Bioenergy Research and Education

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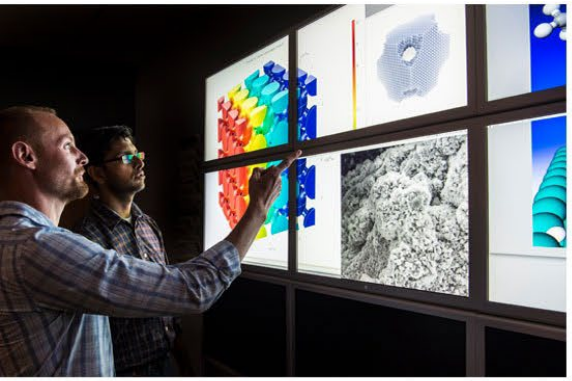
U.S. Department of Energy | Bioenergy Technologies Office

BRIDGES BIOENERGY 101 VIRTUAL WORKSHOP

Incorporating Bioenergy National Laboratory Research Into the Classroom




WEBINAR HOUSEKEEPING

- Attendees will be in listen-only mode
- Audio connection options:
  - Computer audio
  - Dial-in through your phone (best connection)
- Automated closed captions are available
- Technical difficulties? Contact us through the chat feature
- Use the Q&A feature to ask questions
- Today's webinar will be recorded and posted to the BETO website: energy.gov/eere/bioenergy/beto-webinars

Visit the BRIDGES website:
https://www.energy.gov/eere/bioenergy/bioenergy-research-and-education-bridge-program

Send questions: Bioenergy_BRIDGES@ee.doe.gov

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U.S. Department of Energy Bioenergy Technologies Office

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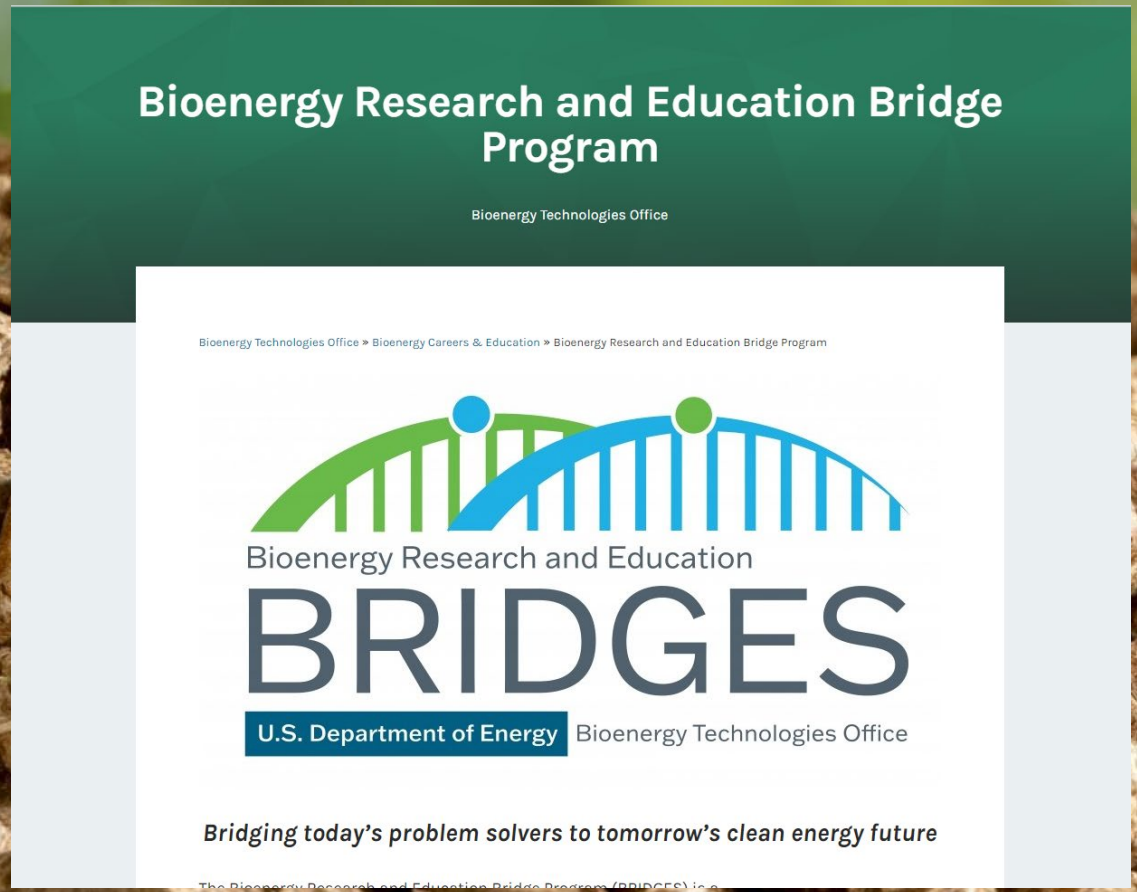
What is Bioenergy?

