



PECO ENERGIZING EDUCATION PROGRAM

PROGRAM GUIDE

2019-2020 United Way OST Programs



An Exelon Company



A note from PECO...

PECO is thrilled to begin year nine of its PECO Energizing Education Program for Out of School Time Programs. Our partners, United Way of Greater Philadelphia and Southern New Jersey (UWGPSNJ) and the National Energy Education Development (NEED) Project make the program interesting, engaging, and fun for students. The program integrates energy education and student leadership, and results in a powerful engagement opportunity for OST programs. We are fortunate to have great organizations participating in PEEP – both new and returning!

PECO continues to partner with UWGPSNJ due to the success achieved in this program. UWGPSNJ is committed to driving real and lasting change for children, youth, and their families by investing in high quality programs that produce real, measurable outcomes, and by inspiring and uniting local communities to collaboratively bring about results to prepare young people to succeed in school and life.

At PECO, being a good corporate citizen means working with our customers and the communities we serve to help protect and preserve the environment. That is what this project is about. The agency leaders and students that participate in the program report impressive results – engaging students in inquiry science and in learning about the energy we use each day.

The hands-on curriculum and kits from The NEED Project provide the basis for the program delivery in an afterschool program. PECO and NEED work together to bring science, math, and energy together to spark interest in young minds. Through this partnership with UWGPSNJ we hope to bring energy, knowledge, and smart energy decisions to agencies providing academic supports and career exposure to our region's youth – allowing students to become energy leaders in their communities.

We're so pleased you'll be joining us for the 2019-2020 program year!

For Questions or Assistance:

About Curriculum, Kits, Community Project, and Follow-up Questions from Training

Emily Hawbaker of NEED

Phone: 800-875-5029

Email: ehawbaker@need.org

About the Reports, and Evaluations

Suzanne O'Connor of UWGPSNJ

Email: soconnor@uwgpsnj.org

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THE PARTNERS



www.peco.com

Based in Philadelphia, PECO is Pennsylvania's largest electric and natural gas utility, serving 1.6 million electric and over 500,000 natural gas customers in southeastern Pennsylvania.

Founded in 1881, PECO is one of the Greater Philadelphia Region's most active corporate citizens, providing leadership, volunteer, and financial support to numerous arts and culture, education, environmental, economic development, and community programs and organizations to improve the quality of life in the region.

PECO supports more than 9,600 local jobs, and has an annual economic impact of over \$4.5 billion in PA. The company operates and maintains a network with 21,000 miles of distribution and transmission lines and 11,600 miles of underground gas pipelines.



www.UnitedforImpact.org

United Way of Greater Philadelphia and Southern New Jersey has, for nearly a century, responded to the needs of our local community while simultaneously addressing the root causes of key issues. We do this by inspiring and uniting the power of individuals, the business community, and the public and nonprofit sectors around common goals. Together, we're able to drive real community impact in our neighborhoods, our communities, and our region. Together, we're working to ensure that every individual and family is able to achieve educational success, financial stability and good health.



www.NEED.org

The National Energy Education Development (NEED) Project

The mission of The National Energy Education Development (NEED) Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government leaders, and community leaders to design and deliver objective, multi-sided energy education programs. The NEED Project is dedicated to developing innovative energy education materials and training programs for teachers and students. Launched by Congressional Resolution in 1980, the NEED program is now a dynamic force in more than 65,000 classrooms nationwide.

The NEED Project's multi-sided training and instructional programs on all aspects of energy, including production, consumption, and economic and environmental issues, give students an understanding of the interrelationship between energy and the environment. More importantly, NEED's student-directed activities empower students to take active roles in educating their peers, families, and communities about energy issues. NEED programs focus on developing a clear understanding of the science of energy, and then building knowledge of the sources of energy, uses of energy, and the conservation and efficiency of energy.

PECO ENERGIZING EDUCATION PROGRAM AND UNITED WAY TEAM

PECO

Michael A. Innocenzo, President and CEO, PECO

Romona Riscoe Benson, Director of Corporate Relations

Christina Kerrigan, Sponsorship and Event Manager

The National Energy Education Development (NEED) Project

Mary E. Spruill, Executive Director

Emily Hawbaker, Curriculum Director

United Way of Greater Philadelphia and Southern New Jersey

Suzanne O' Connor, Director of Education

THE CURRICULUM COMMITTEE APPROACH

“Systems-thinking” focuses on how systems’ components interact with the components of other systems. Learning about systems is not another subject added to the curriculum; it is instead a tool used to model and understand relationships in the real world and in the curriculum. The systems-thinking process helps students understand the complex interactions between natural and social systems, and develops strategies that facilitate the solving of complex problems.

WHAT IS A SYSTEM?

