

# Wind Energy I

Prepared By: Taylor Farnetti

**Overview & Purpose:** This first class period of 90 minutes will be an introductory lesson on going over different alternative energy sources. It will then move on to a more descriptive lesson on wind, where the students will become engaged into how wind farms work.

**Objectives:** *Students will be able to...*

- Distinguish devices that convert one form of energy into another form of energy
- Identify the different sources of energy
- Understand the process of a wind farm
- Understand the job of a wind technician
- Identify the outcome of wind energy
- Discuss the outcome of wind energy
- Discover opportunities from wind energy

**Background Information:** They will have an overview on sources of energy before this lesson. The speaker and virtual tour will give them a little insight on what goes on in a wind farm.



## Performance Expectation(s)

HS-PS3-3 Design, build, and refine a device that works within a given constraint to convert one form of energy into another energy.

## Classroom Activities/Procedures & Timeline

This day will be an introduction for the students. At first we will have a discussion on what devices convert one form of energy into another form of energy. Then we will do an activity called K-W-L which will have the students engaged on what they know already about alternative energy forms. Then we will try to a group activity called mix and match where the students will match the definitions to the energy source. After we get them started thinking about energy I will introduce wind energy. I will have them watch a virtual tour on wind farms, and have a class discussion about what they saw and understood from the video. Then I will have a guest speaker come and talk for 30 minutes about what a wind technician does. After this I will have them do an activity where they think about the daily lives of a wind technician and how much goes into this job that they would have not thought of before. I will then end the class by having them watch some clips of dirty jobs of a wind technician and these clips will be paired up with questions for the students to discuss and answer. I will tell them to bring their discussion questions and answers to class the next day. Their homework will be find a recent article on wind energy and write a paragraph about this article.

**Assessments:** (e.g., lab, quiz, test, oral presentation, survey, rubric, etc.)

Survey (K,W,L/asking them what they knew about wind energy before this activity, what they want to know, and after this lesson they will discuss what they learned)

They will also do a virtual lab and a lab with the clips on the job of a wind technician. These labs will have them discuss in groups about what they are understanding about the process of the job.

## Extensions/Homework:

Find a recent article on wind energy and write a paragraph about this article.

## References:

- Guest Speaker
- ISU energy notes
- Youtube
- Dirty Jobs DVD

## Equipment/Materials/Technology Needed:

- Computers
- DVD Discs
- Smart Boards
- Guest Speaker Materials

## Teacher Resources:

(e.g., readings, set-up instructions, lecture files, data files, etc.):

- <https://www.youtube.com/watch?v=BgkuAJnJzys>
- Documents/4 Lesson Plan Ideas.docx
- <http://www.youtube.com/watch?v=aO9XKNTg3js>

*(only the first 20 minutes of this clip)*

Set up for DVD clips: have them get into groups of 4 people. Have the stations numbered so the Students know where they are going. Make sure you hand them the hand out with Questions about the movie clips.

## Student Resources:

(e.g., handouts, worksheets, data, etc.):

- kwl\_chart.doc
- <https://www.youtube.com/watch?v=BgkuAJnJzys>
- <http://www.youtube.com/watch?v=aO9XKNTg3js>
- Dirty JobsWorksheet.docx
- <http://tis-science.wikispaces.com/file/view/Energy+worksheet.pdf>

## Accommodations & Safety Concerns:

- Large print textbooks
- Textbooks for at-home use
- Graphic organizers
- Additional time for assignments
- Seats in front for hearing/seeing impairments
- Assigned groups

## Scoring Rubric for Oral Presentations

Category	Scoring Criteria	Total Points	Score
<b>Organization</b> (4 points)	The type of presentation is appropriate for the topic and audience.	<b>2</b>	
	Information is presented in a logical sequence	<b>2</b>	
<b>Content</b> (25 points)	Introduction is attention-getting, lays out the problem well, and establishes a framework for the rest of the presentation.	<b>5</b>	
	Technical terms are well-defined in language appropriate for the target audience.	<b>5</b>	
	Presentation contains accurate information.	<b>5</b>	
	Material included is relevant to the overall message/ purpose.	<b>5</b>	
	Appropriate amount of material is prepared, and points made reflect well their relative importance.	<b>5</b>	
<b>Presentation</b> (31 points)	Speaker maintains good eye contact with the audience and is appropriately animated (e.g., gestures, moving around, etc.).	<b>2</b>	
	Speaker uses a clear, audible voice.	<b>2</b>	
	Delivery is poised, controlled, and smooth.	<b>1</b>	
	Good language skills and pronunciation are used.	<b>2</b>	
	Visual aids are well prepared, informative, effective, and not distracting.	<b>4</b>	
	Length of presentation is within the assigned time limits.	<b>5</b>	
	Information was well communicated.	<b>15</b>	
<b>Score</b>	<b>Total Points</b>	<b>60</b>	

## Wind Energy 1 - KWL Sheet

What do I <b>K</b> now?	What do I <b>W</b> ant to know?	What have I <b>L</b> earned?

