

Expert Pack: WIND ENERGY

Submitted by: Milwaukee Public Schools

Grade: Grades 4-5

Date: March 2015

Topic/Subject
What can we learn about wind energy?
Texts/Resources
Book(s) <ol style="list-style-type: none">1. The Boy Who Harnessed the Wind2. Energy Island
Article(s) <ol style="list-style-type: none">3. "Wind Power" - Reading A to Z4. "Wind Power" - Read Works5. Teaching Engineering-Pinwheel Activity
Infographic(s) <ol style="list-style-type: none">6. How a Wind Turbine System Works7. How Loud is a Wind Turbine?8. The Beaufort Scale [chart]9. Countries that Generate the Most Electricity from Renewable Resources
Other Media <ol style="list-style-type: none">10. Where Does Wind Come From?11. The Wind Power Game Show12. Wind Energy 101 - Wind Turbines13. Wind Turbine: How Does It Work?
Each expert pack contains a variety of selections grouped to create as coherent and gradual a learning process for students as possible, generally beginning with lower levels as measured by quantitative and qualitative measures, and moving to more complex levels in the latter selections. This graded approach helps support students' ability to read the next selection and to become 'experts' on the topic they are reading about. <i>Refer to annotated bibliography on the following pages for the suggested sequence of readings.</i>
Rationale and suggested sequence for reading: <p>The read aloud narrative <u>The Boy Who Harnessed the Wind</u>, introduces students to the positive impact wind energy can have on the world. The second resource "Wind Power" offers them an overview about wind energy. In order to understand the process, "Where Does the Wind Come From" explicitly illustrates how wind is created. Then, the "Beaufort Scale Chart" gives students a common language for describing the strength of wind. Now, students are ready to explore ways to capture the wind with directions to build & test their own pinwheels from <u>Teaching Engineering.org</u>. To continue building vocabulary and knowledge, students read "The History of Wind Energy" and learn how windmills developed into today's turbines. The next four, overlapping resources (one article, one video, one animated website, and one info graphic) explain how turbines harness wind and generate electricity. Students are ready to assess their level of expertise by visiting an interactive website that tests their knowledge of wind energy. Moving beyond the United States, students broaden their understanding of where wind is harnessed in the world, by reading the story <u>Energy Island</u>. The study concludes by returning students to the last pages of <u>The Boy Who Harnessed the Wind</u> to learn more about pioneers, like William Kamkwamba, who are developing wind energy projects in their communities today. Extra resources are provided for continued exploration.</p>
The Common Core Shifts for ELA/Literacy: <ol style="list-style-type: none">1. Regular practice with complex text and its academic language2. Reading, writing and speaking grounded in evidence from text, both literary and informational3. <i>Building knowledge through content-rich nonfiction</i>
Though use of these expert packs will enhance student proficiency with most or all of the Common Core Standards, they focus primarily on Shift 3, and the highlighted portions of the standards below.

College and Career Readiness Anchor Standards for Reading Literary and/or Informational Texts (*the darkened sections of the standards are the focus of the Expert Pack learning for students*):

1. **Read closely to determine what the text says explicitly and to make logical inferences from it;** cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. **Determine central ideas or themes of a text and analyze their development;** summarize the key supporting details and ideas.
10. **Read and comprehend complex literary and informational texts independently and proficiently**

Content Standard(s): NGSS

4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, wind, and electric currents.

Annotated Bibliography

and suggested sequence for reading

[620] The Boy Who Harnessed the Wind

Author: William Kamkwamba and Bryan Mealer

Genre: Autobiographical Non-fiction -Picture Book

Length: 32 pages

Synopsis: When fourteen-year-old William Kamkwamba's Malawi village was hit by a drought, everyone's crops began to fail. Without enough money for food, let alone school, William spent his days in the library . . . and figured out how to bring electricity to his village. Persevering against the odds, William built a functioning windmill out of junkyard scraps, and thus became the local hero who harnessed the wind.

Citation: Kamkwamba, W. (2012). *The Boy Who Harnessed the Wind* (p. 32). Dial Books for Young Readers.

Cost/Access: \$15.00

Recommended Student Activities: Teacher Read Aloud and Wonderings

[690] Wind Power

Author: Reading A to Z

Genre: Non-fiction, Informational Text- article

Length: 2 pages

Synopsis: This nonfiction article explains wind is a source of renewable energy that has been harnessed for decades. It introduces students to wind turbines, wind farms, and their capacity to generate electricity.

Citation: Wind Power. (n.d.). Retrieved January 2, 2015, from <http://www.readinga-z.com/search/#doSearch=Search&searchTerms=wind+energy&searchView=list>

Cost/Access: Cost associated with a subscription

Recommended Student Activities: Quiz Maker

[N/A] Where Does the Wind Come From?

Author: Florida Power and Light

Genre: Informational, animated website

Length: 1 page

Synopsis: This animated website animates how wind is caused by the uneven heating of the earth's surface by the sun. During the day the air above the land heats up faster than the air above water like oceans and lakes. The air above the water is cooler and heavier.

