



Biomass Basics

Alexis Martin

Fellow, Bioenergy
Technologies Office
Department of Energy

August 27, 2015

Agenda

- Overview of Bioenergy
- Biomass to Biofuels Life Cycle
- Importance of Bioenergy
- 2016 BioenergizeME Infographic Challenge

Questions and Comments


Please record any questions and comments you may have during the webinar and send them to BioenergizeME@ee.doe.gov

As a follow-up to the webinar, the presenter(s) will provide responses to selected questions.

For general questions regarding the BioenergizeME Infographic Challenge, please email BioenergizeME@ee.doe.gov

Questions and Comments

Find today's webinar recording and slides on the Bioenergy Technologies Office website:
<http://www.energy.gov/ee-re/bioenergy/webinars>

**ENERGY.GOV**
Office of Energy Efficiency & Renewable Energy

Search Energy.gov

SERVICESEFFICIENCYRENEWABLESTRANSPORTATIONABOUT USOFFICES

Home » Events » Webinars

WEBINARS

[Bioenergy Home](#)[About the Bioenergy Technologies Office](#)[Research & Development](#)[Education & Workforce Development](#)[Financial Opportunities](#)[Information Resources](#)[News](#)[Events](#)[Conferences](#)[Meetings & Workshops](#)**Webinars**[Contact Us](#)

This page contains presentation slides and audio files from the Bioenergy Technologies Office's webinar series that covers many of the Office's activities and features "Hot Topics" discussions relevant to the development of renewable fuels, power, and products from biomass resources.

UPCOMING WEBINARS

Check out our [Events](#) page to find out more about our upcoming webinars.

RECENT WEBINARS

May 27, 2015—A Changing Market for Biofuels and Bioproducts

A strong bioeconomy made up of biomass-derived fuels has an important role to play in a world of quickly changing oil prices. The U.S. Department of Energy, through the Bioenergy Technologies Office (BETO), is supporting research and development to ensure that these biofuels and bioproducts are both available and affordable. In this webinar, Dr. Bryce Stokes (CNUV) and Laurence Eaton (Oak Ridge National Laboratory) will discuss the results of the BETO-funded report the "U.S. Billion-Ton Update," and how this and other research efforts are helping to enhance a secure and sustainable annual supply of biomass for the U.S. bioeconomy.

- [A Changing Market for Biofuels and Bioproducts](#)

April 22, 2015—Biofuels for the Environment and Communities

Biomass-derived fuels are a promising, domestically sourced replacement for fossil-based fuels that can provide benefits to the environment, the economy, and society. The U.S. Department of Energy, through the Bioenergy Technologies Office (BETO), is supporting research and development to ensure the long-term sustainability of biofuels. In this webinar, Drs. Virginia Dale (Oak Ridge National Laboratory) and Cristina Negri (Argonne National Laboratory) will discuss the results of their BETO-sponsored research on how to develop biofuels that positively impact the environmental, socioeconomic, and technoeconomic sustainability of biofuel development in the United States. View the [recorded webinar](#).

What is Bioenergy?

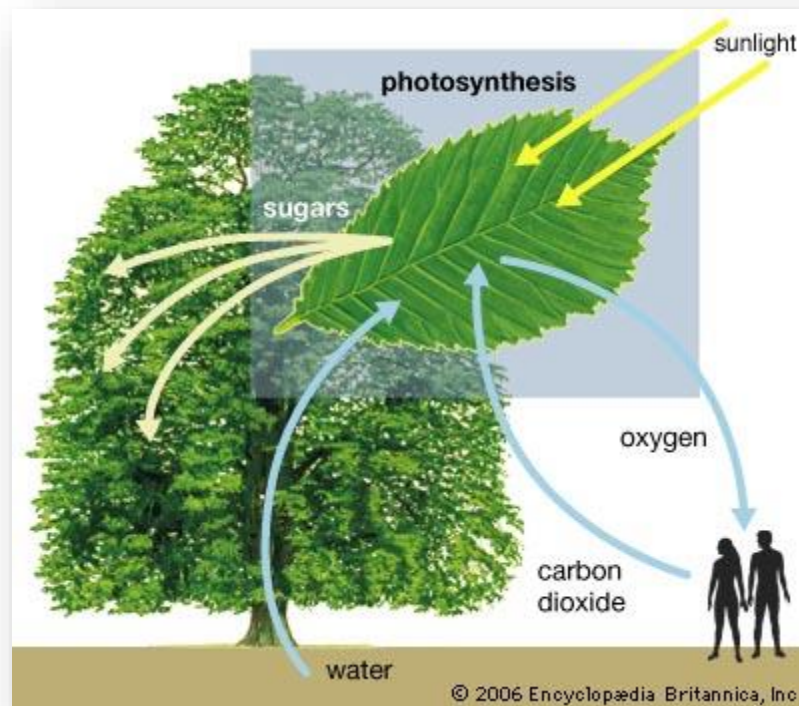
Bioenergy is a form of renewable energy derived from biomass to generate heat and electricity (biopower), biofuels (transportation fuels), biochemicals, and other energy-related bioproducts that are produced from biomass.



