

A First Step to Financing: Writing a Useful Economic Feasibility Study *Using Advanced Biofuels Examples*



Advanced Biofuels USA
www.AdvancedBiofuelsUSA.org
301-644-1395



Advanced Biofuels
USA

501(c)3 Nonprofit
Educational Organization

Founded April 2008

Website:

www.AdvancedBiofuelsUSA.org

Frederick, MD

Advocates for the adoption of
advanced biofuels as an

- energy security,
- military flexibility,
- economic development
- climate change mitigation
- pollution control

solution.

Advanced Biofuels USA Home Page

www.AdvancedBiofuelsUSA.org

Advanced Biofuels USA, a nonprofit educational organization, advocates for the adoption of advanced biofuels as an energy security, economic development, military flexibility and climate change mitigation/pollution control solution.

ADVANCED BIOFUELS USA

HOME ABOUT US BIOFUEL BASICS R&D FOCUS RESOURCES EDUCATION POLICY NEWS

BUSINESS NEWS/ANALYSIS · US LEGISLATION · US REGULATION · US LITIGATION · ORIGINAL WRITING · WHITE PAPERS · POLICY ANALYSIS · SUSTAINABILITY

GAIN EXPERIENCE

"Volunteer with Advanced Biofuels USA for a truly renewable, sustainable future"

COMING EVENTS

CO₂
20 - 21 March 2019
Cologne (Germany)
www.co2-chemistry.eu

as Feedstock for Fuels, Chemistry and Polymers --- March 20-21, 2019
--- Maternushaus, Cologne, Germany

EUROPEAN FUELS MARKETS & REFINING STRATEGY CONFERENCE 2019
17-20 March
Frankfurt, Germany

European Fuels Markets & Refining Strategy Conference --- March 27-28, 2019 --- Frankfurt, Germany

U.S. Department of Energy 2019 Project Peer Review --- March 4-8,

biogas-source-ad....png anaerobic-process....jpg

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2:58 PM 3/2/2019

Before we start:

What do you think of when you
hear
“bioenergy”?

Does it include energy for transportation?



Before we start:

What do you think of when you
hear

“biofuel”

“renewable fuel”?



A First Step to Financing: Writing a Useful Economic Feasibility Study

- By attending this session, participants will get practical advice for preparing a project for funding or financing; will know what **government grant application reviewers** look for; and what **private investors** should be examining. And they will understand the need to incorporate information in the economic feasibility study that will provide **background information** for potential investors, granting agencies and communities that may have an interest in the project.
- They will learn about technical and professional expertise that might be required to finance a bioeconomy project successfully.
-
- Participants will also learn **basic information about biofuel production and distribution as the foundation of examples used in the presentation.**

A Useful Economic Feasibility Study

Delmarva Energy Beet to Jetfuel Feasibility Study

- *Purpose and Scope (Why are you doing this?)*
- *Implementation (How do you propose to do it?)*
- *Economic Analysis (Supply & Value Chains, Markets)*
 - *Including non-monitizable value and potentials*
- *Putting It All Together: Costs and Income*
- *Further Research Needed*
- *Recommendations and Conclusions (Including policy)*

Writing a Useful Economic Feasibility Study Using an Advanced Biofuels Example

Overview

- **Advanced Biofuels Basics**
 - Set the stage
 - Background
 - Problem, challenges, opportunity
- **Financing, Investing Focus**
 - Government Grants
 - Private Grants
 - Investors
- **Q&A throughout**

Advanced Biofuels Basics

What are they?

Why do we need them?

What are they used for? (Yesterday, Today, Tomorrow)

How are they made?

Financing, Investing

Further Discussion: Sustainability

Policy Considerations

Markets



Advanced Biofuels Basics

What are they?

Why do we need them?

What are they used for? (Yesterday, Today, Tomorrow)

How are they made?



What Are Advanced Biofuels?

*Ethanol is a biofuel,
not the only biofuel.*

Biodiesel

Renewable Diesel

Biogas/Renewable Natural Gas

Biojet

Biobutanol

Drop-in Hydrocarbons

BioHeat ®

Cooking Fuel

Rocket Fuel



Corn-based ethanol (nearly 200 proof moonshine or 100% ethanol) is **one of** the few currently commercially available biofuels you can buy for vehicles in the US today.



- And the ethanol molecule is part of many other things too.

- Wine
- Beer
- Whiskey



AND, ethanol can be made from many things, not just corn.
More on that later....

Advanced Biofuels Basics

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Markets



What We Have

Bakken
Oil Fields

Minneapolis

Chicago



What We Can Have



Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—

Virtually no oil is used to produce electricity in the US—just 1%.

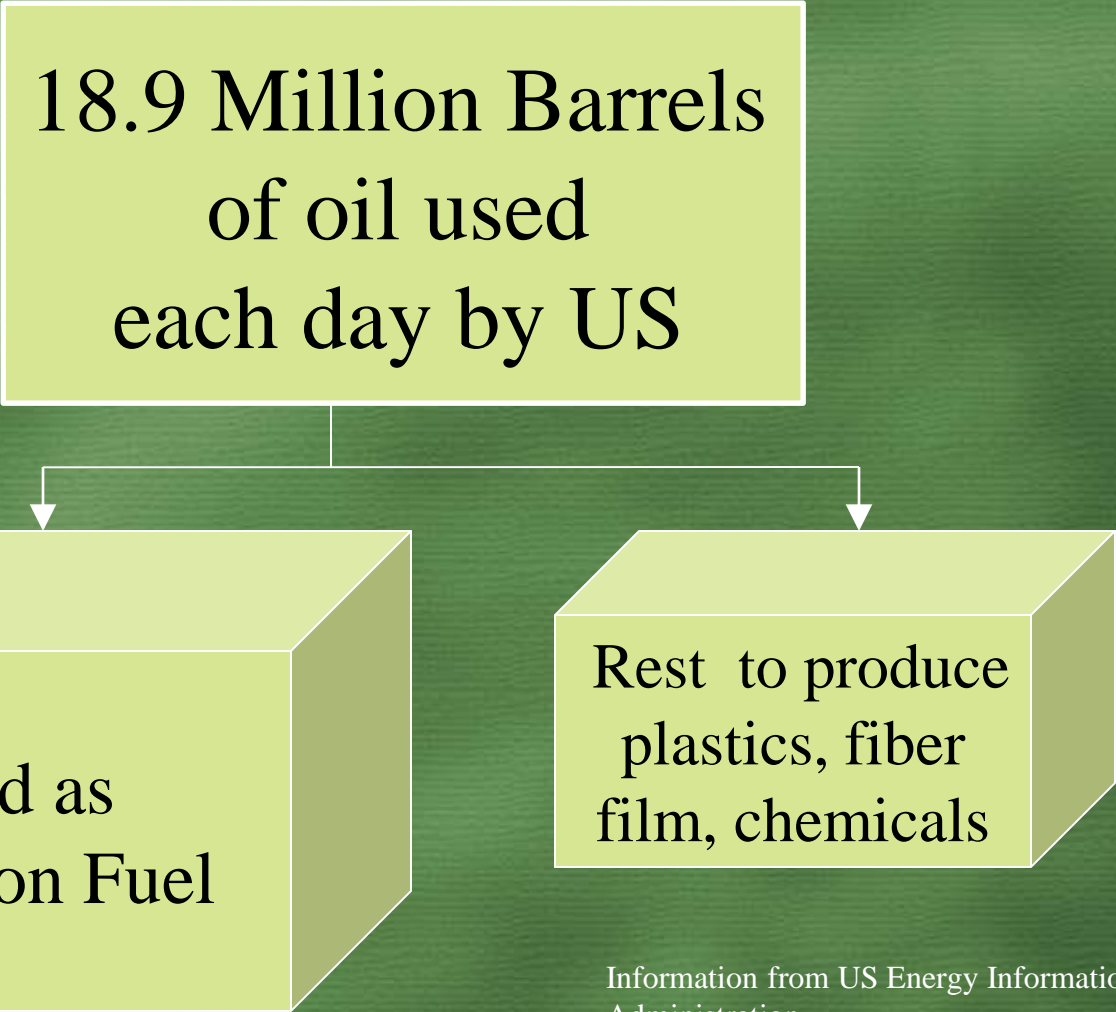
Windmills and solar can produce electricity but cannot power planes, heavy duty shipping



Why Replacing Fossil-Fuel Oil (Petroleum) with Advanced Transportation Biofuels Is Important—

TODAY

18.9 Million Barrels
of oil used
each day by US



```
graph TD; A[18.9 Million Barrels of oil used each day by US] --> B[71% Used as Transportation Fuel]; A --> C[Rest to produce plastics, fiber film, chemicals];
```

The diagram is a flowchart. At the top is a rectangular box containing the text '18.9 Million Barrels of oil used each day by US'. Two arrows point downwards from the bottom of this box to two separate 3D rectangular boxes below. The left 3D box contains the text '71% Used as Transportation Fuel'. The right 3D box contains the text 'Rest to produce plastics, fiber film, chemicals'.