**Dirty Jobs: Wind Turbine Technician**

- 1** What do the wind turbines do?
  
  
  
  
  
  
  
  
  
  
- 2** What is the first thing Mike Rowe says about the wind turbines?  
They look kind of \_\_\_\_\_.
  
  
  
  
  
  
  
  
  
  
- 3** How many units does this wind farm have?
  
  
  
  
  
  
  
  
  
  
- 4** What is the job they do in this episode? Be specific.
  
  
  
  
  
  
  
  
  
  
- 5** What are some of the safety gear they are wearing?
  
  
  
  
  
  
  
  
  
  
- 6** How high is this wind turbine?
  
  
  
  
  
  
  
  
  
  
- 7** What did you find interesting about this job? (Name at least 3 things)
  
  
  
  
  
  
  
  
  
  
- 8** How many houses can this wind farm power?

- 9** What is their main job... to fix or inspect?
- 10** What were some of the things **Mike Rowe** had to do outside and inside the wind turbine?
- 11** What were the two main things that they had to clean off of the inside of the turbine?
- 12** Why is the turbine compared to a car? What did they have to change?

Alternative Sources of Energy  
**Integrated Environmental Science**  
9th /10th Grade

## Wind Energy 2

Prepared By: Taylor Farnetti

**Overview & Purpose:** The purpose of this lesson is to have the students get a better understanding of the different parts of a wind turbine. This will help them understand how a wind turbine works for the next day when they have to build their own wind turbine. They will also do an activity where they will be able to understand where and why engineers build their turbines in certain places.

**Objectives:** *Students will be able to...*

- Research sources on their part of the wind turbine
- Present their research on their topic
- Reflect on what they had presented and what others had presented
- Identify what goes into a wind farm
- Distinguish how to build a wind turbine
- Identify the difference in the speed and smoothness of the wind at different altitudes
- Distinguish where to build/have wind turbines

**Background Information:** They will have heard all about wind turbines from different sources like our guest speaker last class, the wind farm tutorial, dirty jobs, and the lessons about alternative energy sources.



### Performance Expectation(s)

HS-PS3-3 Design, build, and refine a device that works within a given constraint to convert one form of energy into another energy.

### Classroom Activities/Procedures & Timeline

**Bell Ringer:** The students will discuss their recent articles with a partner, then will present their partners article to the class so I know they have discussed it with each other.

- Research different sources to make a poster and a presentation in groups of 4 students.
  - turbine
  - blade design
  - history of wind
  - wind velocity
  - mechanics of the wind turbine
  - modern wind machines
  - wind power plants
- Present the information to the class using the poster as the visual aid.
- Reflect on each presentation including their own presentation

### Activity: **See the Wind**

1. Take the students outside. An open field is a great place to do this experiment. It is also helpful if the field is bordered on one side by some obstructions (trees, buildings), which will disrupt the smooth flow of the wind. This will help the students "see" the lower wind speeds and turbulence caused by forests, buildings, hills at lower elevations.
  2. You can lay out the kite or balloons now or have them ready to go before the students arrive.
  3. Run up the streamer kite or balloon. Once you get the kite up pretty high in the air, tie it down and ask the students to make the following observations:
    - Are they all the doing the same thing?
    - Compare the streamers that are closer to the ground to the ones that are up near the balloon or kite. Are some flapping around more than others? Are some more straightened out? Are they all going the same direction?
  4. Have the students make some observations on their class sheet.
  5. After they have drawn pictures and made observations collect the materials and gather the group together. For one final experiment, ask the students to lie as flat as they can on the ground. Can they feel the wind? Is it strong or weak? If you can, have a student climb to a higher elevation (building, rock, etc) to compare what it is like after lying on the ground.
- They will then have discussion questions on the lab
  - Their homework will be the reflections on the presentations and the discussion questions on the lab activity

**Assessments:** (e.g., lab, quiz, test, oral presentation, survey, rubric, etc.)

- oral presentation
- rubric for presentation
- lab/activity
- discussion questions

### Equipment/Materials/ Technology Needed:

- Posters
- LapTops
- Large sturdy kite or a large helium filled balloons
- String
- Streamers (Caution tape or party streamers)
- Wind Speed Meter (optional)

