

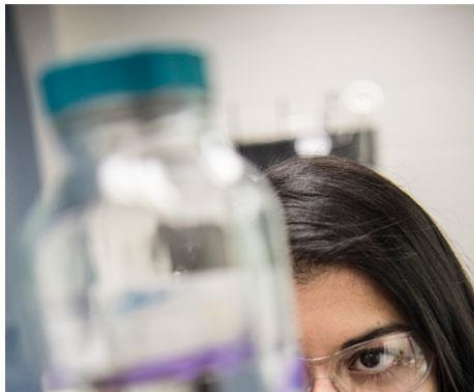
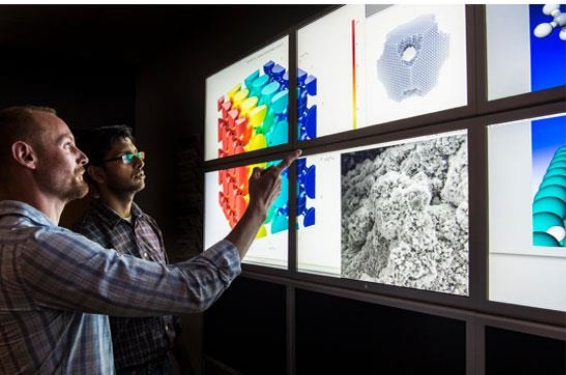


Bioenergy Research and Education

# BRIDGES

U.S. Department of Energy Bioenergy Technologies Office

## Preparing a National Bioenergy Workforce through Authentic Case Studies



# BRIDGES TEAM



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## Resources for Educators to Introduce Bioenergy Topics and Prepare a National Workforce



- Bring current U.S Department of Energy scientific research to the classroom
- Create awareness of bioenergy topics and careers
- Ease the transition from academics to industry
- Provide equitable access to high-quality bioenergy learning materials.

# BRIDGES Student and Instructor Guides Now Available



## STUDENT GUIDE

**Upcycling: Could My Plastic Bag Someday Become the Sustainable Alternative?**

Bioenergy Research and Education Bridge (BRIDGES) Program



## STUDENT GUIDE

**Farm to Flight: Are Sustainable Aviation Fuels Good for the Environment?**

Bioenergy Research and Education Bridge (BRIDGES) Program



## STUDENT GUIDE

**Solid Waste to Energy: Traditional Ecology and Environmental Justice**

Bioenergy Research and Education Bridge (BRIDGES) Program




## STUDENT GUIDE

**Regional Feedstocks: Are They the Answer to Achieving a Net-Zero Future?**

Bioenergy Research and Education Bridge (BRIDGES) Program




## FACT SHEETS AND PRIMER



**Municipal Solid Waste-to-Energy: Traditional Ecology and Environmental Justice**

Bioenergy Research and Education Bridge (BRIDGES) Program Case Study Fact Sheet

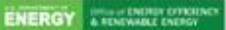


According to the Environmental Protection Agency (EPA), we generate 290 million tons of trash and up to 100 billion tons of waste annually.

**Sustainable Solutions for a Waste-to-Biofuels Challenge**

Students will be introduced to the challenges of managing municipal solid waste, opportunities for turning these products into usable energy sources, and exciting careers in the bioenergy field.

Students will explore the challenges associated with any community designing a sustainable waste management strategy, and the unique challenges experienced by an over-burdened and underserved community. Students will focus on the ways that science and technology can




**What is BETES?**

The Bioenergy Technologies Office within the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy supports the research, development, and demonstration of technologies aimed at reducing domestic greenhouse gas emissions for the industries of petroleum gas extraction across the U.S. economy.

Bioenergy can help create an economically sound and secure future while reducing environmental impacts by:

- Developing affordable domestic fuels and products.
- Advancing clean energy sources.
- Generating domestic jobs to support the growth of the U.S. bioeconomy.

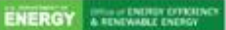
**Get Involved!** For more information about the BRIDGES program or to access BRIDGES materials, visit [energy.gov/BRIDGES](http://energy.gov/BRIDGES), or email [BRIDGES@eere.doe.gov](mailto:BRIDGES@eere.doe.gov).



For more information, visit [energy.gov/bridges](http://energy.gov/bridges)  
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related career paths.