The scientific idea of a system implies detailed attention to inputs and outputs and interactions among the system’s components.

In this unit, students apply higher-level thinking and creative problem-solving when they explore the interface between the natural and social systems that comprise their own communities. They will develop a more comprehensive understanding of the complexity of real-world concerns as they investigate how diverse cultural, economic, and political systems interact with their natural surroundings. In addition, students can apply their knowledge and skills from across the curriculum to study the systems that define their chosen community.

Systems to consider when introducing energy concepts to students:

Natural Systems: Wetlands; Water; Plants; Ecosystems; Soil; Agriculture; Forest; River

Social Systems: Family; School; Community; Governments: Local, Regional, State, and Federal; as influenced by economics, transportation, cultures, religions and a bigger world-view.

WHAT IS THE PECO ENERGIZING EDUCATION PROGRAM?

Fondly known as “PEEP,” the PECO Energizing Education Program brings project-based, hands-on energy science curriculum to Out of School Time programs. Participating OST programs receive staff training, lesson plans and engaging energy science kits. PEEP is designed for students in grades 4 – 9. Consistent with best practice, PEEP includes a family engagement component.

PEEP, in particular, aims to serve students experiencing factors that put them at risk of dropping out of school. These factors include:

- Low attendance (less than 85%)
- Poor academic performance
- High suspensions and detentions
- Chaotic school/program environment
- Adverse childhood experiences (ACEs)
- Low parent engagement
- Work/family demands that interrupt school engagement
- Absence of a supportive adult
- Disconnect between school academics and future career opportunities
- Learning differences

Two key tools in preventing school disengagement during these years are: career exposure and academic supports. PEEP utilizes both of these tools to re-engage students.

1. Select a contract manager at the agency and teacher leaders from each site to supervise implementation of the program. It is recommended that no fewer than two teacher leaders participate, to provide support for each other and to support the lessons with any number of students.
2. Participating agencies will participate in a mandatory one-day training session (November 8) at The Franklin Institute. This training session is designed and delivered by The NEED Project.
3. Incorporate PECO’s energy-focused curriculum and related activities into your afterschool programs or clubs between November and June.
4. Work with students, leaders, parents, and community members to plan and implement an energy-focused community outreach project, to be completed by May 15, 2020. Be sure to select a community partner(s) to work within the implementation of the project. Revise the budget to show how you have used the PECO cash grant for this project.
5. Participate in a mandatory mid-year check-in evaluation to be certain the program is progressing as planned. Attend a mid-program, half-day refresher workshop, (date TBD), at the Franklin Institute.
6. Execute the community project and create a presentation, video, and student performance about the project and its results. Submit projects for review by May 15, 2020. Students will prepare to present at The PECO Energizing Education Celebration in late May, 2020. All programs will present and must make an effort to attend. (Required)
7. Complete leader and student evaluations and submit to NEED no later than June 1, 2020.

WHAT RESOURCES DOES THE AGENCY RECEIVE?

The PECO Energizing Education Program includes:

1. A One- Day Leader Training (November 8) and a half-day refresher workshop (TBD) at the Franklin Institute
2. A choice of Curriculum and hands-on kits to teach about:
 - the science of energy and energy transformations
 - solar energy
 - wind generation
 - hydropower
 - natural gas
 - energy efficiency and conservation
3. A cash grant (based on number of participating students), to support the program's selection of and implementation of an energy-focused community outreach project
4. End of Year Educational Celebration — Date TBD, assistance provided with transportation
5. A sponsored opportunity to attend the NEED Energy Conference for Educators, July 19-23, 2019 in Albuquerque, New Mexico

THE CURRICULUM AND HANDS-ON KITS

NEED curriculum and three kits for the program are provided by grade level (leaders select the appropriate level/topic) at the PECO Energizing Education Program Training Workshop.

CURRICULUM GUIDES

We have chosen from over 130 teacher and student guides for teaching the science of energy, sources of energy, electricity and transportation, and efficiency and conservation. All leaders participating in the program will receive a class-set of NEED's Energy Infobooks at their selected appropriate grade level. These student readers serve as the text for a comprehensive energy education program. All other guides can be downloaded or ordered from NEED for supplementing the unit, if time permits.



HANDS-ON STUDENT KITS

The program will include selections from NEED's hands-on classroom kits including: *The Science of Energy*, *Energy from the Sun*, *Energy from the Wind*, *Energy of Moving Water*, and an energy efficiency and conservation kit. Leaders will choose from three of the Sources of Energy kits listed.