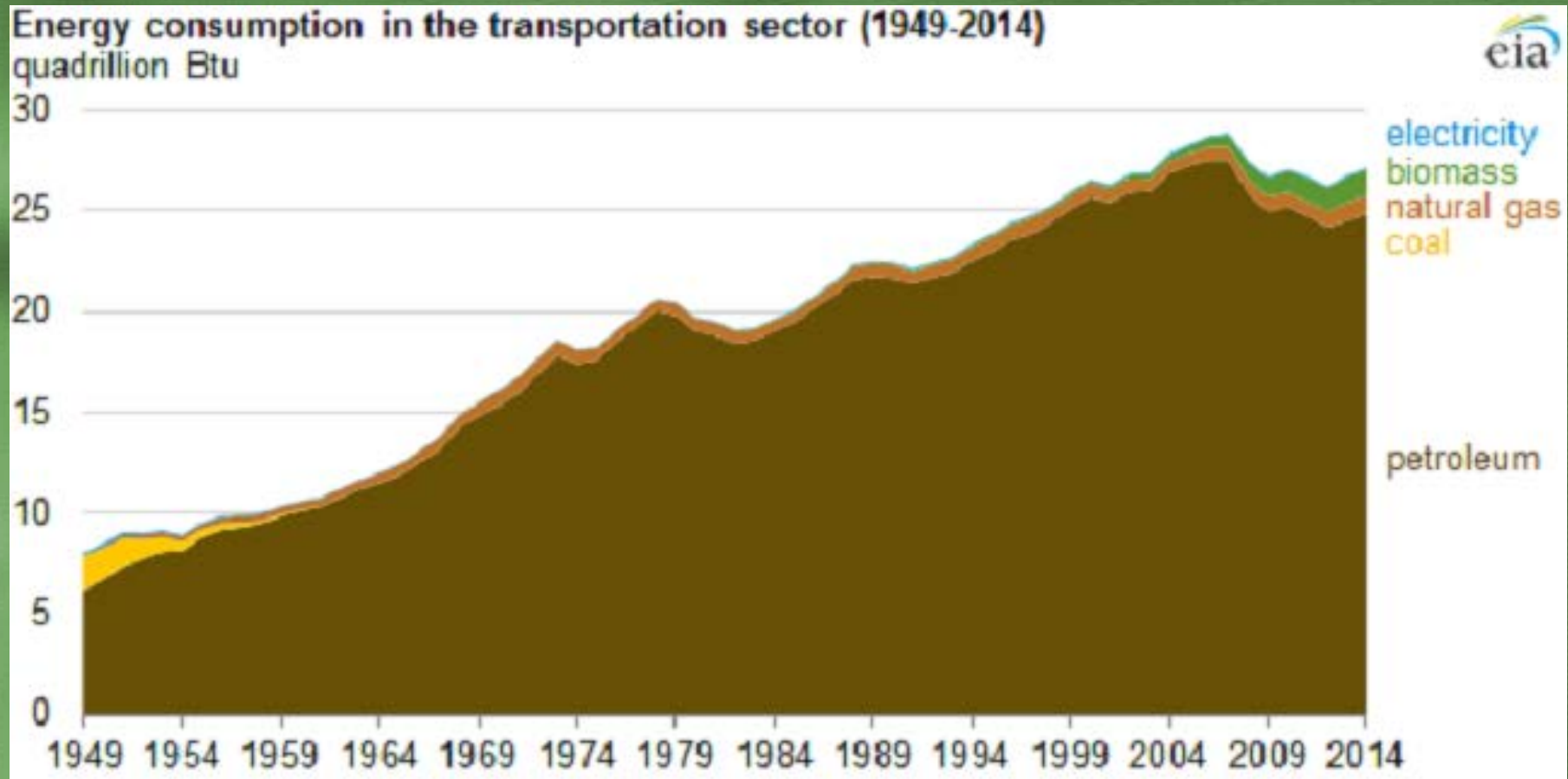
71% Used as
Transportation Fuel

Rest to produce
plastics, fiber
film, chemicals

Information from US Energy Information
Administration



Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—



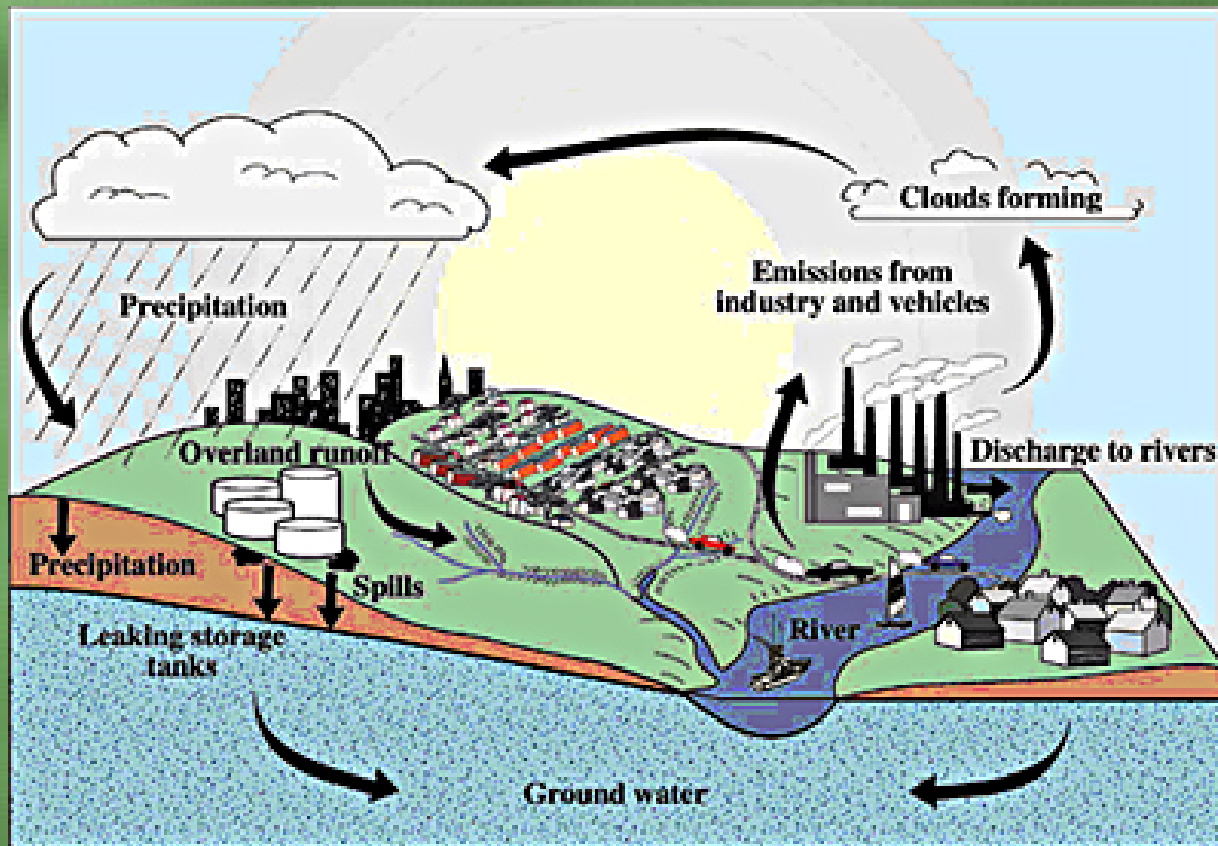
Oil has held more than a 90% share of the transportation market for more than 60 years.

Information from US Energy Information Administration

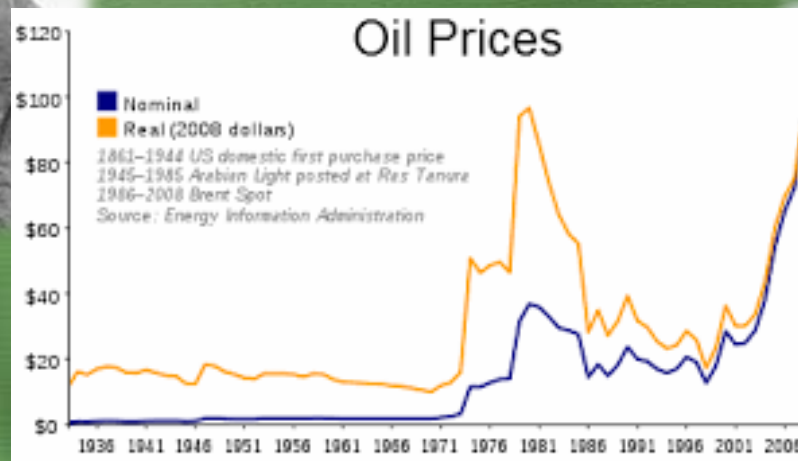


Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—

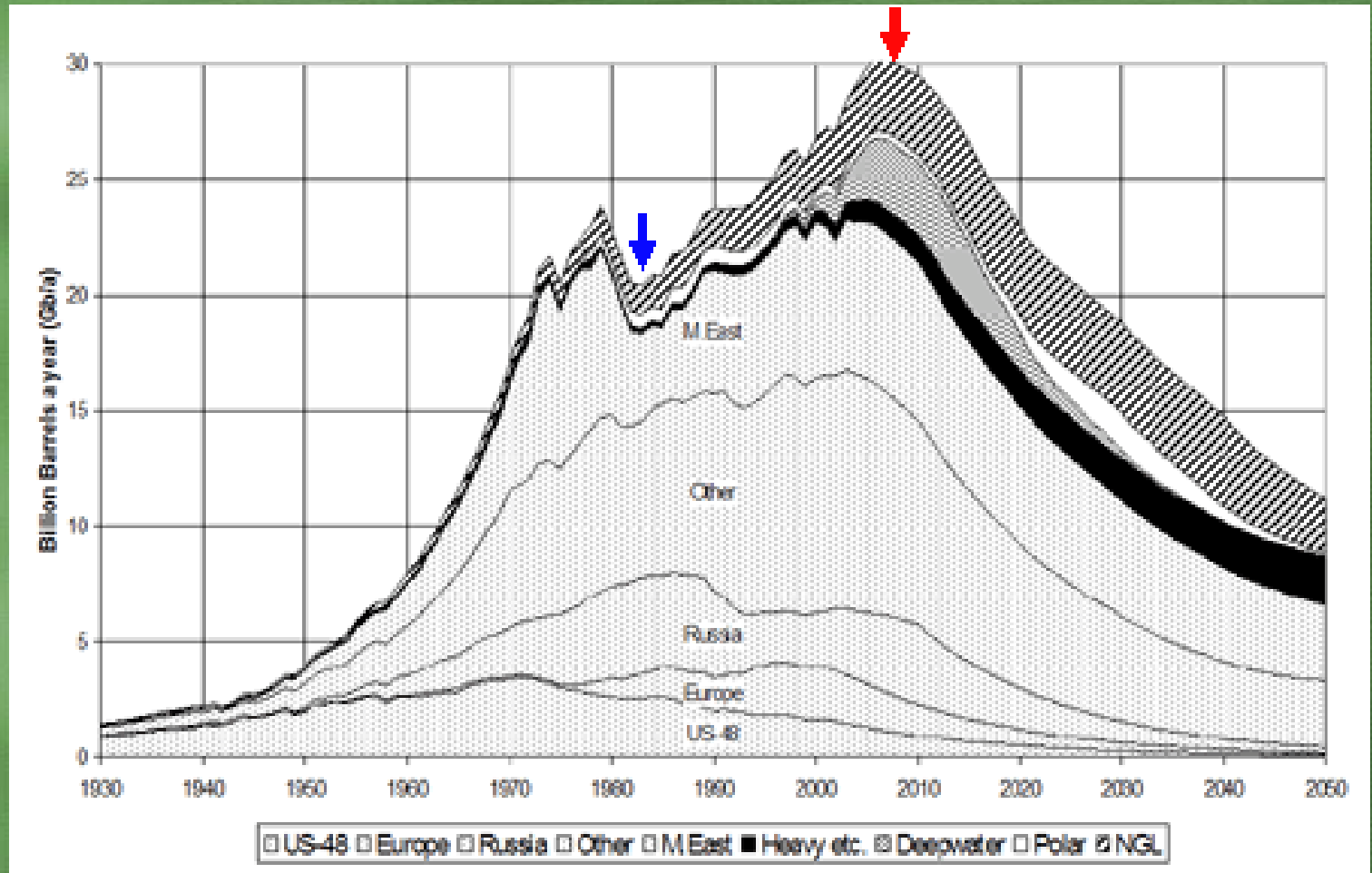
Ethanol Replaces MTBE as an Oxygenate.



Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important— Oil Disruption--Geo-Political like 1973 Oil Embargo or Other Causes

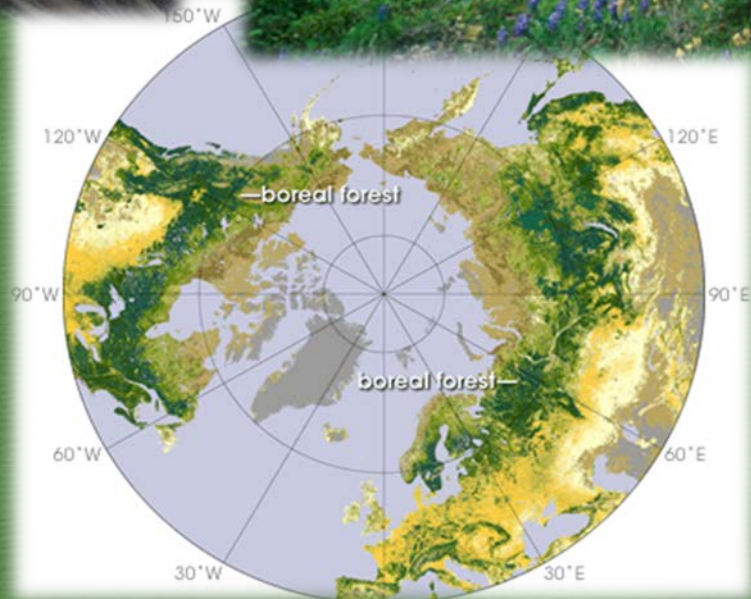


Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important— Peak Oil



Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—

Before oil runs out, it becomes more difficult and dangerous to extract.

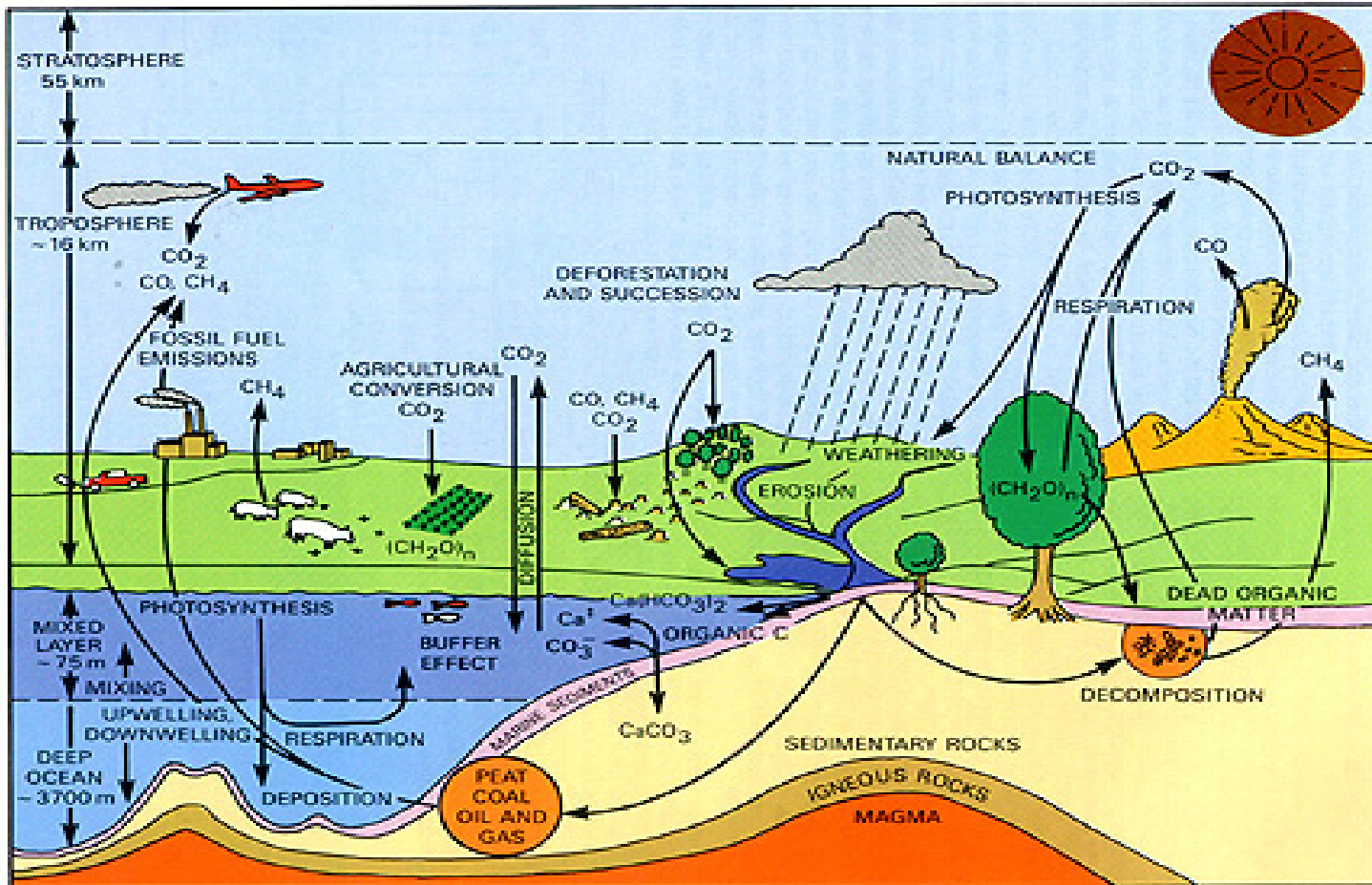


Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—

Before oil runs out, it becomes more difficult and dangerous to extract.