### Teacher Resources:

(e.g., readings, set-up instructions, lecture files, data files, etc.):

- [http://learn.kidwind.org/sites/default/files/see\\_the\\_wind2.pdf](http://learn.kidwind.org/sites/default/files/see_the_wind2.pdf)
- set up instructions/directions for the lab activity.
- rubricforpresentation.docx

### Student Resources:

(e.g., handouts, worksheets, data, etc.):

- [http://learn.kidwind.org/sites/default/files/see\\_the\\_wind2.pdf](http://learn.kidwind.org/sites/default/files/see_the_wind2.pdf)
- discussion questions/hand outs for the students in this link also



## Rubric

### Extensions/Homework:

Reflection questions on the day of presentations and lab activity.

### References:

- [http://learn.kidwind.org/sites/default/files/see\\_the\\_wind2.pdf](http://learn.kidwind.org/sites/default/files/see_the_wind2.pdf)
- any of the sites the kids use to find information on their topic

### Accommodations & Safety Concerns:

- Large print textbooks
- Textbooks for at-home use
- Graphic organizers
- Additional time for assignments
- Seats in front for hearing/seeing impairments
- Assigned groups



## Wind Energy 3

Prepared By: Taylor Farnetti

**Overview & Purpose:** The purpose of today will be for the students to see how a wind turbine works by making their own wind kit. Blade design and engineering is one of the most complicated and important aspects of current wind turbine technology. Engineers strive to design blades that extract as much energy from the wind as possible while also being durable, quiet and cheap. I want students to visually see what goes into building a wind turbine.

**Objectives:** *Students will be able to...*

- Distinguish devices that convert one form of energy into another form of energy
- Understand the process of a wind farm
- Identify the outcome of wind energy
- Discuss the outcome of wind energy
- Discover opportunities from wind energy
- Discover how much power is available in a certain area of wind
- Construct a wind kit
- Reflect on their designs

**Background Information:** They will have an overview on sources of energy before this lesson. They will have researched wind turbine parts/designs during the previous class period.



### Performance Expectation(s)

HS-PS3-3 Design, build, and refine a device that works within a given constraint to convert one form of energy into another energy.

### Classroom Activities/Procedures & Timeline

**Bell Ringer:** What have you learned so far about wind energy? What do you think are things to consider when building a wind turbine ■ Research different sources to make a poster and a presentation in groups of 4 students.

This would start a discussion for the first 15 minutes of class. After the bell ringer I will put them into groups to have them build their own wind turbine. It will be somewhat of a contest to see who constructed the best turbine. I would have a discussion with them to see why they came up with the design they did. I also will have them answering discussion questions that I have attached.

After they have built their first design and tested it. I want them to discuss with other groups and get ideas from each other what they could do to improve their design. I will make them reconstruct their design to come up with a better outcome. After they have tested their second design, I will have a class discussion about the activity and wind energy. This will be somewhat of a review to get them ready for the quiz. They will then take their quiz on wind energy. I will tell them their homework is to finish up the discussion questions from the activity and to study for their brief test they will have next class on energy and wind.

**Assessments:** (e.g., lab, quiz, test, oral presentation, survey, rubric, etc.)

- Lab
- Quiz
- Presentation of their designs

**Extensions/Homework:**

- WindKit Worksheet
- Study for Test that is next class.

**References:**

- Kidwind website

### Equipment/Materials/Technology Needed:

- Model turbine that can quickly interchange blades (KidWind turbines are perfect).
- Blade construction materials (cardboard, balsa wood, coroplast, index cards, scissors, glue, tape, etc).
- Multimeter or Voltage/Current Data Logger
- Box fan
- Ruler
- Pictures of wind turbine blades
- Scale model turbines (optional)
- PowerPoint of wind turbines blades (optional)
- Wind speed meter (optional)

**Teacher Resources:**

(e.g., readings, set-up instructions, lecture files, data files, etc.):

- Kidwind website

**Student Resources:**

(e.g., handouts, worksheets, data, etc.):

- wind kit worksheet quiz

**Accommodations & Safety Concerns:**

- Large print textbooks
- Textbooks for at-home use
- Graphic organizers
- Additional time for assignments
- Seats in front for hearing/seeing impairments
- Assigned groups
- Extra time putting the wind kit together
- extended time on the quiz

Name: \_\_\_\_\_

### Wind Kit Design

Blade design and engineering is one of the most complicated and important aspects of current wind turbine technology. Engineers strive to design blades that extract as much energy from the wind as possible while also being durable, quiet and cheap. Now you and your group get to really think like an engineer! Using your background knowledge on what you researched last class on wind turbines think about a design that you would like to use. You will have the next 15 minutes to construct the best design you can while competing with your classmates.

