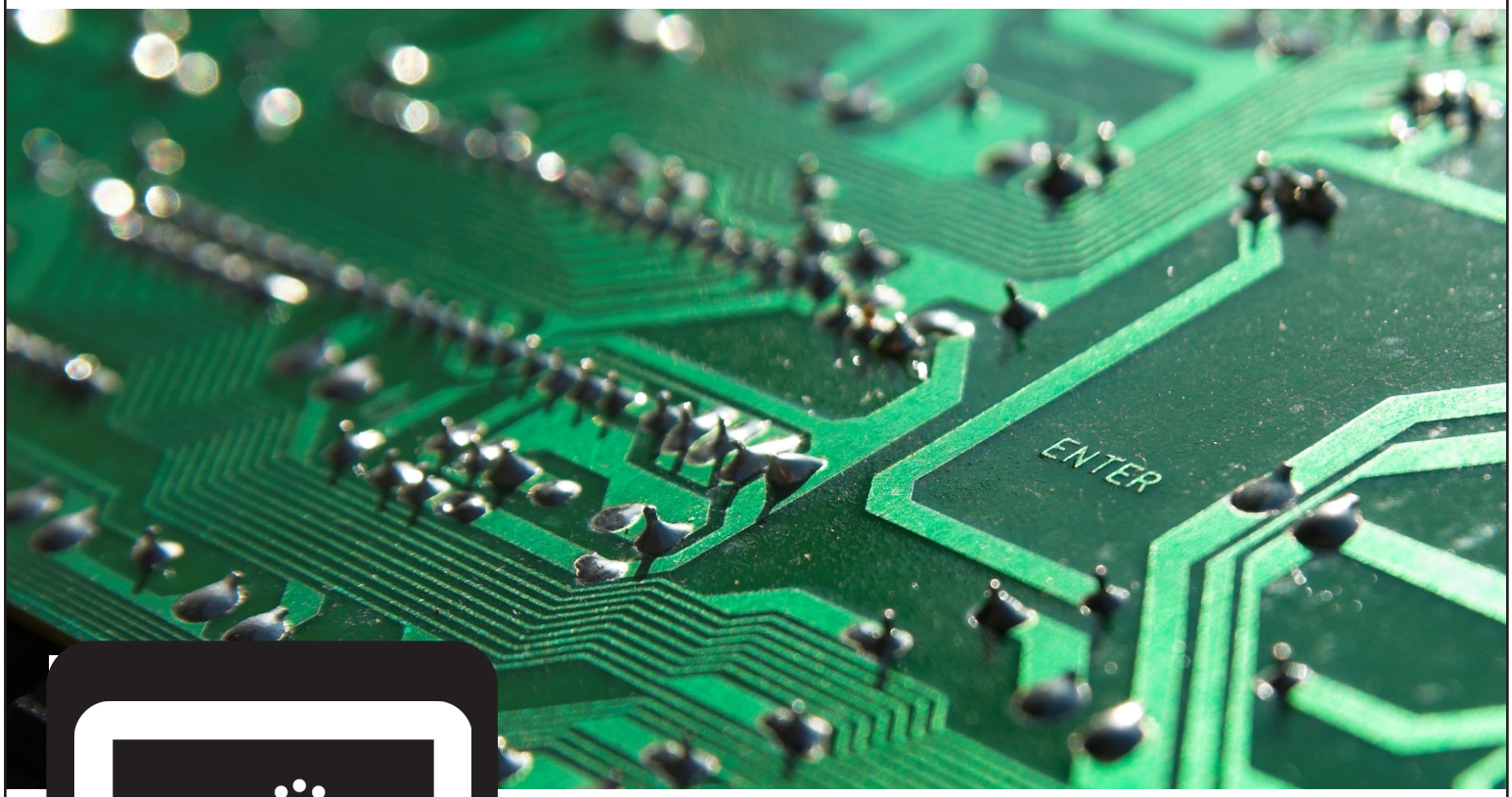
2015-2016

Digital Energy

Students use NEED Infobooks and graphics to prepare digital presentations that teach others about energy topics.