Photos courtesy of USDA and NREL

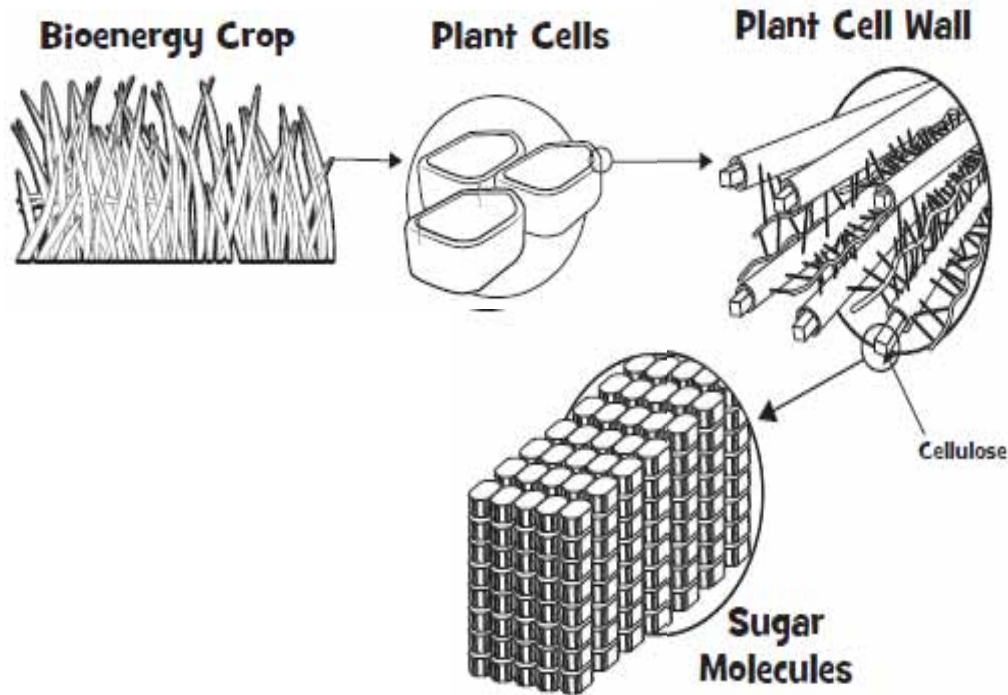
What is Biomass?

Biomass: any organic (living/once living) material that has stored sunlight in the form of chemical energy (sugars like cellulose)



Photosynthesis = Light + water + carbon dioxide → sugars

What is Biomass?



Cellulose is the main component of plant cell walls. Made from sugar molecules, the **cellulose serves as a structural frame** (steel beams) for the cell wall.

Sustainable Feedstocks



Agricultural Residues: Plant parts left in the field after harvest are commonly called agricultural residues. This plant matter and secondary residues like manure and food processing wastes can be useful feedstocks. *Photo: iStock/6710081*



Forest Residues: Leftover wood or plant material from logging operations, forest management, and land-clearing are available feedstock resources. Secondary residues like mill wastes supplement this category. *Photo: NREL/04190*



Energy Crops: Fast-growing trees and perennial grasses are specifically grown for energy uses. Trees and perennial grasses can often be grown on land that is less suitable for conventional crops and can stabilize the soil. These crops have high biomass production potential. *Photo: iStock/4373820*