### Intro Questions:

**1** Have you ever seen a wind turbine in real life?

**2** Why would we want to build wind turbines?

**3** How much energy do we get from wind?

**4** Where are wind projects built?

**5** What variables affect the power output from wind turbines? Push students on this last question to get several answers: wind speed, generators, size of the turbine, gear ratio, blade design.

**6** We will now begin exploring blade design of wind turbines.



### NOW START DESIGNING!

#### Blade Variables

What variables affect how much energy the blades can capture? (Length, number, pitch/angle, shape, weight, material, curvature, twist, wind speed, etc.) You and your group must choose one blade variable to test. Once you have performed regulated experiments on this one variable collect your data.

Data:

#### Blade Construction and Testing

Once your group has an approved plan you can start to construct and test blades. As you are doing this make sure you are isolating one variable and keeping all others constant. Also make sure you are being safe and collecting meaningful data. When you have constructed a set of blades, mount the blades on the wind turbine and place it in front of the fan. When the blades are spinning the turbine is producing electricity. Use a multimeter to measure voltage. If you have time, also measure current (amps). Remember: Power is equal to voltage times current ( $P = IV$ ). It is important to work efficiently as possible, you need to collect data from 3–4 different tests of your isolated variable.

Data:

## Evaluating the Blades

Aside from power output, you can also evaluate blades based on their quality of construction and the aesthetics of the blade design. When you have finished your design you will come together as a class. Each group will display their blades on a desk or table. Spend 10-15 minutes walking around and evaluating the blades of each of your classmates. You have each been assigned a team number do not forget that. You can rate each one on a 1-5 scale for both quality of construction and aesthetics of the design. Predict which group's design will be the most efficient and work the best.

### Data:

#### Team 1:

#### Team 2:

#### Team 3:

#### Team 4:

#### Team 5:

#### Team 6:

### Conclusion:

- 1 Which groups design worked the best? Why?
- 2 Were your predictions correct? Why or why not?
- 3 How did your design work?
- 4 What would you do if you could go back a redesign your design? (BE VERY SPECIFIC!)
- 5 What worked the best for your turbine design?
- 6 What did you learn from this activity?
- 7 Did your previous research from last class help you with your turbine design?



# Wind Energy 4

Prepared By: Taylor Farnetti

**Overview & Purpose:** This class is the last lesson to my wind energy activity. They will have around 90 minutes to research improvements on their designs, talk about revisions in groups, make improvements, and present these to the class. We also will have a class discussion about the revisions they researched. We will then have a discussion on the past 3 lessons to review with a round robin to check for understanding, which will be a formative assessment. Then at the end of reviewing we will have a quiz/test for a summative assessment.

**Objectives:** *Students will be able to...*

- Distinguish devices that convert one form of energy into another form of energy
- Identify the different sources of energy
- Understand the process of a wind farm
- Understand the job of a wind technician
- Identify the outcome of wind energy
- Discuss the outcome of wind energy
- Discover opportunities from wind energy
- Identify the purpose of the previous lessons
- Understand their revisions
- Distinguish how to make their wind kit could get better.

**Background Information:** They will have an overview on wind before this lesson. The previous lessons have helped prepared them for this lesson.



## Performance Expectation(s)

HS-PS3-3 Design, build, and refine a device that works within a given constraint to convert one form of energy into another energy.

### Classroom Activities/Procedures & Timeline

This day will be a conclusion for the students on wind energy. At first we will have a discussion on what devices convert one form of energy into another form of energy. Then we will do an activity of where will have the students discuss where they can do research on improvements. Then we will try a group activity where they discuss their improvements with each other and learn from each other. Then we will have a class discussion. After we get them started thinking about their visions we will check for their understanding of the lesson on wind energy. I will have them present what improvements they would think is the best. We will then have a discussion on the past 3 lessons to review with a round robin to check for understanding, which will be a formative assessment. Then at the end of reviewing we will have a quiz/test for a summative assessment.

**Assessments:** (e.g., lab, quiz, test, oral presentation, survey, rubric, etc.)

- oral presentation
- quiz/test
- informal assessment (discussion)

**Extensions/Homework:**

- Find a recent article on sun energy (solar panels).