Grade Levels:

- Elem Elementary
- Int Intermediate
- Sec Secondary

Subject Areas:

- Science
- Language Arts
- Technology

NEED
National Energy Education Development Project

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NEED Mission Statement

The mission of The NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.

Teacher Advisory Board Statement

In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.

Permission to Copy

Energy Data Used in NEED Materials

NEED believes in providing the most recently reported energy data available to our teachers and students. Most statistics and data are derived from the U.S. Energy Information Administration's Annual Energy Review that is published yearly. Working in partnership with EIA, NEED includes easy to understand data in our curriculum materials. To do further research, visit the EIA website at www.eia.gov. EIA's Energy Kids site has great lessons and activities for students at www.eia.gov/kids.

National Energy Education Development

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www.NEED.org

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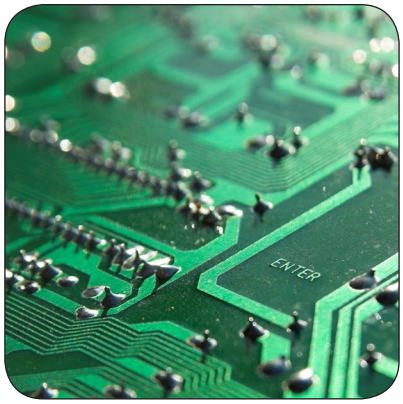


Digital Energy

Table of Contents

Standards Correlation Information

www.NEED.org/curriculumcorrelations

Next Generation Science Standards

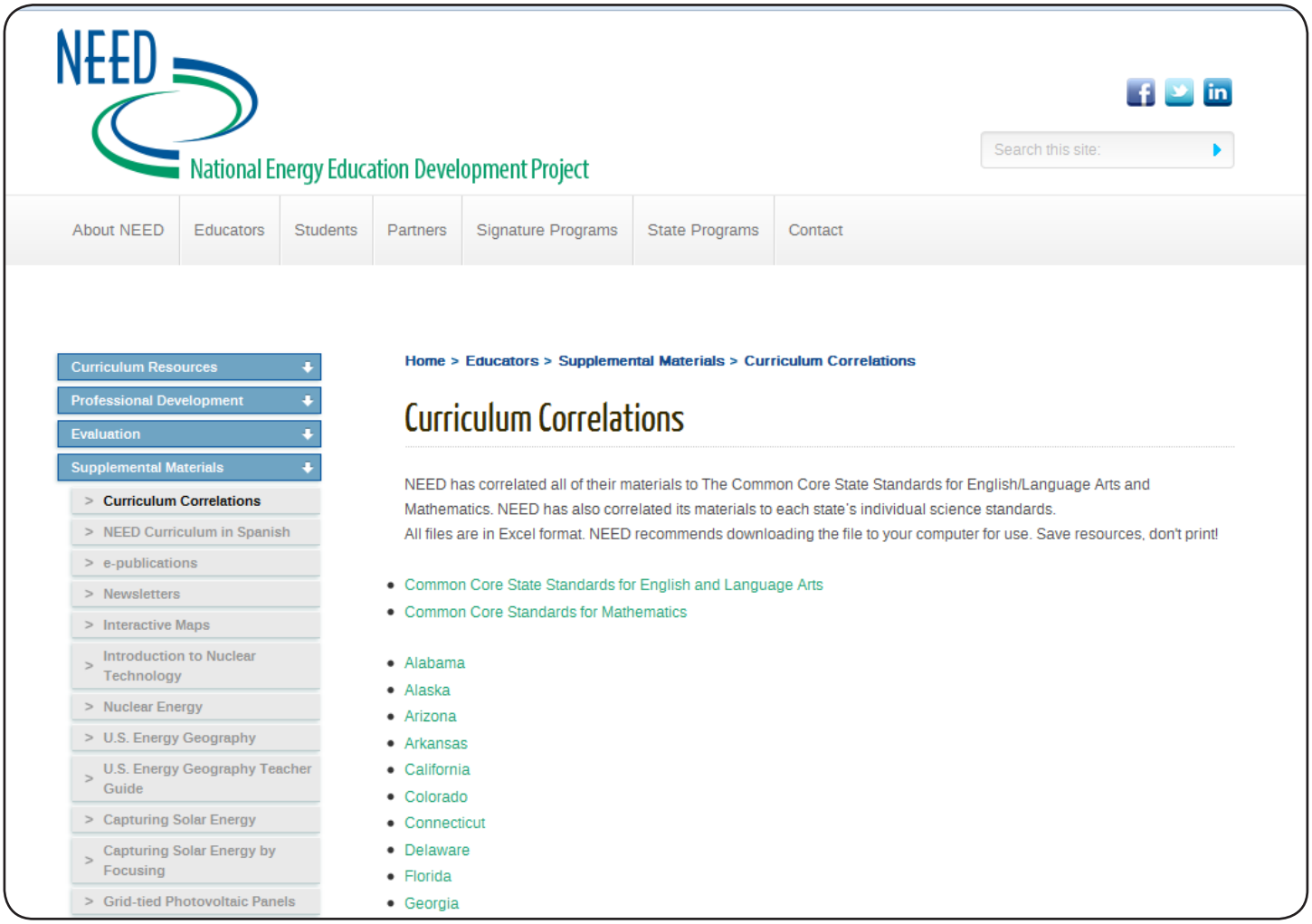
- This guide effectively supports many Next Generation Science Standards. This material can satisfy performance expectations, science and engineering practices, disciplinary core ideas, and cross cutting concepts within your required curriculum. For more details on these correlations, please visit NEED's curriculum correlations website.

