

ENVIRONMENT &
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Environmental Issues Forums in the Classroom—High School Teacher Guide

Energy Choices: What Should We Do About America's Energy Future?



Environmental Issues Forums in the Classroom – High School Teacher Guide is part of NAAEE's Environmental Issues Forums series. EIF provides tools, training, and support for engaging adults and students in meaningful, productive discussions about sticky issues that affect the environment and communities. For more information about EIF and to download materials, please visit: <https://naaee.org/our-work/programs/environmental-issues-forums>

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NAAEE is the professional association for environmental educators in North America and beyond.

Education We Need for the World We Want

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Introduction

Meeting our substantial appetite for energy raises a complex network of economic, environmental, and political issues. There are national-security and economic considerations, and environmental issues such as air and water pollution and potential climate-change effects from fossil fuels, such as extreme weather, sea-level rise, and changing growing seasons. We have important choices to make—from individual and community actions to corporate policies and government regulations. Each of these choices will impact our well-being. As a teacher, you have the opportunity to help your students understand energy issues and the choices we need to make.

This teacher's guide introduces you to the Environmental Issues Forums issue advisory [*Energy Choices: What Should We Do About America's Energy Future?*](#) *Energy Choices* offers an opportunity for you and your students to use a deliberative process to consider a range of energy options. This teacher's guide provides background information on deliberation and how to use *Energy Choices* in your classroom, including material that will help you moderate a forum with your students. In addition, the guide points you, the teacher, to resources on energy issues.

Environmental Issues Forums (EIF)

EIF, an initiative of the [North American Association for Environmental Education](http://naaee.org) (<http://naaee.org>), is designed to promote meaningful, productive deliberation, convened in your classroom, about difficult issues that affect the environment and communities. EIF is modeled on the National Issues Forums (NIF)—a nonpartisan, nationwide network of locally sponsored public issues forums. EIF, like NIF, is rooted in the simple notion that democracy requires an ongoing deliberative public dialogue. People need to come together to reason and talk – to deliberate about common problems. Understand together. Decide together. Act together.

In addition to *Energy Choices: What Should We Do About America's Energy Future?*, NAAEE and NIFI published *Climate Choices: How should we meet the challenges of a warming planet?* For more information on EIF and to access additional issue guides and resources, visit <https://naaee.org/our-work/programs/environmental-issues-forums>.

About *Energy Choices: What Should We Do About America's Energy Future?*

We have long been aware of the wide-ranging impacts of fueling our energy needs, along with ever-increasing global demands. This awareness is reflected in everything from growing support for clean energy, to the development of new ways to extract oil and natural gas, to efforts to do more with less power. The question is how to navigate the changing landscape and arrive at a clean, secure energy future that supports a thriving economy. The *Energy Choices* issue advisory outlines three options that present different ways to approach the problem, along with their potential trade-offs:

- Option 1: Keep America energy self-reliant and stable
- Option 2: Take local responsibility for clean energy
- Option 3: Find ways to use less energy

Deliberative forums on this issue may not be easy. It may be helpful to remind your students that the objective of these forums is to begin to work through the tensions between the various things that we hold most valuable.

Why use EIF in the Classroom?¹

Through EIF in the Classroom your students will actively engage essential environmental issues through deliberation and participation in democratic practices. They will learn to listen to one another and consider alternative perspectives. They will deliberate about the choices they can make and the actions they can take in their own communities to address our energy future. They will discuss energy issues in a nonpartisan, non-confrontational manner.

In productive deliberation, people examine the advantages and disadvantages of different options for addressing a difficult public problem, weighing these against the things they hold deeply valuable. The framework in the *Energy Choices* issue advisory describes three options and provides an alternative means for moving forward to avoid polarizing rhetoric. Each option is rooted in a shared concern, proposes a distinct strategy for addressing the problem, and includes roles for citizens to play. Equally important, each option presents the drawbacks inherent in each action. Highlighting these drawbacks allows the students to see the trade-offs that they need to consider in pursuing any action. It is these drawbacks, in large part, that make coming to shared judgement so difficult—but ultimately, so productive.