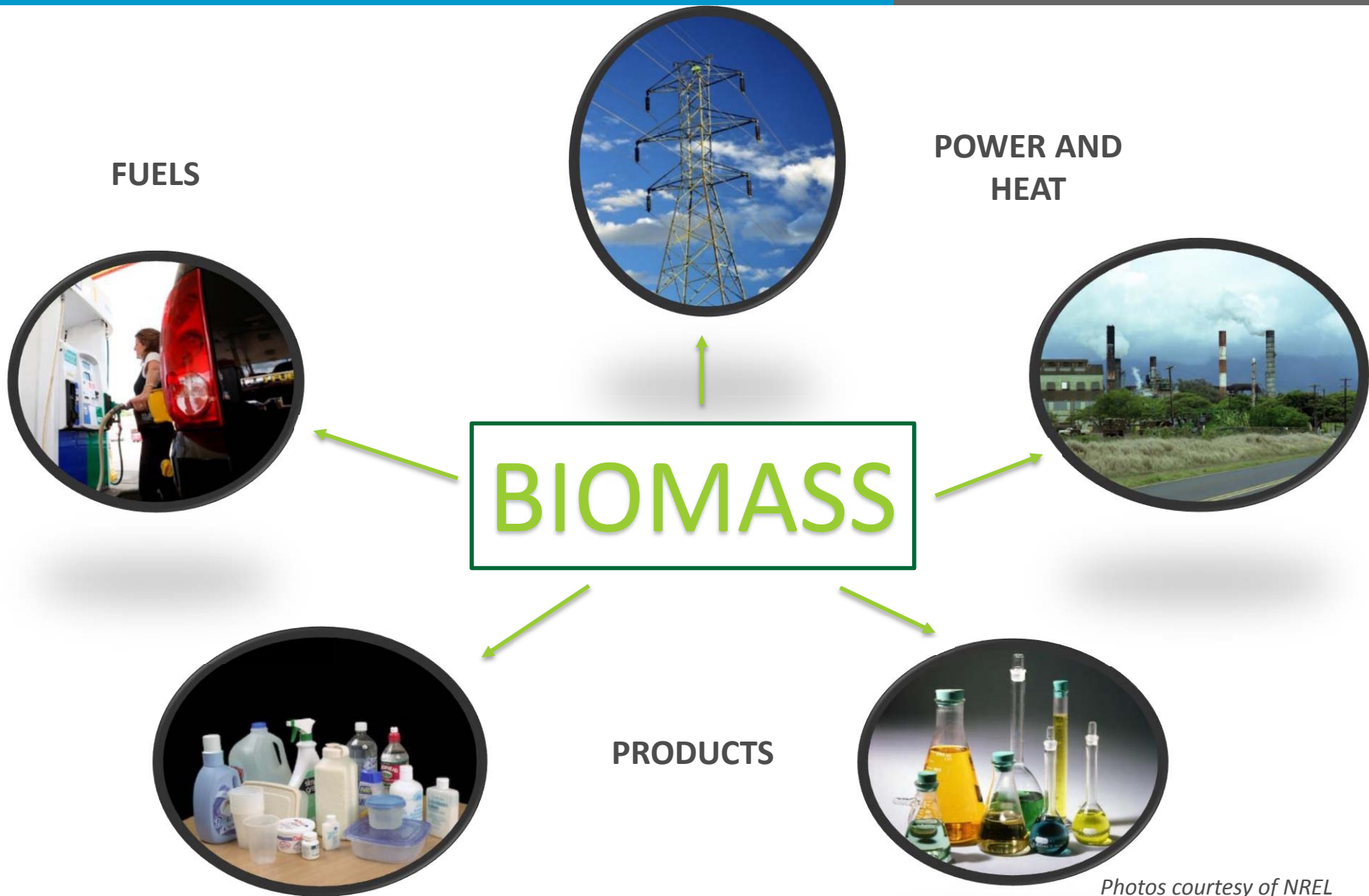


Algae: Many macroalgae, microalgae, and cyanobacteria carry out photosynthesis to drive rapid biomass growth. Algae biomass can contain high levels of oil, making it a promising feedstock for biofuels, including renewable gasoline, diesel, and jet fuel. *Photo: NREL/01726, 19549*



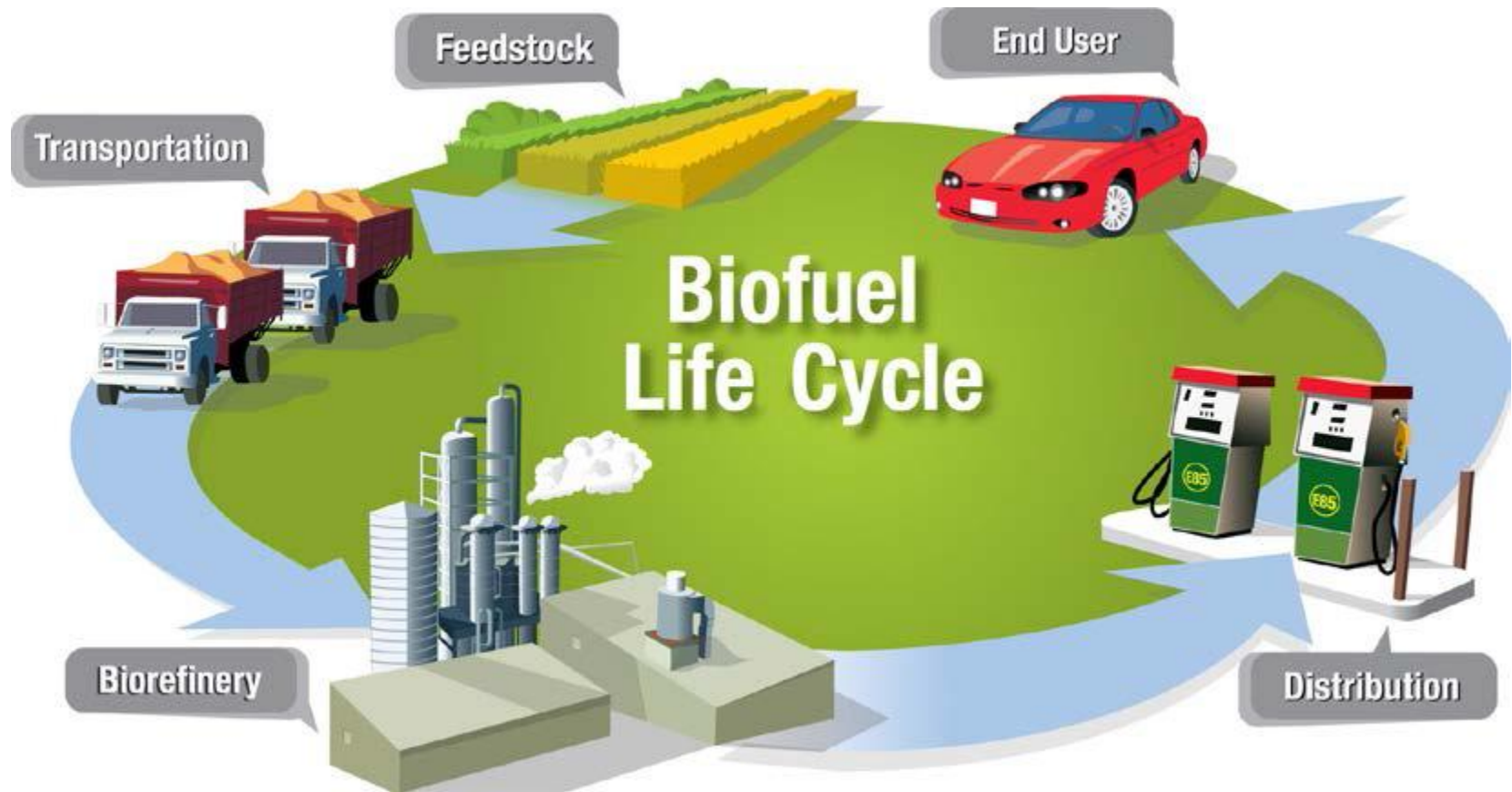
Municipal Solid Waste: MSW has potential as a gasifier feedstock. Its near-term availability and pre-existing collection and transport infrastructure make it a particularly attractive resource. *Photo: iStock/14910937*