Common Core State Standards

- This guide has been correlated to the Common Core State Standards in both language arts and mathematics. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED curriculum correlations website.

Individual State Science Standards

- This guide has been correlated to each state's individual science standards. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED website.



Teacher Guide

A student-driven activity where students investigate energy topics and teach others using digital media and graphics.

Background

In this cooperative learning activity, students work in small groups to prepare short digital presentations on various energy topics. The activity has been designed for students in grades 5-12, for use with NEED's *Intermediate* and *Secondary Energy Infobooks* and graphics library. Infobooks and graphics can be accessed from www.NEED.org.

This activity is an excellent stepping stone for use following NEED's *Energy Expo* or *Science of Energy* unit. In this activity students must take on more of the non-fiction text synthesis and be able to instruct others, which deepens their understanding of content. Guided questions and content can be selected from the provided list, or students can independently select their topics and create their own questions. Students are encouraged to create their own graphics to showcase their content and teach others.

Materials

- *Sample Script,* page 8
- *Energy Consumption Assessment,* page 9
- *Graphical Representation Master,* page 10
- *Student Guide,* pages 11-12
- Energy 101 PowerPoint
- *Energy Infobooks*, at appropriate level
- Internet access
- Digital projector and speakers

Preparation

- Decide if you will pre-select student topic areas, or will allow students to select their own topic.
- Preview the list of topics and guided questions suggested for student projects. As necessary, select and/or prepare additional topics and guided questions that may fit the goals of your unit.
- Familiarize yourself with the *Student Guide* and the Infobook(s) you wish to work with.
- Make copies of the *Sample Script* and *Energy Consumption Assessment*, so that these two pages are back to back.
- Download the Energy 101 PowerPoint presentation from www.NEED.org and save the file to project for the class.
- Prepare a copy of the *Graphical Representation Master* for projection and discussion.
- Make copies of the *Student Guide*, and any fact sheets needed from the Infobooks, as necessary.

NOTE: Infobooks can alternatively be downloaded and viewed as a PDF or in e-reader format, if you wish to avoid printing and encourage students to read digitally. Each can be downloaded from www.NEED.org. Students should navigate to the "Students" tab and click "Infobooks" to view entire guides, individual source fact sheets, and the guides in their e-reader format.