Bioenergy 101

- Bioenergy Technologies Office (BETO): BETO supports research, development, and demonstration to enable the sustainable use of domestic and waste resources for the production of biofuels and bioproducts.
- Bioenergy: Energy produced from biomass. When you see "bio-" in front of fuels, products, and power, it means these were made from biomass instead of petroleum.
- Bioeconomy: A global transition to the sustainable use of renewable biomass resources in energy and products aiming to increase economic, environmental, and social benefits and reduce environmental and social harm.
- Biomass: An energy resource derived from plant material. It includes agricultural residues (leftovers), forest residues, purpose-grown energy crops (such as algae and some kinds of grasses), urban wood waste, and food waste.

Access the BRIDGES Curriculum



Access the BRIDGES Portal to download all BRIDGES materials needed for instructors to develop their curriculums.

Access the BRIDGES Educator Resources Portal

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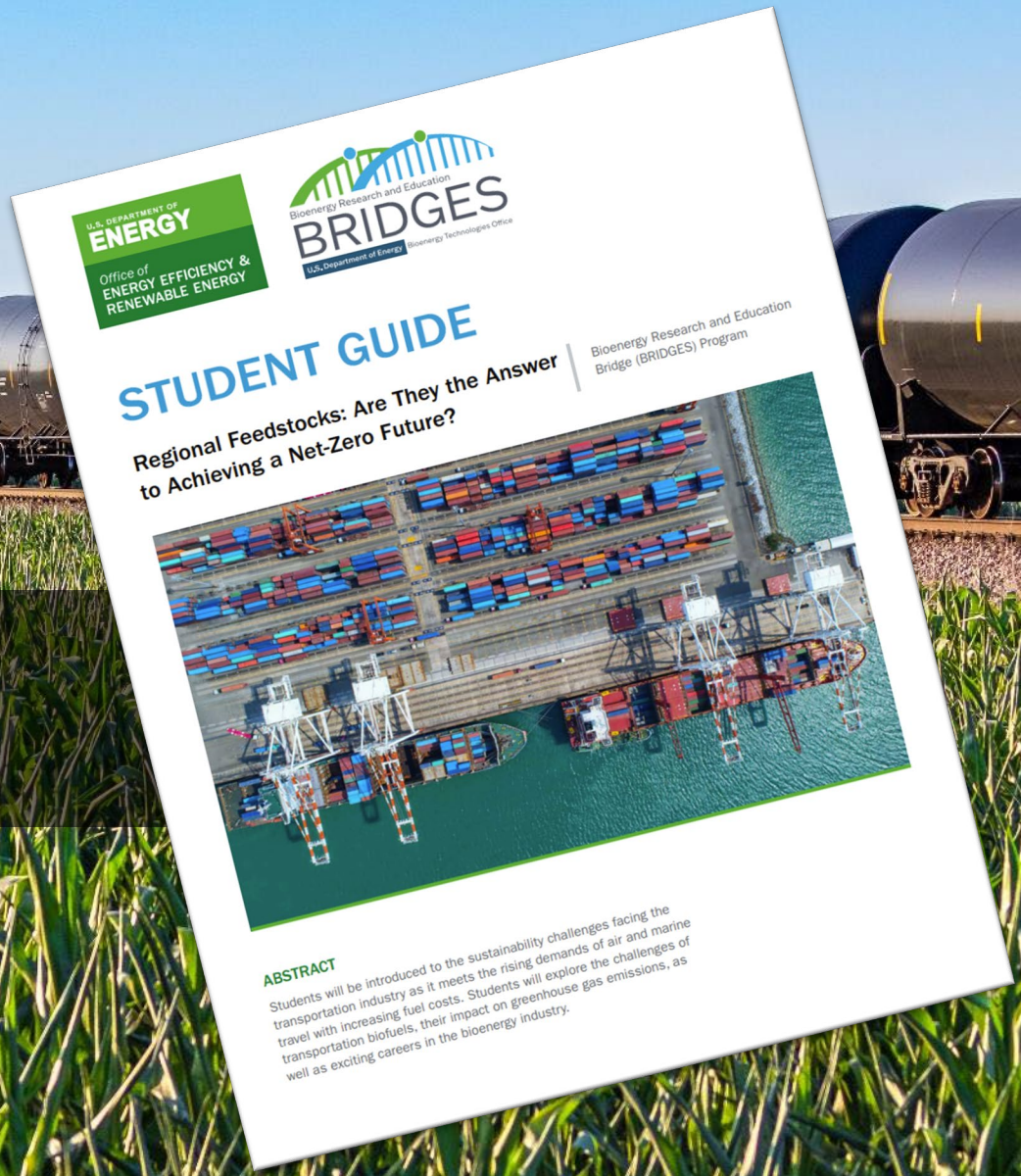
Regional Feedstock Case Study



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Scenario

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

Scenario

If the transportation sector is to transition away from fossil fuels to using to lower-carbon emitting fuels and potentially reaching a net-zero future, the United States must dramatically increase sustainable transportation fuel production and use. Sustainable fuels are made from renewable biomass and waste resources and have the potential to deliver the performance of petroleum-based jet fuel with a fraction of its carbon footprint. However, the use of sustainable transportation fuels has been limited by lack of supply and high production costs. Addressing these challenges will require a collaborative effort from industry and government to study the biomass-to-bioenergy supply chain and apply innovative solutions.