What can Biomass Produce?



Photos courtesy of NREL

How Biomass is Turned into Bioenergy



Feedstock Supply and Transport

Plant-based renewable biomass is harvested, chopped into small pieces, or rolled into bales. Processed biomass is transported to a storage site at a biofuel plant or biorefinery.



Feedstock to Biorefinery

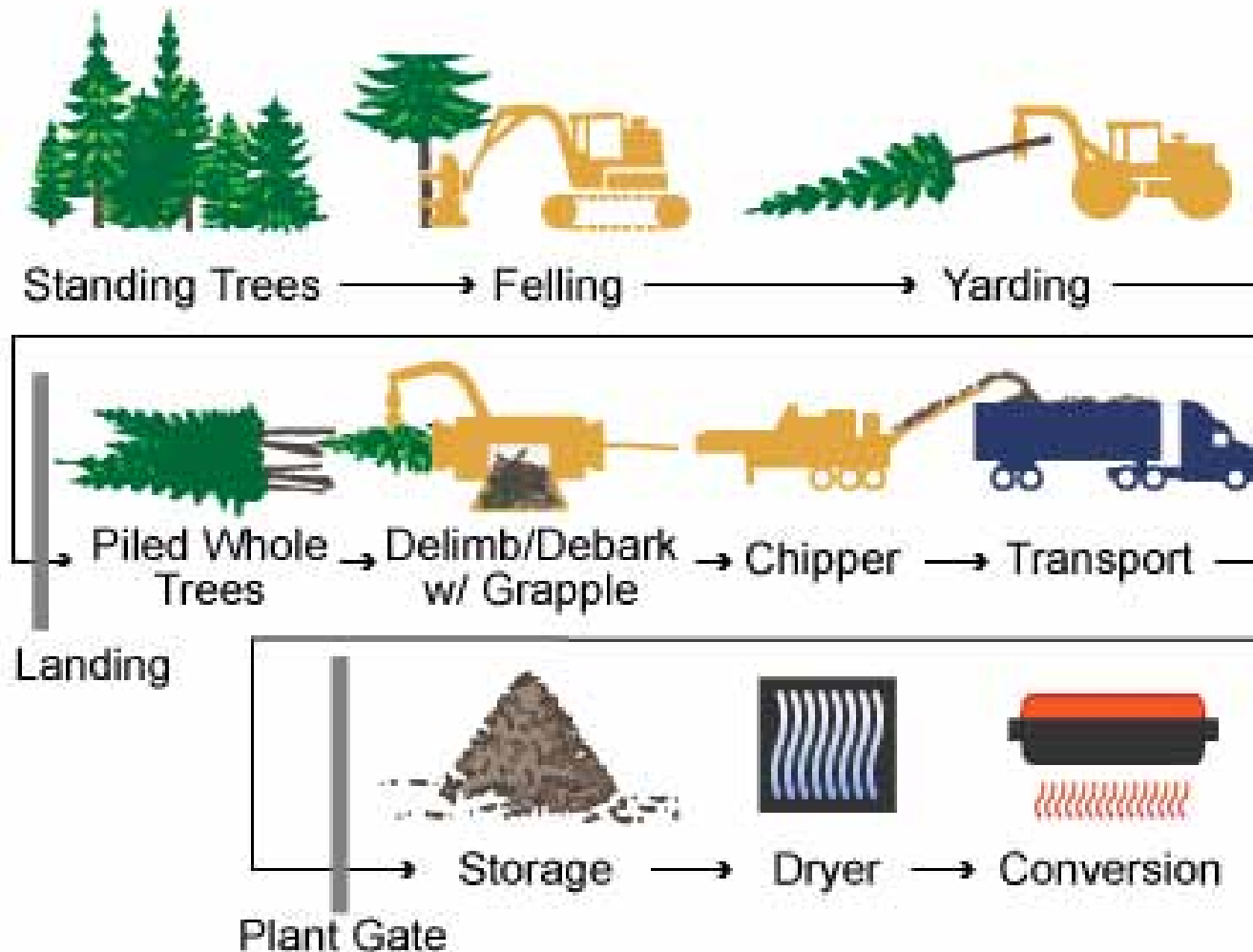


Photo Credit: INL

How Does a Biorefinery Operate?