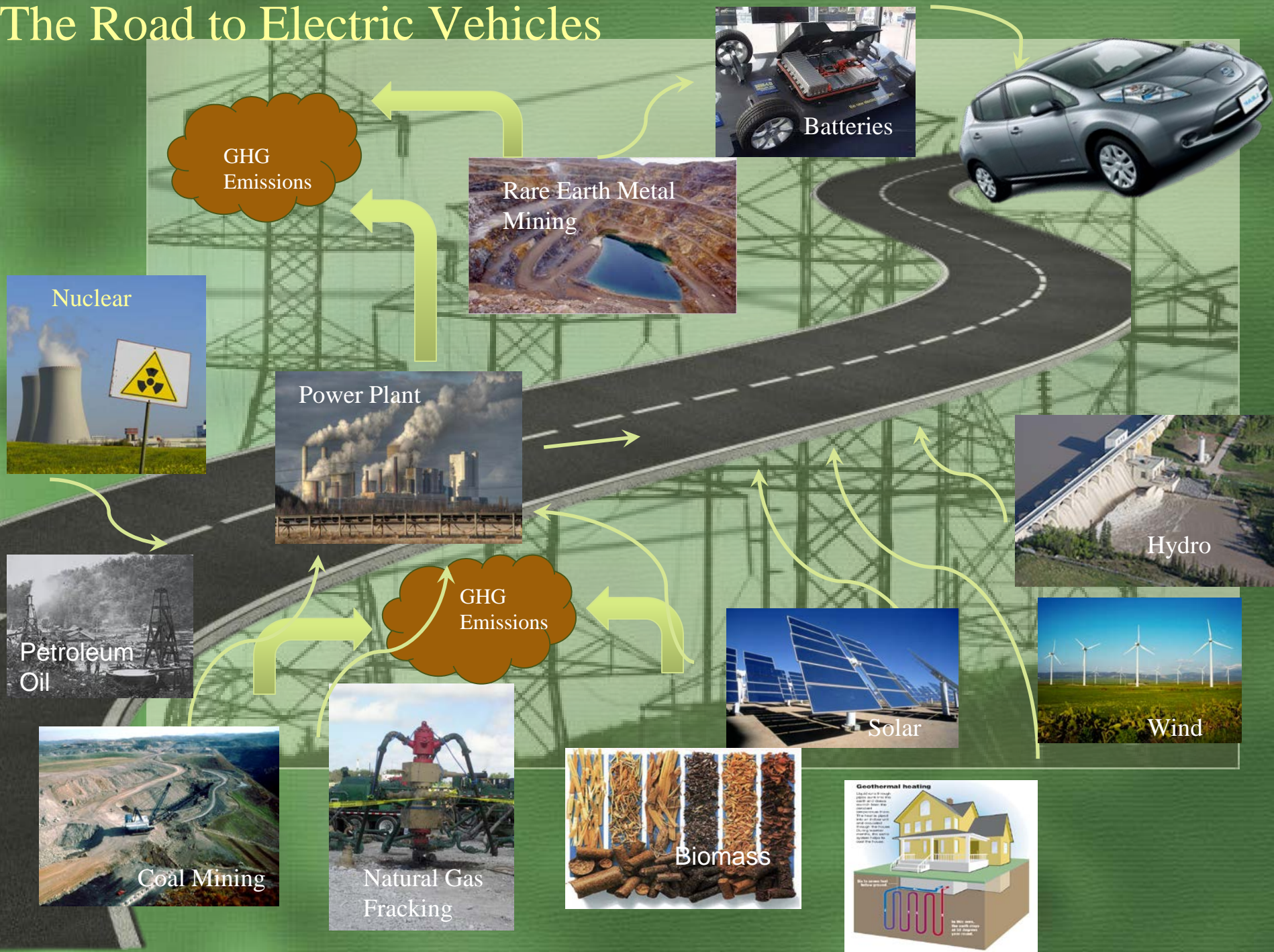


Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—

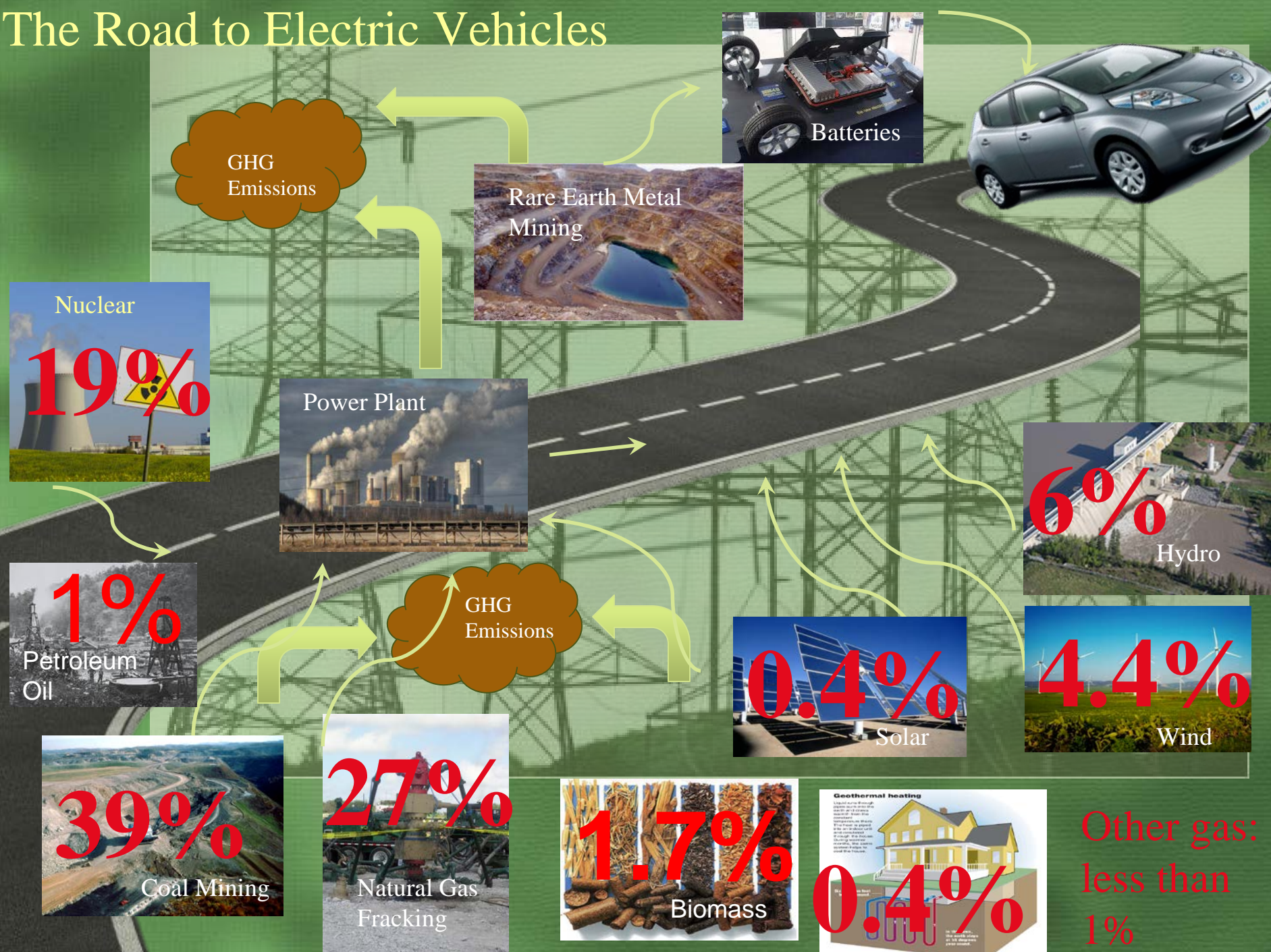


Part of a low life cycle carbon emissions
climate change mitigation solution

The Road to Electric Vehicles



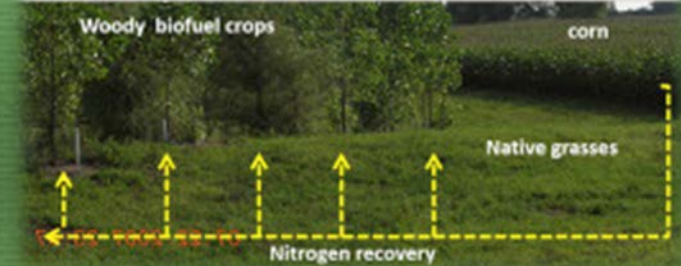
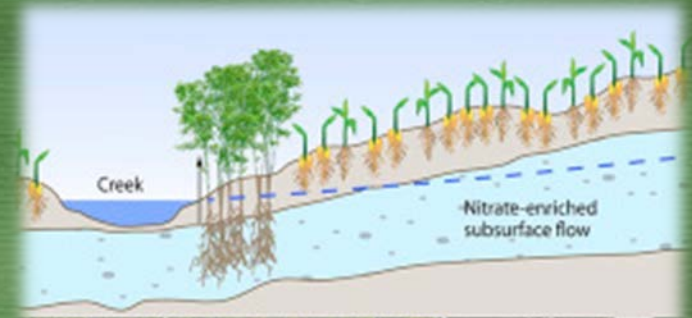
The Road to Electric Vehicles



Why Replacing Fossil-Fuel Oil With Advanced Transportation Biofuels is Important—

Solutions to Problems

- Reduce carbon footprints
- Erosion control
- Waste water treatment
- Remediation of contaminated soil
- Nutrient management
- Carbon sequestration
- Alternative to carcinogens / Air Quality
- Overflowing landfill relief/plastic recycling
- Burning agricultural waste in fields
- Grease (fatbergs) in sewers
- Contaminated black market used cooking oil



What Are Advanced Biofuels?

What are they?

Why do we need them?

What are they used for? (Yesterday, Today, Tomorrow)

How are they made?

Sustainability

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Markets



Yesterday: Early Automobiles

Biodiesel History



Rudolf Diesel

- Ran with peanut oil
- Optimistic about biofuels for future
- 1st Diesel Engine, 1893
- Alterations because of low petroleum prices



"The use of vegetable oils for engine fuels may seem insignificant today but such oils may become, in the course of time, as important as petroleum and coal-tar products at the present time." (Rudolf Diesel, 1920)

16



With Spark Advance to
Change Fuels – Flex Fuel

Ford Model T



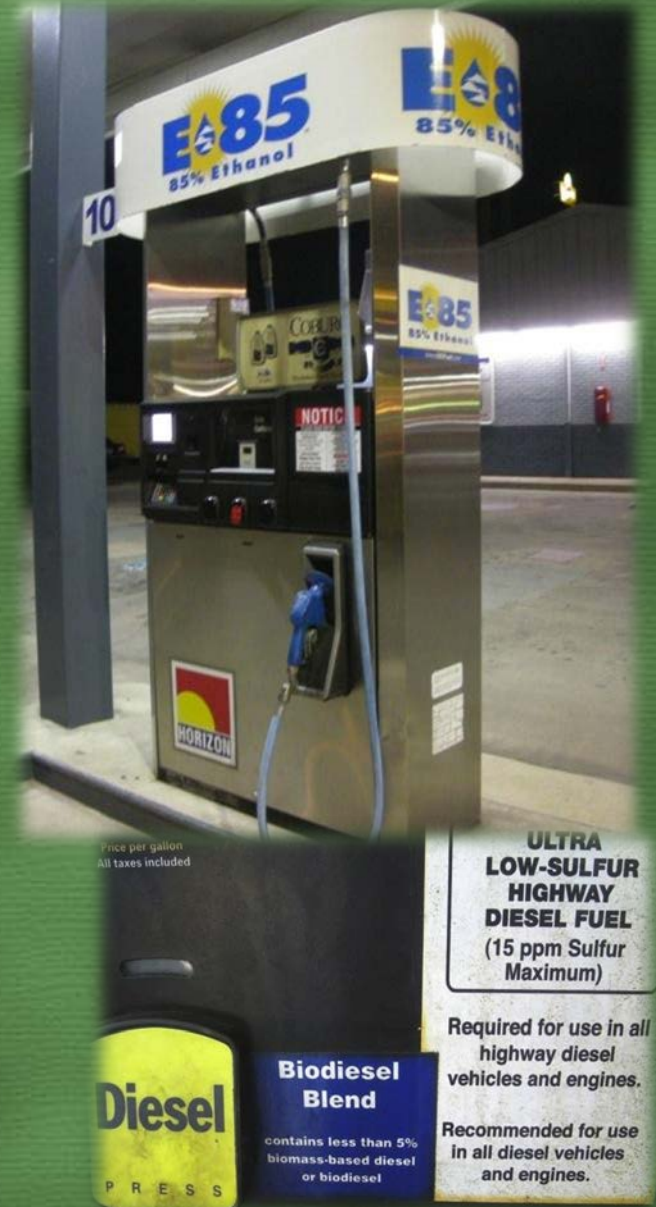
What Are Advanced Biofuels Used For?

Today

- Fueling Cars and Trucks



- Fueling Aircraft



What Are Advanced Biofuels Used For? Today



Ethanol Cook Stoves

Project Gaia:

Nigeria

Ethiopia

Haiti

Brazil

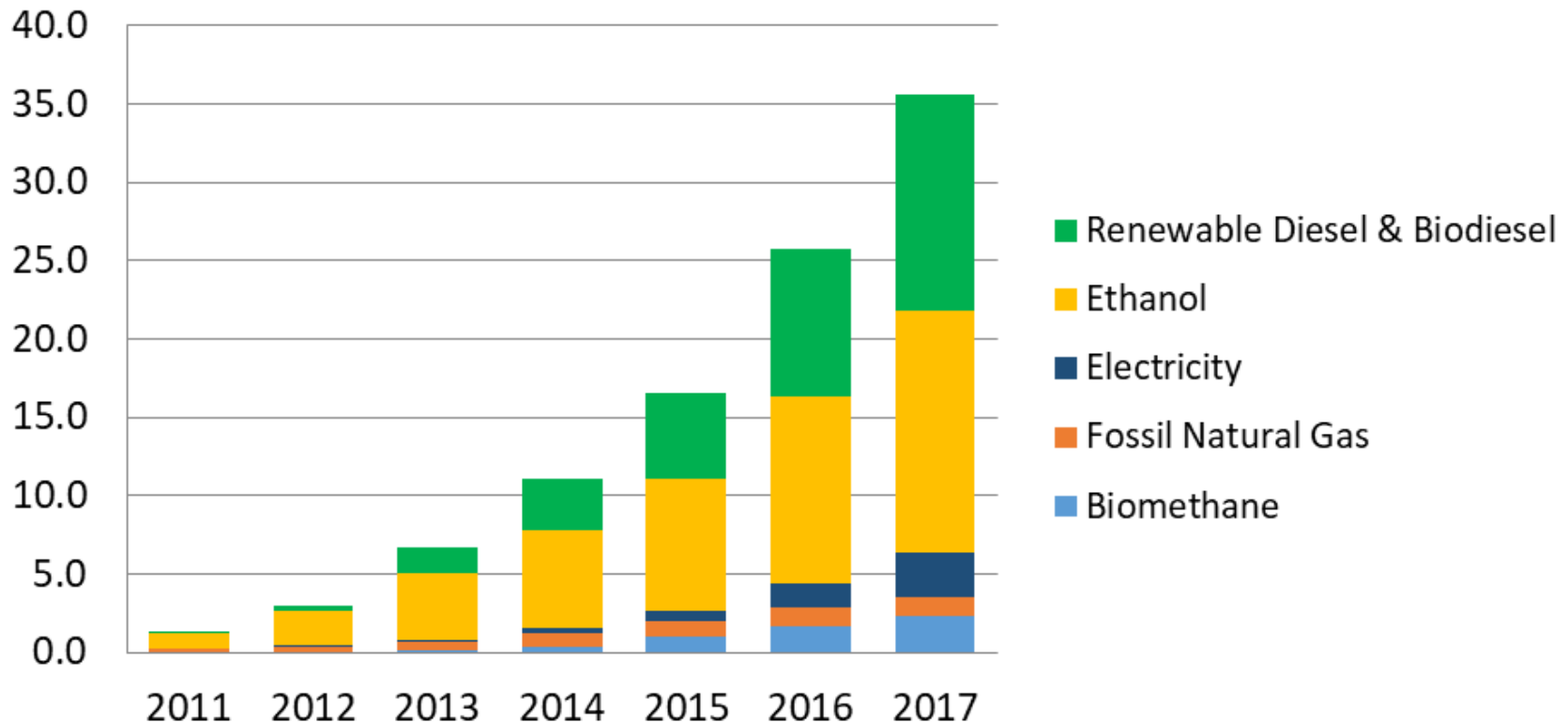
Tanzania



What Are Advanced Biofuels Used For? Today

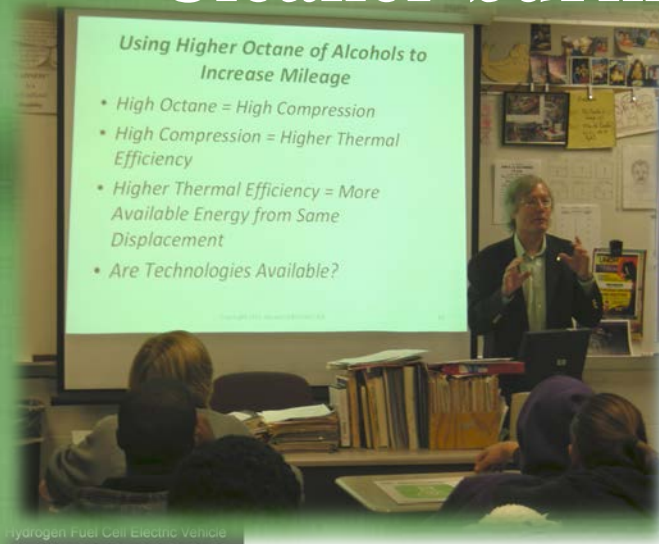
Cumulative CO2 Reductions (million tons)

SOURCE: California Energy Commission, Low Carbon Fuel Standard Dashboard

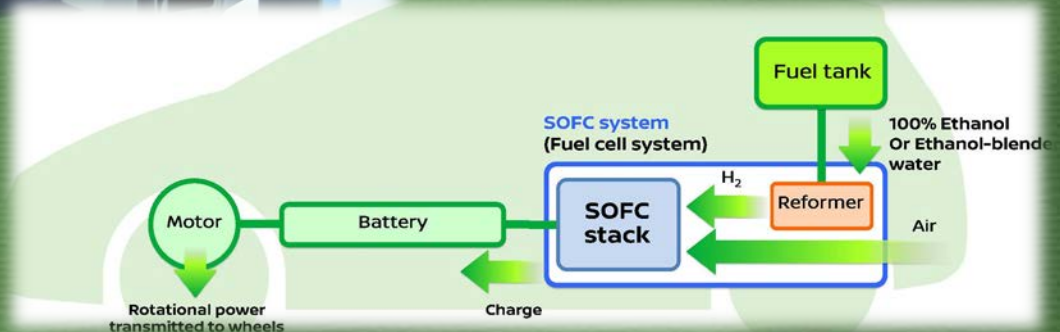
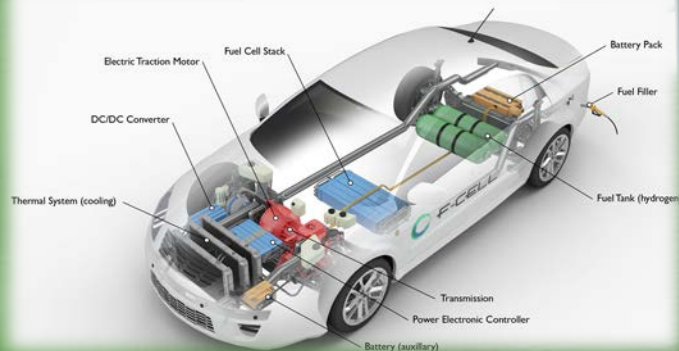


What Will Advanced Biofuels Be Used For Tomorrow?

- High octane fuels for high mileage vehicles
- Cleaner burning fuels for lower maintenance



Hydrogen or Ethanol for **Fuel Cells**



What Will Advanced Biofuels Be Used For Tomorrow?

- Military Aviation Fuels
- Military Marine Fuels



What Will Advanced Biofuels Be Used For Tomorrow?



The Great Green Fleet

2012 Pacific Rim Exercises

2016 Expanded Emphasis



What Will Advanced Biofuels Be Used For Tomorrow?



Rocket Fuel: Resupply Missions to the International Space Station

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What Are Advanced Biofuels?

How are they made?

Feedstock

Logistics

Technology



Agriculture and Forestry: The Foundations of the Bioeconomy

Feedstocks

Logistics

Technology



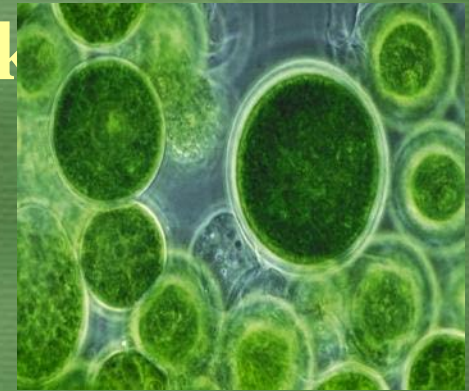
Feedstocks:

- Sugars, Starches
- Oil seed crops
- Grasses
- Trees and Forest Waste
- Agricultural Residues
- Algae
- Food/Animal Processing Residues
- Energy Crops
- Thin Air



Examples of Potential Feedstock or Energy Crops

- Algae
- Corn stover
- Corn cobs
- Energy cane
- Sorghum
- Forestry waste
- Municipal waste
- Sawdust
- Chicken manure
- Agricultural residues
- Grasses such as
 - Switchgrass
 - Miscanthus
- Sugar beets
- Coffee grounds
- Jatropha
- Camelina
- Paper/pulp mill waste
- Used telephone poles
- Halophytes...



Process: 4th Generation

Direct-to-Fuel
Solar Fuels
Electrofuels



Algenol's cyanobacteria



Examples of potential crops/plants which can be used for production of biofuels



Sorghum

Examples of potential crops/plants which can be used for production of biofuels



Sunflower or
Jerusalem
Artichoke

Examples of potential crops/plants which can be used for production of biofuels



Canola

Examples of potential crops/plants which can be used for production of biofuels

ENERGY GRASSES



Phragmites



Miscanthus



Arundo or
Giant Reed

Examples of potential crops/plants which can be used for production of biofuels



**ENERGY
GRASSES**

Switchgrass



Examples of potential crops/plants which can be used for production of biofuels

ENERGY GRASSES



Examples of potential crops/plants which can be used for production of biofuels



Sugar
Beet/Sugar
Beet Pulp

Energy Beets



Examples of potential crops/plants which can be used for production of biofuels

Sugar Cane

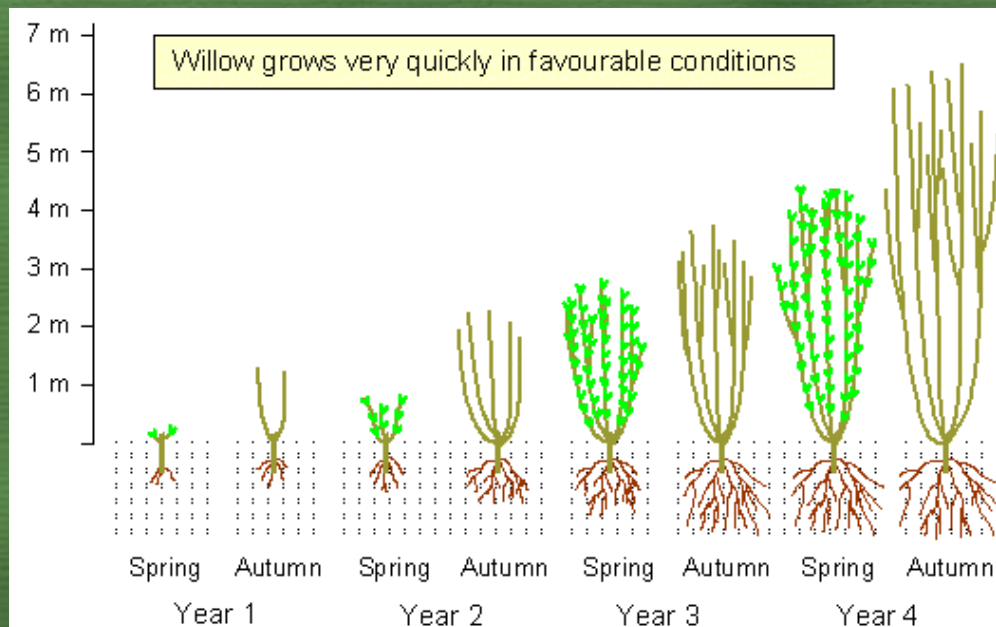


Cassava



Examples of potential crops/plants which can be used for production of biofuels

Short Rotation Coppice
Willow
Poplar



Examples of potential crops/plants which can be used for production of biofuels

Kenaf



Examples of potential other things which can be used for production of biofuels



Algae

Examples of potential crops/plants which can be used for production of biofuels



AGRICULTURAL RESIDUES

Corn Stover, Cobs
Straw from Wheat,
Rice, Barley



Examples of potential other things which can be used for production of biofuels



Woody Biomass

Examples of potential crops/plants which can be used for production of biofuels

Jatropha
Moringa



Examples of potential crops/plants which can be used for production of biofuels



Cashew Apple



Sisal Bole

Examples of potential other things which can be used for production of biofuels



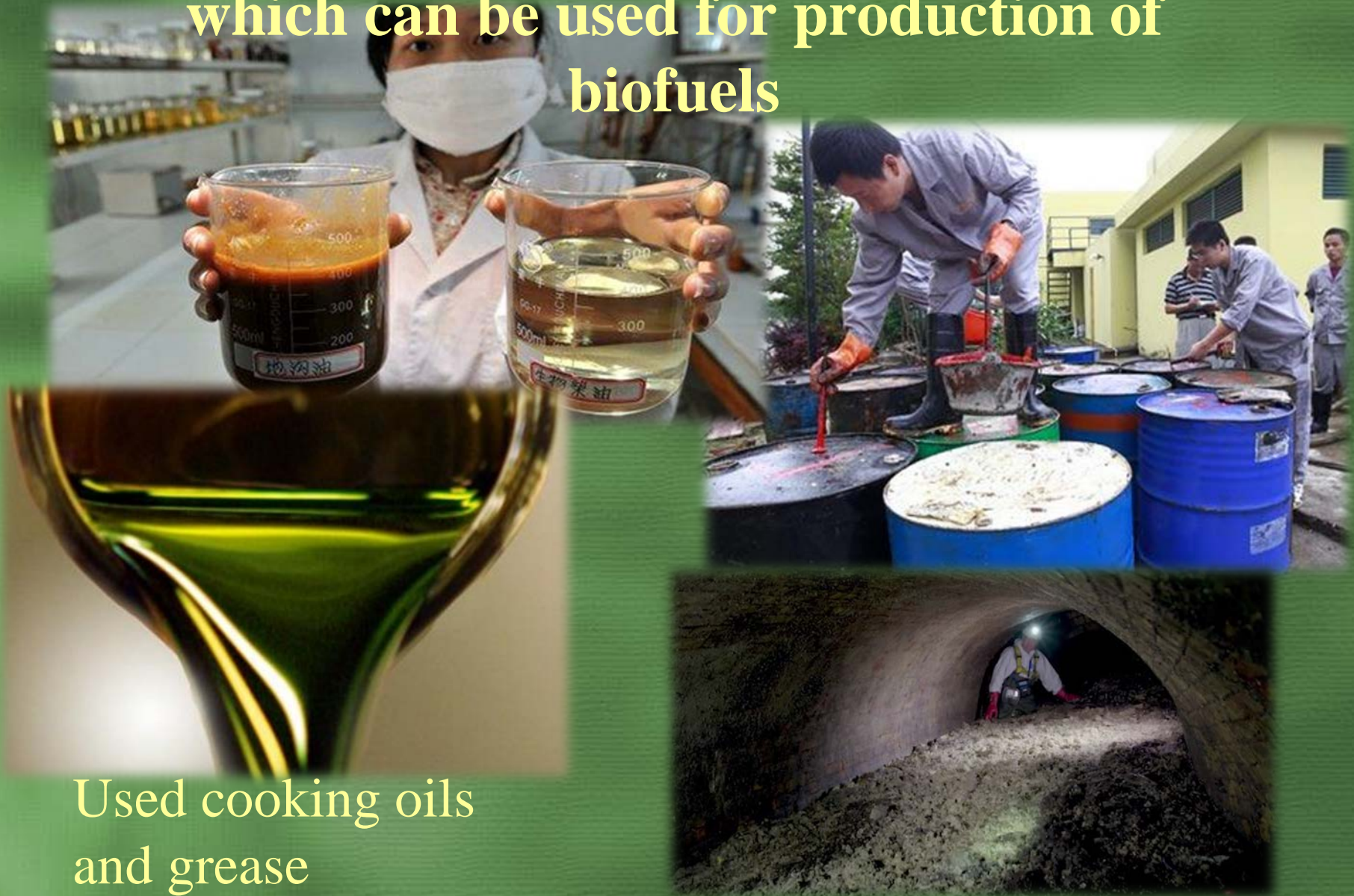
Sorted
Municipal
Solid Waste



Leather “Fleshings”



Examples of potential other things which can be used for production of biofuels



Used cooking oils
and grease

Examples of potential other things which can be used for production of biofuels



Landfill Methane/Anaerobic Digestion
Biogas/Renewable Natural Gas

Agriculture:

The Foundation of the Bioeconomy

(along with carbon recycling)

Feedstocks

Jobs Related to Feedstocks



A Few Types of Jobs Available in Advanced Biofuels Feedstock Development and Production

- Agronomists
- Farmers
- Farm workers
- Farm equipment designers
- Biologists
- Biologists specializing in genetic research
- Biologists specializing in plant cells
- Chemists
- Chemical engineers
- Researchers into bioenergy crop development
- Agriculture/horticulture experts
- Freight railroad operators, engineers, loaders, unloaders
- Equipment operators, technicians
- Farm product purchasers/traders
- Agricultural and Forestry Supervisors
- Agricultural Inspectors
- Computer Software Engineers
- Others?