For sustainable transportation fuels to play a major role in achieving net-zero carbon emissions, the production of biofuels will need to be dramatically scaled up. Orchid Bioenergy is a pioneer in making low-carbon, low-cost, transportation fuels and will enlist the help of a team of researchers at Idaho National Laboratory (INL) to study regional feedstocks and the bioenergy supply chain. Orchid Bioenergy needs to reduce production costs and carbon emissions, while increasing the quality of the fuel composite. They plan to scale up operations by building a new biorefinery to meet the demand for transportation biofuels and maximize profits. Through a collaboration between industry and DOE national laboratories, Orchid Bioenergy and INL scientists will be studying biomass harvest to conversion. You will be part of a team of interns, challenged by your mentors to research which regional feedstock is best suited for producing the lowest moisture and highest quality product for the lowest cost. In addition, your team must also determine the best location for the next biorefinery to help offset production costs and carbon footprint.

Your final project is to produce an infographic mapping a viable bioenergy value chain from biomass harvest to conversion to share with the DOE and the board of directors for Orchid Bioenergy.

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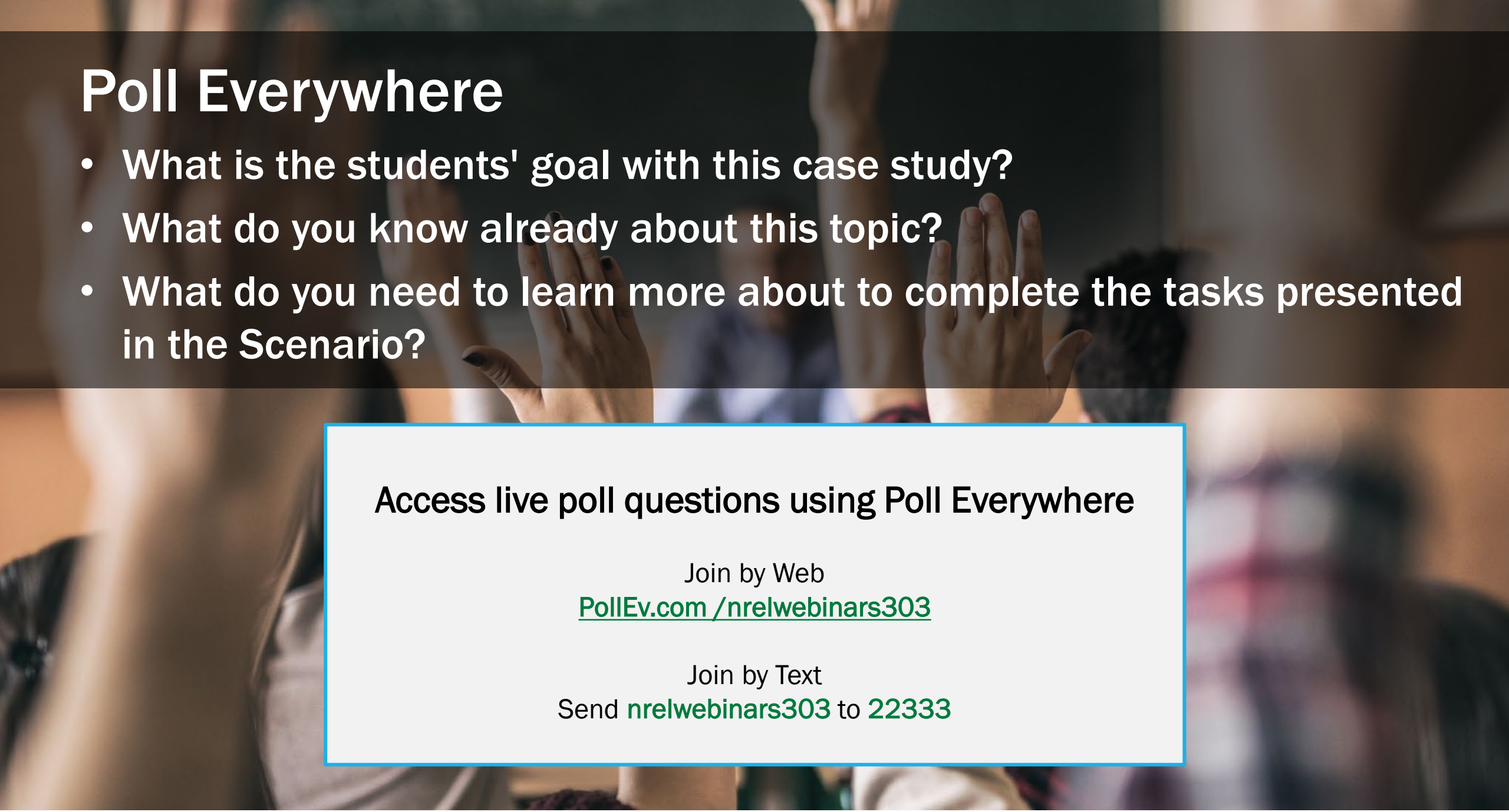
Poll Everywhere

- What is the students' goal with this case study?
- What do you know already about this topic?
- What do you need to learn more about to complete the tasks presented in the Scenario?