Citation: (n.d.). Retrieved January 2, 2015, from <http://www.fplsafetyworld.com/?ver=kkblue&utilid=fplforkids&id=16208>

Cost/Access: \$0.00

Recommended Student Activities: Pop Quiz

[N/A] The Beaufort Scale Chart

Author: Francis Beaufort

Genre: Informational Chart

Length: 1 page

Synopsis: This chart progressively rates the strength of the wind in miles per hour and its visible effects.

Citation: How Strong is the Wind. (n.d.). Retrieved January 2, 2015, from <http://enconv.org/docs/index-35759.html>

Cost/Access: \$0.00

Recommended Student Activities: Included in the Pop Quiz activity with Where Does the Wind Come From?

[N/A] Interactive Pinwheel Activity

Author: TeachEngineering.org

Genre: Expository Directions and Interactive Activity

Length: 3 pages

Synopsis: Students learn about wind energy by making a pinwheel to model a wind turbine. Just like engineers, they decide where and how their turbine works best by testing it in different areas of the playground.

Citation: Wind Energy- Pinwheel Activity. (n.d.). Retrieved February 6, 2015, from https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_earth/cub_earth_lesson04_activity2.xml.

Cost/Access: free online resource

Recommended Student Activities: Accompanying Pinwheel Experiment Recording Sheet

[680L] Wind Power

Author: Rachel Kreisman- ReadWorks.org

Genre: Informational Text- article

Length: 1 page

Synopsis: This passage explains how windmills were used to create power, and how turbines are able to harness greater quantities of wind power. It is an introduction to wind turbines and wind farms.

Citation: Kreisman, R. (2015, January 3). Wind Power.

Cost/Access: \$0.00

Recommended Student Activities: Sensational Six

[NA] Wind Energy 101: Wind Turbines

Author: US Department of Energy

Genre: Informational Video with

Length: 2:16 minutes

Synopsis: This introduction to the parts of a turbine and how it works can be used after the concepts presented in the article "Wind Power," and before the video "*How a Wind Turbine System Works*" and the info graph *How Loud are Wind Turbines?*

Citation: (n.d.). Retrieved January 3, 2015, from <http://thekidshouldseethis.com/post/27523788908>

Cost/Access: \$0.00

Recommended Student Activities: Sensational Six

[N/A] How a Wind Turbine System Works

Author: Hawkeye's Evergreen Program

Genre: Info graphic

Length: 1 page

Synopsis: This drawing depicts the basic elements of a wind turbine generating system interconnected to a utility's electric grid.

Citation: Renewable Energy. (n.d.). Retrieved January 3, 2015, from http://www.hawkeyerec.com/downloads/Wind_Turbine_System_Works.pdf

Cost/Access: \$0.00

Recommended Student Activities: Sensational Six

[N/A] Wind Turbine: How Does it Work?

Author: Alstom

Genre: Informational Text - captioned video

Length: 2:58 minutes

Synopsis: This captioned video advances student's knowledge. After reading the article "Wind Power" and viewing the video "Wind Energy 101: Wind Turbines," this video not only reviews the main components of the wind turbine, but also explains how it generates electricity by converting the kinetic energy of the wind into electrical energy. It also compares the distinctive features of onshore and offshore wind turbines.

Citation: Alstom. (2013, August 13). Wind turbine: How does it work? Retrieved January 5, 2015, from https://www.youtube.com/watch?v=YCpGQ_aMb7I

Cost/Access: \$0.00

Recommended Student Activities: Sensational Six

[N/A] How loud is a Wind Turbine?

Author: General Electric

Genre: Info graphic

Length: 1 page

Synopsis: The info graphic compares the decibels generated by a wind turbine to everyday machines (lawnmower) helping students understand more about wind farms and turbines.

Citation: How Loud is a Wind Turbine? (n.d.). Retrieved January 3, 2015, from <http://files.gereports.com/wp-content/uploads/2010/11/larg-wind-turbine.jpg>

Cost/Access: \$0.00

Recommended Student Activities: Sensational Six

[N/A] The Wind Power Series

Author: The Low Carbon Partnership: Our Planet Series

Genre: Interactive Game Show Video site

Length: TBD by each player

Synopsis: Students visit this interactive website and are able to apply their knowledge on wind energy to categories of wind energy questions. It also includes linked videos and cartoon. It is included to help students master the information learned before proceeding on.

Citation: <http://www.ourplanet.org.uk/how-wind-is-formed.asp>

Cost/Access: \$0.00

Recommended Student Activities: Website is interactive.

[920L] Energy Island How One Community Harnessed the Wind and Changed the World

Author: Allan Drummond

Genre: Literary Fiction - Picture Book

Length: 32 pages

Synopsis: A narrative tale and a science book, this inspiring true story proves that with a little hard work and a big idea, anyone can make a huge step toward energy conservation.

Citation: Drummond, A. (2011). *Energy Island How One Community Harnessed the Wind and Changed the World* (1st ed.). New York: Foster Francis Books.