What Are Advanced Biofuels?

How are they made?

Feedstock

Logistics

Technology



Logistics: Harvest, Storage, Transport



Single-Pass Combination Harvester

AGCO Corporation's single-pass combination harvester saves time and money on corn stover collection by simultaneously harvesting grain and baling corn stover residues in one operation.



FEEDSTOCK:
CORN STOVER



Self-Propelled Bale Picking Truck

Instead of picking up corn stover bales one by one, FDC Enterprises' bale picking truck picks up two at a time for a full load of 36 bales instead of 12 and can transfer them straight onto a truck bed.



FEEDSTOCK:
CORN STOVER



Logistics: Harvest, Storage, Transport



Switchgrass Harvesting, Transport, and Storage System

TennEra found that chopping switchgrass on the field and transporting it in bulk is actually cheaper than baling it and moving it in bales—although costs for storage are higher, chopping switchgrass on the field is much cheaper than grinding bales at the biorefinery.



Forage Harvester with Optimized Woody Crop

The State University of New York's project adapted existing forage harvesting machinery to harvest larger and taller crops with greater efficiency and higher-quality wood chips than alternatives such as tractor-mounted machinery.



Logistics: Harvest, Storage, Transport



What Are Advanced Biofuels?

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Processes

Biochemical

- Fermentation
- Anaerobic Digestion
- Plant extraction
- Transesterification
- Hydrolysis
- Enzymatic Catalysis
- CO₂-to-liquid bio-catalytic conversion

Thermochemical

- Gasification
- Plasma arc gasification
- Pyrolysis
- Thermochemical conversion of sugars

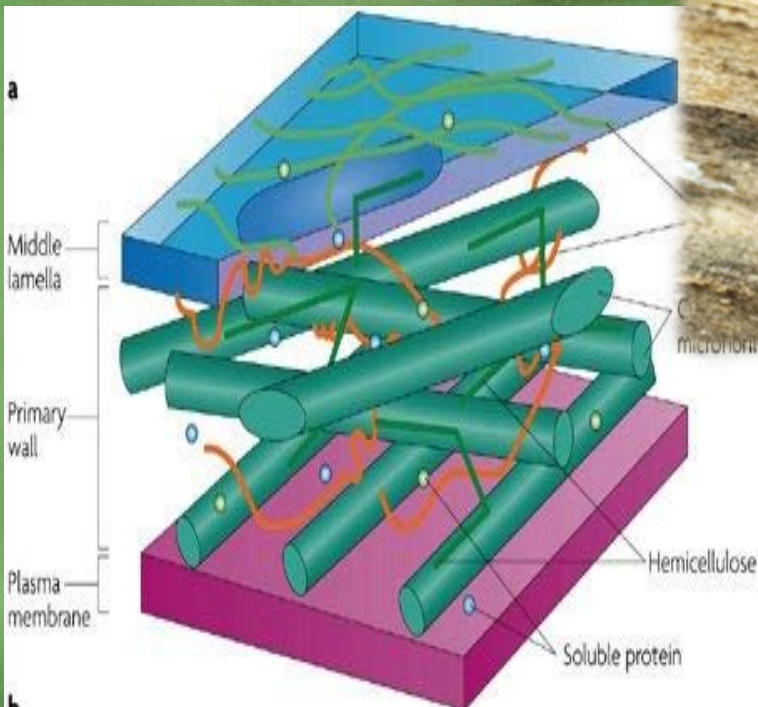
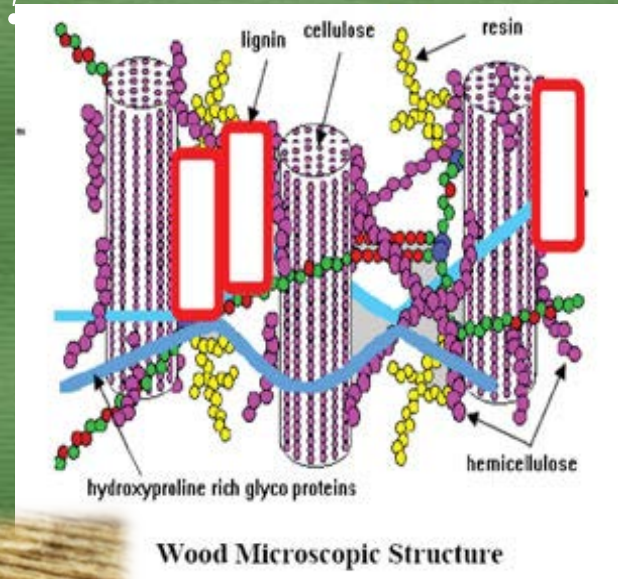


Aviation Fuel Processes

- Alcohol to Jet (ATJ)
- Catalytic Conversion of Oil to Jet (CCOTJ)
- Catalytic Conversion of Sugar to Jet (CCSTJ)
- Catalytic Hydrothermolysis, Hydroprocessing to Jet (CH-HRJ)
- Direct Fermentation of Sugar to Jet (DFSTJ)
- Fischer-Tropsch Synthesized Paraffinic Kerosene (FT-SPK)
- Hydrotreated Depolymerized Cellulosic Jet (HDCJ)
- Hydroprocessed Esters & Fatty Acids (HEFA)
- Synthesized Iso-Paraffinic Fuel (SIP)

“Why aren’t we there yet?”

Biomass Recalcitrance



- Lignin
 (“You can make anything you want from lignin except money”)
- Cellulose
- Hemicellulose
- Pectin

“Why aren’t we there yet?”

Never Been Done Before

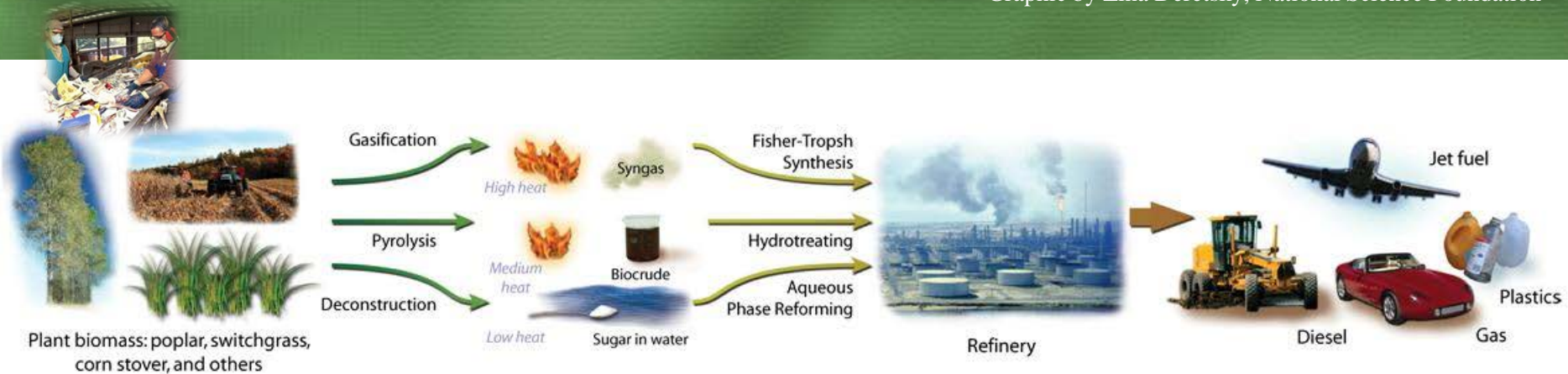
- **Job Number One – Demonstrate highly reliable operation**



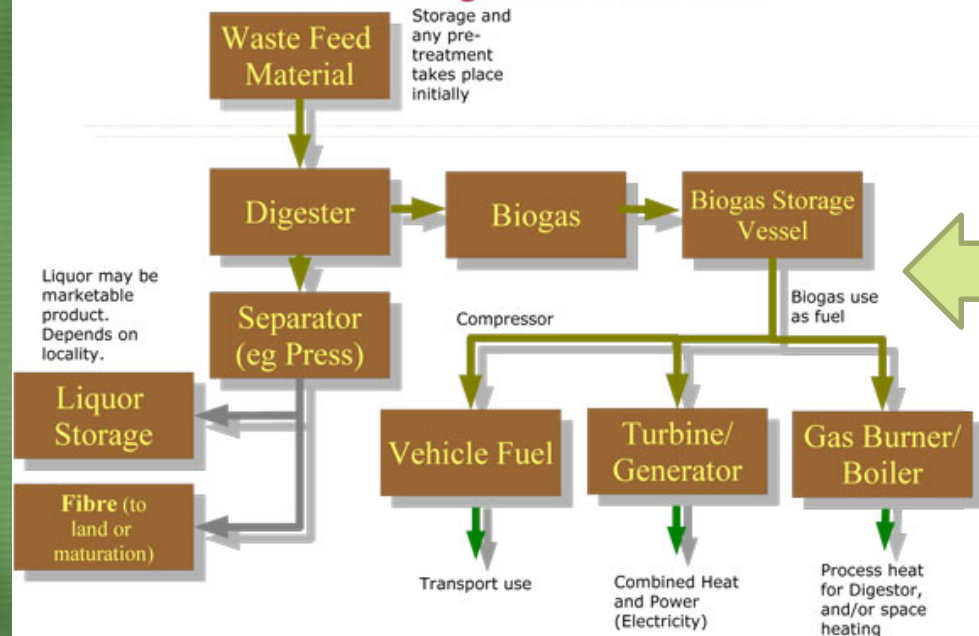
Thanks to Brian Foody of Iogen for sharing their nightmares as well as their dreams and accomplishments.