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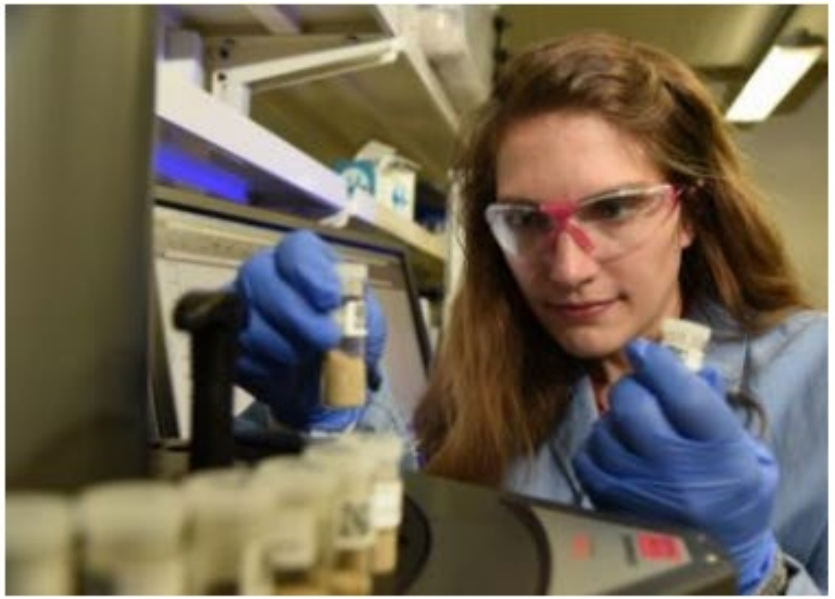
Regional Feedstock Case Study

- **Students assume the role of a bioenergy research intern investigating the biomass-to-bioenergy value chain from harvest to conversion.**

- **Their goal is to research which regional feedstock is best suited for producing :**
  - Lowest moisture and highest quality product for the lowest cost.
  - The best location for the next biorefinery to help offset production costs and carbon footprint.



Preparation

Students are introduced to INL's:

- Bioenergy Feedstock Library
- Bioenergy Feedstock Characterization Lab

Corn Stover

Data Sheet PDF (Single Pass) (Revised 11-28-2016)
Data Sheet PDF (Multi Pass) (Revised 11-28-2016)
Data Sheet PDF (Ensiled) (Revised 11-29-2016)

Corn stover is the most common crop for bioenergy research. Corn stover, an agricultural by-product, consists of the leaves and stalks of corn plants left in a field after harvest. It can be harvested with a single piece of equipment for both cutting and baling (single pass), or use a double-pass method that first cuts and drops the stover in windrows in the field and then picks up and bales the windrowed stover, typically introducing more ash from soil.

Switchgrass

Data Sheet PDF (Revised 11-28-2016)

Switchgrass is a native warm-season perennial grass that can thrive in a variety of climatic conditions and soil types. It can be grown on land that is not suitable for row crop production in either conventional tillage or no-till production systems.

Miscanthus

Data Sheet PDF (Revised 7-10-2019)

Miscanthus (commonly known as Elephant Grass) is a tall perennial grass that resembles bamboo. It is easy to grow, requires few nutrient inputs, and produces a crop with a high biomass yield and low mineral content. *Miscanthus* can be grown on lands not suitable for row-crop production.

Sorghum

Data Sheet PDF (Revised 11-28-2016)

Sorghum is a cereal grain that grows tall like corn and can be produced as a quick-growing annual. High-biomass sorghum uses water and nutrient inputs efficiently, is drought resistant, has robust establishment characteristics, and can be produced