THE GUIDE TO TEACHING ABOUT ENERGY

PEEP was designed with a systems thinking approach to energy and environmental education. The program encourages students to learn about energy through direct engagement – discovering and applying energy knowledge to the energy choices and challenges we all face, both now and in the future. This guide to teaching about energy was created to provide the background and foundation components for the successful completion of the program. Most of the resources referenced within the guide will be provided to participating educators, but are also available online at shop.NEED.org.

ONLINE RESOURCES

The PECO Energizing Education Program site and resources: <http://www.NEED.org/peco>

The NEED Project website – curriculum, standards alignment, assessments, and more: <http://www.NEED.org> and shop.NEED.org.

PECO: <http://www.peco.com/>





2019-2020 DETAILED PROGRAM TIMELINE

- November 8** **PECO Energizing Education Program Training at The Franklin Institute**
- December 6** **All kits and materials received from NEED based on submission of paperwork.**
- December 13** **All participating agencies submit confirmation of receipt of curriculum materials and kits to NEED**
All kits should be opened, and any questions about materials sent to Emily at NEED- ehawbaker@need.org
- January 31** **Checkpoint 1: Have completed...**
Science of Energy activities, some basic energy sources or efficiency and conservation activities, preliminary planning of community project
- February/ March Refresher Workshop at TFI (half-day), date TBD**
- February 28** **T-shirt Design Submissions due**
Submit student t-shirt designs to Emily - ehawbaker@need.org or in person.
- March 3** **Application Deadline for Sponsorship to the NEED Energy Conference for Educators (July 19-23)**
- March 6** **Submit program update and check-in (email response to Emily)**
Leaders will need to respond to email and be prepared to submit one-page review form via email to include:
- Have you secured any partners for the project?
 - Who from the agency is responsible for making sure the project continues to meet the planned timeline?
 - Have you been able to keep expenses within budget?
 - Are there obstacles for which you require assistance from NEED?
 - Have you begun to plan the PowerPoint/video you will upload?
 - Are you gathering video and photos along the way?
- April 3** **Checkpoint 2: Have we...**
- Completed renewable energy sections and continue work on energy efficiency and conservation?
 - Launched the community project?
 - Assessed student performance during the activities?

May 8

Community Project wrap-up, evaluations being completed

- Consider showing the draft to the agency team, administrators, or other partners and friends.
- Have students begin brainstorming how they would present their project at the PECO Energizing Education Program Celebration.
- Begin preparation for student presentations, should the project be selected to present, work out technical difficulties ahead of time.
- Curriculum pieces are still being used and assessed.

May 15

Community Project completed, photos and videos submitted to file upload site for review

May 8 - May 29

Prepare presentations for PECO Energizing Education Program Celebration

- Students prepare brief (3 minutes or less) presentation to be shared with students, teachers, and community members at the celebration
- Prepare, practice, repeat

Late May

PECO Energizing Education Program Celebration (late afternoon/dinner, location and date TBD)

June 31

Program Wrap-up

- Print/copy *Student and Leader Evaluations* from the website (www.need.org/peco) for each student. Once students have completed the evaluations, mail or scan and email evaluations to NEED. Be sure to label your organization and site/location clearly. Evaluations may also be returned at the program celebration.

By mail:

**The NEED Project
attn: Kimberly Swan
8408 Kao Circle
Manassas, VA 20110**

By email to Kimberly Swan: kswan@need.org.