**Bioenergy Research and Education BRIDGES Program Prepares a National Bioenergy Workforce**

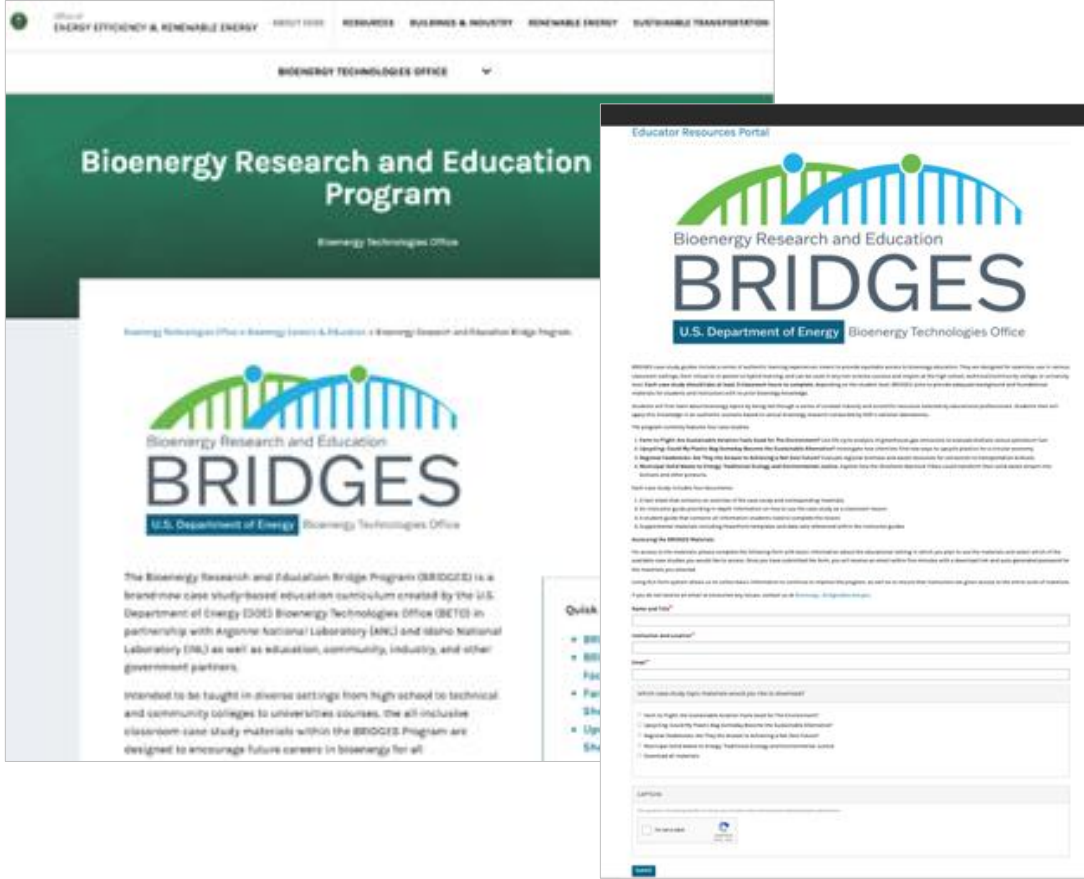
**What is BRIDGES?**

The U.S. Department of Energy (DOE) Bioenergy Technologies Office (BETO) Bioenergy Research and Education Bridge (BRIDGES) is an educational development program designed to assist education in teaching bioenergy topics to help prepare the future bioenergy workforce.

The bioenergy-themed case studies are based upon foundational bioenergy research at DOE national laboratories. Specific goals for the BRIDGES program include:

- Translating DOE scientific research for the classroom setting.
- Creating awareness of bioenergy topics and careers.
- Accelerating the transition from academia to industry.
- Providing equitable access to high-quality bioenergy learning materials.

## WEB PORTAL FOR DIGITAL DOWNLOAD



The screenshot shows the Bioenergy Research and Education BRIDGES web portal. The main header reads "Bioenergy Research and Education Program" and "Bioenergy Technologies Office". The central focus is the "BRIDGES" logo, with the text "U.S. Department of Energy Bioenergy Technologies Office" below it. A sidebar on the right contains a "Quick" menu with links for Home, About, Get Involved, and Contact Us. Below the menu is a search bar and a "Quick" section with a "Search" button. The main content area displays a list of resources, including "Municipal Solid Waste-to-Energy: Traditional Ecology and Environmental Justice" and "Sustainable Solutions for a Waste-to-Biofuels Challenge".

# INSIDE A BRIDGES CASE STUDY...



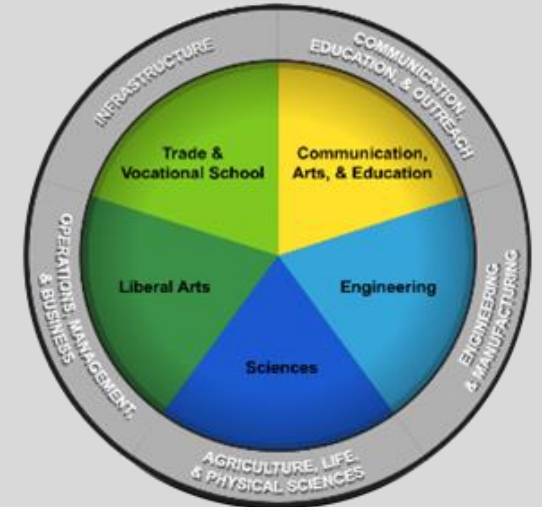
Topic Introduced with Authentic Scenario