Processed biomass is treated with heat and chemicals



Biorefinery



Enzymes break down cellulose into sugar



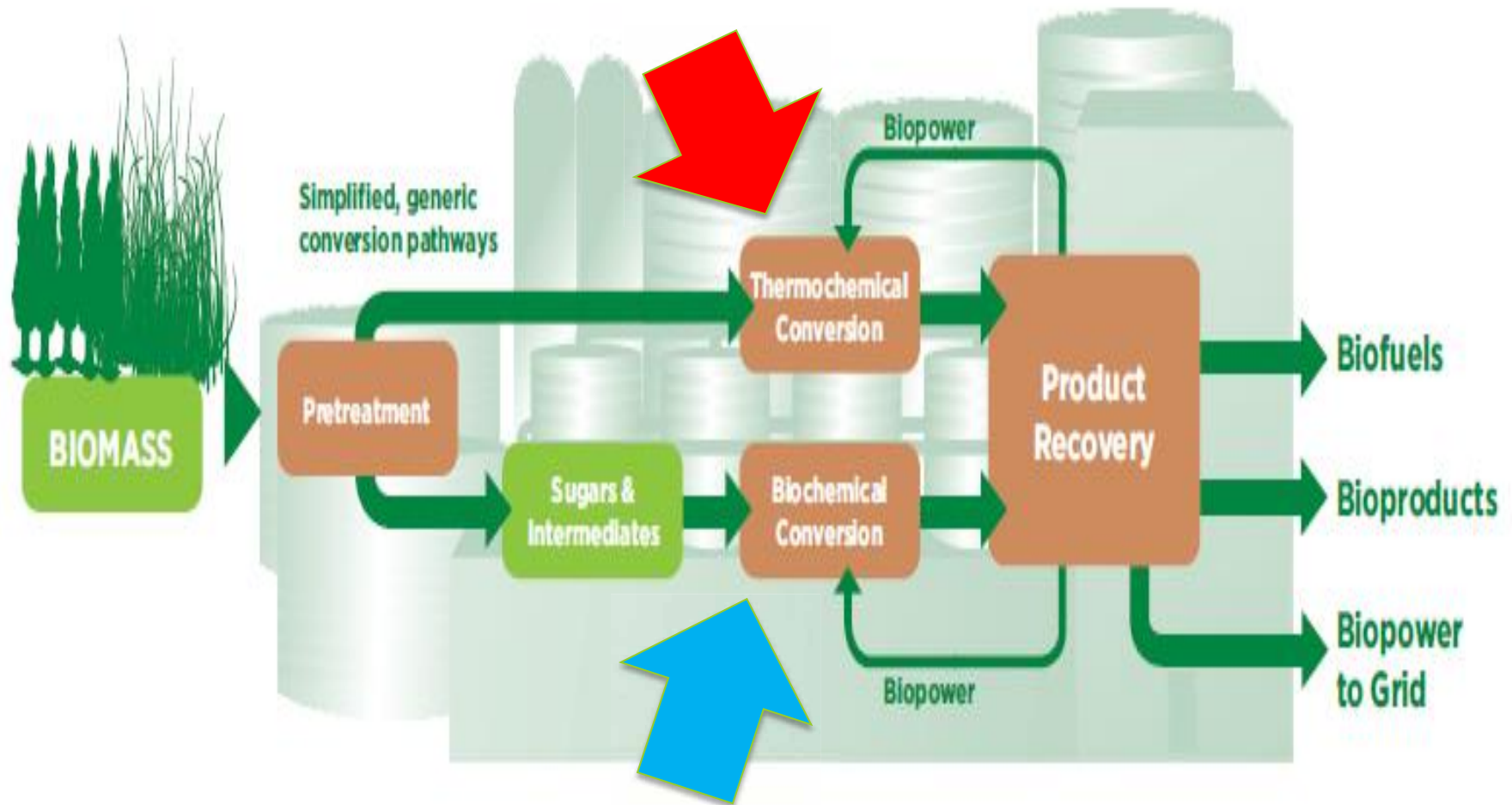
Microbes ferment sugar into ethanol



Ethanol is purified and prepared for distribution

Photos courtesy of NREL

At the Biorefinery: Step-by-Step Process



Distribution: Fuels Travel to Consumers

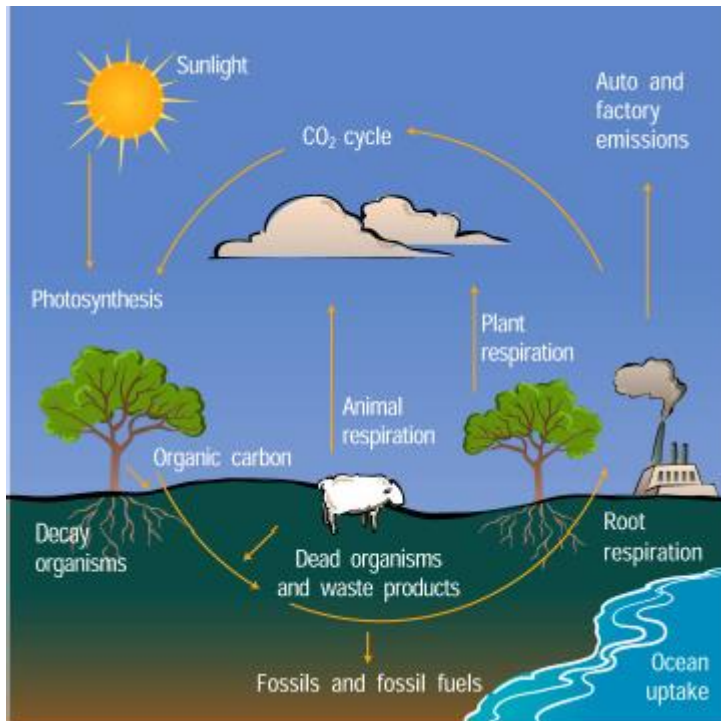


Where can Biofuels be Used?



Photos courtesy of NREL

Why Do We Need to Stop Using Fossil Fuels?



- **Fossil fuels** are non-reusable sources of energy, such as oil, coal, and natural gas
- Fossil fuels are **putting too much carbon dioxide into the air.**
- The **use of fossil fuels is one of the main causes of pollution.** When that carbon is released into the air through burning- by using it to power vehicles or to heat factories- then it mixes with oxygen and becomes carbon dioxide.
- The carbon dioxide is heavier than other gases in our atmosphere and does not allow the warm rays of the sun to escape the atmosphere at night.

What are the Benefits of Bioenergy?

- Improved national energy security
 - Biofuels can be grown, harvested, and produced domestically
- Increased economic growth
 - Biofuels create domestic jobs and increase economic activity
- Broad-based environmental benefits
 - Reduce greenhouse gas (GHG) emissions and increase land conservation

BioenergizeME Infographic Challenge

Purpose

- Provide an engaging virtual venue for 9-12th-grade participants to gain foundational knowledge about bioenergy and to educate others about what they have learned.
- Their enhanced energy literacy will enable them to be better consumers of energy information and to dispel energy myths they encounter in the media and from other sources.

Challenge Activities

- Student teams research bioenergy topics and report their findings in an infographic.