- Submit United Way end-of-year reporting Suzanne, soconnor@uwgpsnj.org

RECOMMENDED PECO ENERGIZING EDUCATION PLANNING GUIDE

<p>Session 1</p> <p>Unit Introduction</p> <ul style="list-style-type: none"> • Pre-test /poll • Preview : unit goals & community project • <i>Energy Conservation Contract</i> 	<p>Session 2</p> <p>The Science of Energy - Introduction</p> <ul style="list-style-type: none"> • Teacher Demo • Intro to forms of energy & energy transformations • Discuss schedule of activities 	<p>Session 3</p> <p>The Science of Energy - Station Investigations</p> <ul style="list-style-type: none"> • Station explorations • Read to understand 	<p>Session 4</p> <p>The Science of Energy - Station Investigations</p> <ul style="list-style-type: none"> • Prepare presentations • Students present stations to peers (if ready) 	<p>Session 5</p> <p>The Science of Energy - Station Investigations</p> <ul style="list-style-type: none"> • Students present stations to their peers
<p>Session 6</p> <p>Forms and Sources of Energy</p> <ul style="list-style-type: none"> • Review stations • <i>Forms and Sources of Energy</i> • <i>Science Of Electricity Demonstration</i> 	<p>Session 7</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • <i>Energy Roundup</i> • Renewables and nonrenewables • Kit-based activities 	<p>Session 8</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities 	<p>Session 9</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities 	<p>Session 10</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities
<p>Session 11</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities 	<p>Session 12</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities 	<p>Session 13</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities 	<p>Session 14</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities 	<p>Session 15</p> <p>Energy Sources Activities</p> <ul style="list-style-type: none"> • Renewables and nonrenewables • Kit-based activities
<p>Session 16</p> <p>Introduction to Saving Energy</p> <ul style="list-style-type: none"> • Students read to gain background knowledge about energy usage 	<p>Session 17</p> <p>Introduction to Using Energy Efficiency Tools</p> <ul style="list-style-type: none"> • Students learn how to use tools 	<p>Session 18</p> <p>Building Survey</p> <ul style="list-style-type: none"> • Students analyze their building's energy systems 	<p>Session 19</p> <p>Saving Energy in Your Community Building</p> <ul style="list-style-type: none"> • Survey reflection • Brainstorm changes • Brainstorm ideas for community outreach 	<p>Session 20</p> <p>Planning Day</p> <ul style="list-style-type: none"> • Students begin organizing ideas for their community outreach projects
<p>Session 21</p> <p>Saving Energy at Home</p> <ul style="list-style-type: none"> • Explore home applications of the building survey 	<p>Session 22</p> <p>Saving Energy at Home</p> <ul style="list-style-type: none"> • Revisit - <i>Energy Conservation Contract</i> 	<p>Session 23</p> <p>Saving Energy at Home</p> <ul style="list-style-type: none"> • Revisit - <i>Energy Conservation Contract</i> 	<p>Session 24</p> <p>Review and Wrap-up</p> <ul style="list-style-type: none"> • <i>Energy in the Round</i> • <i>Energy Web</i> 	<p>Session 25</p> <p>Review and Wrap-up</p> <ul style="list-style-type: none"> • Post-test/poll • <i>Energy Carnival</i>
<p>Session 26</p>	<p>Session 27</p>	<p>Session 28</p>	<p>Session 29</p>	<p>Session 30</p>
<p>COMMUNITY OUTREACH PROJECTS </p>				



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- The planning sequence on the previous page for your PECO Energizing Education Program Unit provides a sample sequence to use. Due to the time frame of this project lessons are expedited. In the future, you may wish to delve deeper into these topics and investigations.
 - If you wish you can plan your own sequence below, based on your familiarity with the topic, or your time constraints.
 - Leaders should thoroughly review all materials and plan units according to the needs of their students and their classroom timing and sequencing. Essential elements of the unit include: pre/post tests, *Science of Energy*, renewable and nonrenewable sources, and energy efficiency and conservation activities.
 - All NEED materials have been aligned to PA Standards www.NEED.org/educators/curriculum-correlations/

MY PECO ENERGIZING EDUCATION PLANNING GUIDE

Session 1	Session 2	Session 3	Session 4	Session 5
Session 6	Session 7	Session 8	Session 9	Session 10
Session 11	Session 12	Session 13	Session 14	Session 15
Session 16	Session 17	Session 18	Session 19	Session 20
Session 21	Session 22	Session 23	Session 24	Session 25
Session 26	Session 27	Session 28	Session 29	Session 30
COMMUNITY OUTREACH PROJECTS 				

PEEP RECOMMENDED PACING LESSON GUIDE

Day 1: Unit Introduction

Activity

Introduce students to energy and the goals of the unit through a pre-test and a contract.

Objective

Students will commit to saving energy at home and school, by creating their own pledge.

Materials

- *Energy Conservation Contract*
- NEED Energy Polls (www.need.org/evaluation)

Procedure

Direct students to assess their knowledge of energy prior to the unit, by taking the NEED *Energy Poll* as a pre-test. Discuss with them that they will be learning about energy – everything from the science of energy, to how we use energy, to how we should save energy. Preview the unit with students and what their desired outcomes should be. Tell them they will be working together as a group to create a community outreach project to share with others what they have learned. Assign the *Energy Conservation Contract* activities to students and ask them to pledge with their families to make a commitment to saving energy over the next 30 days. They will revisit their ratings and pledges at the close of the unit. **It may be helpful to assign the survey portions of the activity to students as home activity, prior to this Session. If you choose to do this, you can help students determine their conservation ratings in a group and devise a pledge for their family. **

Day 2: The Science of Energy - Introduction

Activity

Introduce students to the science of energy through demonstrations and discussions.

Objective

Students will identify and describe the forms of energy and examples of each. Students will be able to identify basic transformations of energy between forms.