**References:**

- any websites the students use
- the librarian set up a web podcast to help the students to find online resources for this topic

**Equipment/Materials/  
Technology Needed:**

- Computers
- DVD Discs
- Smart Boards
- Quiz
- Test

**Teacher Resources:**

(e.g., readings, set-up instructions, lecture files, data files, etc.):

**Student Resources:**

(e.g., handouts, worksheets, data, etc.):

**Accommodations & Safety  
Concerns:**

- Large print textbooks
- Textbooks for at-home use
- Graphic organizers
- Additional time for assignments
- Seats in front for hearing/seeing impairments
- Assigned groups

# Gas Bill Project

Prepared By: Taylor Farnetti

**Overview & Purpose:** This class will be a project for students to see how to be energy efficient. The students will be able to look at a gas bill and analyze it. After this, the students will be able to create a paper to write their ideas to change about this house that is neglecting to be energy efficient and why they should have these changes.

**Objectives:** *Students will...*

- Distinguish how to read a gas bill
- Identify how to be energy efficient
- Understand the process of energy efficiency
- Research about how to have a house be energy efficient
- Identify the outcome of being energy efficient
- Discuss how to improve a household
- Discover opportunities from being energy efficient
- Understand how to defend their position with evidence

**Background Information:** Students will have an overview on sources of energy before this lesson. They will have had practice reading gas bills very briefly.



## Crosscutting Concept(s)

Influence of Science, Engineering, and Technology on Society and the Natural World

Modern civilization depends on major technological systems.

Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.

# Gas Bill Project

## Classroom Activities/Procedures & Timeline

(Two 90 minute class periods)

### 1st Day

**Bell Ringer:** Have you ever thought of making a house energy efficient? Do you run your house energy efficiently? If so how? How could you run your house energy efficiently?

Students will come in and work on the bell ringer.

The teacher will hand out random made up gas bills to students put into groups of 3-4 students. The students will have to look at these fake gas bills and try to make predictions about what this house would look like. After they make their predictions as a group, they would get what their house actually looked like.

Their next task would pick things to change about the house to make it more energy efficient. The teacher would give them a certain amount of money that they had to spend on the renovations.

As a teacher I encourage you not to help them with ideas and let them research and figure out what to change on their own. This way the students have a chance to be more creative. After they make these renovations they would present to the class on the changes they had made. They can either do a power point on the changes or build the model. Students will go home and work on their research. The students or teacher could assign roles to do so students do evenly amount of work. They also will have to ask their families about their own gas bills to compare to the one that was given. This way the families are being included into this activity.

### 2nd Day

Students are working on their project this day majority of the day. They will present their renovations later on. After this I will hand them an exit slip where they will write about what they had learned from this lesson. Also finish up what is left in their gas bill project packet.

### Extensions/Homework:

- Family questions
- Research renovations
- Analysis Questions

### References:

- any websites the students use
- the librarian set up a web podcast to help the students to find online resources for this topic.

## Equipment/Materials/Technology Needed:

- Computers
- Made up Gas Bills
- Websites / Sources
- Materials

## Teacher Resources:

(e.g., readings, set-up instructions, lecture files, data files, etc.):

- Make up gas bills
- Make up what houses look like (given in packet but can be changed)
- Teacher Instructions
- Rubrics
- Exit Slip

## Student Resources:

(e.g., handouts, worksheets, data, etc.):

- Gas Bill Instructions/Packet
- Rubric
- Exit Slip
- Research
- Sources

## Accommodations & Safety Concerns:

- Large print textbooks
- Textbooks for at-home use
- Graphic organizers
- Additional time for assignments
- Seats in front for hearing/seeing impairments
- Assigned groups

## Rubric

Category					
<b>BUDGET</b> (Renovations)	<b>5</b> Greatest Future Energy Saved While staying in Budget (\$2000-\$2500)	<b>4</b> Future Energy Saved While staying in Budget (\$1501-\$2000)	<b>3</b> Greatest Future Energy Saved While going over Budget (over \$2500)	<b>2</b> Greatest Future Energy Saved While staying in Budget (between \$1001-\$1500)	<b>1</b> Not spending enough of the Budget (less than \$1000)
<b>Reasons for renovations</b>	<b>5</b> Reasons for renovation was supported fully with evidence	<b>4</b> Reasons for renovation was supported mostly with evidence	<b>3</b> Reasons for renovation was supported mostly without evidence	<b>2</b> Reasons for renovation was supported partly	<b>1</b> Reasons for renovation was not supported
<b>Format</b>	<b>5</b> Power point, typed paper, poster, fully explained	<b>4</b> Power point, typed paper, poster, somewhat explained	<b>3</b> Power point, typed paper, poster, not explained	<b>2</b> Handwritten, complete sentences	<b>1</b> Handwritten, incomplete sentences
<b>Quality</b>	<b>5</b> Neat, typed, organized, colorful, pictures	<b>4</b> Neat, typed, organized, colorful	<b>3</b> Neat, typed, organized	<b>2</b> Organized, colorful, pictures	<b>1</b> Neat

Total points = \_\_\_\_\_

# Gas Bill Project

Name: \_\_\_\_\_

We will be looking at a part of home ownership. The gas bill will be the main concentration of this project.

