

Local Sustainable Energy

Overview: Students should understand how biofuels can help create energy independence for a local community. Students will also see how alternative energy sources serve as an economically stable and sustainable product for a community.

Keywords: biofuel, biomass, feedstock, byproduct, energy portfolio, renewable resource, non-renewable resource, clean energy, economically viable, supply chain, bioproduct.

Age / Grade Range: 6th to 8th

Background: As a society we have become more and more dependant on non-renewable resources like oil, coal, and natural gas. As we burn these fuels to produce energy we are further contributing to the greenhouse gas emissions that are linked to climate change. To continue living the energy dependant lifestyles we are accustomed to while reducing our impact on the planet; we need to look to alternative and renewable energy resources.

Biofuels are one example of an alternative to non-renewable energy sources. Biofuels are renewable fuels made from living things like plants or from waste that living things produce. A feedstock is the bulk raw material that is eventually turned into a biofuel. An example could be sawdust as a feedstock for wood pellets that are burned to heat a home in a wood stove.

Biofuels are considered to be renewable sources of energy because they can be replenished on the timescale of a human lifespan whereas non-renewable fuels can not be replenished during a human life span. When creating energy from a renewable energy source, this is called clean energy.

As communities start to look for energy sources that are effective and renewable, they often look for an energy resource with a supply chain that is economically viable. Many renewable resources can produce energy, however, the challenge lies in creating a system to supply that energy while benefiting the community socially, economically, and environmentally.

Next Generation Science Standards & Common Core:

Common core:

WHST.6-8.2

WHST.6-8.8

Next Generation:

MS-PS 3-3

MS-ESS 3-3

Goals: Students will watch two videos about biofuel production in different regions of the United States. Students will then answer questions to show they have interpreted the significant information in each video. Next, Students will be tasked with writing an article that tells the story of an alternative energy source that could be produced by their own community.

Objectives:

- Students will understand that biofuels are a renewable energy source
- Students will understand that biofuel feedstocks can produce numerous byproducts as well as biofuels.
- Students will understand that biofuels can help local economies by providing jobs as well as energy independence.

Materials:

- <https://vimeo.com/107651669> - "Bioenergy Day"
- <https://www.youtube.com/watch?v=tKseGM4ujzg> - "NARA overview"

Set up: Visit NARA website (nararenewables.org) become familiar with NARA project. Watch videos above: "Bioenergy Day" and "NARA overview"

Classroom Time: 1 hr.

Introduction (Engage):

As renewable energy technology becomes more widespread it is important to tell the story of success and failures within the field. These stories about countries, cities, and communities converting to alternative energy can raise awareness about new technology and increase interest in science. In this lesson we will look at two stories that tell about bioenergy initiatives that are being implemented to push the boundaries of how biomass can be used in a local area's energy portfolio. The narrative style of communication used in this lesson aims to increase engagement and comprehension of science content. Students should become engaged in the stories being presented while taking note of science content being presented.

Activity (Explore):

Explore Pt. 1:

After the Instructor introduces the activity and key vocabulary students will watch the first video "Bioenergy Day."

Explore Pt. 2:

After Instructor gives a brief introduction to the NARA project Students will watch the video "NARA overview."

Explanation:

Explain pt. 1:

After watching the video they will follow up by filling out the following worksheet "Story of Colorado's Biofuel"

The Story of Beetle Kill and Biofuel

The _____ Beetle epidemic killed many trees in Colorado, leaving _____ Million acres of dead forest. This forest material is expensive to _____ and when left standing is a

source of fuel for _____ that can endanger local human populations. Now this Biomass can be used to produce _____ energy at The Eagle Valley Biomass Power Plant. This plant benefits local communities by providing an alternative to energy from coal powered plants, creating _____ in the local economy, and powering 12,000 _____.

This story is an example of federal organizations(_____), private organizations (_____), and communities (_____) working together to create local, economically sustainable, alternative energy systems.

Explain pt. 2:

After watching the video they will follow up by filling out the NARA story worksheet.

The NARA Story

The Northwest Advanced Renewables Alliance (NARA) has recognized that there is an excess of _____ in the Pacific Northwest that could be used as a feedstock for biofuels. These feedstocks could be turned into biofuel and _____. Often times this biomass is left on the ground and eventually _____, emitting CO₂ into the atmosphere. NARA would like to involve _____ from local communities in the decision making process while creating a supply chain for biojet fuel. This project will also involve _____ from local universities and private logging companies. If this project is successful, it will show

that public institutions, private companies, and local communities can work together to solve problems from the _____ to the _____.

Elaboration: Students will now create a story about alternative energy use in their community.

Who are the people involved in your story?

What type of alternative energy may be available in your community? (example: Solar is available most places, wind is available in most flat arid regions, places with lots of rivers have hydropower resources, and forested regions with timber industries may have biomass available for bioenergy.)

What types of jobs may be associated with the type of alternative energy resource this community chooses to develop?(ex. Researchers, transportation, infrastructure installation, plant workers)

Which non-renewable energy resources will this clean energy be replacing and what effect will it have on CO₂ emissions.

What will be the benefits for the environment and the local economy that this renewable energy resource can bring to your community?

NOW, Put all these things together to write a short story that follows the format of the worksheets you completed about the videos.

Evaluation: Each participant should share their story with one other student as well as creating two questions about the story that is shared with them. Answer your partners questions and discuss the likelihood of this story taking place in your community.

Additional Resources:

nararenewables.org

energy.gov

nextgenscience.org

corestandards.org

