career titles and challenge other groups to correctly sequence the cards. Finally, they can compare the complexity of developing various energy resources (e.g., renewable vs. nonrenewable).

### Final Connection

Use this activity to provide a basis for thinking about careers related to renewable energy. Then, challenge students to incorporate what they have learned in a cumulative project, such as “Sustainable Communities” or “Green Home Design.”

### Credits

Wind Farm Career Cards developed by Mick Sagrillo, Sagrillo Power & Light.





# Wind Farm Career Cards

## Wind turbine design engineer

A scientist/mathematician who calculates the loads and forces on a theoretical wind turbine and tower. Works with mechanical, electrical, and electronic components.



## Computer Assisted Drawing (CAD) designer

Draws blueprints for the fabrication of various components for the wind turbine.



## Computer technician \*

Monitors the turbines' components through the computer. Identifies problems and informs the windsmith about necessary repairs.



## Welder

Uses blueprints to fabricate the mainframe that manufactured components attach to.



## Land agent

Negotiates contracts with local landowners for the siting of wind turbines.



## Wind prospector

Determines areas with the best wind resources and monitors wind speeds.



## Crane operator

Operates crane to assemble tower and wind turbine pieces.



## Surveyor

Stakes out locations for turbines on a piece of ground.



## Draftsman

Reads and makes changes to blueprints.



## Fiberglass technician

Fabricates the blades.



## Geologist/Soil technician

Determines depth of bedrock. Identifies soil type so that an appropriate foundation can be designed.



## Hydraulics technician

Installs hydraulic brake controls on the wind generator.



## Machinist

Uses blueprints to fabricate various components for the wind turbine.



## Wind farm designer

Determines best locations within a good wind resource area to site turbines.



## Computer programmer

Programs the control monitoring equipment for the wind turbine.





# Wind Farm Career Cards

## Foundation engineer

Designs appropriate foundation for the site's soil and bedrock.



## Excavator

Uses backhoe and blasting or drilling equipment to dig the appropriate hole for the foundation.



## Concrete contractor

Sets forms for the concrete foundation. Pours concrete. Tests concrete to determine if it has cured properly.



## Data recorder

Computer technician that collects and interprets wind speed and wind turbine output data and makes reports about how much electricity the wind system is generating.



## Electrician\*

Connects the wind turbine's electrical wiring to the tower wiring, then to the transformer that belongs to the electrical utility.



## Telephone technician

Wires the turbine and tower with phone cables to connect the wind turbine computer to the main control room computer.



## Assembly technician

With the help of the crane, assembles the tower and wind turbine.



## Computer technician +

Programs the turbine's computer and tests system monitors.



## Electrical engineer

Installs various electronic monitoring and control systems in the wind turbine.



## Electrician +

Wires the generator to various electrical controls.



## Testing technician

Tests the final turbine assembly.



## Commissioning engineer

Checks over all of the tower including blades, electrical, and computer components to make sure they are all operating properly before the wind turbine can be activated.



## Windsmith

Performs necessary maintenance and required repairs on the turbines. These include mechanical, welding, electrical, and hydraulic repairs.





# Answer Key: Steps in Developing a Wind Farm: Wind Farm Career Cards

## Step 1: System Design and Manufacturing

1. Wind turbine design engineer
2. Computer assisted drawing (CAD) designer
3. Draftsman
4. Machinist
5. Welder
6. Electrician +
7. Hydraulics technician
8. Electrical engineer
9. Fiberglass technician
10. Computer programmer
11. Testing technician

## Step 3: Installation

1. Surveyor
2. Geologist/Soil Technician
3. Foundation engineer
4. Excavator
5. Concrete contractor
6. Crane operator
7. Assembly technician
8. Electrician \*
9. Telephone technician
10. Computer technician +
11. Commissioning engineer

## Step 2: Siting

1. Wind prospector
2. Land agent
3. Wind farm designer

## Step 4: Operation and Maintenance

1. Windsmith
2. Computer technician \*
3. Data recorder

NOTE: Since the same laborer is used to do various tasks, a + or \* is used to identify which skills are needed in each step when the same career is listed more than once.