## **Part 1** Answer the questions about this gas bill.

- 1** What is the billing period for this gas bill?
- 2** What are the delivery charge rates?
- 3** How is gas measured?
- 4** What is the environmental cost recovery?
- 5** Is the gas usage higher or lower than last year for the same month? Predict the reason for the change in yearly cost?
- 6** What are the lowest months for gas usage?
- 7** What are the highest months for gas usage?
- 8** Is this an estimated bill or was the meter read?

## **Part 2** Ask one of your parents to compare this bill to your household's gas bill. Then answer the following questions:

- 1** What type of heating do you have at your residence? (Gas, electric, other)
- 2** Approximately, how many square feet is your residence?

- 3 Does your residence have any energy efficient qualities like argon filled windows, extra insulation, wrapped water heater, etc?
- 4 For this month, was your NICOR gas bill more or less than the bill shown?
- 5 Has your residence used more gas this year compared to last year?

**Part 3** This section will talk about the bill that was given to you. Answer the following questions:

- 1 With just knowing how much the gas bill was for this house, write a description of the house using at least 7-8 complete sentences. (Is it big, small, old, new, energy efficient, etc)

**Final Part** Now that you have looked at the gas bill and gave your description of the house, here is the real description of the house:

- 60 years old home
- 1000 sq. feet for the main level, 1000 sq ft basement
- 60 year old Lenox Gas Furnace
- Single pane gas windows (10)
- 16 in of insulation in the attic
- Aluminum siding

*Here is your job.* You will need to write a paper or do a project on what improvements you would make to this home and the reason behind your decision. You will have a maximum of \$2500 to spend. Go to a source (website, newspaper, or store) to find the prices. The final part of the project will be making a list of improvements that need to be done in the future.

### **Suggested Websites:**

<http://www.aceee.org/consumerguide/checklist.htm>

<http://edis.ifas.ufl.edu/FY1028>

<http://home.howstuffworks.com/how-to-make-your-home-energy-efficient.htm>

[http://apps1.eere.energy.gov/consumer/your\\_home/](http://apps1.eere.energy.gov/consumer/your_home/)





# Energy Choices and Careers

Prepared By: Taylor Farnetti

**Overview & Purpose:** The purpose of this lesson is to inform the students about energy decisions, and have the students explore jobs and quality of life with choices in energy.

**Objectives:** *Students will...*

- Distinguish some of their energy choices in their daily lives
- Identify if these energy choices are what they need or what they want
- Research jobs that are in the energy field
- Identify how energy affects our daily lives (economic, political, environmental, and social)
- Understand the process of certain jobs that are in the energy field
- Write a research paper about a certain job in the energy field

**Background Information:** The students should have some background information on energy concepts.



## Crosscutting Concepts

### Energy and Matter

Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

### Influence of Science, Engineering, and Technology on Society and the Natural World

Modern civilization depends on major technological systems. Engineers continuously modify these technological systems. Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks.

## Classroom Activities/Procedures & Timeline

### 1st day: (90 minutes)

This class will start off with a bell ringer and then move into the activity of writing a research paper.

**Bell Ringer:** Think of your daily routine and write down some of the activities you do. Decipher if this activity was something you needed or wanted.

Or you could use the needs VS. wants activity worksheet attached. After this activity decide if you want your students to read the article attached to resources below.

After the students have finished their lists and decided if they really need or want this activity, then we would have a discussion about what they think a need/want is. After we have a discussion this could lead into a debate about who thinks we need certain things or if many of their activities are wants. Then I would hand out the energy sheet of showing what they do almost all the time takes up energy.

The students and the teacher will get into a discussion on how does our society get this energy.

Some example questions could be:

*What were the different types of energy that we talked about earlier? What jobs are in this field?*

After the discussion the teacher would give them the rubric for the research paper, and tell the students to be creative and create a research paper about a job in this field. Each individual student would get an energy job field where they would be able to discuss how to get this job, what do these people do, fun facts, and etc. This activity would finish out the rest of the day with researching and writing their papers. If the students do not finish their paper, then they would finish for homework.

### 2nd Day

Students would get into groups of 4 each of them having the same job. They would discuss their papers, Peer edit, and collaboratively work together to make a presentation on their job to present to the class. This way each job will present to the class to take notes on the jobs in this field. They would understand what goes into these jobs and what are some of their struggles.

After they present have a class discussion would talk about why do we need these jobs, do these jobs help our environment, are our needs providing jobs for this field (social factors), do these types of jobs help our society save money.