- Selected teams promote their infographic in an 11-day social media challenge.
- Winners are selected in two categories: quality of infographic and effectiveness of social media campaign.




Classroom-Ready Support Materials!

BioenergizeME resources provided

- Challenge rules, research topics and prompts, evaluation rubrics
- Guidance on doing research, creating infographics, and developing a social media campaign
- Research references, search phrases, and links to government-funded publications
- Easy for educators and fun for students!

Developing future leaders who will determine the bioenergy landscape of tomorrow



BioenergizeME Infographic Challenge Toolkit

Infographic Challenge 2015

"Bioenergy—Building on the Shoulders of Giants"

Deadlines
Infographic Submission March 20, 2015
National Bioenergy Social Media Campaign April 13-23, 2015

Bioenergy Technologies Office
Spring 2015

1 RESEARCH

Research your topic fully. Pull together a list of important facts that you think are important. Make sure to use credible sources.

2 SKETCH

Remember, you are going to share facts and data that tell a story. Write that story out, and draw a sketch for each key point.

3 DESIGN

Now it's time to bring everything together in one cohesive design. Choose the layout, and choose a color palette. Bring your sketches to life with hand-drawn or digital illustrations and icons. You can create these from scratch or find ready-made resources online. Be sure to use a consistent style throughout the infographic.


4 TEST

Getting input from others will let you know if your infographic is doing what you want it to. Show your infographic with others and ask them for feedback.

5 FINALIZE

Review the feedback that you receive, and incorporate constructive changes to produce a final version of your infographic.