Cost/Access: \$7.25 - paperback or \$17.99 Hardcover

Recommended Activity - Picture of Knowledge

[N/A] Countries that Generate the Most Electricity from Renewable Resources

Author: US Energy Information Administration

Genre: Info graphic

Length: 1 page

Synopsis: This info graphic gives students a pictorial representation of which countries in our world are producing electricity using wind energy, and other renewable resources.

Citation: Khosla, S. (2014, June 14). Retrieved January 3, 2015, from <http://www.globalpost.com/dispatch/news/business/energy/140620/top-10-renewable-electricity-generation-countries-chart>

Cost/Access: \$0.00

Recommended Student Activities: Could be added after reading [Energy Island](#) to answer student's questions

[621.4] The Boy Who Harnessed the Wind - Last two pages of the book

Author: William Kamkwamba and Bryan Mealer

Genre: Autobiographical Non-fiction -Picture Book

Length: 2 pages

Synopsis: The last two pages of the book are an informational biography about William Kamkwamba and include details on how he build his first turbine and describes his current work with wind energy today.

Citation: Kamkwamba, W. (2012). *The Boy Who Harnessed the Wind* (p. 32). Dial Books for Young Readers.

Cost/Access: \$15.00

Recommended Student Activities: See Expert Packet for a Close Read on The Boy Who Harnessed The Wind

Additional/Optional Resources

[N/A] The Pros and Cons of Wind Energy]

Author: Ujwal Deshmukh

Genre: Informational Text - Article and Online article - *with accompany audio feed*- PUSH "Listen"

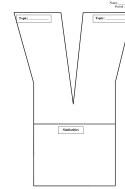
Length: 2 pages

Synopsis: This passage offers the pros and cons of wind energy in simple, student friendly language and offers an accompany anchor chart.

Citation: Deshmukh, U. (2013, May 15). Wind Energy Pros and Cons. Retrieved January 3, 2015, from <http://www.buzzle.com/articles/wind-energy-pros-and-cons.html>

Cost/Access: \$0.00

Recommended Student Activities: Y chart = pros/cons/ what do you think?



[NA] Wind Power Career Chat

Author: U.S. Department of Energy

Genre: Text - Online Article=student can select a career and read the interview

Length: 1-2 pages per career interview

Synopsis: This passage offers the pros and cons of wind energy in simple, student friendly language and offers an accompany anchor chart.

Citation: (2011, January 1). Retrieved January 3, 2015, from http://apps2.eere.energy.gov/wind/windexchange/pdfs/wpa/2011/wind_power_career_chat.pdf

Cost/Access: \$0.00

Recommended Student Activities: Picture of Knowledge

[N/A] Energy Play: Harry Spotter and the Chamber of Windy Myths

Author: Amy Constant and NEED Teachers with support from Energy Information Administration

Genre: Reader's Theater

Length: 4 pages

Synopsis: This reader's theater could be used in conjunction with the "pros and cons" article. The spoof on Harry Potter debates where the best place to locate a wind turbine would be, with a little magic, and addresses many of the same advantages and disadvantages mentioned in the article.

Citation: Constant & NEED teachers, A. (n.d.). Energy Play: Harry Spotter and the Chamber of Windy Myths. Retrieved January 3, 2015, from <http://www.eia.gov/kids/resources/teachers/pdfs/HarrySpotterPlay.pdf>

Cost/Access: \$0.00

Recommended Student Activities: For fun with classmates

[N/A] WindShip: Return of the Age of Sail

Author: GAS2

Genre: Informational Video

Length: 4:12 minutes

Synopsis: This additional resource offers a glimpse into wind energy of the future.

Citation: WindShip: Return of the Age of Sail. (2013, September 20). Retrieved January 3, 2015, from (n.d.). Retrieved January 3, 2015, from <http://thekidshouldseethis.com/post/>

Cost/Access: \$0.00

Recommended Student Activities: Rolling Journal

[N/A] Wind Tree Uses Micro-turbine Leaves to Generate Electricity

Author: Suzannah Butcher

Genre: Informational Video

Length: 1:14 minutes

Synopsis: A French start-up says its Wind Tree is ideal for urban environments, harnessing the most gentle of winds to produce power through its micro-turbine leaves. Suzannah Butcher reports.

Citation: Wind Tree uses micro-turbine leaves to generate electricity. (2014, December 29). Retrieved January 3, 2015, from Wind Tree uses micro-turbine leaves to generate electricity . Reuters Plus Reuters Plus

Cost/Access: \$0.00

Recommended Student Activities: Rolling Journal

Petersen, C. (2004). *A True Book WIND POWER*. New York: Children's Press: Scholastic. **Lexile 680**

This book describes how wind occurs in nature and how it can be used to produce electricity, both now, and in the future

Benduhm, T. (2009). *Energy for Today Wind Power*. New York: Weekly Reader. **Lexile 651-690**

Identifies renewable and nonrenewable sources of energy, focusing on wind power, explaining what it is, how it works, and its role in meeting the energy needs of the future. Also Available In Spanish

Sherman, J. (2004). *Fact Finder: Wind Power*. New York: Capstone Press. **Lexile 800**

Explains the atmospheric conditions that cause wind, and looks at how power of wind has been harnessed to generate electricity.