- Preview and peruse NEED's graphics library to share and discuss examples of graphics with students, http://need-media.smugmug.com/Graphics.
- Create a list of digital media formats students may use to create their projects. Examples can include, but are not limited to: podcasts, movie trailers/posters, PSAs, infomercials, PowerPoints, Prezis, Slide Rockets, Flair, social media sites, websites, etc.
- Separate students into groups of two to three students and, if necessary, designate a topic for each group. It may make sense to group students heterogeneously, so that each group has balanced skill sets. Conversely, it may make sense to group students homogeneously, or based on similar interest in a topic. You may also choose to survey student interest levels on various topics to assist in grouping students homogeneously.

Grade Levels

- Elementary, grade 5
- Intermediate, grades 6–8
- Secondary, grades 9-12

Time

- Three to six 45-minute class periods.

Web Resources

Aside from using NEED's *Energy Infobooks* and graphics library at www.NEED.org. Students may use other government and industry sites for content and graphics inspiration. Some suggestions include:

U.S. Energy Information Administration (EIA)
www.eia.gov

EIA Energy Kids
www.eia.doe.gov/kids

EIA - Energy Explained
www.eia.gov/energyexplained/index.cfm

National Renewable Energy Laboratory
www.nrel.gov

The Society of Petroleum Engineers, ENergy4Me
www.energy4me.org

U.S. Department of Energy
http://energy.gov

U.S. Department of Energy Office of Energy Efficiency and Renewable Energy
http://energy.gov/eere

✔ Procedure

1. Introduce the activity to your class. Explain to students that they will be working in small groups, researching an energy-related topic, and creating a digital presentation or digital media piece to teach others about their topic, using appropriate graphics.
2. Give the sample Energy 101 presentation using the sample script. Ask students to pay close attention to the framework and design used in the presentation, as it can serve as a template for their final project.
3. Ask students to share something they learned from the presentation. Pass out the sample script page so that the script is facing downward and the assessment questions are facing up. Ask students to answer the prescribed questions based on the information they heard and saw in the presentation. Discuss answers, as needed, referring to the script on the other side of the page. Discuss as a class why it might be important to have a planned script when giving a speech or presentation. Have students evaluate the effectiveness of your presentation for answering the questions…if you dare.
4. Discuss the presentation itself. What elements worked well to demonstrate energy consumption? How can graphics work to a presenter's and a learner's advantage? Could they ever be a disadvantage? Ask students what they liked and didn't like about the graphics used in the presentation, and ask them to elaborate on how the graphic(s) might be improved.

   NOTE: This sample presentation is very basic, some of which is purposeful. This is meant to be a template that students could improve upon quite easily by switching any number of things, including the presentation format or media itself. Many of the graphics are black and white. Students might note that more color and flair can assist in depicting information, but it should be noted that too much color or flair can be a distraction to their presentation goals.
5. Project the *Graphical Representation Master*. Read the background aloud. If necessary, show examples of each of the various types of graphics you may find in a textbook or online. Ask students to create their own graphic, of any type, that depicts some or all of the nonfiction text presented. Allow as much time as necessary, or assign for homework. When students have completed their graphics, ask them to pair up and share their work. Each student should be able to point out two strengths and one potential improvement from their partner's work.
6. Share some of the student-created graphics with the whole class. Discuss the variety of ways the same information can be synthesized and represented. Highlight how each method may appeal to learners for different reasons. Explain to students that your example presentation used pre-prepared graphics. Their presentations will use a combination of pre-prepared graphics and student-created graphics. Remind students that borrowed graphics must be cited. Review the citation methods your students may have learned and clarify your preferred citation method, if necessary.
7. Pass out the *Student Guide* and explain the project components and grading procedure. Be sure to address and assign due dates and progress checks for various tasks, as needed. Share the list of digital media and presentation options and suggestions you have prepared.
8. Put students into their assigned groups and identify their topics, or discuss that they will be allowed to select their topic, pending approval. Depending on the groupings and the students in your class, it may be necessary to review good practices for group work. Emphasize that everyone must work together and take ownership of work completion. Clarify that group work is a component of their final grade.
9. Allow as much time as needed for project completion. Monitor group work and check-in on progress. Make sure groups are devising their assessment questions, writing their scripts, creating their graphics, and assembling their digital media/presentations.