Watch Deliberation in the Classroom

Deliberation in the classroom has a long history of engaging students in discussions about a variety of issues. The following videos provide imagery of what forums look like in school classrooms.

- Birmingham, Alabama and Wausau, Wisconsin Students. This 20 minute video shows how forums were conducted in two different classrooms on two different topics.: https://www.youtube.com/watch?v=g_SdCnoLgao
- Watch this introductory video on how to run forums in high school classrooms: <https://www.youtube.com/watch?v=5kRXIfH2QBI>
- Strategies for Student-Centered Discussion. This video will provide tips on how to let students drive the discussion and how to use reflection: <https://www.teachingchannel.org/videos/strategies-for-student-centered-discussion>

Tips for Using Deliberation in Your Classroom

- As a moderator and teacher, explore the *Energy Literacy Essential Principles and Fundamental Concepts* and its Quick Start Guide to review the foundations of energy literacy. Both are available for free download at <https://energy.gov/eere/education/energy-literacy-essential-principles-and-fundamental-concepts-energy-education>.
- You may also want to explore the Teaching Energy Science website. You will find background information on each of the *Energy Literacy Principles and Fundamental Concepts*. In addition, you can select from a variety of high school level lesson plans recommended to support greater understanding of each of the *Energy Literacy Principles and Fundamental Concepts*. <http://cleanet.org/clean/literacy/energy/index.html>

¹ EIF in the Classroom is modelled after materials developed by the National Issues Forums Institute, <https://www.nifi.org/es/educators-center>

- Review the January 2015: Energy Education special issue of the *Journal of Sustainability Education*
<http://www.jsedimensions.org/wordpress/january-2015-energy-education/>
- Localize the forum. Some suggestions include:
 - Find background information that ties energy use impacts to your community.
 - Trace the sources of energy used to generate electricity in your community.
 - Research your state's use of renewables vs. non-renewables. Why is your state an optimal location for that form of renewable energy?
 - Research your state's emission standards or recent energy policies that may affect climate change. This could be part of a prior or post forum activities conducted with the students as well!
- Prepare your students for the forum. Students need background information and evidence to engage the topic fully. You may want to ask the students to read the introduction to *Energy Choices* in advance of the forum and engage them in a discussion. In addition, you may want to ask them to read Introduction to Energy and Energy Consumption from the *Secondary Energy Infobook* published by NEED (2016). This publication can be downloaded for free at:
<https://7ad3lz9zmyhppfq26wugt151-wpengine.netdna-ssl.com/wp-content/uploads/2020/12/Secondary-Energy-Infobook.pdf>
- Introduce students to energy through this 4-minute introductory energy video from TED Ed <https://www.youtube.com/watch?v=fHztd6k5ZXY>. For additional ideas, see Class 1 – Introduce the Forum Process, Deliberation, and *Energy Choices* (on page 6).
- Depending on your students' experiences with deliberation, consider spending a few lessons prior to the forum, introducing active listening skills and principles of argumentation.
- Emphasize the importance of students exploring the options, even if they don't agree with the approach personally. This is critical to making the exercise run smoothly.
- Encourage, as appropriate, students to develop ideas that take the learning from the forum to the next level. This could include the development of infographics, social media campaigns, or school events. Let your students take charge to showcase their learning and take energy action. Just make sure that these next projects have SMART (Specific, Measurable, Achievable, Realistic, and Timely) objectives.