Saunders, N. (2009). *Wind Power: Energy for the Future*. New York: Garth Stevens. **Lexile 850**

Photographs, illustrations, and diagrams describe the concepts and issues related to wind power and how scientists are attempting to make it more efficient.

Wind Powered Car Educational Kit Academy Plastics \$14.14

Sku: ACY18140

http://www.riders.com/wind-powered-car-educational-kit?gclid=CPm447_e08MCFQgKaQoda7QAxg

Details

This is the Wind Power Car Educational Kit from the Academy Hobby Models. Suitable for Ages 14 & Up.

FEATURES:

- Car moves forward regardless of wind direction
- Demonstrates the process of converting wind into useable power
- Maximum car speed is determined by number of blades, wind velocity and direction
- Select 2 or 4 blades depending on wind velocity
- Easy to assembly
- No glue or paint required
- Pictorial instructions



Supports for Struggling Students

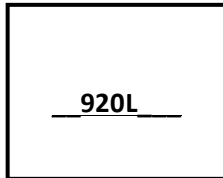
By design, the **gradation of complexity** within each Expert Pack is a technique that provides struggling readers the opportunity to read more complex texts. Listed below are other measures of support that can be used when necessary.

- Provide a brief **student-friendly glossary** of some of the academic vocabulary (tier 2) and domain vocabulary (tier 3) essential to understanding the text
- Download the Wordsmyth widget to classroom computers/tablets for students to access student-friendly definitions for unknown words. <http://www.wordsmyth.net/?mode=widget>
- Provide brief **student friendly explanations** of necessary background knowledge
- Include **pictures or videos** related to the topic within and in addition to the set of resources in the pack
- Select a small number of texts to **read aloud** with some discussion about vocabulary work and background knowledge
- Provide **audio recordings** of the texts being read by a strong reader (teacher, parent, etc.)
- **Chunk the text** and provide brief questions for each chunk of text to be answered *before* students go on to the next chunk of text
- Pre-reading activities that focus on the **structure and graphic elements** of the text
- Provide **volunteer helpers** from the school community during independent reading time.

Text Complexity Guide
Energy Island, by Allan Drummond

1. Quantitative Measure

Go to <http://www.lexile.com/> and enter the title of the text in the Quick Book Search in the upper right of home page. Most texts will have a Lexile measure in this database. You can also copy and paste a selection of text using the Lexile analyzer.



2-3 band	420 -820L
4-5 band	740 -1010L
6-8 band	925 - 1185L
9 -10 band	1050 – 1335L
11 – CCR	1185 - 1385

2. Qualitative Features

Consider the four dimensions of text complexity below. For each dimension*, note specific examples from the text that make it more or less complex.

<p>In this true narrative, we meet the environmentally friendly people of Samsø who proudly call their home Energy Island. The text offers this Danish Island as an example of a community, who in just ten years reduced their carbon emissions by 140% and became almost energy independent by harnessing their wind power. Additional themes of perseverance, innovation, and communication run throughout the text.</p> <p style="text-align: right;">Meaning/Purpose</p>	<p>The island's story is told in a linear plot. Informational sidebars, dispersed throughout the text, support the reader with additional facts, definitions, and examples. The page structure requires a reader with flexibility and stamina willing to stop on the page to gather more information from the sidebars, conversations bubbles, and illustrations.</p> <p>Structure</p>
<p style="text-align: right;">Language</p> <p>The tone of the text is upbeat and conversational, yet complex in its syntax and rich with Tier 2 vocabulary (conserve, ordinary, drastically). Content specific words (nonrenewable energy) are supported in the sidebars with working definitions. There are some phrases the readers may be unfamiliar with such as, "Hold on to your hats."</p>	<p>Knowledge Demands</p> <p>Students will arrive at this text with an understanding of how wind is created, how turbines work, how electricity is generated, and related science terms if the texts have been read in the suggested order. They may need additional support understanding where Denmark is located on a world map and why it is especially windy there.</p>

3. Reader and Task Considerations

What will challenge students most in this text? What supports can be provided?

- Rereading, chunking, and discussion could support students with when to read the side bars.
- Finding and analyzing complex sentences could provide support with various conventions.
- Encouraging readers to create text-to-text connections within the expert pack will deepen comprehension.

*For more information on the qualitative dimensions of text complexity, visit http://www.achievethecore.org/content/upload/Companion_to_Qualitative_Scale_Features_Explained.pdf

Expert Pack: Wind Energy

Milwaukee Public Schools

Grades: 4-5

Date: March 2015

Learning worth Remembering

Cumulative Activities – The following activities should be completed and updated after reading each resource in the set. The purpose of these activities is to capture knowledge building from one resource to the next, and to provide a holistic snapshot of central ideas of the content covered in the expert pack. *It is recommended that students are **required** to complete one of the Cumulative Activities (Rolling Knowledge Journal or Rolling Vocabulary) for this Expert Pack.*

1. Rolling Knowledge Journal

1. Read each selection in the set, one at a time.
2. After you read *each* resource, stop and think what the big learning was. What did you learn that was new *and important* about the topic from *this* resource? Write, draw, or list what you learned from the text about (topic).
3. Then write, draw, or list how this new resource added to what you learned from the last resource(s).