Wheat Straw

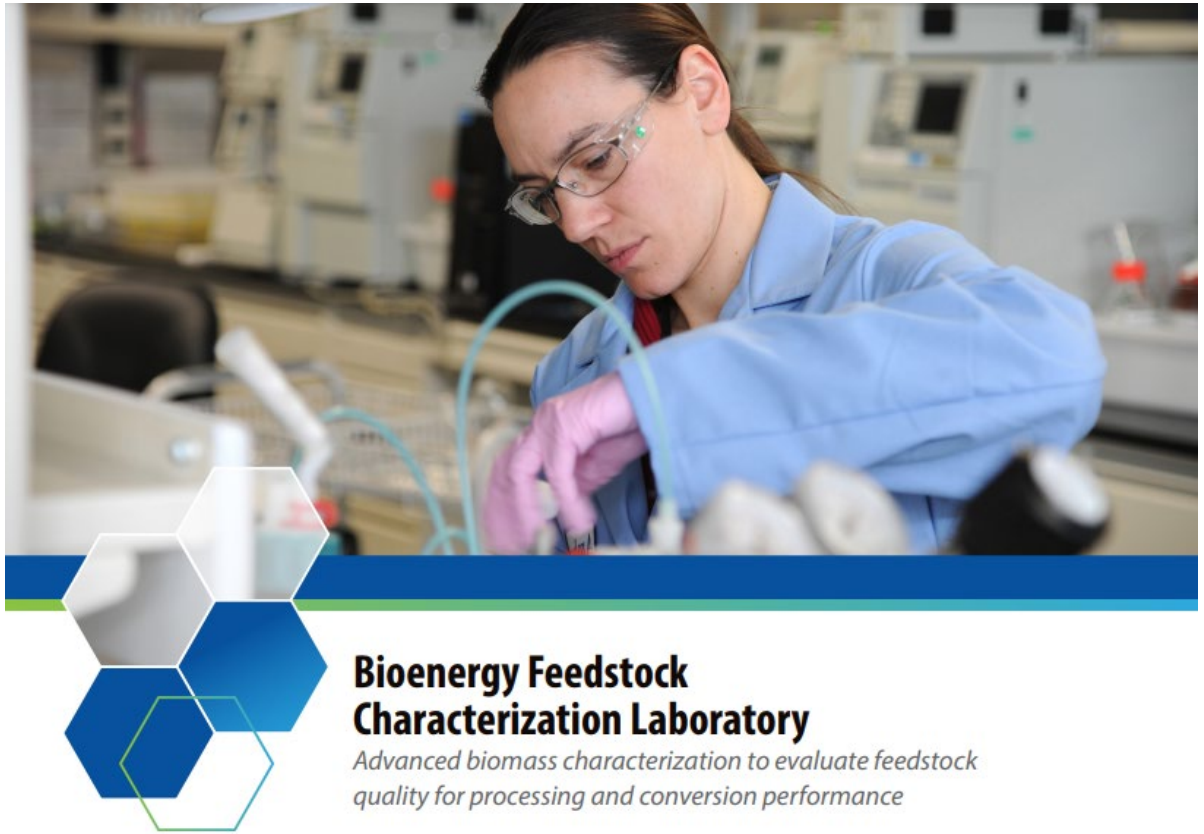
Data Sheet PDF (Revised 11-28-2016)

Wheat straw, an agricultural by-product, consists of the dry stalks that remain after the grain and chaff have been removed. It's use as a large-scale biomass power source is increasing in many parts of the world.