✔ Presentations

1. On the designated day(s) for presentations, go over the order in which groups will present.
2. Each group must make sure the audience has copies of their assessment questions. Clarify if you will allow groups to work together to complete the assessments or if students should work individually.
3. Assist in moderating group presentations, making sure groups keep the presentations moving and adequately address questions and discussions that arise from their presentations.
4. Collect any written work from groups and individuals for assessment purposes. You may choose to go over the assessment questions from each group's presentation as a class or collect them for grading.

☑ Evaluation

- Evaluate group work using the outline below, or prepare your own. Be sure to share the grading scheme with students before they complete their projects.

▪ Presentation thoroughly addresses topic with five essential facts/details	20 points
▪ Visual presentation incorporates appropriate mechanics and is appealing	10 points
▪ Scripted talking points enhance and support visual content	10 points
▪ Presentation includes appropriate number of graphics with citations	5 points
▪ Graphics support and enhance content	5 points
▪ Creation of at least two original graphics	20 points
▪ Presenters are able to answer questions, facilitate discussion	5 points
▪ Assessment questions provided	5 points
▪ Assessment questions are adequately covered in presentation content	5 points
▪ Written script provided	5 points
▪ Group member contributions	10 points

- You may also choose to separately assess the answers to each group's assessment questions. Groups may also create outlines and storyboards or plans to help them create their projects. You may collect these for additional points, as needed.

Sample Script

ENERGY 101

Slide One—Title Slide

Introduce project to students. Explain that creating a PowerPoint is one of their digital media presentation options. Pass out the *Energy Consumption Assessment* if you wish for students to work on the questions while you present. Explain that this PowerPoint will introduce them to energy and its consumption.

Slide Two—What Is Energy?

Energy is the ability to do work or cause change. Energy produces warmth, light, sound, movement, and growth. Energy powers technology. Where do you think energy comes from?

Slide Three—Where Do We Get Our Energy?

Energy consumption is how much energy we consume or use. Turn to your neighbor and brainstorm the number of ways you have used energy since leaving your home this morning. Where do you get your energy to move, make noise, think, and grow? Yes, the food you eat is your fuel. The food you eat got its fuel from the sun. The sun is a key factor in photosynthesis, and in the creation of many of our energy sources. Where do we get the energy to power the lights in this room? There are many sources of energy and electricity. Today we will talk about those sources and how they are used in the United States.

Slide Four—U.S. Energy Consumption by Source

So where do we get the energy to heat our homes, manufacture goods, and drive our cars? There are many energy sources. Nonrenewable energy source supplies are limited, and people can't make more in a short time. Renewable energy sources are ones that there is a continual supply of, and we are not in danger of depleting the supply. Why do you think Petroleum is our number one source of energy? It is a valuable transportation fuel. Take a minute to write down the sources and their energy consumption percentages.

Slide Five—Population Versus Energy Consumption

We have 4.45% of the world population, yet consume 18.5% of the energy.

What factors do you think contribute to this difference? (rich country, many cars, lots of technology and items that use electricity, areas that use a lot of heat and areas that use a lot of air conditioning…)

What are some things we can do to balance out our energy use? (use more efficient appliances, use more efficient cars, use alternative fuel sources, buy renewable energy, reduce, reuse, recycle, repair, walk instead of drive, carpool, buy ENERGY STAR® appliances, etc.)

Slide Six—Home Energy Consumption

In a typical home, almost half of the energy used is for heating and cooling. How could location play a factor in changing these numbers? Would desert areas like Las Vegas have the same heating/cooling percentages as Vermont? What could you do to help reduce some of these costs? How do you think energy use in a school compares to energy use at home?