Materials

Teacher Demonstration (*Science of Energy Kit*)

Suggested Handouts

- *Forms of Energy and Energy Transformations (Intermediate Science of Energy)*

✓ Procedure

Perform the teacher demonstration from the *Science of Energy* Kit. While students are shaking the jars of sand, go over potential and kinetic energy and their respective forms. Have students give other examples of each form of energy, other than those listed on the handout. Once the forms have been introduced, revisit the jars of sand from the demonstration and discuss. Ask students why there was a temperature change. (*Motion energy was transferred into thermal energy as the sand was shaken – friction created thermal energy.*) Outline the Law of Conservation of Energy using the Energy Transformations handout. Discuss that, no matter what, energy is never destroyed – it simply changes form, and most energy transformations begin with the sun. Encourage students to think of other simple energy transformations and draw them out. Outline the schedule for completing the Science of Energy stations, and put students into groups.

Day 3-5: The Science of Energy - Station Investigations

Activity

Students investigate stations and use inquiry process skills to learn about energy transformations within various systems. Each station will take approximately 20-30 minutes.

🎯 Objective

Students will understand that energy does not disappear, but changes from one form to another.

📄 Materials

- *Intermediate Science of Energy* Kit
- Hot Water (Station One, Four, Five)
- Cold Water

Suggested Handouts from *Science of Energy*

- *Station Presentation Planning Guide* (page 23)
- *Forms of Energy* (page 45)
- *Energy Transformations*
- *Lab Safety Rules*
- *Station Guides and What Was Happening?*
- *Station Reporting Forms*

✓ Procedure

Organize students into groups. Each group should be assigned a station, 1-6. Set up stations ahead of time with copies of handouts and all supplies for students. Students will investigate the station with their group. Students should record the question and then answer as appropriate in their notebook or on the handout you have copied. Offer as open an experience as your students can handle. As students investigate they should keep track of all relevant data and observations, surprises, real-world connections, and thoughts in their science notebooks.

After each investigation the group should reflect on what they observed by answering the questions, “What happened at the station? What energy transformations did you observe?” These questions should be provided to students so that they can refer back to them as they write their conclusions. Students should be encouraged to use evidence to support their thinking. They should read “What Was Happening?” and reflect with their group to confirm their thinking or change their misconceptions.

The group will then prepare to present their station and the involved transformations to other groups using the planning guide. Once groups have prepared their presentation, divide each group in half. During round one of presentations, half of the group will stay put and present. The other half will rotate to other stations. Once all students have rotated and presented in round one, the groups should switch roles.

Day 6: Forms and Sources of Energy

Activity

Make connections between the various forms of energy and the related sources that allow us to harness their energy through a transformation or series of transformations.

🎯 Objectives

Students will identify the ten sources of energy and the forms of energy stored or delivered by each source. Students will also be able to differentiate between renewable and nonrenewable resources. Finally, students should be able to list the chief sources of energy the United States consumes for energy and how the energy is harnessed.

📄 Materials

- Assembled *Science of Electricity* demonstration model (*Energy of Moving Water* Teacher Guide)

Suggested Handouts

- *Forms and Sources of Energy* (*Intermediate Science of Energy*)

✓ Procedure

Begin by reviewing the station investigations and all of the energy transformations students witnessed. Explain to students that energy transformations are what allow us to turn energy into something useful. Motion can be transformed into electrical energy. Chemical energy can be transformed into motion energy. In the United States we use a variety of sources to power our lives. Each of those sources relies on a transformation of energy. Have students complete the *Forms and Sources of Energy* worksheet and discuss. What do students notice about the sources of energy we use for most of our energy?

Ask students where they think electricity comes from? Ask them to explain how electricity is created. Many students may be unable to do so. Show the class the *Science of Electricity* model. Ask students to describe what they see and diagram it. Explain to students that many of the sources are used to turn larger turbines like this one in order to generate electricity or energy. Although the turbine generator is much larger in a power plant, they contain the same simple items – magnets and coils of wire. Ask students to discuss with their partners how they think each of the ten sources is used to generate electricity.



Day 7-15: Energy Sources Activities

Teachers will select two of the three renewable energy units to use with their students.

**Each kit is individually designed as a one-two week unit. Teachers are encouraged to examine each kit and activities carefully and choose which lessons will best meet their objectives and the students' needs. Teachers can also use this time to explore nonrenewable sources of energy through various activities or whole units.*

Activity

Students will investigate energy from various sources.

🔄 Objectives

Students will understand how renewable and nonrenewable resources are being used to generate energy and, more specifically, electricity.

📄 Materials

- Solar, wind, or hydropower kits
- Materials for nonrenewable activities
- Copies of activities for students
- *Energy Roundup* supplies (*Energy Games and Icebreakers*)

✓ Procedure

Examine the kits you received and the list of suggested resources below. Choose the activities you wish to explore with students. Gather materials and make copies or project the activities you choose to explore. Open the mini-unit on sources of energy by playing the game *Energy Roundup* with the class.