Your Role as a Moderator

- ✓ Provide an overview of the deliberation process.
- ✓ Ask probing questions about what's at stake in each issue and each option.
- ✓ Encourage participants to direct their questions and responses to one another.
- ✓ Remain neutral.
- ✓ Report: We want to know what you think and what your students think. Please fill out the moderator response form (at the end of this guide). Please ask your students to fill out the post-forum questionnaire, available online at [nifi.org/questionnaires](https://naaee.org/sites/default/files/energy_choices_participant_questionnaire.pdf) or download from: https://naaee.org/sites/default/files/energy_choices_participant_questionnaire.pdf

If this is your first experience as a moderator:

- You don't have to be an expert on the issue.
- Read the issue advisory thoroughly.
- Consider questions that get to the heart of the issue and think through the essence of each option. This is a critical part of preparation.
- Stay focused on what the forum is about—deliberation. Ask questions that probe the underlying motivations of each option, the trade-offs it might require, and the willingness of the participants to recognize them. (See the sample questions listed below)
- Listen to others; remain neutral.
- Keep the discussion moving and focused on the issue. Sometimes it's difficult to move on to another option when there is so much more that could be said. But in order to make progress, participants need time to weigh all the major options fairly.
- Be mindful of the time. Reserve ample time for reflections on the forum. In many ways, this is the most important work the group will do. As the moderator you will need to provide reminders that time is passing, but it is also up to all the participants to help preserve the time to reflect on what they have said and what they might want to do about it.

Sample Class Schedule – EIF in One Week²

A community forum typically takes about 2-3 hours. Using EIF in the classroom requires a modified schedule to accommodate class periods, but also potentially allows for a deeper consideration of the issue over multiple days. The National Issues Forums Institute suggests that a forum can be completed in the course of one school week, provided that students are already familiar with the forum process and are proficient readers and speakers. Adjustments to the following schedule will need to be made to fit the needs of your students and school.

Class 1 – Introduce the Forum Process, Deliberation, and *Energy Choices*

Class 2 – Forum Discussion of Option #1 Keep America self-reliant and stable

Class 3 – Forum Discussion of Option #2 Take local responsibility for clean energy

Class 4 – Forum Discussion of Option #3 Find ways to use less energy

Class 5 – Forum Discussion of Common Ground

Holding Your Forum

Materials

- ✓ Copies of *Energy Choices: What Should We Do About America's Energy Future?*
Download the PDF at: <https://www.nifi.org/en/issue-guide/energy-choices>
- ✓ Copies of *Energy Choices Participant Questionnaire*. Download the PDF for free at:
https://naaee.org/sites/default/files/energy_choices_participant_questionnaire.pdf
- ✓ Moderator's Response Form for *Energy Choices: What Should We Do About America's Energy Future?* at the end of this teacher's guide.

² The sample class schedule and much of the information on holding classroom forums is adapted from Smith, E. (2001) *National Issues Forums in the Classroom*. Dayton, OH: National Issues Forums Institute

Class 1 - Introduce the Forum Process, Deliberation, and *Energy Choices*

- Introduce or review the forum process.
- Introduce or review the characteristics of deliberation. When people deliberate they:
 - Assume that many people have the pieces of a workable solution to a problem
 - Listen and try to understand other people's ideas and perspectives
 - Search for strength in another person's views
 - Realize what is valuable to them
 - Weigh the costs and consequences of choices
 - Consider compromises
 - Identify actions that they would be willing to take or live with
 - Reach a shared understanding of a problem and its possible solutions
- Establish or review ground rules for deliberation. They should agree that:
 - Everyone is encouraged to participate
 - No one or two individuals should dominate
 - The discussion should focus on the options
 - All the major options should be considered fairly
 - They will maintain an open and respectful atmosphere for the discussion
 - They will listen to each other
- Have students take this online interactive Energy Awareness Quiz to help you identify key areas of energy to research or prioritize for your forum.
<http://cleanet.org/clean/literacy/energyquiz.html>
- Introduce energy as an issue. Provide the following definition of energy literacy and ask students to reflect: Energy Literacy is an understanding of the nature and role of energy in our lives and globally and the ability to apply this understanding to make individual and community decisions.
- Ask the students to reflect on energy issues by answering the following questions in their notebooks or journals:
 - Right now, these are my thoughts and opinions about energy
 - During the forum, I want to learn the following about our energy choices
 - At this point, I think that the best approach to energy use is
 - I do/do not (circle one) expect my ideas about energy issues to change because
 - At this time, I think that people who disagree with me should consider the following points or ideas

You may want to have the students create cue cards for each question so that they can refer back to these during the forum.