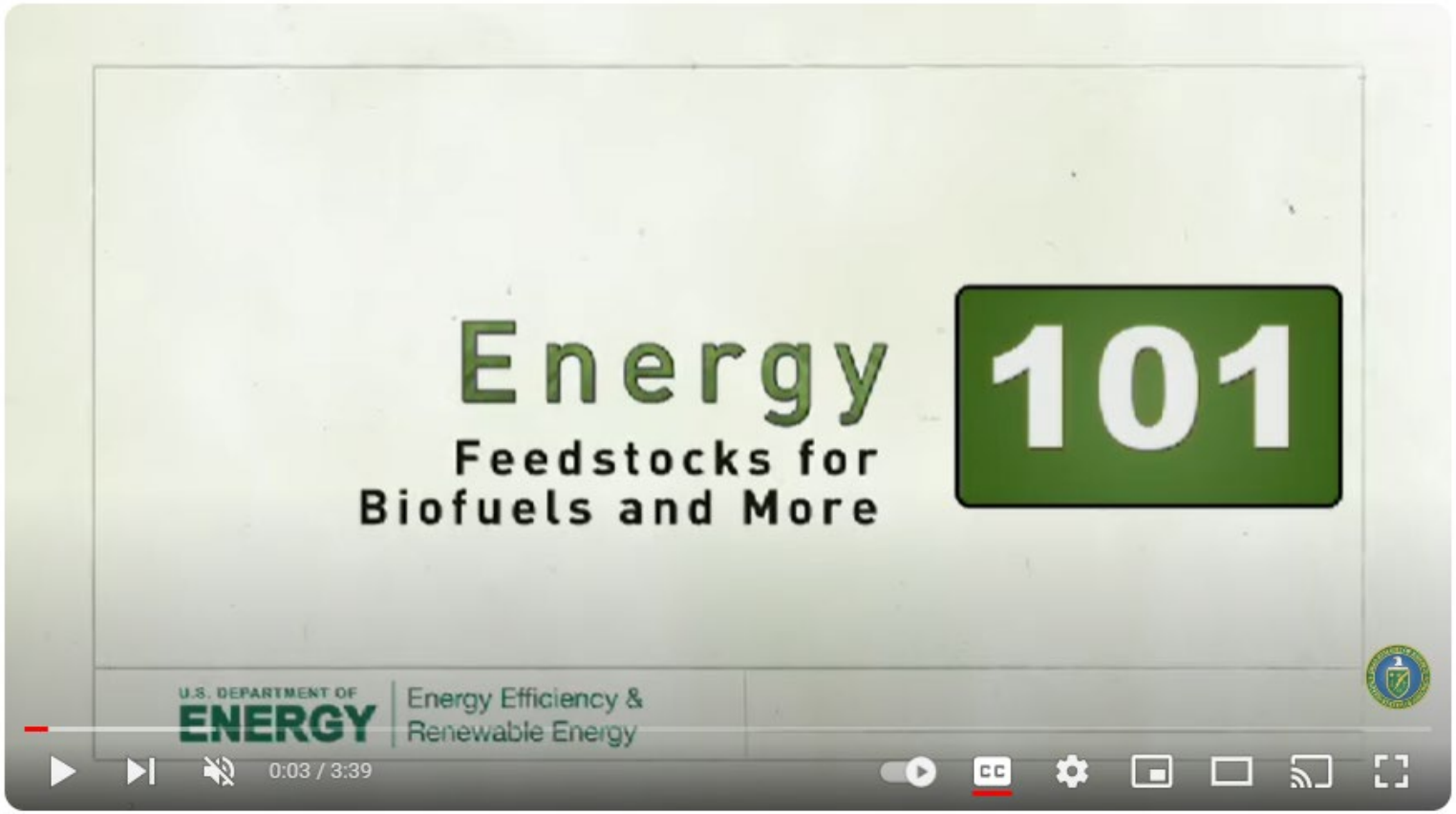
Hybrid Poplar

Data Sheet PDF (Revised 1-8-2018)

Poplars grow fairly well in the northern, central, and southern United States. Extensive genomic resources and ease of clonal propagation and transformation, will allow the generation of advanced transgenic clones with enhanced traits.



Preparation



Energy 101: Feedstocks for Biofuels and More

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Task 1: Biomass-to-Bioenergy Examples

- Explore "Biomass Supply and the Sustainable Development Goals: International Case Studies"

	Forest Biomass	Agricultural Residue	Energy Crops	Waste Biomass
Year & Location				
Harvest				
Transport				

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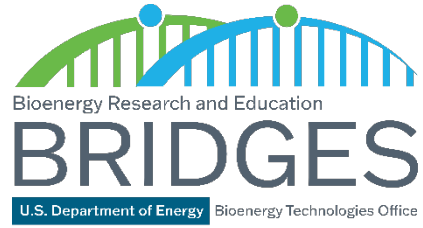
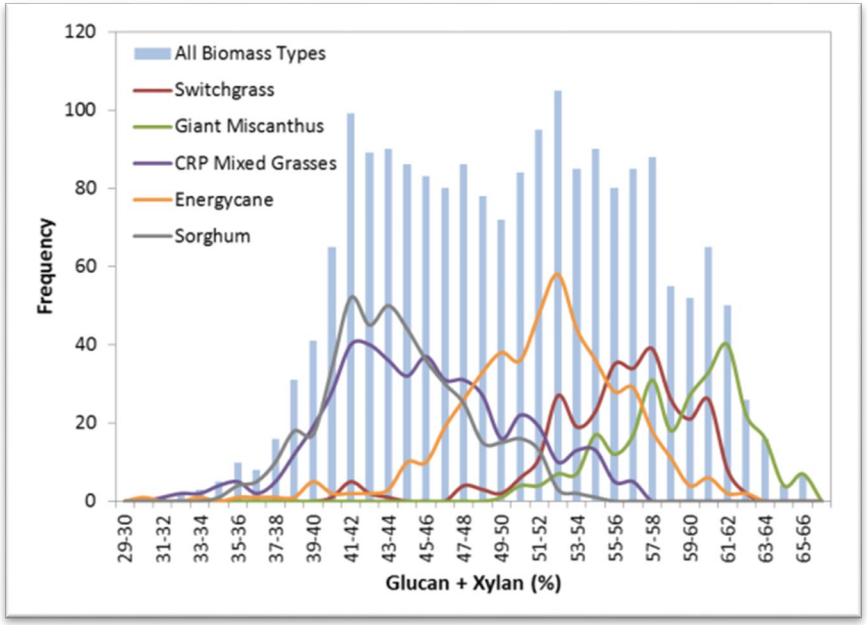
Breakout Session



Task 2: Review Biomass Characterization and Regional Supply Data

- Students learn the ideal characteristics for conversion to biofuels.



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Biomass Value Chain	Description	Pros	Cons
Biomass Selected			
Feedstock Characterization Notes			
Harvest			
Transport			

Task 3: Focusing Your Research

Teams come to a consensus on the biomass-to-bioenergy value chain they will recommend to Orchid Bioenergy

They will also make a recommendation for the best location for the next Orchid biorefinery.