Students Explore Resources



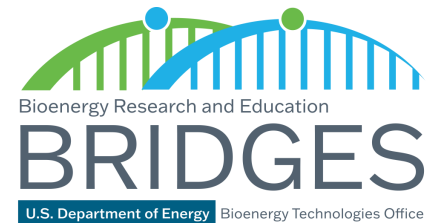
Students Demonstrate Learning



Career Exploration

# Topic Introduced with Authentic Scenario

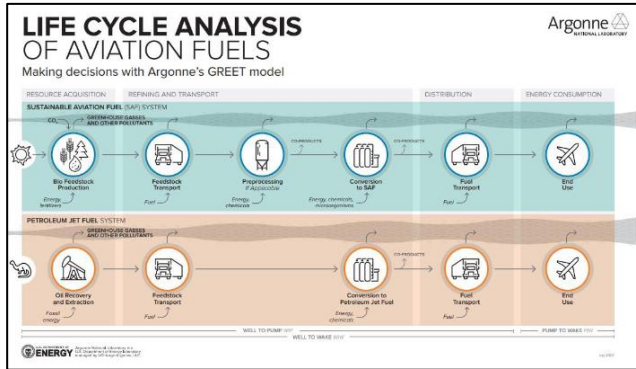
- Students play role of a sustainability specialist
- Phone call comes in from an airline CEO saying the board of directors is concerned.
- The board requires an expert analysis ... are sustainable aviation fuels good for the environment?



# Students Explore Bioenergy Resources



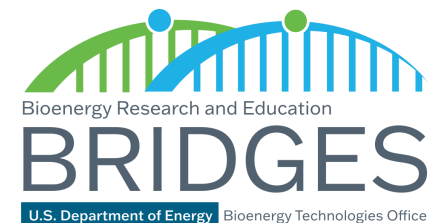
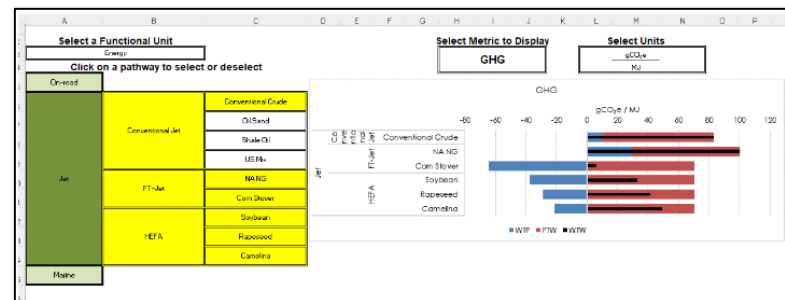
- **Part 1: Bioenergy and Lifecycle Analysis**
  - Guide students through resources and background information



Description	State of Development	Emission Reduction Factor (ERF)
<b>Wastes</b>		
Municipal solid waste (MSW)	Following sorting to remove any recyclable components, typical organic MSW can be processed into SAF.	Current ERF: 70%
Forestry waste residues	Opportunities are substantial but tend to be linked to specific regions (such as the Nordics) that have an existing timber or paper industry.	Current ERF: 70%-80%
Wood processing waste	Wood chips left over from the processing of wood into building materials.	Current ERF: 70%-80%
Agricultural	The cellulosic waste left over	Current ERF: 70%-80%

- **Part 2: Working with a Computational Model as a Life Cycle Analyst**
  - Students use GREET (Greenhouse gases, Regulated Emissions, and Energy use in Technologies)

**STUDENT GUIDE**  
Farm to Flight: Are Sustainable Aviation Fuels Good for the Environment?  
Bioenergy Research and Education Bridge (BRIDES) Program