SUGGESTED RESOURCES FOR RENEWABLE AND NONRENEWABLE SOURCES OF ENERGY

SOURCES OF ENERGY	LEVEL	NEED RESOURCES	SUGGESTED ACTIVITIES
Oil and Natural Gas	Elementary	<i>Wonders of Oil and Natural Gas</i> <i>This Mine of Mine</i> <i>Energy Expos</i>	<i>Core Sampling</i> <i>Perforated Well Casing</i> <i>Building an Oil Rig</i> <i>Nifty Natural Gas Story</i>
	Intermediate	<i>Exploring Oil and Natural Gas</i> <i>Fossil Fuels to Products</i> <i>Energy Expos</i>	<i>Core Sampling</i> <i>Perforated Well Casing</i> <i>Exploring Porosity</i>
	Secondary	<i>Exploring Oil and Natural Gas</i> <i>Fossil Fuels to Products</i> <i>Energy Expos</i>	<i>Career Networking Template</i> <i>In the Round</i> <i>Natural Gas Production to Market</i> <i>Fracturing a Cake</i>
Nuclear (non-kit-based)	Intermediate	<i>Energy from Uranium</i>	<i>Atomic Mass Model</i>
	Secondary	<i>Exploring Nuclear Energy</i>	<i>Isotopes activities</i> <i>Candy decay activities</i>
Biomass/Waste –to-Energy (non-kit-based)	Elementary	<i>Talking Trash</i>	Museum Setup
	Intermediate	<i>Museum of Solid Waste and Energy</i>	
	Secondary	<i>Museum of Solid Waste and Energy</i>	
Coal (non-kit based)	Elementary	<i>All About Coal</i>	<i>A Cool Coal Story</i> <i>Coal Mining activity</i>
	Intermediate	<i>Understanding Coal</i>	<i>Coal Mining Match</i> <i>Mining Challenge</i> <i>A Cool Coal Story</i> <i>Baseload Balance</i>
	Secondary	<i>Exploring Coal</i>	<i>Coal Chemistry Activities</i> <i>Coal Debate</i> <i>Baseload Balance</i> <i>Mining and reclamation activities</i>
Solar	Elementary	<i>Wonders of the Sun</i>	<i>Solar Energy to Heat</i> <i>Solar Energy Can Cause Chemical Reactions</i> <i>Cooking with Solar Energy</i> <i>Transforming Solar Energy into Electricity</i>
	Intermediate	<i>Energy from the Sun</i>	<i>Radiant Cans</i> <i>Temperature and UV Beads</i> <i>Solar House</i>
	Secondary	<i>Exploring Photovoltaics</i>	<i>Investigating PV Cells</i>
Wind	Elementary	<i>Wonders of Wind</i>	<i>Measuring Wind Speed</i>
	Intermediate	<i>Energy from the Wind</i>	<i>Blade Investigations</i>
	Secondary	<i>Exploring Wind Energy</i>	<i>Wind Can Do Work</i>
Hydropower	Elementary	<i>Wonders of Water</i>	<i>Land and Water</i> <i>Water Can Do Work</i> <i>Force of Water</i>
	Intermediate	<i>Energy of Moving Water</i>	<i>Magnets and Compasses</i> <i>Force of Water Investigations</i> <i>Turbine Explorations</i>
	Secondary	<i>Exploring Hydroelectricity</i>	<i>Dams and Their Uses</i> <i>Turbine Explorations</i>

Note: NEED's Energy Infobooks (at any level) are also good resources for basic information on all of the sources of energy.

Day 16: Introduction to Saving Energy

Activity

Students are introduced to energy consumption, conservation, and efficiency. After brainstorming ways they use energy, students read more information to gain a foundation before conducting energy audits.

Objective

Students will be able to list how energy is used at home and school.

Materials

▪Efficiency and Conservation Teacher and Student Guides

Reading

Efficiency and Conservation Student Guide

Science Notebooks

Students should list ways that they use energy in the classroom and at home as they read. Optional: Make copies of the graphic organizers in the energy efficiency and conservation Student Guide, and have students record their notes on the organizers.

Procedure

Students can complete the reading individually or as a jigsaw. Make sure to discuss and highlight main ideas and supporting details that students picked out from their reading.

Day 17: Introduction to Using Monitoring Tools

Activity

Students learn how to use various energy management tools. Once they have read the directions, students should be allowed to gather informal data around the classroom and/or building.

Objective

Students will understand how to operate tools and measure to collect data about energy usage.

Materials

▪Tools from the energy efficiency and conservation Kit

Suggested Handouts

▪Copies of applicable pages from the energy efficiency and conservation Student Guide (see chart on page 15)

Science Notebooks

Students draw a diagram of the tool they've been assigned and explain how it works, recording sample data as they go.