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Task 4: Create an Infographic

Students demonstrate their chosen biomass to bioenergy value chain by creating an infographic to be shared with FCIC and presented to Orchid's board of directors to help them decide which feedstock is the best investment and best location to build their next biorefinery.

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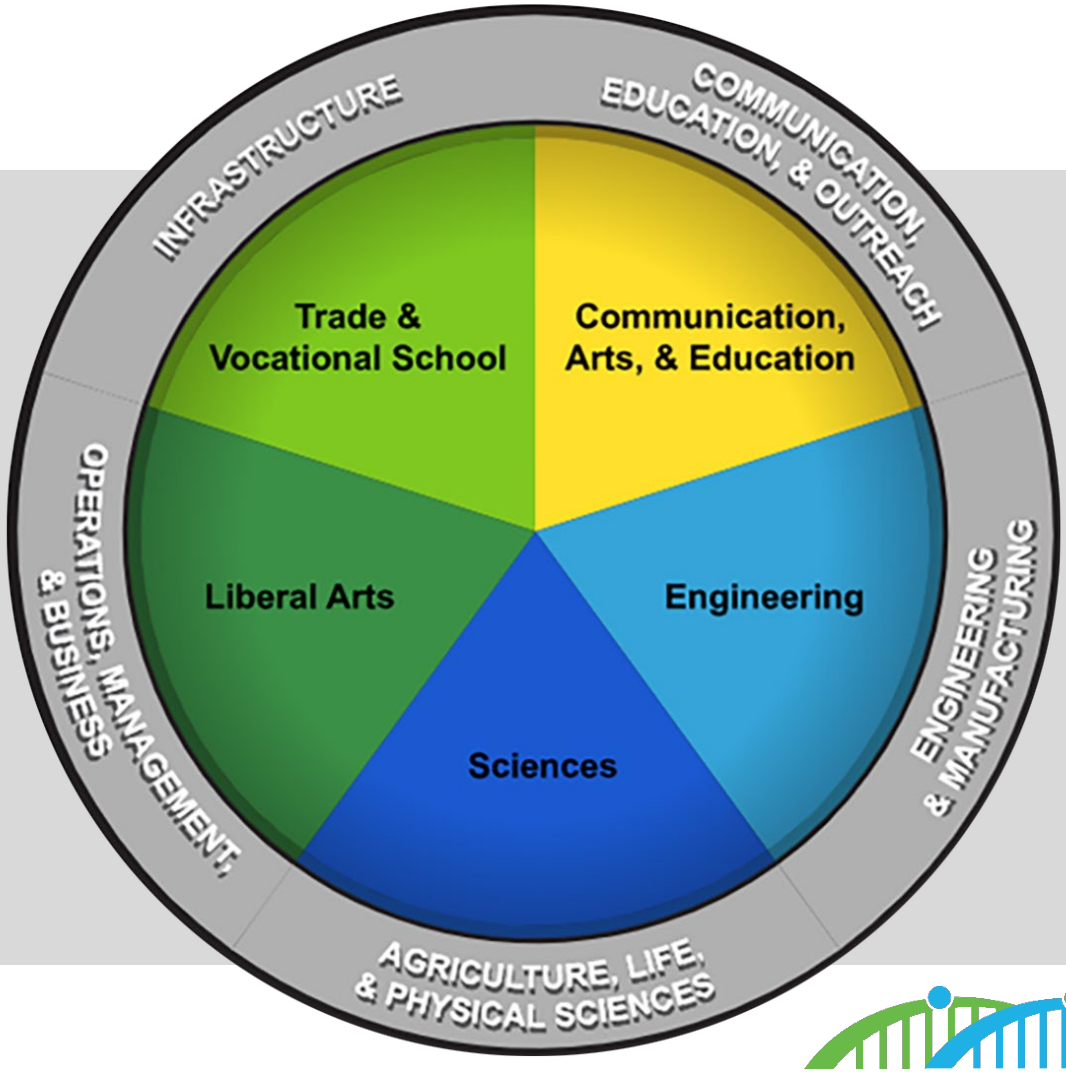
STUDENTS EXPLORE BIOENERGY CAREERS