Sample Student Response

Title	Write, Draw, or List	
	New and important learning about the topic	How does this resource add to what I learned already?
1. The Boy Who Harnessed the Wind	The wind has power, and by harnessing it, energy can be produced to create electricity.	
2. “Wind Power “ (Reading A to Z)	Wind is generated by the uneven heating of the earth's surface. Wind power has been used for a long time	Introduces wind energy with a basic explanation of how wind is created and has been harnessed to do work since ancient times. Hints at the pros and cons of wind turbines and wind farms.
3. Where Does the Wind Come From?	Wind is air in motion, created by the uneven heating of the earth's surface.	How to think about wind as a force, how it flows, and effects things in its path.
4. “The Beaufort Scale Chart”	There is a scale that rates the strength of the wind and describes each category in terms of its effect on the land.	Gives students a working vocabulary of wind terminology and helps them see wind as a powerful source in nature.
5. Interactive Pinwheel Activity	Pinwheels are simple turbines. There are certain angles and conditions that best capture the wind.	Wind is not always present in all locations. Wind has the power to influence objects.
6. “Wind Power” (Read Works)	More power can be harnessed from the wind by making modern windmills called turbines. When the blades spin, it powers a generator that makes electricity.	Begins to explain how the wind can be harnessed by machines to create electricity. Teaches wind energy vocabulary to enhance future learning on the topic.

7. Wind Energy 101: Wind Turbines	Wind turbines work in very specific ways to produce power. Located in mass, they produce a wind farm.	The video reinforces all the concepts and vocabulary learned to date. Adds facts about the turbines (height, etc.) and how much electricity they can generate.
8. How a Wind Turbine System Works	There is an interconnectedness of wind turbines to homes and businesses through a utility grid and power lines.	On this info graphic, Students will track how current flows through existing utility lines to benefit a community.
9. Wind Turbine: How Does it Work?	Facts and figures about the amount of energy that can be produced by a wind turbine.	This captioned video reinforces the information presented in the last video and adds additional details and more specifics about different types of wind turbines.
10. How Loud is a Wind Turbine?	Wind turbine produce decibels comparable to common appliances and machines.	The infograph prompts students to weigh some of the pros and cons wind farms in their community.
11. The Wind Power Series	Students review their knowledge about wind energy with this online quiz game.	Fills in any learning gaps on the topic and may prompt questions for future independent research.
12. Energy Island	Countries around the world are harnessing wind power very successfully.	This book narrates how Denmark has become a leader in wind energy production.
13. Countries that Generate Power from Wind Energy	There are many countries producing wind energy around the world.	The graphs also show we are not producing enough wind energy power to keep up with the demand for electricity.
13. The Boy Who Harnessed the Wind	People, like William Kamkwamba can go to school to become engineers who work with wind energy.	Wind energy is always improving and can have a positive effect on our world.

2. Vocabulary: "Fantastic Five"

- Read each resource then determine the 5 words from each text that most exemplify the central idea of the text.
- Next use your 5 words to write about the most important idea of the text. You should have as many sentences as you do words.
- Continue this activity with EACH selection in the Expert Pack.
- After reading all the selections in the Expert Pack, go back and review your words.
- Now select the "Fantastic Five" words from ALL the word lists.
- Use the "Fantastic Five" words to summarize the most important learning from this Expert Pack.

Title	Five Vocabulary Words & Sentences
"The Boy who Harnessed the Wind"	<p>Words: scorched, windmill, junk yard, generator, blades</p> <p>Sentences:</p> <ol style="list-style-type: none"> 1. When the fields were scorched and dry, no food would grow and the people were starving. 2. William read that a windmill could create electricity and pump water. 3. He found all the pieces to build a windmill in the junk yard. 4. An old generator helped William create electricity with his windmill. 5. William created the blades of the windmill from plastic pipes that he heated and flattened.