Slide Seven—Coming Soon

Introduce the student project and ask students to critique the presentation, thinking about what works and what could be improved upon.

Energy Consumption Assessment

1. Write an energy flow and trace it back as far as you can. Where does most of our energy start?

2. What sources of energy do we use the most? Why do you think we do not use more renewable sources?

3. Make a VENN diagram. Label one side "Energy Use at School" and the other "Energy Use at Home." You need to have at least 15 things in it (minimum of five in each of the three sections).

4. List at least three things you could do to reduce your home energy bill.

5. Do you think American's use energy wisely? Write a paragraph defending your opinion, with two to three supporting details.

Graphical Representation Master

🕮Background

Ever wonder why graphic designers choose certain colors, or use a certain image to depict a concept? Graphics are an important part of how we learn and piece information together. Graphics help our brains synthesize information and represent it in a different, and often, more helpful manner. Graphics can take a difficult concept to understand and make it meaningful. Graphics are more than just graphs and charts; graphics can include diagrams, maps, many types of graphs, illustrations, photographs, and infographics.

✔ Procedure

- Read the text below. Underline and highlight any information you find to be important, interesting, or essential.
- Create a graphic that depicts some or all of the nonfiction text.
- Use colors, and any type of graphic you wish. Create your graphics digitally or on paper – whatever you are comfortable with.
- Share and discuss the graphics you have created as a class.

🕮Nonfiction Text

Our Earth is surrounded by a blanket of gases called the atmosphere. Without this blanket, our Earth would be so cold that almost nothing could live. It would be a frozen planet. Our atmosphere keeps us alive and warm.

The atmosphere is made up of many different gases. Most of the atmosphere (99 percent) is oxygen and nitrogen. Less than half of one percent is a mixture of greenhouse gases. Greenhouse gases include water vapor, carbon dioxide (CO_2), methane, F-gases, ozone, and nitrous oxide (NO_X). Water vapor is the most common greenhouse gas, but can have varying levels of concentration depending on the climate.

Carbon dioxide is the gas we produce when we breathe and when we burn wood and fossil fuels. Methane is the main gas in natural gas. It is also produced when once-living matter decays, and from animal waste. The other greenhouse gases are produced by burning fuels and from other natural and human activity.

Student Guide

TEACH YOUR CLASS ABOUT AN ENERGY SOURCE

✪ Assignment Checklist

Thoroughly check each part of your project, making sure to look for correct spelling, grammar, and punctuation, before presenting.

- ☐ Research topic using Infobooks and personal research.
- ☐ List 5 essential details and create an outline.
- ☐ Write 5 assessment questions.
- ☐ Create a plan or storyboard for your presentation.
- ☐ Design and create a presentation using your digital media.
- ☐ Create and use 5 graphics. (see below)
- ☐ Rehearse presentation.

🕮 Background

We use many different energy sources to do work for us. We use ten major energy sources in the United States. Several of these sources are used to make electricity. Your group has been assigned one energy-related topic to study. You will research your topic, create a presentation using graphics, and teach the class about your topic.

Do your best!

✔ Procedure

Step One – Backwards Planning: Research and Assessment Creation

- If your group has been assigned a topic, read it thoroughly together and ask any questions you may have of your teacher. If your group is selecting its own topic, brainstorm and narrow down the focus of your presentation. Make sure your teacher approves your topic.
- Read the Infobook sections that relate to your topic. Conduct additional research using reliable sources, including government and industry support websites. Take notes and review your notes together as a group.
- Before you begin preparing your presentation and making your graphics, think about what you want your classmates to know about your topic. What is essential? From your group's research notes, identify five essential details and flesh out any supporting facts important to your topic in the form of an outline.
- As a group, prepare five assessment questions that someone should be able to answer about your topic and the essential details you identified.
- Decide upon the digital media type and format of your presentation. Prepare a storyboard or plan as a group.