- Assign the reading of the *Energy Choices* issue advisory as homework. In addition, you may want to ask them to read Introduction to Energy and Energy Consumption from the *Secondary Energy Infobook* published by NEED (2016). This publication can be downloaded for free at:
<https://7ad3lz9zmyhppfg26wugt151-wpengine.netdna-ssl.com/wp-content/uploads/2020/12/Secondary-Energy-Infobook.pdf>
- Have students identify energy sources (both renewable and nonrenewable). Ask them to read background information on each and to identify common types of each, using the American Geosciences Institute website
<http://www.agiweb.org/education/energy/index.html>
- Depending on their background, assign an article on how to read scientific papers.
http://www.sciencemag.org/careers/2016/03/how-seriously-read-scientific-paper?utm_source=sciencemagazine&utm_medium=facebook-text&utm_campaign=seriouspaper-3110

- Introduce the topic of energy use by taking a few minutes to talk about personal experiences with energy use. Give students an opportunity to tell their stories. A good question to ask is, “Can anyone describe how energy issues have affected them or their family or community?”

Class 2 – Forum Discussion of Option #1 Keep America self-reliant and stable

We should use our own abundant natural resources to produce all the energy we need to fuel our economy and avoid entanglements in unstable and unfriendly regions. Relying on the market and technological advancements will continue to lead us to a cleaner energy future. BUT large-scale energy production, even solar and wind power, has major environmental impacts, and unfairly affects communities near facilities like mines, refineries, and transmission lines. Furthermore, the transition to cleaner energy may not occur quickly enough to stave off the threat of climate change.

1. Begin the forum by setting goals.
2. Review the ground rules for deliberation.
3. Hold a short discussion on trade-offs and why thinking about trade-offs is particularly important to deliberation.
4. Moderate a discussion of Option #1 Keep America self-reliant and stable (see suggested questions below).
5. Invite students to sum up the day's discussion.
6. Assess students' participation and understanding.

Questions to Surface Trade-Offs and Tensions

- This option assumes we'll be able to secure our current way of life—including the amount of energy we use—through market and technological advancements. Is consumption itself an issue to be considered?
- “Not in my backyard” is a saying used to describe practices that are good as long as people are not negatively impacted locally. Would you want fracking or an oil pipeline in your town? What if you rely on the fossil fuels that come from fracking or are in a pipeline that runs through a neighboring state? What if you consider the entire Earth to be your “backyard”? Do you think you would support the continued extraction of fossil fuels?
- What are some of the unintended consequences of large scale energy production through expanded oil, solar, and wind production?
- How important is reducing the impacts on climate change when considering various energy sources such as oil, natural gas, and coal?
- What is the “cost” of energy independence for the United States? Cost can be political, social, economic, etc.
- The construction of pipelines, oil refineries, and wind and solar farms require large amounts of land. How does this impact our current ideas of property rights? How much of a change are we prepared to accept?
- What are the best ways to produce the energy we need and become energy independent?
- Is nuclear power a sustainable resource for our energy needs? What are the impacts of nuclear wastes on our environment and community?
- This option is mostly about protecting our way of life by producing all the energy we need—but what about the impacts on wildlife and/or special natural areas? Do we want to protect those as well?

- What role should large energy companies play in securing America's energy future? Is there a need for more or less regulation and oversight?
- How does this option address your concerns about energy consumption and production?
- What worries or makes you uncomfortable about this approach?
- If this approach worked perfectly, what would the trade-offs or consequences be?