Process Path: Feedstock-to-Fuels and Products

Graphic by Zina Deretsky, National Science Foundation

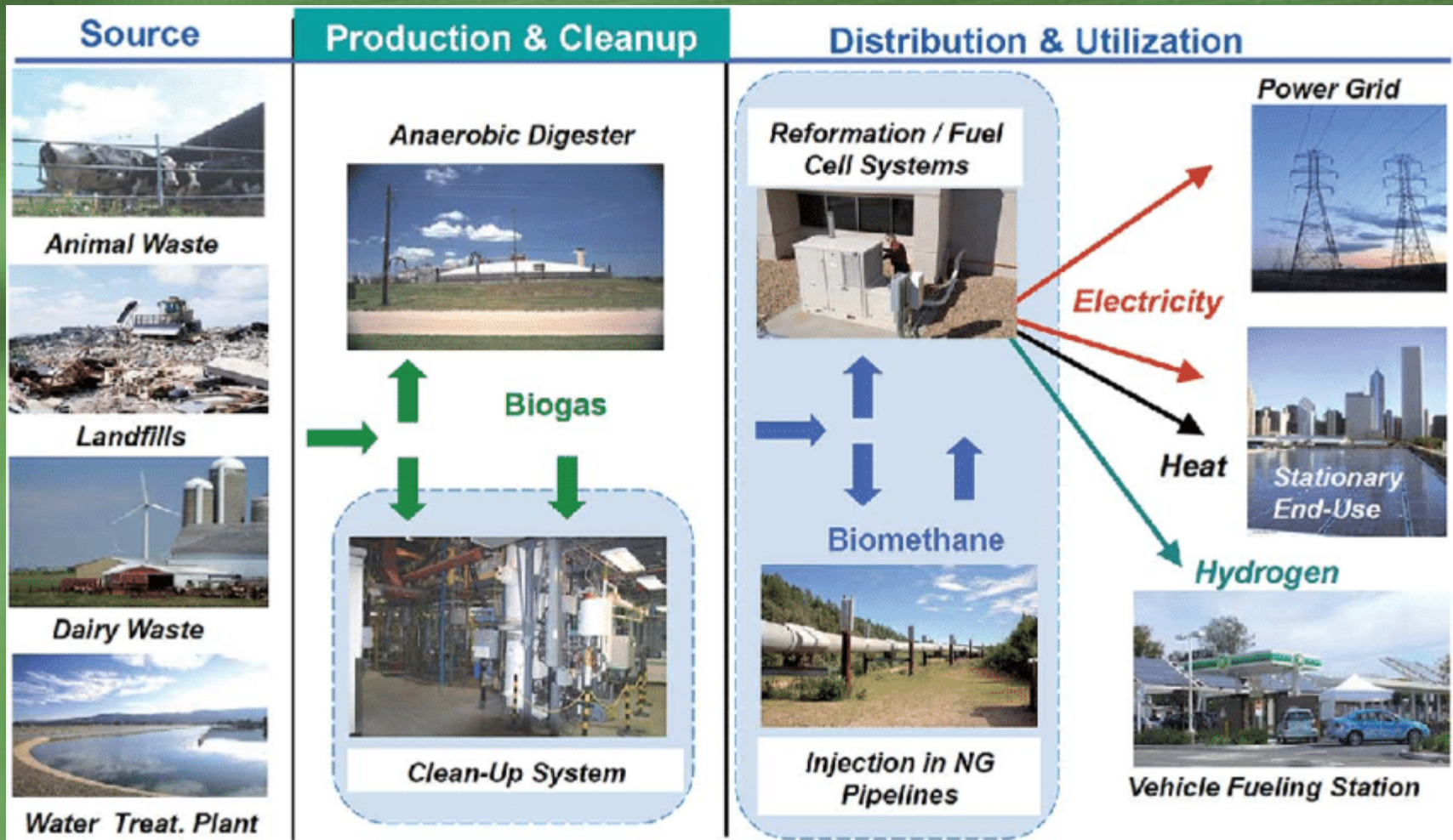


Anaerobic Digestion Flow Chart



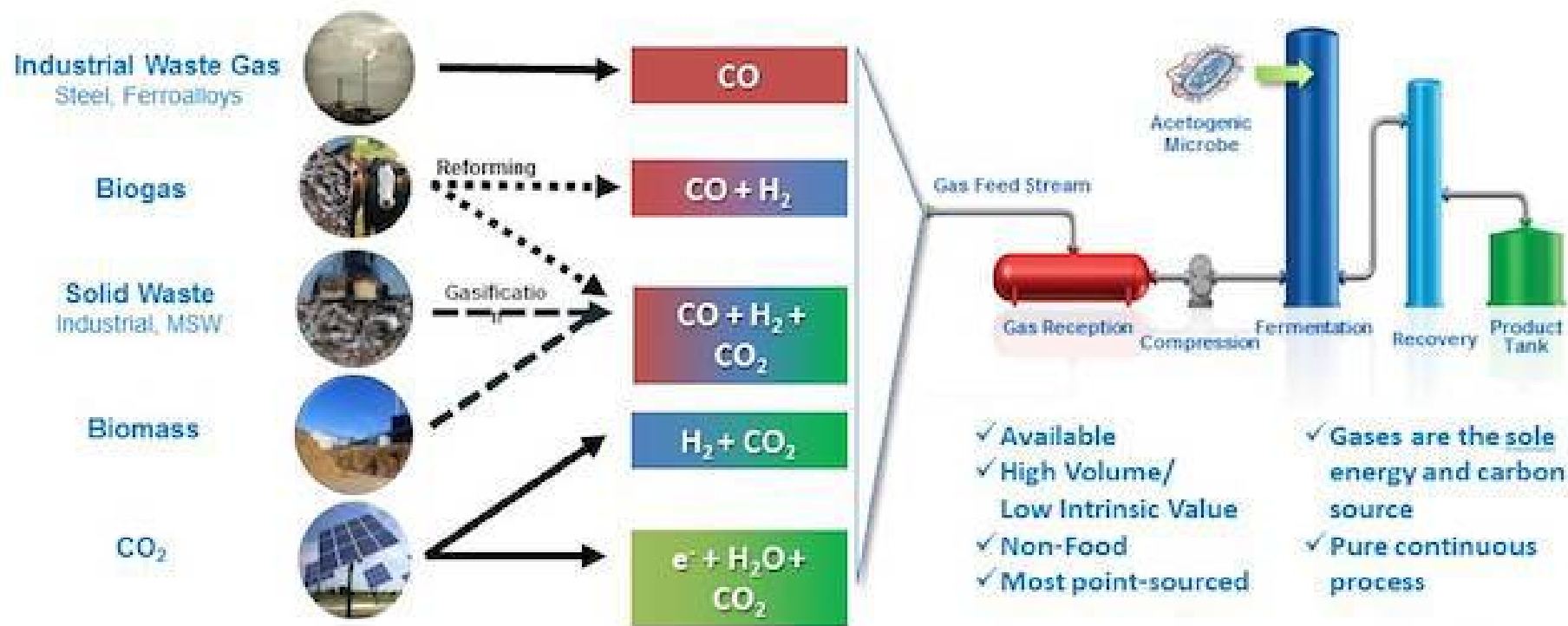
Biogas to
RNG
cleanup
needed

Process Path: Biogas-to-Fuels and Products



Recycling Carbon

Waste Carbon Streams as a Resource for Gas Fermentation

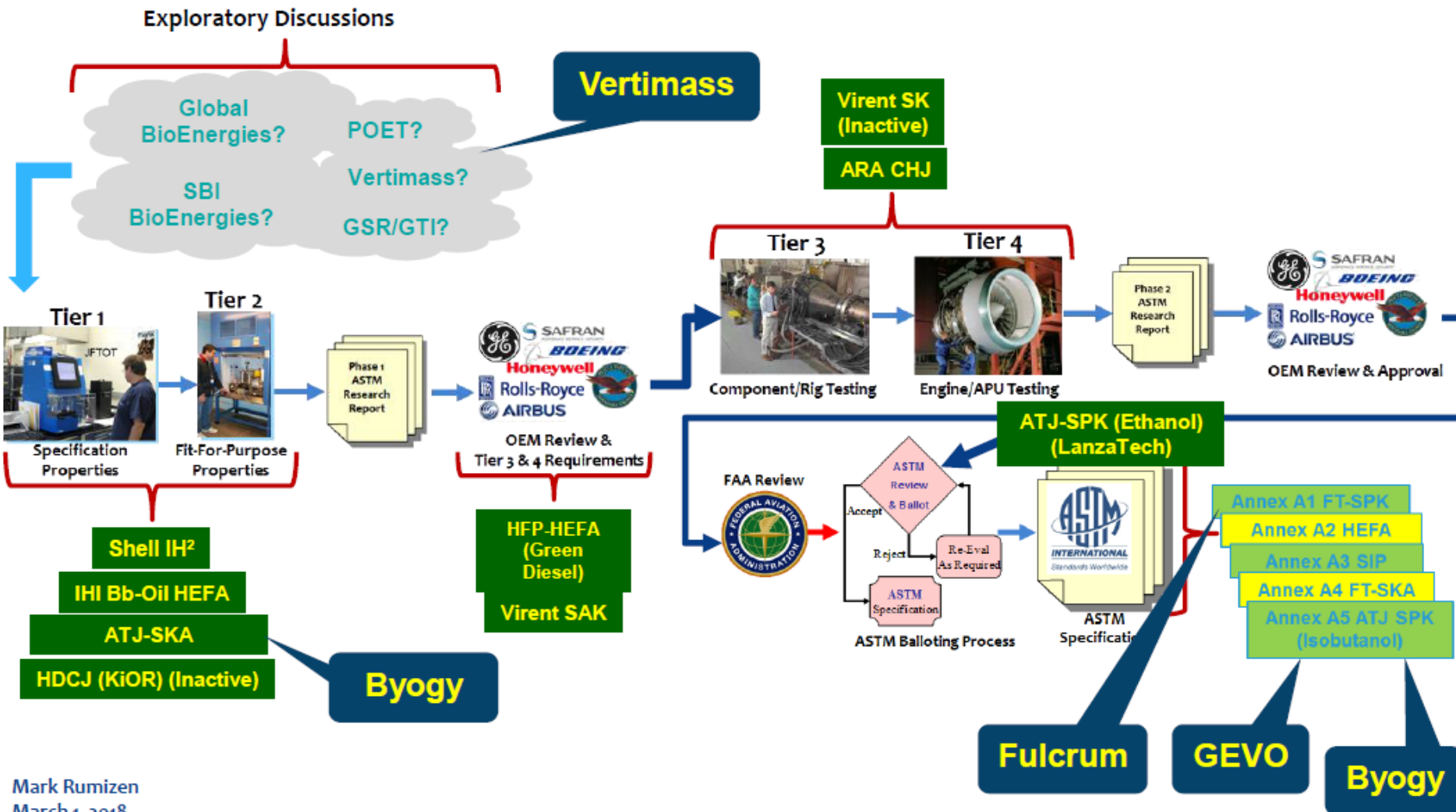


Liaw et al., 2016, Gas Fermentation – A Realistic Platform for Commercial Scale Production of Low Carbon Fuels and Chemicals from Waste and Renewable Feedstocks, Frontiers Microbiol. 7: 684.



ASTM D4054 Qualification Status

Path To BioJetfuel



Role of Policy in Financing/Investing

International Commercial Aviation Policies



- **European Emissions Trading System**
 - The EU ETS covers CO₂ emissions from flights within and between countries participating in the EU ETS. International flights to and from non-ETS countries are also covered.
- In October 2013 the International Civil Aviation Organization (ICAO) Assembly agreed to develop a global market-based mechanism to address international aviation emissions by 2016, and to apply it by 2020. In response, the EU has decided to limit the scope of the EU ETS to flights within Europe until 2016. Exemptions for operators with low emissions have also been introduced.
- Q: Will calculations include life cycle or just tail pipe emissions?

A Few Types of Jobs Available in Advanced Biofuels Production

- Biologists
- Biologists specializing in genetic research
- Biologists specializing in plant cells
- Chemists
- Chemical engineers
- Systems engineers
- Research assistants
- Process Technicians
- Lab technicians
- Industrial engineers
- Industrial architects
- Construction workers, Managers
- Truck drivers
- Plant operations managers
- Equipment operators, technicians
- Computer Software Engineers
- Refinery Equipment Manufacturers
- Welders
- Boilermakers
- Pipe Fitters
- Others?



A Few Types of Jobs in Marketing and Transporting Renewable Fuels, Chemicals and Products

- Investors
- Market researchers
- Lawyers
- Accountants
- Commodities traders
- Truck drivers
- Fueling station operators
- Freight railroad operators, engineers, loaders, unloaders
- Equipment operators, technicians
- Farm product purchasers/traders
- Marketing Software Engineers
- Sales professionals: wholesale and retail
- And many others



Advanced Biofuels Basics

What are they?

Why do we need them?

What are they used for? (Yesterday, Today, Tomorrow)

How are they made?

Financing, Investing

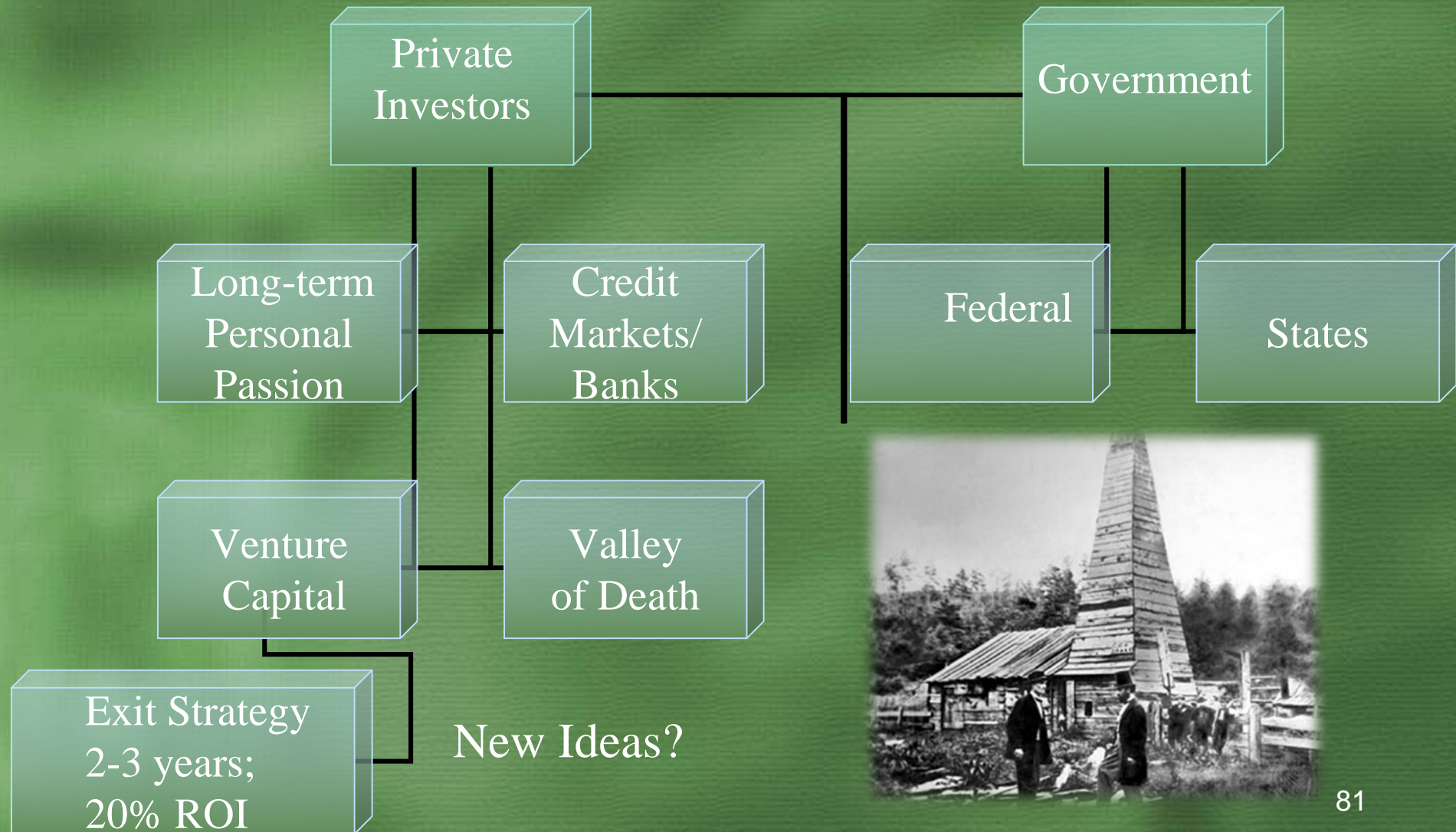
Government Programs

Private Grants

Investors



Funding of “new” and “never been done before” technologies



A Useful Economic Feasibility Study

Delmarva Energy Beet to Jetfuel Feasibility Study

- *Purpose and Scope (Why are you doing this?)*
- *Implementation (How do you propose to do it?)*
- *Economic Analysis (Supply & Value Chains, Markets)*
 - *Including non-monitizable value and potentials*
- *Putting It All Together: Costs and Income*
- *Further Research Needed*
- *Recommendations and Conclusions (Including policy)*