Step Two – Presentation Creation

- Break up the presentation work so that each person has a task or set of tasks to which they can contribute.
- Write a script for your presentation based on your outline and your storyboard/plan.
- Decide what graphics your presentation must have to help enhance and support your script. Your group needs to have a total of five graphics. Of the five graphics, two must be original graphics, created by your group members.
    - Look for supporting graphics from other sources.
    - Create your graphics.
    - Make sure data and information used to create the graphics is reliably sourced and cited. (Ask your teacher for citation help, if you are unsure about this.)
- Create a digital media piece that showcases your graphics and helps deliver the essential information about your topic. A good overall presentation may not have every piece of text contained in your script written out. The media and images should support, demonstrate, and/or enhance the talking points in the script while it is read and relayed to the audience.
- Rehearse your scripted presentation as a group, making sure that all members have a role, and your digital media is saved and accessible from where you will be presenting to the class.
- Anticipate and prepare for any questions your classmates may have. Verify that your presentation script and media together contain the information in your assessment questions.

Step Three – Presentations

- Present your media and script to the class.
- Allow for discussion and questions regarding your topic. Each team member should be prepared to answer questions about the content or graphics used.
- Make sure that each of your classmates has your team's assessment questions.

✚Positive Presentation Tips

- Memorize your part, or better yet, know the information so well that you do not need to memorize it. Avoid reading from the script, if you can, so you are able to make eye contact with the audience.
- Project. Speak loudly enough so students in all corners of the room can hear you.
- Speak slowly and clearly. Be aware that you may have the tendency to talk too fast when you are nervous.
- Use some kind of pointer (it can be built into the presentation) to discuss important parts of each graphic.
- Position yourselves so that you can present the information without blocking the view of your audience.
- If you feel nervous speaking in front of others, remember that everyone else probably feels the same way.
- Run through your complete presentation a couple of times to make sure everyone is comfortable with their parts and can read or say all of the words correctly in their part of the presentation.
- Practice your part in the same spot you will present to the class. Or, practice your part in front of a group of friends or family members. These practices may help you to feel more comfortable when it is your turn to go in front of your classmates.

Sample Digital Energy Topics

General Energy

- How much energy consumed in the United States comes from nonrenewable sources of energy? How does this compare with renewable energy sources? How can we consume less nonrenewable resources?
- What is energy efficiency? Howis energy efficiency important to the generation of electricity in a power plant? What are the efficiencies of different types of generation facilities?
- How much energy is consumed by your home state? How does your state compare to other states and the national averages?
- How do different sectors of the economy use energy differently?
- How do we harness energy offshore? What obstacles must be be considered and accounted for? Who owns the land and makes sure facilities are properly monitored?
- How are the prices of electricity and fuels determined? What entities are responsible for driving prices?

Petroleum

- How was petroleum formed? How does petroleum consumption compare to petroleum reserves?
- How many products can be made from a barrel of crude oil? What processes are undertaken to refine it?
- Where is petroleum produced nationally, and internationally? How can petroleum production be a concern politically, economically, and socially?
- How is petroleum recovered from underground rock? What processes and technologies make the process easier?
- Why are oil spills challenging to clean up?

Natural Gas

- How was natural gas formed? How does natural gas consumption compare to natural gas reserves?
- How is natural gas transported? What is the process required for liquefying natural gas? What are the benefits and challenges of using LNG?
- Where is natural gas produced nationally, and internationally? How can natural gas production be a concern politically, economically, and socially?
- What is the process of hydraulic fracturing? How can this be a beneficial and controversial practice at the same time?

Coal

- What are the different types of coal? How does the energy content vary for each? Are different types of coal found in certain locations?
- How do we remove coal from the ground? What are the challenges of mining coal safely? What is reclamation and how is it important to effective mining practices?
- Why is coal used for so much of our electricity production? What are the challenges related to keeping it a major part of our electricity generation picture?