Class 3 – Forum Discussion of Option #2: Take local responsibility for clean energy

*If we want our country to transition to clean, low-carbon power, everyone needs to participate, as not only a consumer but also a producer. Currently, electricity in our system mainly flows one way, from large power plants through transmission and distribution lines to end users. We need to decentralize that system to enable cleaner, locally produced energy to flow where it needs to. **BUT** retooling our power grid and fueling infrastructure could be costly, take a long time, and cause economic disruptions. This would change how our communities look and how we live, and add a responsibility for producing power that people may not want or be able to afford.*

1. Begin the forum by setting goals.
2. Review the ground rules for deliberation.
3. Review why thinking about trade-offs is particularly important to deliberation.
4. Moderate a discussion of Option #2: Take local responsibility for clean energy (see suggested questions below).
5. Invite students to sum up the day's discussion.
6. Assess students' participation and understanding.

Questions to Surface Trade-Offs and Tensions

- What are some ways renewable sources of energy were used centuries or even millennia ago?
- If localized energy production is almost certainly going to cause noticeable changes to the places we live in, how much change are we prepared to accept?
- If you were a homeowner or a business owner, would you be willing to accept the responsibility of generating your own energy by installing solar panels and wind generators on your home or business? Should this be mandated?
- Should government provide incentives to car manufacturers to reduce carbon pollution? This may require taxpayer dollars. Is this the best use of these public resources? [Note: You may want to examine California standards or incentives for electric cars as references.]
- How should we balance individual rights and the good of the community, especially when it comes to property rights? For example, explore the need for land in building solar or wind farms or a pipeline locally.
- Would the typical family in this community be willing to pay more for energy in order support a decentralized system that enables cleaner, locally produced energy to flow where it needs to?
- Are you concerned about unintended consequences of retooling our power grid to support a decentralized energy system?
- How does this option address our concerns about overall energy use?
- What worries or makes us uncomfortable about this approach?
- If this approach worked perfectly, what would the trade-offs or consequences be?

Class 4 – Forum Discussion of Option #3: Find ways to use less energy

*We should aggressively reduce energy use and boost efficiency. Energy consumption in the United States has leveled off recently, but to tackle climate change, we must rapidly reduce carbon emissions. Using less energy could also lead to greater security. **BUT** requiring energy conservation could restrict personal choices and limit economic growth. And tackling climate change could depend more on replacing fossil fuels with cleaner fuels than on how much energy we use.*

1. Begin the forum by setting goals.
2. Review the ground rules for deliberation.
3. Review why thinking about trade-offs is particularly important to deliberation.
4. Moderate a discussion of Option #3: Find ways to use less energy (see suggested questions below).
5. Invite students to sum up the day's discussion.
6. Assess students' participation and understanding.

Questions to Surface Trade-Offs and Tensions

- Which of your daily require the use of and need for fossil fuels?
- Would you be willing to change your lifestyle—eat differently, ride a bike or take public transportation more often, lower your home thermostat—in order to use less energy? Do you think changes like these should be required?
- What activities would you be willing to reduce or eliminate if it meant that our energy supplies would last longer and our atmosphere would become cleaner?
- Does the U.S. need to decrease its energy consumption? If so, what are the best approaches to conserving energy on a national scale in the United States? Why?
- Should regulations be introduced to require businesses or individuals to collectively use less energy?
- Is it more important to you to reduce, reuse or recycle?
- Would you drive a car run on biofuels or waste? Why? What about an electric car?
- How does this option address your concerns about energy use and security?
- What worries or makes you uncomfortable about this approach?
- If this approach worked perfectly, what would the trade-offs or consequences be?