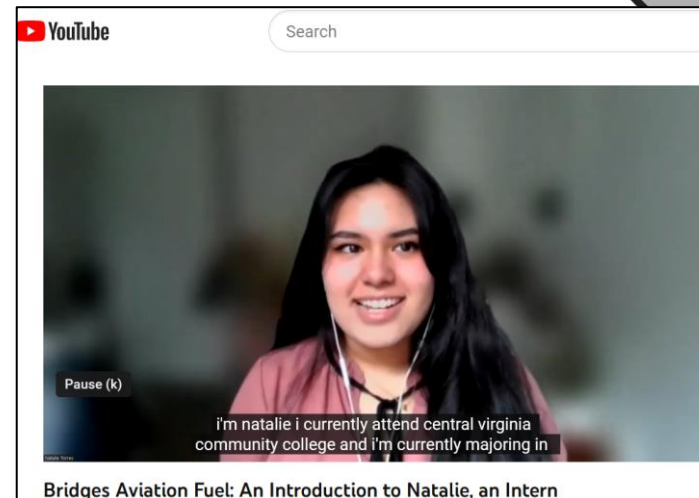
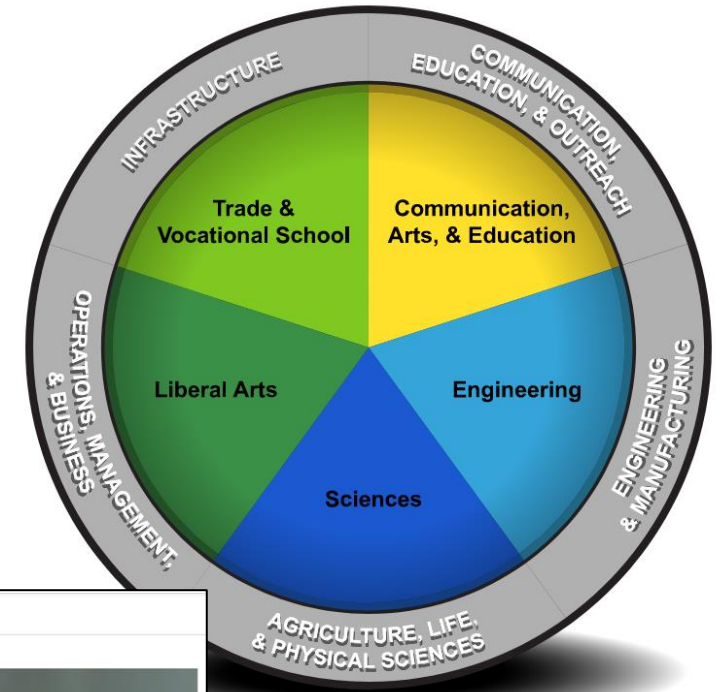
# Students Demonstrate Learning

- **Students develop and communicate their findings as presentations for a board of directors.**
- **Students demonstrate understanding of bioenergy, sustainable aviation fuels, life cycle analysis.**
- **Students are supported in making professional presentations that communicate technical knowledge and findings to a non-technical audience.**



## Career Highlight: Sustainability Specialist

- Average salary
- Common majors for this position
- Responsibilities of a sustainability specialist
- Students then explore the career wheel to identify a career of interest to them



# Case Studies in Action

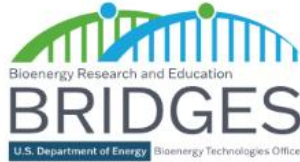
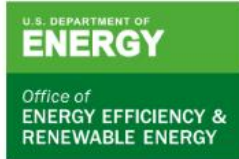
*“What I liked about working with the case studies was that they presented real-world problems that we got to get our hands on and solve...there was a little bit of leeway on how we wanted to get to our solution, and as long as our evidence supported it, we were free to find our own path.”*

-Shaelynn Nixon,  
INL High School Intern

*“The case study was a great way to learn about the industrial applications of processes like hydrogenolysis and how you can make something useful from something most would generally perceive as waste”*

-Brecken Allegood,  
INL High School Intern





## INSTRUCTOR GUIDE

Farm to Flight: Are Sustainable Aviation Fuels Good for the Environment?

Bioenergy Research and Education  
Bridge (BRIDGES) Program



## Assumes No Bioenergy Background

- Case Study Introduction/Background
- Learning Objectives
- Prerequisite Knowledge
- Classroom Implementation Strategies
- Rubrics
- Example answers to background questions
- Additional resources

# How can you be involved in BRIDGES?

- Who in your network could benefit from free quality instructional materials in bioenergy?

**Let's get the word out!**

- Attend one of the BETO BRIDGES Office Hours for more information and support-  
**Nov 2, Nov 16, Nov 30, Dec 7**

- Reach out if you would like to partner, join our board, or need more information:  
**Bioenergy\_BRIDGES@ee.doe.gov**

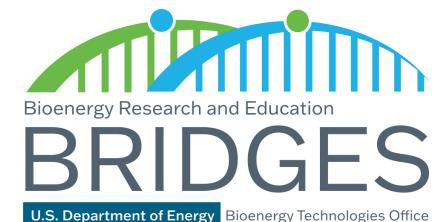
**Visit the BETO BRIDGES Website:**

<https://www.energy.gov/eere/bioenergy/bioenergy-research-and-education-bridge-program>



## SUBSCRIBE FOR UPDATES

Sign up to receive Bioenergy Technologies Office news, events, and funding opportunities.



# PARTNERSHIPS



# Questions?



Feedstock



Algae



Conversion



Systems



Data