Nuclear Energy

- How does the process of nuclear fission work? What are the benefits and concerns behind using fission to generate electricity?
- What is the uranium fuel cycle? How is uranium processed, used, and stored?
- What is radiation? How much radiation do we get from nuclear energy and from other activities?
- How does the process of nuclear fusion work? Where is fusion used for energy and what is the future of fusion?

Sample Digital Energy Topics

Hydropower

- How does the water cycle impact a hydroelectric generating facility? How does a hydropower plant affect the local environment and ecosystem?
- How are hydrokinetic technologies being tested and used for electricity generation? What are the benefits and challenges of hydrokinetic technology?

Biomass and Waste

- What role do plants play in our energy consumption? What plants and biomass materials are being tested for future use? What are the benefits and challenges of using plants for fuels and energy?
- What happens to the municipal solid waste generated in America? How does the amount recycled compare to the amount landfilled, and the amount used for electricity generation?
- How is trash used to generate electricity? What processes are available and where are they used?

Geothermal

- Why is geography a major factor in the use of geothermal energy? Where is geothermal energy used to generate electricity? Who generates the most?
- What is a geothermal heat exchanger? How do these items work to save energy in the home?
- How is geothermal energy good for the environment? Are there pollutants involved?

Solar

- How does a PV cell work? What are the limitations of using PV cells and arrays? What emerging technologies should we expect to see?
- What are the types of concentrating solar power (CSP) and how do they work? Where are the largest facilities and how do their generating capacities compare to the use of photovoltaics?

Wind

- Where is offshore wind being used? What are the challenges to installing offshore wind turbines?
- How are land use and animal species affected by wind turbine installation?

Electricity

- How and why is electricity generation different from one state to another? What sources are used to generate most of our electricity?
- What is the difference between baseload power and peak generation power? Why do we use certain sources to meet electrical demand at different times of the day?
- How is electricity generated? How is electricity transmitted and carried across the land?
- What is the electrical grid? What is the future of our electrical grid in the United States?

Energy and the Environment

- How are radiation, conduction, and convection different? Where do these concepts show up in our everyday lives as heat is on the move?
- What is the carbon cycle? How do we contribute to this natural cycle? What is a carbon footprint?
- How is climate different from weather? What is global climate change and what evidence exists to support it?
- What is the difference between energy efficiency and energy conservation? How do these practices serve to benefit our bank accounts and our environment?

Digital Energy Evaluation Form

State: _____ **Grade Level:** _____ **Number of Students:** _____

1. Did you conduct the entire activity?	❑ Yes	❑ No
2. Were the instructions clear and easy to follow?	❑ Yes	❑ No
3. Did the activity meet your academic objectives?	❑ Yes	❑ No
4. Was the activity age appropriate?	❑ Yes	❑ No
5. Were the allotted times sufficient to conduct the activity?	❑ Yes	❑ No
6. Was the activity easy to use?	❑ Yes	❑ No
7. Was the preparation required acceptable for the activity?	❑ Yes	❑ No
8. Were the students interested and motivated?	❑ Yes	❑ No
9. Was the energy knowledge content age appropriate?	❑ Yes	❑ No
10. Would you teach this activity again?	❑ Yes	❑ No

Please explain any 'no' statement below.

How would you rate the activity overall?	❑ excellent	❑ good	❑ fair	❑ poor
How would your students rate the activity overall?	❑ excellent	❑ good	❑ fair	❑ poor

What would make the activity more useful to you?

Other Comments:

Please fax or mail to: **The NEED Project**
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Manassas, VA 20110
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TXU Energy
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United Way of Greater Philadelphia and Southern New Jersey
University of Nevada–Las Vegas, NV
University of North Carolina
University of Tennessee
University of Texas - Austin
University of Texas - Tyler
U.S. Department of Energy
U.S. Department of Energy–Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy–Wind for Schools
U.S. Department of the Interior–Bureau of Land Management
U.S. Energy Information Administration
West Bay Exploration
West Virginia State University
Yates Petroleum Corporation