5 STEPS FOR BUILDING AN INFOGRAPHIC



Infographic Rubric			
	1	2	3
Research Content	<ul style="list-style-type: none">• The data and facts presented are evidence based from reliable sources. All sources are referenced. All content is accurate.• The analysis and explanation of the research topic selected.• The information and messages present a logical flow.	<ul style="list-style-type: none">• The content contains one inaccuracy, and content is partially cited with credible sources.• The analysis and explanation are incomplete.• One of the elements of the infographic does not logically flow with the subject matter.	<ul style="list-style-type: none">• The content contains more than one inaccuracy, content is occasionally cited, and/or credible sources are visibly lacking.• Lacking analysis and explanation.• More than one of the elements of the infographic does not logically flow with the subject matter.
Design	<ul style="list-style-type: none">• The infographic is highly attractive in terms of layout, design, and neatness. The color choices enhance the visibility of the infographic, and the fonts used are readable and complement the content.• The chosen data visualization formats make the data presented clear and simple for the viewer to understand.• The images and illustrations match the tone and subject matter of the infographic.	<ul style="list-style-type: none">• The infographic is adequately attractive in terms of layout, design, and neatness. Color and font choices do not add or detract from the infographic.• The chosen data visualization formats illustrate the data correctly, but some may be difficult for the viewer to understand.• The images and illustrations are relevant but may distract attention away from the content of the infographic.	<ul style="list-style-type: none">• The infographic lacks attractiveness in terms of layout, design, and neatness. Fonts used are difficult to read, and color choices are distracting.• Data visualizations are seen, but other formats could have been chosen to better illustrate the data for the viewer.• The images and illustrations used do not match the subject matter of the infographic and take away from the content of the infographic.
Mechanics	<ul style="list-style-type: none">• Grammar• Guidelines/ format	<ul style="list-style-type: none">• The writing is free of errors.	<ul style="list-style-type: none">• The writing contains one or more errors.

SOCIAL MEDIA GUIDE



GOAL: Share what you've learned about bioenergy through a 10-day social media campaign!

HOW TO DO IT:

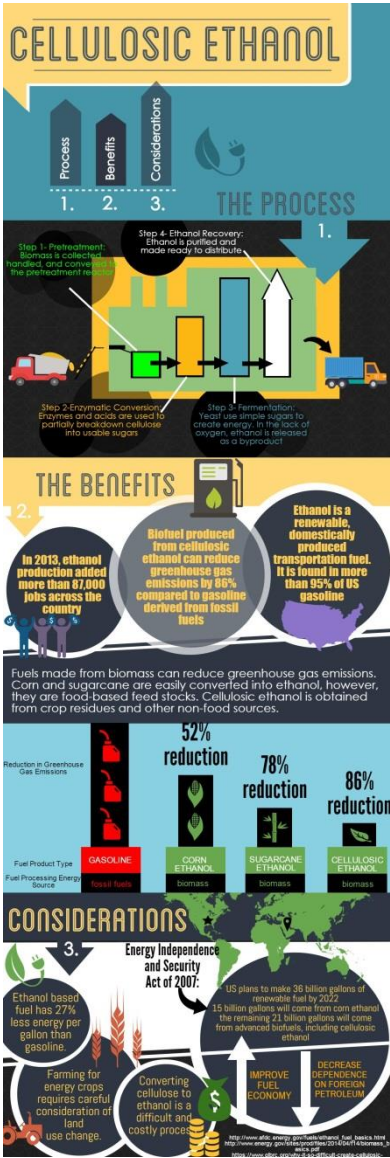
- Assign team roles**
 - Determine what roles each person will play in the campaign.
 - 1. Team Director**
Lead and organize your team, keep your team on schedule, and oversee progress (views, likes, and shares) during your social media campaign.
 - 2. Content Manager**
Determine key messages you want to convey to your audience about your infographic, and write catchy text to draw viewers in.
 - 3. Engagement Manager**
Identify the various social media networks (Twitter, Instagram, Facebook, etc.) for your campaign. Engage and respond to questions and comments from followers.
- Plan a strategy & timeline**
 - Plan ahead by creating a strategy and timeline. This is necessary to design a successful campaign.
 - Tasks**
 - Choose the social media networks you will use.
 - Write content (catchy text—just a sentence or two) that promotes your infographic.
 - Schedule the days and times your team will post your posts in the various social networks, and make plans about how you'll respond to comments.
 - Deadlines**
You will have one week to prepare your social media strategy and ten days to carry it out.
- Start your campaign & monitor progress**
 - Social media campaigns start April 13, 5:00 p.m. central time.**
 - Posting Social Media**
Be creative to bring attention to your infographic and encourage audiences to share your infographic across their social networks.
 - Responding to Comments**
Reply quickly and courteously to comments about your infographic. See how your viewers react and what they are learning about bioenergy from your infographic.
 - Monitor Progress**
Measure your success by talking likes, shares, and comments, and consider adjusting your outreach strategy based on your progress.