Class 5 - Ending the Forum

1. Discuss areas of common ground (see suggested questions below).
2. Invite students to sum up the day's discussion.
3. Assess students' participation and understanding.
4. Assign a formal assessment, such as a project or essay, to be completed out of class.
5. Ask the students to reflect on our energy choices by answering the following questions in their notebooks or journals:
 - o If someone were to ask me about our energy issues, this is what I would tell them
 - o Right now, this is what I think about energy production and use
 - o My ideas about the issue changed/did not change (circle one) because
 - o I think that the most difficult part of making trade-offs and choices is
 - o The most important thing that I learned from participating in the forum is
6. Ask students to complete the *Energy Choices Participant Questionnaire*. Download the PDF at:
https://naaee.org/sites/default/files/energy_choices_participant_questionnaire.pdf

Questions that Promote Individual Reflections

- How much did you know about energy before the forum? How has your understanding of the issue changed?
- How has your thinking about other people's views changed?
- How have your perspectives changed as a result of what you heard in this forum?
- What resources did you use during the forum that were helpful?

Questions that Promote Group Reflections

- What didn't we work through?
- Can we identify any shared sense of purpose or direction?
- Which trade-offs are we willing to make to move in a shared direction?
- Which are we unwilling to make?
- What do we still need to talk about?
- How can we use what we learned about ourselves in this forum?
- Do we want to continue these discussions? What would we want to accomplish?

Moderator Questionnaire

Complete the *Moderator's Response Form* available at the end of this guide or complete the online form: <https://www.nifi.org/en/post-forum-questionnaires>.

Please mail written questionnaires (both yours and your students') to National Issues Forums Institute, 100 Commons road, Dayton, OH 45459 or you may scan and e-mail them to reports@nifi.org.

Background Resources

In some cases, teachers may be able to build the deliberative process into a larger unit of study. In the sections below, selected resources (videos, classroom activities, websites) are suggested for each major section of the *Energy Choices* issue guide (Introduction, Option 1, Option 2, Option 3). These resources are not meant to be exhaustive, but to provide a starting place to learn more about energy issues and to enhance student deliberation.

Introducing Energy

Videos

- U.S. Department of Energy, Energy 101 Videos (24 introductory videos on a variety of topics such as Geothermal, Hydropower, Lighting Choices, Cool Roofs, and Energy Efficient Commercial Buildings)
<https://www.youtube.com/playlist?list=PLACD8E92715335CB2>
- U.S. Department of Energy, Energy Literacy Videos (8 videos highlighting the Essential Principles of Energy, also available in Spanish)
<https://energy.gov/eere/education/downloads/energy-literacy-videos>
- U.S. Department of Energy, Lab Break Through Video series features discoveries that have changed our world <https://energy.gov/science-innovation/innovation/lab-breakthroughs>
- Joshua M. Sneideman, A guide to the energy of the Earth. TED Ed video
<http://ed.ted.com/lessons/a-guide-to-the-energy-of-the-earth-joshua-m-sneideman>

- Energy at the Movies (hour-long educational special documenting how Hollywood has captured the history of energy through popular films). It is free to watch online using link below.
<http://energyatthemovies.com/>

Energy Literacy

- *Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education* (Framework for Informal and Formal Educators)
https://energy.gov/sites/prod/files/2014/09/f18/Energy_Literacy_Low_Res_3.0.pdf
- Energy Literacy Framework—A Quick Start Guide for Educators on how to use the framework
https://energy.gov/sites/prod/files/2015/03/f20/EnergyLiteracy_QuickStartGuide.pdf
- 7 Energy Literacy Principles
<https://energy.gov/eere/education/downloads/7-energy-literacy-principles>