Examples of Government Grants, Programs

- **ARPA-E** (US Department of Energy)
- **DARPA** (US Defense Department)
- **REAP** (USDA Rural Energy for America Program)
- **BIP** (Biofuel Infrastructure Partnership)
- **SBIR/STTR** (Small Business Programs—Innovation Research and Technology Transfer)
- **State programs**
 - Maryland MIPS (Maryland Industrial Partnerships)

Example of Grants listing

American Diversified Energy **C O N S U L T I N G S E R V I C E S** Call 202-750-0007

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Project & Business Grants

More than 10,000 grants, loans, loan guarantees, research and development and incubator programs, and tax incentives are available from federal agencies -- and 1,000 or more are available from the 50 states

- [Federal Grants](#)
- [State Grants](#)
- [RFPs](#)
- [Loan Guarantees](#)
- [SBIR -STTR](#)
- [Unsolicited Proposals](#)
- [Minority-Owned Businesses](#)
- [New Businesses](#)
- [Technology Readiness](#)
- [Federal Funding Directory](#)
- [40 Mistakes That Will Kill a Proposal](#)

This support is available to assist entrepreneurs, companies, and communities develop new technologies and carry out projects using the latest technologies to create jobs, stimulate economic development, improve community health, and maintain U.S. leadership in technology innovation and its competitiveness in the global market

For information on how to take advantage of these opportunities, [call](#) or [email](#) us
For more detail, click on the buttons below:

Lee Enterprises Consulting's online series on due diligence

- Part 1: Introduction to Bioeconomy Project Financing & Due Diligence – 9/26/18
- Part 2: Expanded Technology Readiness Level (TRL) Definitions for the Bioeconomy – 10/1/18
- Part 3: Getting the Most out of Technoeconomic Analyses – 10/8/18
- Part 4: Federal Funding Opportunities for Each of the Nine Technology Readiness Levels (TRLs) Part 1: TRLs 1-3 – 10/15/18
- Part 5: Federal Funding Opportunities for Each of the Nine Technology Readiness Levels (TRLs) Part 2: TRLs 4-9 – 10/22/18
- Part 6: 40 Mistakes That Will Kill a Proposal – 11/16/18
- Part 7: Financing a Biomass Project When Commercializing New Technology – 11/23/18.
- Part 8: Evaluation of Existing and Projected WtE projects – the New Waste Business Model – 11/29/18.
- Part 9: Strategic Due Diligence of Emerging Technologies for the Advanced Bioeconomy – 12/5/18.
- Part 10: Intellectual Property for Project Development – 12/14/18.
- Part 11: Technical Due Diligence Early and Often: the Best Insurance For Bioeconomy Investors – 12/20/18
- Part 12: Production Off Take Agreements – 12/28/18.
- A 50-page summary of the series' topics may be available.

Technology Readiness Levels

THE FIRST STEP: Basic Research

TRL-1

SCIENTIFIC RESEARCH IS INITIATED

beginning the translation to applied research and development (R&D). Basic principles are observed and reported. The concept and its basic functionality are demonstrated through analysis, testing, and reference to features shared with existing systems / technologies. First-principles modeling and simulation may complement physical experiments.

SUCCESSFUL COMPLETION:

when it is shown that the proposed technology, concept, process, or approach is likely to meet objectives with additional testing.

Federal funding opportunities:

- **NATIONAL SCIENCE FOUNDATION (NSF)**

The NSF provides financial support in a wide range of scientific areas, from astronomy to zoology. In addition to funding research in the traditional academic areas, the agency also supports "high risk, high pay off" ideas, novel collaborations, and projects that may seem like science fiction today but may be commonplace tomorrow. With an annual budget of \$7.5 billion, NSF makes about 12,000 new grant awards each year, providing support for all fields of fundamental science and engineering, including energy innovation and energy efficiency.

- **U.S. DEPARTMENT OF AGRICULTURE (USDA)**

- **National Institute of Food and Agriculture (NIFA)**

NIFA supports research, educational, and extension efforts in a wide range of scientific fields related to agricultural and behavioral sciences. This includes:

- *Advanced Technologies: bioenergy, biotechnology, nanotechnology*
- *Animals: animal breeding, animal health, animal production, aquaculture*
- *Business and Economics: markets and trade, natural resource economics, small business, StrikeForce*
- *Education: learning and engagement, minority serving institutions, workforce development*
- *Environment: climate change, ecosystems, invasive pests and diseases*

IPOs **Private Financing/Investing**

Green Bonds

Public/Private Partnerships

Master Limited Partnerships

(Only fossil fuel; Legislation pending for renewables)

Venture Capital

Loans

Loan Guarantees

Corporate re-investment—REGI, ICM, Co-ops

Foreign support

Price of oil

Carbon tax/price/cost

Other policy drivers

Competitive in existing markets

Examples of Recent Grant/Funding Opportunities

DE-FOA-0002029: FY19 Bioenergy Technologies Office Multi-Topic Funding Opportunity Announcement

DEADLINE: June 3, 2019

(U.S. Department of Energy) This Funding Opportunity Announcement (FOA) will provide funding to address the highest priority R&D areas within biofuel technologies, bioproducts, and biopower. It includes Areas of Interest (AOIs) from all five BETO programs: Feedstock Supply and Logistics; Advanced Algal Systems; Conversion; Advanced Development and Optimization; and Sustainability and

May 10, 2019 [Read Full Article](#)

SoCalGas Seeks Nonprofits for Environmental Champions Grant Program

by Betsy Lillian (NGT News) Southern California Gas Co. (SoCalGas) has kicked off its 2019 Environmental Champions Grant initiative, which seeks applications focused on clean air, clean energy and renewable natural gas. Nonprofit organizations can apply for grants of up to \$25,000 each between May 2 and June 5. Winners will

May 7, 2019 [Read Full Article](#)

DE-FOA-0002029: FY19 Bioenergy Technologies Office Multi-Topic Funding Opportunity Announcement

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May 3, 2019 [Read Full Article](#)

Examples of Recent Grant Opportunities

USDA Announces Sustainable Agricultural Systems Grant Opportunity

DEADLINE: June 4, 2019

(U.S. Department of Agriculture) Within AFRI, the longterm purpose of this Sustainable Agricultural Systems (SAS) Request for Applications (RFA) is to help transform the U.S. food and agricultural system to increase production in sustainable ways as we approach a world population of 10 billion by 2050, and to do so in the context

May 16, 2019 [Read Full Article](#)

USDA Announces NIFA Grant Opportunity DEADLINES: August 1, 2019 for FY2019; April 2, 2020 for FY2020

(U.S. Department of Agriculture) In this RFA, NIFA requests applications for six AFRI priority areas through the Foundational and Applied Science Program for FY 2019 and FY 2020. Applicants considering applying to the second year should check the AFRI RFA webpage and www.grants.gov. The goal of this program is to invest in agricultural production

May 16, 2019 [Read Full Article](#)

Grant Available for Fuel Retailers

(Morning Clips) Grant aimed at increasing the number of E15 pumps in the state — The Corn Marketing Program of Michigan unveiled a new grant program aimed at increasing the availability of higher-level blends of ethanol fuel to Michigan consumers. The grant is open to fuel retailers in Michigan who want to

May 15, 2019 [Read Full Article](#)

Private Financing/Investing

Why Aren't We There Yet?

- 2008 Economic Collapse
- Low Oil Prices
- Low Natural Gas Prices
- Unsupportive Policies
- Required Matching
Funds/Investors/Skin in the Game

The Problem

- **Related to Farms**

- Commodity prices are cyclical and put tremendous cost pressures during down cycles (2/3rd of the farms are below breakeven)
- Regulations continue to get tighter for both water and air discharges at Federal/State/Local levels

- **Related to Organic Food Waste**

- 133 billion tonnes of food was unused and wasted (USDA 2010)
- Regulations by USDA, EPA and Municipalities at the State level (e.g., Massachusetts and Connecticut) continue to divert organics

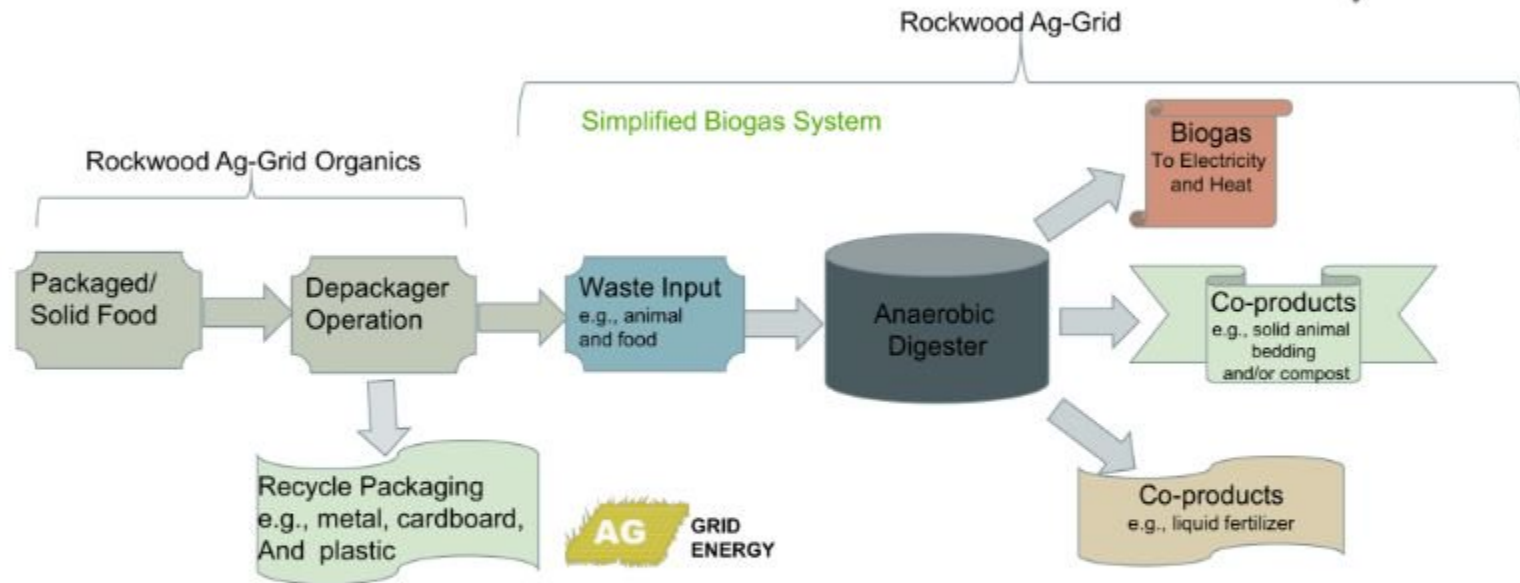
- **Related to Renewable Energy/Emissions**

- States have Renewable Portfolio Standards that need to be met
- Animal manure has significant methane emissions

- **Related to Nutrient Management on farm lands**

- Nutrient cycling on our farm lands requires planning.
- Organic farming is shifting the nutrient management requirements
- Phosphate remediation

Adding depackager to Rockwood Ag-Grid Bio-based route for Organic Waste to Energy



- Can receive solid food waste
- Can receive packaged food waste

Target Markets

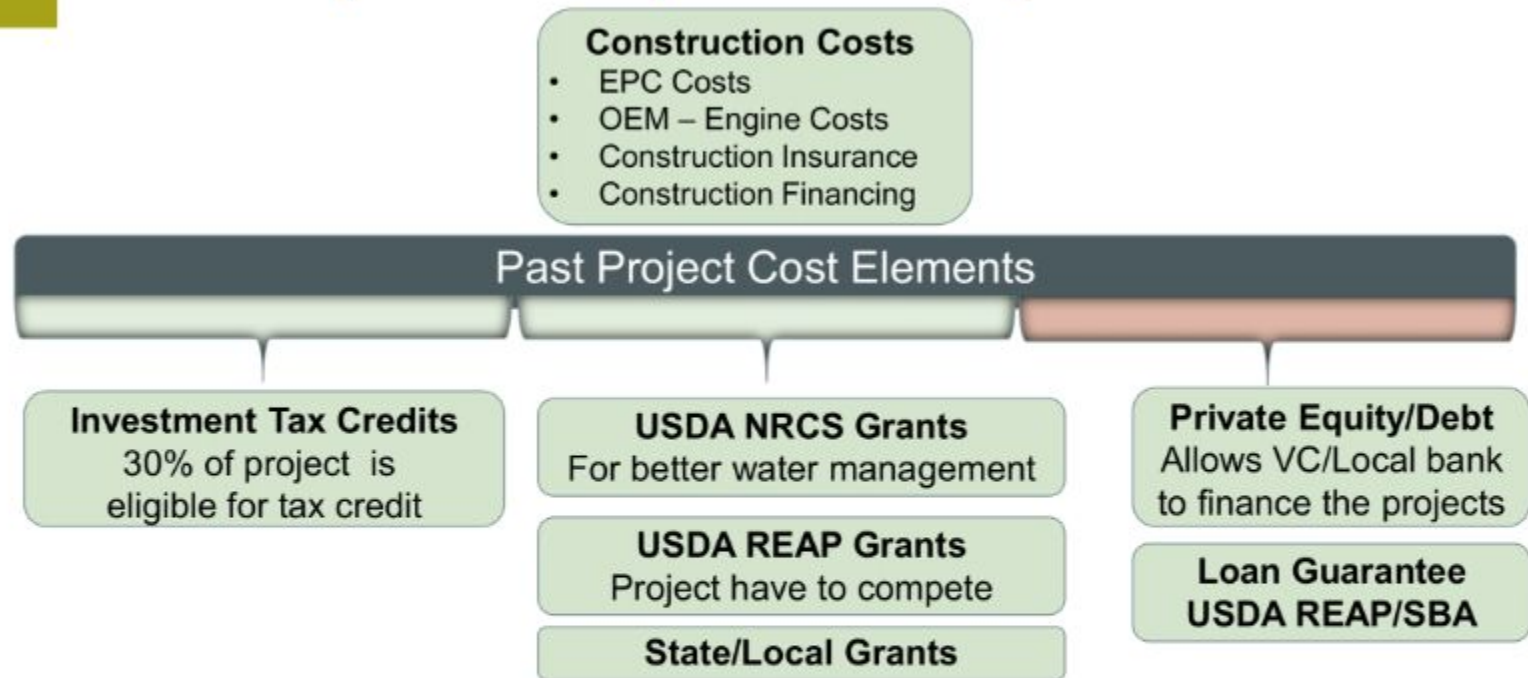
Rationale: Initial focus on Northeast market to align with opportunities promoted by northeast states for bio-based renewable energy programs