After class discussion students will have an exit slip asking them about what they have learned from these presentations not only about the jobs but the factors or choices that affect our society. This also can be completed as homework. (Feedback for presentations also can be given as an assignment).

## Equipment/Materials/Technology Needed:

- Computers
- websites for research
- Needs vs Wants worksheet
- Rubric for Presentation
- Exit Slip

## Teacher Resources:

(e.g., readings, set-up instructions, lecture files, data files, etc.):

- Rubric
- Websites
- Teacher guide
- Needs vs Wants Worksheet
- <http://www.thesimpledollar.com/taking-a-deeper-look-at-wants-versus-needs/>
- Article to give to your students about needs vs wants

## Student Resources:

(e.g., handouts, worksheets, data, etc.):

- Rubrics for presentation and research paper
- Needs vs Wants Activity
- Research Paper Guidelines
- Presentation Guidelines
- Article (<http://www.thesimpledollar.com/taking-a-deeper-look-at-wants-versus-needs/>)
- Websites to use for research

## Rubric

<p><b>Assessments:</b> (e.g., lab, quiz, test, oral presentation, survey, rubric, etc.)</p> <ul style="list-style-type: none"> <li>oral presentation</li> <li>Exit slip</li> </ul> <p><b>Extensions/Homework:</b></p> <ul style="list-style-type: none"> <li><b>1st Day</b> - Finish research paper</li> <li><b>2nd Day</b> - Feedback on presentations</li> </ul> <p><b>References:</b></p> <ul style="list-style-type: none"> <li>any websites the students use</li> <li>the librarian set up a web podcast to help the students to find online resources for this topic.</li> </ul> <p><b>Personal Comments/Notes:</b></p> <ul style="list-style-type: none"> <li>There is a teacher guide if you need further instructions about this activity. It also has some websites for your students to research.</li> </ul>	<p><b>Accommodations &amp; Safety Concerns:</b></p> <ul style="list-style-type: none"> <li>Large print textbooks</li> <li>Textbooks for at-home use</li> <li>Graphic organizers</li> <li>Additional time for assignments</li> <li>Seats in front for hearing/seeing impairments</li> <li>Assigned groups</li> </ul>
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	<b>0</b>	<b>2</b>	<b>4</b>	<b>6</b>
<b>Content</b>	Piece is lacking information and/or information is inaccurate and irrelevant.	Provides basic information, some of which may be incorrect and/or irrelevant; based on minimal research.	Provides partially complete, accurate, and relevant information; based on adequate research.	Provides complete, accurate, and relevant information; based firmly on extensive and careful research.
<b>Thinking and Communication</b>	Demonstrates little understanding of the topic. Ideas are not expressed clearly or supported by examples, reasons, details, and explanations. No interpretation and analysis of the material	Demonstrates some understanding of the topic, but with limited analysis and reflection. Ideas are not expressed clearly and examples, reasons, details, and explanations are lacking. Examines the issue from a single perspective.	Demonstrates a general understanding of the topic. Ideas are generally expressed clearly through adequate use of examples, reasons, details, or explanations. Examines the issues from more than one perspective.	Demonstrates in-depth understanding and insight into the issue(s) under discussion, through careful analysis and reflection. Ideas are developed and expressed fully and clearly, using many appropriate examples, reasons, details, or explanations. Examines the issue from three or more perspectives.

## Energy Choices and Careers

	<b>0</b>	<b>2</b>	<b>4</b>	<b>6</b>
<b>Organization, Mechanics, and Vocabulary</b>	<p>The written sections lack organizational devices, such as paragraphs, sections, chapters, and transitions. Numerous errors in grammar, punctuation, spelling, and/or capitalization. A bibliography or reference section is missing.</p>	<p>Language is copied from another source. Organizational devices, such as paragraphs, sections, chapters, and transitions, are flawed or lacking. Numerous errors in grammar, punctuation, spelling, and/or capitalization. The bibliography or reference sections contains an inadequate number of sources.</p>	<p>The work is written in the author's own words. There are some problems with organizational devices, such as paragraphs, sections, chapters, and transitions. There are several errors in grammar, punctuation, spelling, and/or capitalization. A bibliography or reference section identifies an adequate number of sources.</p>	<p>All idea's are in the author's own, well-chosen words. Organizational devices, such as paragraph sections, chapters, and transitions, have been used effectively. With minor exceptions, grammar, punctuation, spelling, and/or capitalization are correct. A bibliography or reference section identifies a variety of primary and secondary sources.</p>
<b>Use of References</b>	<p>References are seldom cited to support statements.</p>	<p>Although attributions are occasionally given, many statements seem not supported. The reader is confused about the source of information and ideas.</p>	<p>Good use of sources that support information given for the most part.</p>	<p>Compelling evidence from sources is given to support information. Attribution is clear and fairly represented.</p>