Activities, Activity Guides, and Data Sources and Tools

- BITES, Buildings Industry Transportation Electricity Scenarios - online interactive tool to compare energy policy impacts in 4 sectors, buildings, industry, transportation and electricity
<https://bites.nrel.gov/education.php>
- CLEAN—Climate Literacy & Energy Awareness Network—select from over 600 peer reviewed activities
<http://cleanet.org/clean/literacy/index.html>
- EERE Energy Awareness Activity Book
<https://energy.gov/sites/prod/files/2015/02/f19/EnergyActivityBook.pdf>
- EIA—U.S. Energy Information Administration—data sources:
<http://www.eia.gov/>
- KEEP—Wisconsin K-12 Energy Education Program
<http://www.uwsp.edu/cnr-ap/KEEP/Pages/default.aspx>
- NARA Northwest Advanced Renewables Alliance—lessons and activities on energy
energyliteracyprinciples.org
- NASA, Wavelength
<http://nasawavelength.org/resource-search?qq=Energy&educationalLevel=High+school&facetSort=1>
- NEED—National Energy Education Development Project
<https://shop.need.org/collections/secondary-guides>
- REAP—Renewable Energy Alaska Project
<http://alaskarenewableenergy.org>
- SMILE, Energy—collection of activities aligned to the Energy Literacy Principles
<https://www.howtosmile.org/topics/energy>
- U.S. Energy Information Administration, Energy KIDS – secondary level lessons
http://www.eia.gov/kids/energy.cfm?page=activities_secondary
- VEEP—Vermont Energy Education Program
<http://veep.org/>

Websites

- Lawrence Livermore National Laboratory, Energy Flow Chart
<https://www.llnl.gov/news/americans-used-less-energy-2015>

- National Academies of Sciences, What you need to know about energy
<http://needtoknow.nas.edu/energy/>
- U.S. Department of Energy
<https://energy.gov/>
 - Clean Cities Coalitions—Examine what local stakeholders are doing to reduce petroleum use in their communities
<https://cleancities.energy.gov/coalitions/>
 - EERE Education—K-12 competitions, lessons and videos on renewable energy
<http://www.energy.gov/education>
 - Girls in Energy—middle school lessons, profiles and videos of energy in 4 energy areas
<http://www.energy.gov/diversity/girls-energy>
 - Women@Energy—Profiles and videos of women in Energy careers at Department of Energy and national labs
<https://www.energy.gov/women>
- U.S. Energy Information Administration
 - Energy KIDS—background information on multiple energy topics
<http://www.eia.gov/kids/>
 - Energy Explained—Your Guide to Understanding Energy
<http://www.eia.gov/energyexplained/>

Option 1: Keep America self-reliant and stable

Selected Lesson Ideas to Get Started

- Begin a class discussion with a question like: When you flick on a light switch or plug in your computer or cellphone where does the electricity come from? How does it reach your house or school? Have students trace electricity generation, transmission and distribution into homes. Use this lesson for ideas.
https://energy.gov/sites/prod/files/2015/03/f20/EL4_SocStudiesGuides_AGI.pdf and background info: <https://energy.gov/ne/downloads/lesson-2-electricity-basics>
- To understand how electricity flows, engage your students' in an experiment building lemon circuits.
<https://www.energy.gov/sites/prod/files/2016/09/f33/Energy%20Efficiency%20Lesson.pdf>
- Students should use the BITES interactive online tool to explore how four sectors (Buildings, Industry, Transportation, and Electricity) impact energy usage. Most will find that changes are necessary in all sectors in order to meet overall energy and environmental goals cannot be accomplished within a single sector. Use the free workshop lesson.
<https://bites.nrel.gov/education.php>
- Have students explore current government subsidies related to energy production and use (e.g., renewable energy tax credits or ethanol subsidies). Using infographics, students should demonstrate the consequences of energy subsidies on energy use and production.
- Students explore nuclear power and waste in this free multi day lesson to examine the impacts of this energy source.
<https://energy.gov/eere/education/downloads/energy-literacy-social-studies-guide-essential-principle-1>
- Have students make a list of the units of energy involved in the consumption, production and distribution of energy. How do we measure carbon pollution, or a light bulb? Terms

like watt, lumens and calorie are important to understanding energy. See definitions here <https://ww2.kqed.org/quest/2014/11/14/how-is-energy-measured-2/>