<p>“Wind Power” (Reading A-Z)</p>	<p>Words: wind, turbines, power, pollute, power grid Sentences:</p> <ol style="list-style-type: none"> 1. Wind is moving air and can make windmills turn. 2. A wind turbine turns like a windmill and creates electricity. 3. Wind is a source of power and has been used to move objects and do work since ancient times. 4. Wind power does not pollute the earth and it is free. 5. The electricity created by wind turbines can be shared with others through a power grid.
<p>“Where Does the Wind Come From?”</p>	<p>Words: renewable, uneven, elevations, expands, rushes Sentences:</p> <ol style="list-style-type: none"> 1. Wind is a renewable energy because it will never run out. 2. The uneven warming of the air on the earth’s surface creates wind. 3. Since the surface of the earth has many different elevations, the air does not warm to the same temperature at the same time. 4. When warm air over the land heats up, it expands and rises. 5. The cooler air over water rushes in to fill the space the warm air left.
<p>“The Beaufort Scale Chart”</p>	<p>Words: categories, breeze, moderate, gale, damage, Sentences:</p> <ol style="list-style-type: none"> 1. There are twelve categories of wind speed on the Beaufort Scale. 2. When the wind is moving lightly, it is called a breeze. 3. A moderate wind can move branches and blow paper. 4. Winds that make it difficult to walk and break branches are called gale winds. 5. When the wind blows at more than 47 miles per hour it can cause damage to buildings.
<p>“Wind Power” (ReadWorks.org)</p>	<p>Words: pump, modern, generator, electricity, wind farm Sentences:</p> <ol style="list-style-type: none"> 1. Long ago, windmills would run a water pump or mash grain into flour. 2. Wind turbines are modern windmills and they help us get more power from the wind. 3. When the turbine blades spin, they power a generator, which is a machine that makes electricity. 4. Electricity is the energy that runs the lights and other machines in our homes. 5. When many wind turbines are grouped together, it is called a wind farm.
<p>“Wind Energy 101: Wind Turbines”</p>	<p>Words: pressure, weather vane, revolutions, rotor shaft, gears Sentences:</p> <ol style="list-style-type: none"> 1. Uneven air pressure around the blades of the turbine make it spin. 2. A weather vane on top of the turbine with a computer keeps the turbine facing the wind. 3. When the blades spin all the way around, it is called a revolution. 4. As the blades go around, they turn a rod inside the turbine called a rotor shaft. 5. The rotor shaft makes some gears turn and that helps the generator make electricity.

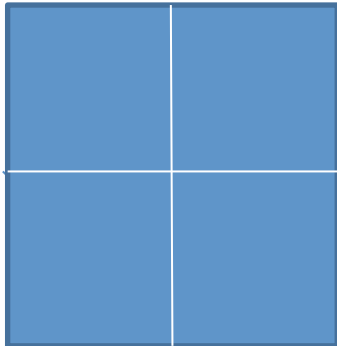
<p>“Energy Island: How One Community Harnessed the Wind and Changed Their World”</p>	<p>Words: fossil fuels, non-renewable, independence, community, harnessed</p> <p>Sentences:</p> <ol style="list-style-type: none"> 1. Fossil fuels come from dead organisms that have been decaying for millions of years and become coal, petroleum and natural gas. 2. Coal, petroleum and natural gas are non-renewable resources, which means we will use them up and we can’t replace them as fast as we use them. 3. When we depend on renewable energy, we have energy independence, so we don’t need non-renewable sources of energy. 4. On Samsø Island, the community came together to become independent of other energy sources. 5. Samsø Island harnessed, or used the energy of the wind to create energy for the people who lived there.
<p>“The Pros and Cons of Wind</p>	<p>Words: pros, cons, benefits, decibels, alternative, unpredictable</p> <p>Sentences:</p> <ol style="list-style-type: none"> 1. The pros of wind energy are that it is renewable, free, and extra energy can be sold to other people. 2. The cons of wind energy are that turbines can kill birds or bats, they are very loud, and they have to be built where there is a lot of wind. 3. Some of the benefits of wind energy are that it is safe and clean with no pollutants created. 4. Wind is an alternative source of energy from what is mostly being used for energy now. 5. One problem is that wind is unpredictable, so it is hard to know how much electricity will really be produced.
<p>“The Boy Who Harnessed the Wind: End Notes”</p>	<p>Words: drought, dynamo, battery, conference, engineer,</p> <p>Sentences:</p> <ol style="list-style-type: none"> 1. When a drought killed his family’s crops, William had to drop out of school. 2. When he built his windmill, William used a small generator called a dynamo to create electricity. 3. Eventually, he was able to charge a car battery, which had enough power to light four light bulbs. 4. William was invited to speak at a conference to tell about how he created windmills to help his family. 5. William went to college in the United States to become an engineer so he can work on other renewable energy projects.
<p>Fantastic Five</p>	<p>renewable, turbine, generator, electricity, power grid,</p>
<p>Summary:</p>	<p>Wind energy is a clean and free form of renewable energy that does not create pollution. Wind turbines are machines that use the power of the wind to turn the blades on the turbine, which operates a generator and then creates electricity. The electricity that is produced can be sent to homes and other buildings through the power grid.</p>

Learning Worth Remembering

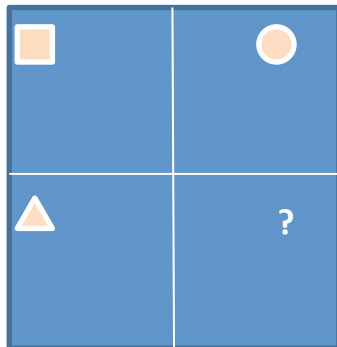
Singular Activities – the following activities can be assigned for each resource in the set. The purpose of these activities is to check for understanding, capture knowledge gained, and provide variety of ways for students to interact with each individual resource. Students may complete some or none of the suggested singular activities for each text. Singular activities should be assigned at the discretion of the teacher.

1. A Picture of Knowledge (Recommended for [Insert Text/Resource Titles])

- Take a piece of paper and fold it two times: once across and once top to bottom so that it is divided into 4 quadrants.



- Draw these shapes in the corner of each quadrant.



- Square
- Triangle
- Circle
- Question Mark

- Write!