Tip:

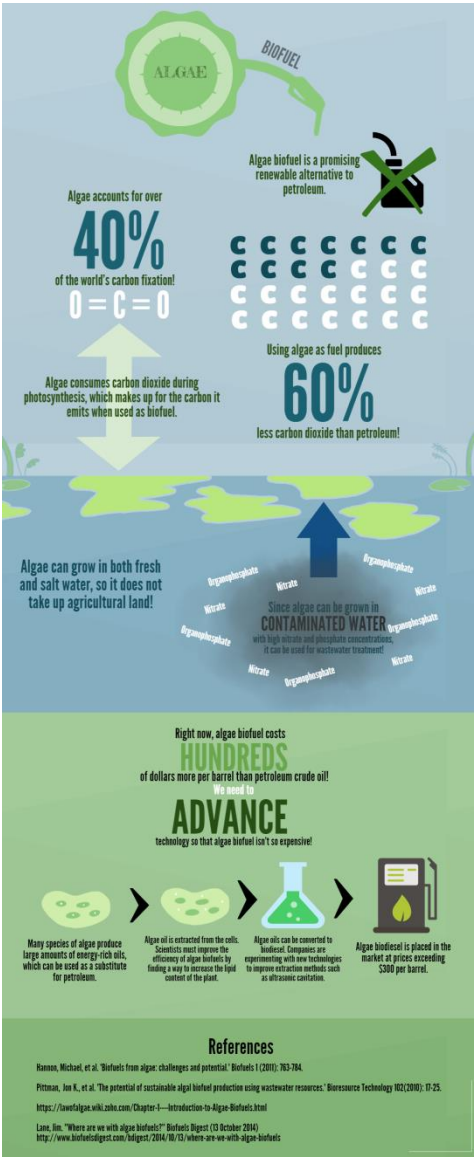
- Stay positive and be thoughtful towards your audience; they may not know very much about your topic, or they may be more knowledgeable than you. "Thanks for checking out my infographic" is a good backup response.
- If you get aggressive or hostile comments, you may ignore or delete them. If this does not stop a verbally-tell a teacher.
- Be active on social media. Like, share, and comment on others' posts, and they may do the same for you.

Spring 2015 Finalists

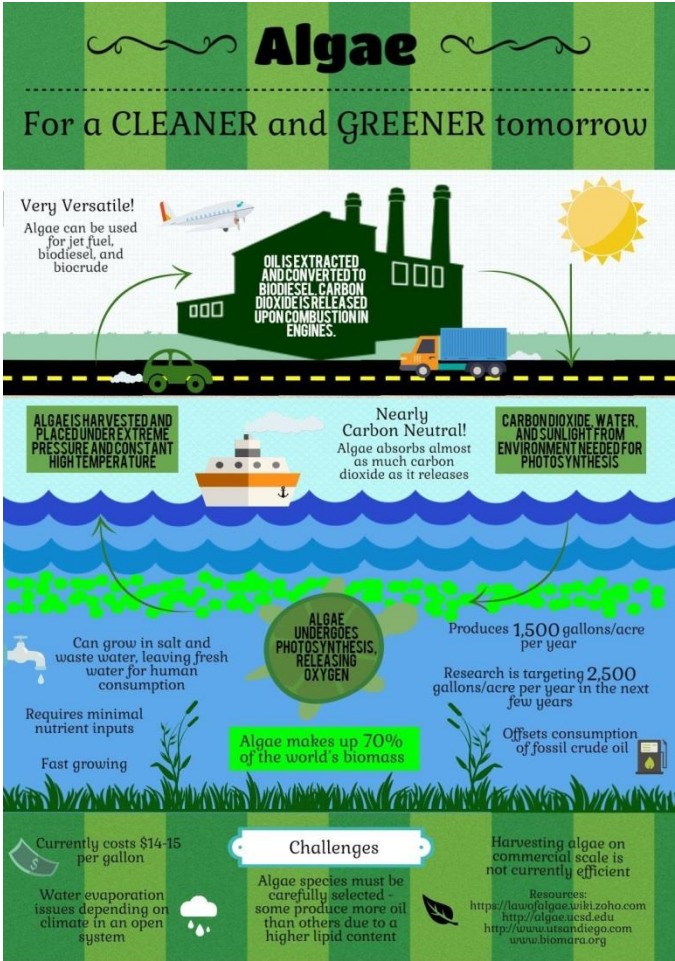
1



2



3



Put Your School/Organization on the Map!

BIOENERGIZEME INFOGRAPHIC CHALLENGE MAP

Bioenergy Home

About the Bioenergy Technologies Office

Research & Development

Education & Workforce Development

Financial Opportunities

Information Resources

News

Events

Contact Us

SAPPHIRE ENERGY INC.

Location:
Columbus, NM

Research Topic:
Integrated Biorefinery

Description:
The Sapphire Energy Inc. integrated biorefinery, located in Columbus, New Mexico, was funded by the U.S. Department of Energy's Bioenergy Technologies Office and utilizes biomass feedstocks such as algae to produce renewable hydrocarbons.

[Learn More](#)

<http://www.energy.gov/eere/bioenergy/bioenergizeme-infographic-challenge-map>

Thank you for your attention!

Questions? Email us:

BioenergizeME@ee.doe.gov

More Information:

<http://www.energy.gov/eere/bioenergy/>