- Animal Farms
 - Focus on mid-size dairies
 - 200 to 750 milking cows
- Waste
 - Dairy manure
 - FOGS
 - Organic Slurry
 - Packaged Organics
- Geography
 - Northeast US predominantly states with food waste ban



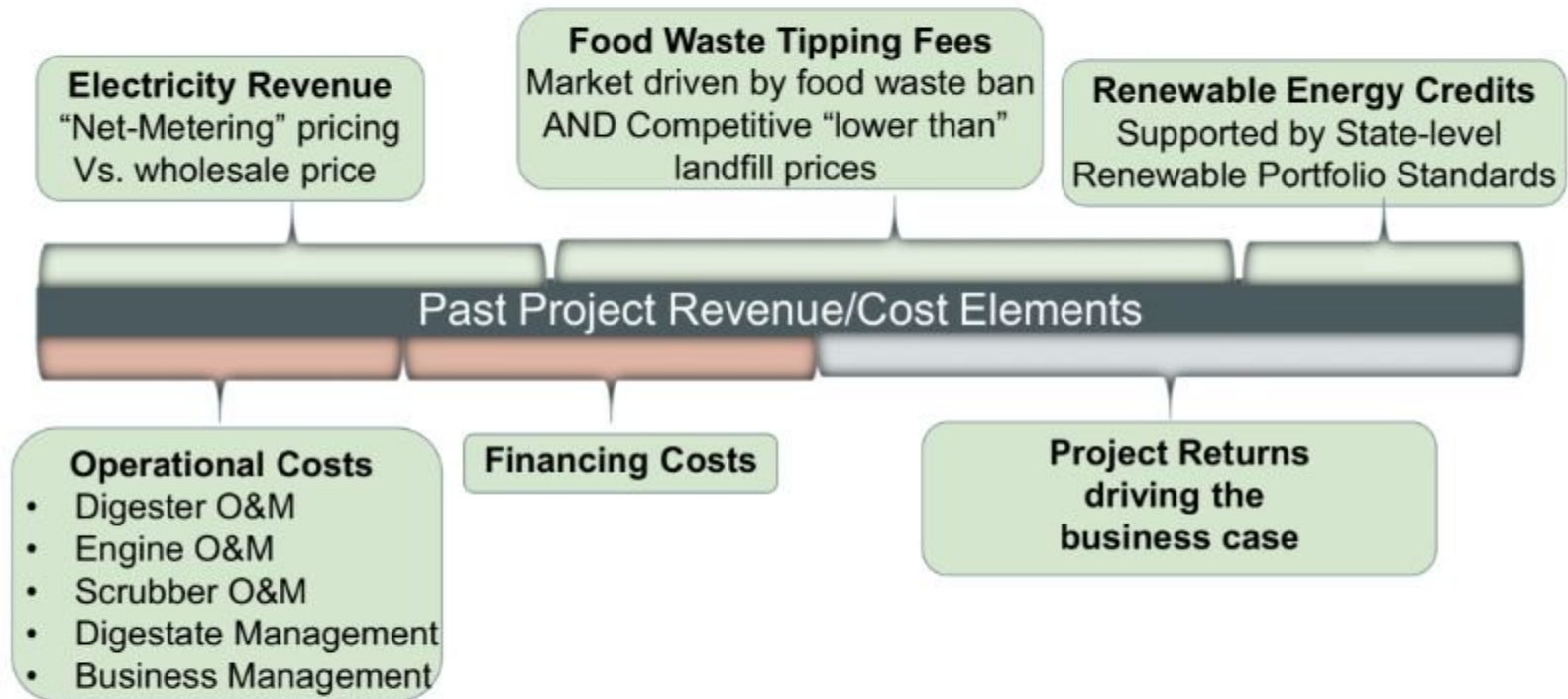
Also, the customer's markets. How/Where will they sell what they make with your system?

Financial Aspects – Development of Funding Sources



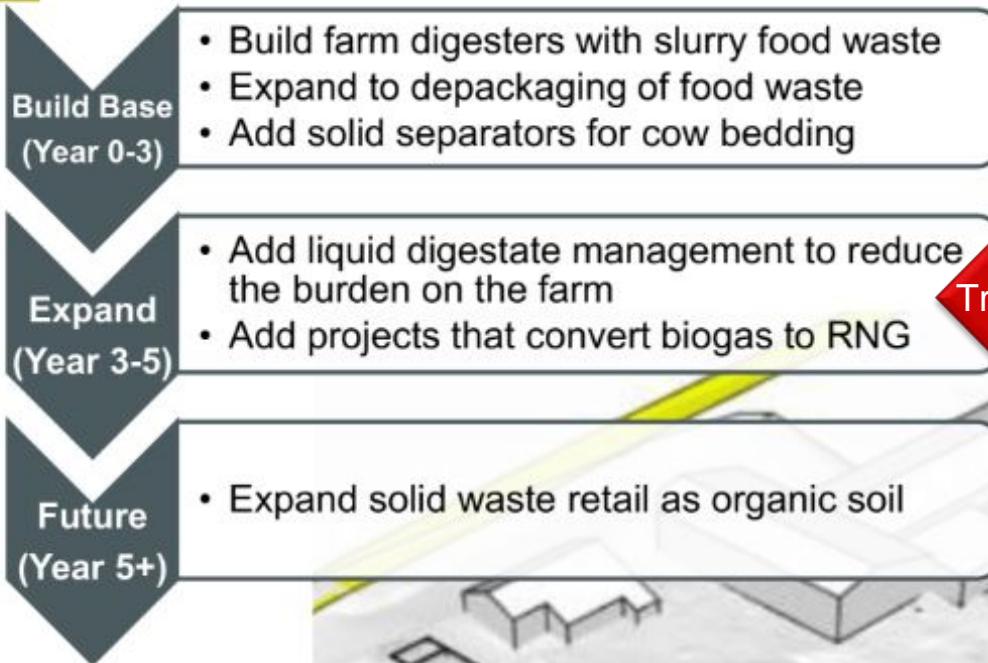
- Future project pressures
 - ITC is no more available beyond 2017
 - Grants are becoming more competitive as the market expands
 - New business models have to be developed to continue to expand

Financial Aspects – Development of Revenue Sources and Business Case



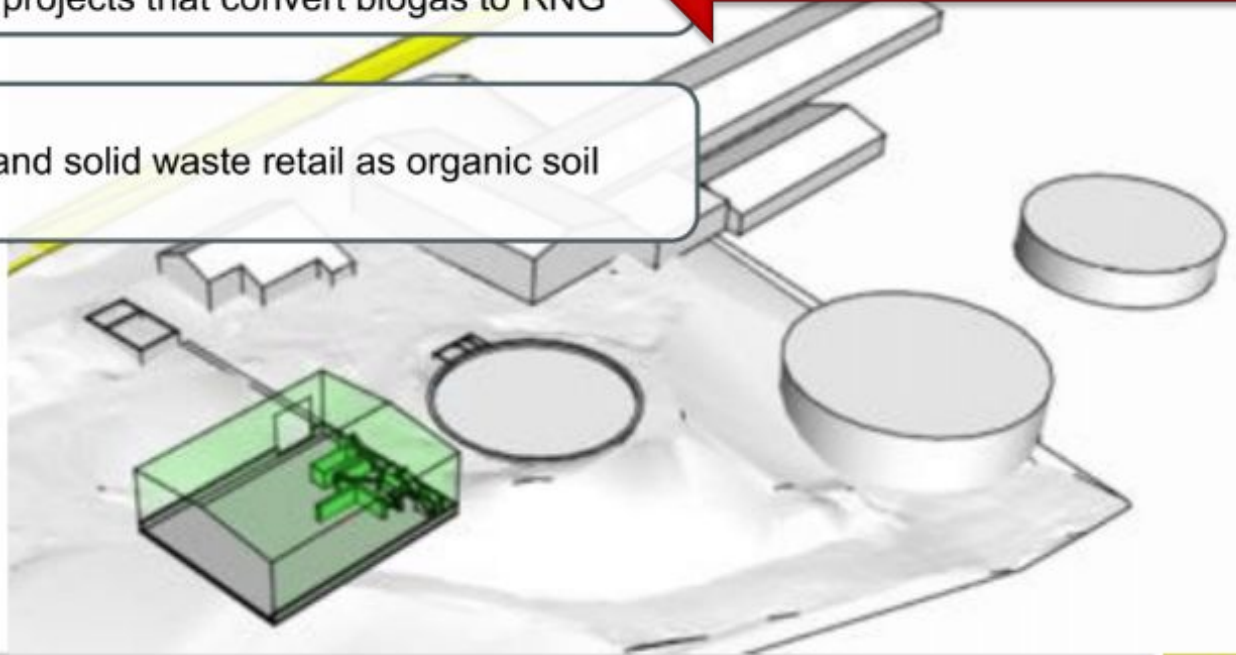
- Future project pressures
 - Net-metering is under pressure from utilities
 - Digestate nutrient on land is becoming more stringent – e.g., phosphorus
 - Renewable energy credits under downward pressure

Ag-Grid Expansion Strategy



Transportation/Biofuel/Renewable Fuel

Depackager at
Rockwood Farms
Estimated start
2Q 2019



Ag-Grid Energy

- Rashi Akki is the founder and CEO of Ag-Grid Energy
 - Dr Akki started Ag-Grid Energy in March 2016. Ag-Grid Energy has 5 projects underway currently where the emphasis is organic waste to renewable energy. Ag-Grid Energy has a vision to drive dairy farm sustainability by converting agricultural and organic waste to energy, enhance nutrient management practices thereby improving farm viability and financial stability.
 - Prior to launching Ag-Grid Energy LLC, Dr. Akki worked for 20 years at the leading chemical company DuPont. Dr. Akki held progressively senior positions in central R&D, DuPont Titanium Technologies, Nonwovens and Industrial Biosciences. The last 3 years of experience at Industrial Biosciences introduced Dr. Akki to advanced biofuels and biogas.
 - Currently Dr. Akki is a member of American Biogas Council and MABEC (Mid-Atlantic Bioenergy Council). Dr. Akki received her B.S. in Chemical Engineering from Osmania University, M.S from University of Connecticut and Ph.D. from Georgia Institute of Technology.
- Rashi.Akki@aggridenergy.com
610-574-8737

Find out more: www.AdvancedBiofuelsUSA.org

For a Truly Sustainable, Renewable Future

Joanne M. Ivancic, Executive Director
301-644-1395
JIvancic@AdvancedBiofuelsUSA.org



A Sustainable Renewable Energy Future

An example of the possibilities—Tying it all together



Energy Beet Project in Delmarva/ Eastern Shore Maryland



Energy Beet Project in Delmarva/ Eastern Shore Maryland

First Harvest



Energy Beet Project in Delmarva/ Eastern Shore Maryland

First Harvest Field Labs

UMES, Plant Sensory Systems, Atlantic Biomass



Energy Beet Project in Delmarva

Initial goals of the project:

- Use a **high yield** (over twice yield of biofuel per acre of corn), **low nutrient** input crop that will reduce agricultural runoff into the Chesapeake Bay.
- Provide **new opportunities for minority** growers and entrepreneurs.
- Implement **a decentralized processing** system that will create good paying jobs in Delmarva.
- Address regional jetfuel markets** not currently served by current biofuel production centers.
- Utilize **Maryland developed** crops, processing technology, and university agricultural expertise.

Energy Beet Project in Delmarva

Initial Goals (continued)

- **Importance of Remediation Potential**

- Reducing Chesapeake and Delaware Bay nutrient runoff
- UMES Expertise in Nutrient Management, long term studies of legacy phosphate from years of use of poultry manure for fertilizer in the area
- UMES Expertise in Plant and Soil Science Research

- **Focus on Animal Feed Applications**

- UMES Expertise in poultry nutrition and physiology



Energy Beet Project in Delmarva

Excitement:

- The more people (faculty, for instance) who heard about the project, the **more people were interested** in bringing their expertise and expanding the goals of the project
- Enhancing the **identity of the Delmarva** as a unique region with valuable strengths and opportunities
- Addressing **climate change** mitigation, adaptation and resilience



Energy Beet Project in Delmarva

Urgency:

- **Fruit/Vegetable industry demise** (over 40,000 idle acres)
- **Most economically depressed area on the East Coast**
- **Significant minority** population
- **Climate Change** consequences are evident—sea level rise, damaging storms
- **Unique access to rail transportation** to existing refineries with commitment to transitioning to renewables
- **Close to major jetfuel markets** (Norfolk Naval Base, DC, Philadelphia, Baltimore, New York)



Energy Beet Project in Delmarva

Maryland-Based Partners

Atlantic Biomass, LLC

<http://atlanticbiomassconversions.com/>



<http://www.plantsensorysystems.com/high-sugar-beets/>



www.AdvancedBiofuelsUSA.org



UNIVERSITY *of* MARYLAND
EASTERN SHORE

<https://www.umes.edu/agriculture/>

Role of Policy in Financing and Investing

<http://www.cc.com/video-clips/n5dnf3/the-daily-show-with-jon-stewart-an-energy-independent-future> Biofuels mentions start at 8:10



Clips of presidents since Richard Nixon exhorting getting off our addiction to oil, develop a long-term energy strategy.