Option 2: Take local responsibility for clean energy

Selected Lesson Ideas to Get Started

- North American's first used geothermal energy more than 10,000 years ago. People used water from hot springs for cooking, bathing and cleaning. The power of geothermal steam is demonstrated in this experiment with a wind turbine. Use Activity 5 to see how two renewables can produce power.
https://energy.gov/sites/prod/files/2014/06/f16/geothermal_energy.pdf
- Students discover the power of the sun by examining photovoltaic cells. Note requires photovoltaic cells to be purchased but lesson is available online.
<http://cleanet.org/resources/41917.html>
- Design and test out solar powered cars! A great way to incorporate design, engineering and physics into your classroom.
<http://cleanet.org/resources/42729.html>
- Have students research the 17 national labs and create a presentation on their areas of focus and innovation. Students should learn how research and development shapes discoveries and energy technologies. <http://energy.gov/about-national-labs> find discoveries and patent info here <https://energy.gov/articles/20-amazing-things-national-labs-have-done> find videos on key discoveries here <https://energy.gov/science-innovation/innovation/lab-breakthroughs>
- Observe firsthand how burning a paraffin wax candle releases particulates into the air. Paraffin wax is made from petroleum, which is a fossil fuel.
<http://nomadpress.net/wordpress/wp-content/uploads/2015/09/RenewableEnergy-Project.pdf>
- Use google maps to have students explore the US and identify sites for renewable energy such as solar farms, wind farms or biofuel refineries. The lesson and instructions are available from CLEAN. <http://cleanet.org/resources/43135.html>

Option 3: Find ways to use less energy

Selected Resources, Tools, and Activities

- A clean energy career can be any occupation that is affected by activities such as conserving energy, developing alternative energy, reducing pollution, or recycling. What do these jobs require? Choose a renewable energy resource for each group of students. Research three to five types of jobs in that field. Use this interactive tool to find information on jobs <http://green360careers.net/> and have students create job profiles for each renewable sector.
- In the U.S., buildings consume about 40% of all energy that is used. Have students design changes in their school to reduce energy use. This is a free lesson to teach students about net zero energy use.
https://www.teachengineering.org/activities/view/cub_zero_energy
- Students examine the transportation sector, another large energy consumer. From cars to shipping of goods around the world, the transportation sector is not only a large energy consumer, it is a big polluter. Students will learn just how much of a polluter in

this lesson. <https://energy.gov/eere/education/downloads/energy-literacy-social-studies-guide-essential-principle-7>

- Students should define Carbon Footprint and make connections between their everyday energy use and actual needs. Have students examine their ideas regarding needs vs wants. Students can use this online carbon calculator from Nature Conservancy to help them get started. <https://www.nature.org/greenliving/carboncalculator/index.htm>
- Have students complete an energy saving contract with their families. NEED has a free template and discussion questions to get you started. <http://www.need.org/files/curriculum/guides/Energy%20Conservation%20Contract.pdf>

Additional Resources -Teaching Argument and Evidence

Hand, G.; Norton-Meier, L.; Staker, J.; Bintz, J. (2009). *Negotiating science: The critical role of argument in student inquiry*. Portsmouth, NH: Heinemann.

Norton-Meir, L.; Hand, B.; Hockenberry, L.; Wise, K. (2008). *Questions, claims, and evidence: The important place of argument in children's science writing*. Arlington, VA: NSTA Press.

Zalles, D. (2017) *Teaching argumentation through controversial environmental issues: A Curriculum model*. Downloadable at: <https://naaee.org/our-work/programs/environmental-issues-forums/eif-classroom>

Zemba-Saul, C.; McNeill, K. L.; Hershberger, K. (2013). *What's your evidence?: Engaging K-5 students in constructing explanations in science*. Boston, MA: Pearson.

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Briefly describe the audience of your forum, including city and state, diversity, age, and number of participants.

What elements of this issue seemed most difficult for the participants?

What common concerns were most apparent?

What things did participants appear to hold most valuable as they wrestled with trade-offs? Please describe.

Which trade-offs were participants most comfortable with? Please describe.

Which trade-offs did the participants struggle with the most? Please describe.

Did the group identify shared directions for action?

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