Procedure

Break students into groups to learn various monitoring tools/conduct investigations. Students should practice using the instruments and record data.

Day 18: School Building Survey

Activity

Students conduct a School Building Survey to further understand how their school uses energy.

Objective

Students will be able to identify how their school uses energy and list ways it could save energy.

Materials

- Energy efficiency and conservation guides and kit

Science Notebooks

Students should keep notes about their survey and observations in their notebooks.

Suggested Handouts

- *School Energy Consumption Survey* (Energy efficiency and conservation, Student Guide)

Procedure

Break students up into groups that will focus on each section of the *School Energy Consumption Survey*. Have the groups research the answers either by physically looking at the system in question, or by talking to your school or district building manager. You may want to invite that person in to talk to your students, or ask if your students can email him/her with questions they cannot answer.

Day 19: Saving Energy at School

Activity

Students share how their monitoring tools work. They also share the results of their investigations and surveys.

Objectives

Students will analyze and interpret their survey data. Students will be able to identify energy saving measures and behaviors.

Materials

- Energy efficiency and conservation guides and kit

Science Notebooks

Students should brainstorm changes that could be made, and the part they can play in making the changes happen.

Suggested Handouts

- *School Energy Consumption Survey* data from previous activity (Energy efficiency and conservation, Student Guide)
- *Findings and Recommendations* (Energy efficiency and conservation, Student Guide)

Procedure

Break students up into groups so that each group has a member who surveyed a different part of the building. Students should analyze their data from each investigation and fill in the remainder of their survey sheets from the other group members. As a group they should brainstorm energy saving solutions for each part of the building, based on the group's data. They can record their findings on the *Findings and Recommendations* handout.

Day 20- Planning Day

Activity

Students design and implement an energy outreach project that will share their new found ideas with some component of the community.

Objective

Students will identify ways that they can help inform the public and inspire changes to be made. Students will be able to identify and explain energy saving measures and behaviors for the school and home.

Materials

▪Materials may vary, based on student ideas and community project

Science Notebooks

Students should begin to brainstorm plans and sketch ideas.

Suggested Handouts

▪*Community Project* worksheets (Program Guide)

Procedure

Discuss the project parameters with students and what they have learned about so far. Begin to brainstorm and plan ideas as a class or in groups.

Day 21-23: Saving Energy at Home

Activity

By analyzing their own living and work spaces, students apply what they have learned to making energy changes in their personal lives at home.

Objective

To identify how their actions affect energy consumption at home and school. Students will be able to identify energy saving measures and behaviors for the home.

Materials

- Energy Conservation Contract*
- Energy House*

Science Notebooks

Students should use their notebooks to reflect on what they have learned about saving energy in the classroom and apply it to the home environment.

Procedure

Students will be applying what they have learned so far to their home environment. Students are encouraged to involve their families in these activities! Students should revisit their *Energy Conservation Contract* activity from Day 1. They should rate their homes again and evaluate their pledge to decide if they should revise or add to their current energy saving behaviors. Students can build an energy efficient house and test its efficiency using *Energy House*. Teachers are also encouraged to visit NEED titles like *Managing Home Energy Use* for more examples of at-home application activities.

Day 24-25: Review and Wrap-up

Activity

Students review what they've learned and revisit their commitments to being energy savers.

Objectives

Students will identify and describe the forms of energy and examples of each. Students will understand how renewable and nonrenewable resources are being used to generate energy. Students will be able to identify and explain energy saving measures and behaviors for the school and home.

Materials

▪Materials will vary based on the activities selected.

Procedure

Use this time to review with your students and tie all the pieces together. Students should return their family surveys from their *Home Energy Efficiency* kits to be returned to NEED. Students should also revisit their *Energy Conservation Contract* activity from Day 1. They should rate their homes again and evaluate their pledge to decide if they should revise or add to their current energy saving behaviors. This is also an excellent time for evaluation of student knowledge. This can be done in many ways. A few suggested activities to use that are all-encompassing and fun include: *Energy in the Round* and *Energy Web* (both are found in *Energy Games and Icebreakers*), as well as *Energy Carnival*. See the list of recommended extensions for other classroom activities to use, should you have more time for your unit, or need extra activities.

Day 26-30: Community Outreach Projects

Activity

Students work together to outline and organize their Community Outreach Project.

🎯 Objective

To create a project that showcases what students have learned and involves the community in being energy aware and energy conscious. Students will identify ways that they can help inform the public and inspire changes to be made. Students will be able to identify and explain energy saving measures and behaviors for the school and home.

Suggested Handouts

- *Community Project worksheets (Program Guide)*

✓ Procedure

Use this time to plan and prepare your activity or event with your students. Review your plans from previous activities and planning time, and adapt where necessary. A sample rubric is provided on page 22 of this Program Guide to use for assessing student knowledge, application, and project goals.



