

Why Would You Put a Wind Turbine There?

By Dawn Kahler-MiTEP lesson plan, summer 2012

Introduction:

Michigan ranks 14th in the United States for its potential for wind energy. This resource is largely under used in the state compared with other states. This lesson exposes students to the potential for wind energy in their state and allows them to use their knowledge of wind to decide where they would place offshore turbines.

Grade Level:

7th – 8th grade

Objectives:

- 1) The learner will read about how wind is created.
- 2) The learner will write about how a model of wind works.
- 3) The learner will look at a map of Michigan and decide where offshore wind turbines would be the most effective.

MI 7th Grade Level Content Expectations met or partially met:

- **E.ES.07.11** Demonstrate, using a model or drawing, the relationship between the warming by the sun of the Earth and the water cycle as it applies to the atmosphere (evaporation, water vapor, warm air rising, cooling, condensation, clouds).
- **E.ES.07.12** Describe the relationship between the warming of the atmosphere of the Earth by the sun and convection within the atmosphere and oceans.
- **E.ES.07.13** Describe how the warming of the Earth by the sun produces winds and ocean currents.

Big Idea:

Big Idea #7: Humans depend on Earth for resources.

Engage- *What did we learn about solar panels and wind turbines in yesterday's lab? (~5 minutes)*

Review yesterday's inquiry lab exploring with solar panels and wind turbines. (*Show photos of yesterday's lab if available.*) In teams, students will use Rally Table to share on thing that they noticed about each item with the group. Each table will share out their team's learning with the class.

Today we will focus on wind turbines.

Explore 1-*How is wind created? (~20 minutes)*

Ask students how they believe wind is created. Write all their ideas on the board. Show students a model that demonstrates movement of air. (Model: 10 gallon tank, bottom filled with sand, bowl with ice and cold water on one side of the tank, thermometer in the sand and the ice water, matches, incense, cling wrap covering the tank and sealed with clear tape, a 100 watt lamp and black paper covering the back side of the tank. Cut a circle in the cling wrap that is directly over the sand. Put the lamp so it sets on the cling wrap without the light bulb touching the cling wrap, yet in the opening in the cling wrap. Turn the lamp on. Then light the incense stick and poke it through the cling wrap. Students should start to note that the smoke begins to move by dropping down over the cooler water and then it travels along the sand and then rises up toward the cling wrap and travels again toward the water where it cools and drops again.) Have students draw the model and label the parts. Have students come up to the model and using a white board marker, they can draw the pattern of the air movement in the model. This should also be on their drawing of the model. Students should begin to notice that the air rises over the warm sand and then drops over the cooler water. Then the cooler air moves in to the area where the warmer air rose. The cooler air

warms and then rises. (Convection which has already been discussed in the year.). This model is to represent how wind is made.

Have students read,

<http://www.physicalgeography.net/fundamentals/7n.html>, on how wind is created. Students should write about how wind is created on their model worksheet and relate it to their model sketch.

Explore 2- *Where does this mean Michigan should put wind turbines? (~10 minutes)*

Look at a map of Michigan. Have students brainstorm with their corner partner “Where on the map, Michigan might get the most wind?” Have tables share their ideas.

Give students maps of Michigan that shows the offshore windspeeds.

http://www.windpoweringamerica.gov/pdfs/wind_maps/mi_90m_offshore.pdf

Have students locate on their map three locations where they would recommend for Michigan citizens to put offshore wind farms. They should mark these with stars.

Evaluate- On the back side of the map, students should complete a Collins Type 3 writing which answers, *“Tell Michigan residents why the location of the wind turbines is important and how the wind is created in these areas.”*

Resources:

Physical Geography website. Forces Acting to Create Wind. Accessed 8-1-12. Available online at <http://www.physicalgeography.net/fundamentals/7n.html>.

U.S. Department of Energy website. Wind Powering America: Michigan Offshore 90-Meter Wind Map and Wind Resource Potential. Accessed 8-1-12. Available online at http://www.windpoweringamerica.gov/windmaps/offshore_states.asp?stateab=mi. Map: http://www.windpoweringamerica.gov/pdfs/wind_maps/mi_90m_offshore.pdf

Additional Resources:

U.S. Department of Energy website. Wind Power Animation. Accessed 8-1-12. Available online at http://www.energysavers.gov/your_home/electricity/index.cfm/mytopic=10501.

Wind Power Services website. Michigan Wind Energy. Accessed 8-1-12. Available online at <http://windpowerservicesllc.com/michiganwind.html>