Square: What one thing did you read that was interesting to you?
Triangle: What one thing did you read that taught you something new?
Circle: What did you read that made you want to learn more?
Question Mark: What is still confusing to you? What do you still wonder about?

- Find at least one classmate who has read [selection] and talk to each other about what you put in each quadrant.

2. Quiz Maker (Recommended for Wind Power)

- Make a list of # questions that would make sure another student understood the information.
- Your classmates should be able to find the answer to the question from the resource.
- Include answers for each question.
- Include where you can find the answer in the resource.

Question	Answer
1. How is wind formed?	1. Wind is caused by the uneven heating of the earth's surface.
2. How do turbines work?	2. The wind flows over the blades causing them to turn a machine inside the tower generating electricity.
3. How have windmills been helpful to farmers?	3. Windmills grind grain and pump water to irrigate the fields.

3. Wonderings (Recommended for The Boy Who Harnessed the Wind)

On the left, track things you don't understand from the article as you read.

On the right side, list some things you still wonder (or wonder now) about this *topic*.

I'm a little confused about:	This made me wonder:

4. Pop Quiz (Recommended for Where Does the Wind Come From? And Beaufort Scale Chart)

Answer the following questions.

Question	Possible Answer
1. What are some types of work done by the wind in throughout history?	The wind has been used to sail ships, grind wheat, pump water and chop wood.
2. What causes wind to form?	Wind is caused by the uneven heating of the earth's surface by the sun. When the warm air rises, the cooler air rushes in and this motion of air is called wind.
3. What is the purpose of the Beaufort Scale?	The Beaufort Scale rates the power of wind and its effect on the land from calm to destructive.
4. How do we know the wind is powerful?	We know the wind is powerful because it can cause widespread damage and destruction. It can also be harnessed to generate electricity.

Expert Pack: Wind Energy

Submitted by: Milwaukee Public Schools, WI
Grades: 4-5 Date: March 2015

Expert Pack Glossary

The Boy Who Harnessed the Wind

<i>Word</i>	<i>Student-Friendly Definitions</i>
Harness	Harness is to bring under control and make ready for use. <i>We can harness a lot of energy on windy days.</i>
Scorched	To scorch is to dry out with heat. <i>Few plants can grow in the scorched desert.</i>
Blades	Blades are a thin, flat part, as of a fan or an oar. <i>The wind causes the windmill blades to spin.</i>
Pinwheel	A pinwheel is a plastic or paper toy, similar to a windmill that is pinned to a stick and has a wheel that is spun by moving air. <i>The girl loved to watch her pinwheel toy spin around and around.</i>
Windmill	A windmill is a machine that uses energy from the wind to turn a large wheel. Windmills are used to grind grain into flour, pump water, and make electricity. <i>Windmills on farms do alot of jobs for the farmer.</i>
Produce	To produce is to make or manufacture. <i>The stronger the wind, the more energy a windmill can produce.</i>
Electricity	Electricity is energy caused by the movement of electrons through matter. <i>Electricity powers the lights in our homes.</i>
Pump	To move a gas or fluid from one place to another. <i>The man pumped gasoline into his car.</i>
Drawing	To draw is to take out or remove. <i>The pump was drawing water up from the well.</i>
Gushing	To gush is to flood out in large amounts and with great force; spurt. <i>Water gushed into the farmers fields giving the crops a big drink of water.</i>
Generator	A generator is a machine that transforms mechanical energy into electrical energy. <i>The generator turns the wind into electricity.</i>

Gale	A gale is a strong wind, especially one of about thirty to sixty miles per hour. <i>The gale force winds blew down many trees.</i>
Swayed	To sway is to swing back and forth or from side to side; rock. <i>The branched swayed back and forth during the storm.</i>
Flickered	To flicker is to burn or cast light in an unsteady, jerky manner. <i>Just before the power went out, the lights flickered.</i>
Surged	To surge is a sudden increase or rush of electric current. <i>Electricity surged through the wires and made the light shine brightly.</i>

Wind Power (Reading A-Z)

<i>Word</i>	<i>Student-Friendly Definition</i>
Rod	A rod is a straight, thin, usually round and inflexible stick, shaft, or bar. <i>The blades are attached to a metal rod.</i>
Wind energy	The act of using the wind to create electricity. <i>We are interested in using wind energy to save money.</i>
Uneven	Uneven means not straight, level, or parallel. <i>It was hard to walk on the uneven road.</i>
Surface	Surface is the outer boundary of something. <i>He ran his hand over the smooth surface of the desk.</i>
Power grid	A power grid is the panel, wires, and lines that deliver electricity. <i>The power grid sends electricity to our houses.</i>
Turbine	A turbine is an engine driven by a moving fluid, such as water, steam, or air, that pushes against the blades or paddles attached to a central shaft. <i>The turbine is working when its blades are spinning.</i>

Where Does the Wind Come From?