RECOMMENDED EXTENSION AND CULMINATING ACTIVITIES

- **Energy Carnival** (grades 3-8) – Students play or lead fun and exciting carnival style games to reinforce or review content or teach others.
- **Energy Expos** (grades 4-12) – Students work in groups to develop exhibits and make presentations on sources and conservation.
- **Energy Flows** (grades 5-12) – Students learn about the forms of energy, how energy is converted from one form to another, and how energy flows through systems, by creating their own energy flows.
- **Infobook Activities** (grades K-12) – These guides at each level serve as a companion to the Energy Infobooks, and contain reinforcement activities about the forms and sources of energy.
- **Great Energy Debate** (grades 6-12) – Students evaluate the advantages and disadvantages of the major sources of energy in a debate format.
- **U.S. Energy Geography** (grades 4-12) – These maps of the United States cover each of the sources of energy and work well to reinforce social studies in the science classroom.
- **Energy Stories and More** (grades K-5) – A series of stories and activities to introduce and reinforce concepts of energy.
- **Current Energy Affair** (grades 6-12) – Students create television news broadcasts to report on the major areas of electric power generation.
- **Mission Possible** (grades 9-12) – Students are challenged to develop an energy plan for a growing country. This math-based activity incorporates spreadsheets and teaches students to consider the environmental and economical costs and benefits associated with producing electricity today.
- **Global Trading Game** (grades 5-12) – Students become economic advisors, geologists, and miners, as they learn about their assigned country's resources and needs, then trade resources with other countries.
- **Energy Enigma** (grades 7-12) – Student teams research clues to uncover energy facts about different sources, while trying to hide the identity of their own source. Teams use brainstorming, organizational, and analytical skills to play.
- **Understanding Climate Change/Exploring Climate Change** (grades 6-12) – Students will understand why we use the sources we do and how their use is impacting the world.
- **Energy Math Challenge** (grades 3-12) – Strengthen your students' math and critical thinking skills while also reinforcing their knowledge of energy.
- **Energy Live!** (grades 4-12) – Students form rock bands and write songs to perform about energy sources, electricity, and efficiency and conservation.
- **Energy Jeopardy** (grades 4-12) – What is FUN, Alex? Students review energy topics through team play in an online or paper format.



T-SHIRT DESIGN CONTEST *Due February 28, 2020*

Assignment: Design a t-shirt for all participants that showcases the program name and program year. Designs should also include some energy-related imagery, such as:

- Energy Sources
- Electricity
- Saving Energy



COMMUNITY PROJECT ASSIGNMENT

Assignment

Create a project that will demonstrate and share your findings about energy. Projects should demonstrate the following:

- What is energy? How do we use/consume/waste energy?
- How is energy generated for our use? How does the use of sources impact us?
- Energy use can be a quality of life issue in your community.
- Students can be active citizens and stewards making informed decisions about energy use.

Your project should help others learn about energy, analyze their own energy usage, and inspire them to make changes that will have a positive impact.

Sample Project Ideas

- putting on a Community Energy Fair/Carnival
- working with younger students to teach them about energy
- creating an energy news program to share online
- hosting family energy nights or events
- writing and presenting a plan to cut down on energy usage in your school or community
- performing energy audits for other schools in your area and helping them make changes

Don't be limited by these ideas. BE CREATIVE! The possibilities are endless!

Share your project! Tell PECO, NEED, and United Way all about it!



COMMUNITY PROJECT BRAINSTORM PAGE

Group Members:

-
-
-
-
-
-

Things we found interesting that we want to share with others: _____

Who do we want to share it with?: _____

Three or more ways we could reach people in our community: _____

The idea we like best and why: _____

Materials/resources we need:

SAMPLE COMMUNITY ENERGY FAIR/EVENT RUBRIC

	UNDERSTANDING OF ENERGY	APPLICATION OF LEARNING	PROJECT EFFECTIVENESS
4	Students communicate an awareness of a variety of ways that energy is generated and consumed.	Students demonstrate understanding that they affect energy systems in their daily choices.	Students' project helps others analyze their energy usage and encourages ways to bring about meaningful change.
3	Students communicate awareness of 3-4 ways that energy is generated and consumed.	Students demonstrate understanding that they use energy.	Students' project helps people become aware of their energy usage.
2	Students communicate awareness of 1-2 ways energy is generated and consumed.	Students demonstrate some understanding that they affect energy systems.	Students' project informs people about energy.
1	Students are unable to communicate how energy is generated and or consumed.	Students are unclear that their actions affect energy systems.	Students' project is unclear or confusing as to how it relates to energy and/or energy conservation.



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