CAREER HIGHLIGHT:
Bioenergy Research Intern

- 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



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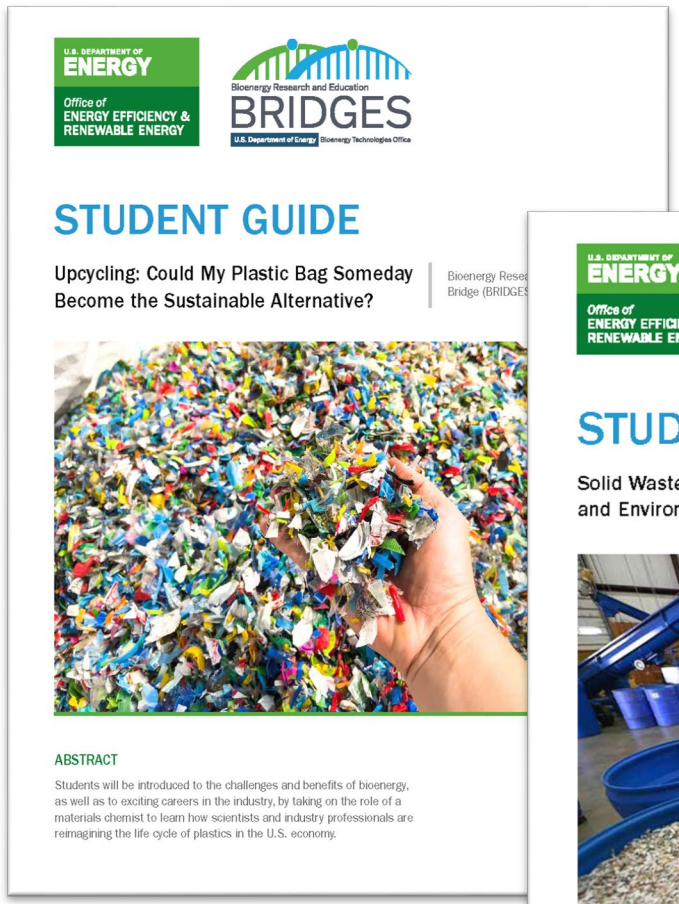
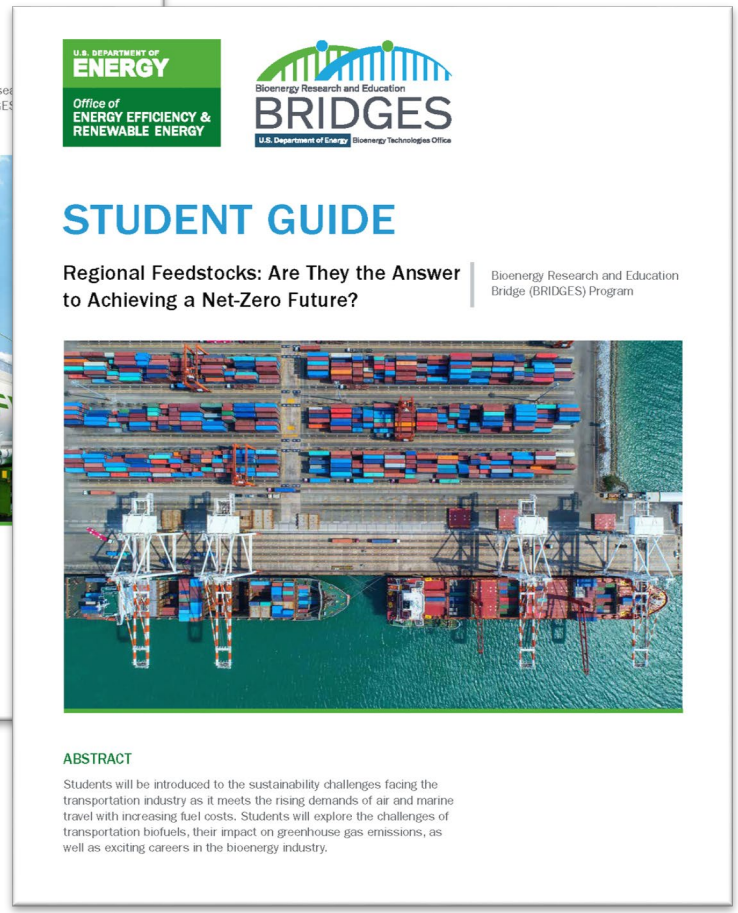
BRIDGES STUDENT AND INSTRUCTOR GUIDES NOW AVAILABLE





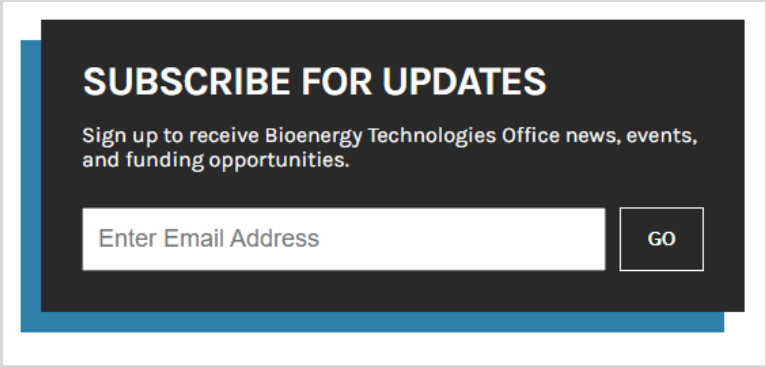
Next Steps and Questions

VISIT THE BETO BRIDGES WEBSITE:

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

OFFICE HOURS (registration only)

Oct 24th, 2024
Nov 7th, 2024



For more information or support, email Bioenergy_BRIDGES@ee.doe.gov

Thank you!

Contact us with additional questions & comments: Bioenergy_BRIDGES@ee.doe.gov