<i>Word</i>	<i>Student-Friendly Definition</i>
Elevation	An elevation is the height to which something rises or is raised, or its height above sea level or ground level. <i>Wind turbines have an elevation of 100 feet above the ground.</i>
Expand	To expand is to make larger or more extensive. <i>The balloon expanded so much, it popped.</i>

Rushed	To rush is a swift and sudden forward movement. When I opened the front door, the cold air rushed in.
Renewable	Renewable energy or resources, like wind and sunlight, don't run out. <i>The wind and sun are renewable energy sources.</i>
Fuel	A source of energy, such as gasoline for cars or food for humans. <i>The wind is the fuel a turbine used to produce electricity.</i>
Sawmill	A building or place in which lumber is cut into boards, planks, or the like. <i>The sawmill can cut many sizes of wooden boards.</i>

Beaufort Scale

<i>Word</i>	<i>Student-Friendly Definition</i>
Gentle	Gentle is gradual or mild. <i>A gently wind may not be strong enough to turn the windmill blades.</i>
Moderate	Moderate is a medium or average amount, size, quality, or degree; not too big and not too little. <i>A moderate wind can blow the leaves down the street.</i>
Severe	Severe is very strong or intense. <i>A severe storm often scares people.</i>
Damage	Damage is to harm or injure; to make something useless. <i>High winds can damage power lines.</i>
Widespread	Wide spread is extended, scattered, or occurring over a wide area. <i>There is widespread interest in using wind turbines.</i>
Devastation	Devastation is the act or an instance of destroying or ruining, or the destruction or ruin thus caused. <i>The tornado caused a lot of devastation in the town.</i>
Calm	Calm is without or almost without motion; still; unmoving. <i>When the air is calm, there is no wind.</i>

Wind Power (Rachelle Kreisman)

<i>Word</i>	<i>Student-Friendly Definition</i>
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Wind farm	A wind farm is an area of land with a cluster of wind turbines for driving electrical generators <i>There were many turbines on the wind farm.</i>
Progress	Progress is forward movement through stages of development; continuous improvement. <i>We are making progress with our plans to build a better turbine.</i>
Modern	Modern means current, present-day, up to date <i>The most modern wind turbines make the most electricity.</i>

How does Wind Energy Work – Turbines

<i>Word</i>	<i>Student-Friendly Definition</i>
Converts	To convert is to transform (something) into another form, substance, or state. <i>Turbines convert the wind into electricity.</i>
AC/DC	AC/DC stands for alternating current/direct current. <i>The power grid could produce AC/DC current.</i>
Battery bank	A battery bank is the result of joining two or more batteries together for a single application. <i>The battery bank produced so much power, the lights glowed.</i>

Energy Island

<i>Word</i>	<i>Student-Friendly Definition</i>
Ordinary	Usual or normal. <i>Monday was just an ordinary day.</i>
Island	An island is a body of land smaller than a continent and completely surrounded by water. <i>We needed a boat to get to the island.</i>
Mainland	Mainland is the main land mass of a country, continent, or region. <i>Most of the farms were on the mainland of the country.</i>
Renewable	Renewable means to be able to make new again. <i>The wind and sun are renewable sources of energy.</i>
Energy independence	Energy independence is the ability to provide energy without relying on anyone else. <i>Finland is a country that is energy independent.</i>
Organic	Organic is pertaining to or coming from living sources. <i>The farmer grew organic vegetables.</i>

Decay	To decay is to rot or become rotted; decompose. <i>The old apples began to decay when no one picked them.</i>
Consume	Consume means to use up. <i>We consume more energy when we turn on all the lights.</i>
Biofuels	A biofuel is a fuel that comes directly from living matter. <i>The cows produce a lot of biofuel that the farmer could sell.</i>
Atmosphere	The atmosphere is the mass of gases surrounding the earth <i>A clean atmosphere helps us breathe better.</i>
Coincidence	A coincidence is the chance happening of two events at the same time. <i>What a coincidence that we would both arrive at the same time.</i>
Prospect	A prospect is a possibility; expectation. <i>Wind energy is a good prospect for the future.</i>
Carbon emissions	Carbon emissions is carbon dioxide and carbon monoxide in the atmosphere, produced by vehicles and industrial processes <i>Cars produce carbon emissions that are bad for the air.</i>
Efficient	Efficient means capable of producing desired results without wasting materials, time, or energy. <i>People like efficient cars.</i>

The Boy Who Harnessed the Wind (Last Two Pages)

<i>Word</i>	<i>Student-Friendly Definition</i>
Famine	A famine is an extreme and widespread shortage of food. <i>When the crops did not grow, the people experienced a famine.</i>
Depend	To depend is to trust or rely on. <i>Plants depend on water and sunshine to grow.</i>
Achieved	To achieve is to be successful or produce results. <i>We achieved good result from growing the new bean plants.</i>
TED Talks	TED is a nonprofit organization devoted to spreading ideas, usually in the form of short, powerful talks. <i>The inventor gave a TED Talk about his new machine.</i>
Irrigated	To irrigate is to water by artificial means, as by pumping and spraying, or by man-made channels from a natural source of water. <i>The farmer used rain water to irrigate his fields.</i>

Engineer	An engineer is one who is trained in the use or design of machines or engines, or in other areas such as electrical or chemical technology. <i>The engineer explained his plans for a new wind turbine.</i>
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