## Energy Careers Rubric

<b>Type of Visual</b>	<b>6</b> Visual Completed (Power Point or poster)		<b>2</b> Visual Somewhat Completed		<b>0</b> no type of visual
<b>Evidence/ Explanation</b>	<b>8</b> Evidence provided from research is fully explained in detail.	<b>6</b> Evidence from research is provided.	<b>4</b> Evidence from research is provided, but might be lacking enough detail.	<b>2</b> Very little evidence from research is provided.	<b>0</b> No Support or Evidence
<b>Presentation</b>	<b>8</b> Members thoroughly share design, explain how and why they do their job, and communicate strong evidence and build well- developed summary of what these people do in our energy field.	<b>6</b> Members share evidence and communicate information found from their research.	<b>4</b> Member participation, information, summary, and/ or organization of presentation is incomplete.	<b>2</b> Member participation, information, summary, and/ or organization is lacking in essential components.	<b>0</b> No presentation given by the whole group or certain members/
<b>Format of Visual</b>	<b>8</b> Power point/poster, typed paper, poster, fully explained.	<b>6</b> Power point/poster, typed paper, poster, somewhat explained.	<b>4</b> Power point/poster, typed paper, poster, not explained.	<b>2</b> Handwritten, complete sentences.	<b>0</b> Handwritten, incomplete sentences.
<b>Quality/ Creativity</b>	<b>8</b> Neat, typed, organized, colorful, pictures.	<b>6</b> Neat, typed, organized, colorful.	<b>4</b> Neat, typed, organized.	<b>2</b> Organized, colorful, pictures.	<b>0</b> Neat.
<b>Punctuation and Spelling</b>	<b>8</b> 1 error.	<b>6</b> 2 or less errors.	<b>4</b> 3 or less errors.	<b>2</b> 4 or less errors.	<b>0</b> Many errors.

Name \_\_\_\_\_ Total Points = \_\_\_\_\_ x 2.5 = \_\_\_\_\_

Name: \_\_\_\_\_

## Careers in Energy Research Paper and Presentation Guidelines:

A day in the life of: \_\_\_\_\_

Gas and Oil Drillers, Gas Engineers, Nuclear Engineer, Nuclear Engineer – Military (Navy), Electrical Power Engineers, Coal Power Plant Workers, Coal Miners, Electrical Occupations (Power Systems), Wind Turbine Designers, Wind Turbine Technicians, Solar Energy Jobs.

After you have picked what energy career your task is to do a research paper on this career.

### Information to include into your paper:

- What High School course work will help you attend a college with this career
- What 2 year or 4 year colleges are available to attend for this career
- What are the requirements to attend this college
- Explain what the program is and what is the class load for the program is
- What does your job entail
- How does this job help the society
- Describe the energy sources that it entails
- History of the job/ How has it changed
- What does the future hold for this job
- What is the average salary for this energy job
- Is it non renewable energy/ renewable energy
- What are some safety requirements for this job
- Fun Facts to include in your research
- Advice given that you can find from professionals in this career
- You can include any other research you have found on this job. If you can interview someone in one of these fields it will be extra credit to use them as a source (5 pts).

**Reference your rubric for your paper. Make sure it is following this rubric with format. Page limit is at least 2 pages.**

Name: \_\_\_\_\_

## Needs VS. Wants Activity

**Step 1:** Take a step back and brainstorm your daily activities. Write all of this down on a separate sheet of paper. After you have written all of your daily activities down, I want you to think about all of the appliances, objects, items, etc. that go into your daily activities. You then will prioritize these things as what you think you need in life or what you want. I also want you to add certain things that you think you might want/ need that might not be objects in your daily activities or that are not objects at all that you want to include.

**Step 2:** Pair up with another classmate and compare lists. Go through them and discuss each other's needs and wants. Pick five out of both your lists that you want in our society and five from your needs list.

**Step 3:** Look at this list of five wants and needs... How many of these things are electronics? Where do they fall (needs/wants)? Discuss with your partner. We will come together as a class to have a discussion about your lists and what we think about these lists.

**Step 4:** Try to think about our energy unit. How many of your needs or wants are included into electronics or any type use of energy. How do we get some of this energy? What were some of the energy job fields we had discussed last class? Do their jobs affect our needs or wants? How so?

**Step 4:** Be prepared to discuss all of these topics as a class. Think of questions you would like to ask.