U.S. DEPARTMENT of ENERGY | Office of Energy Efficiency and Renewable Energy

Bioenergy Technologies Office

Overview

Outline

1. Administration Priorities
2. U.S. Bioenergy
3. BETO Strategy and Structure
4. RD&D Priorities

Executive Orders/Actions

1. National Energy Emergency (Jan. 20, 2025) calls for approval of year-round E15 sales
   - Biofuels are considered a domestic energy source.
2. Unleashing American Energy (Jan 20, 2025)
   - Affordable and reliable domestic energy sources
3. Empowering Commonsense Wildfires Prevention and Response (June 12, 2025)
   - innovative uses of woody biomass and forest products to reduce fuel loads in areas at risk of wildfires.

Bioenergy from Biomass and Waste:

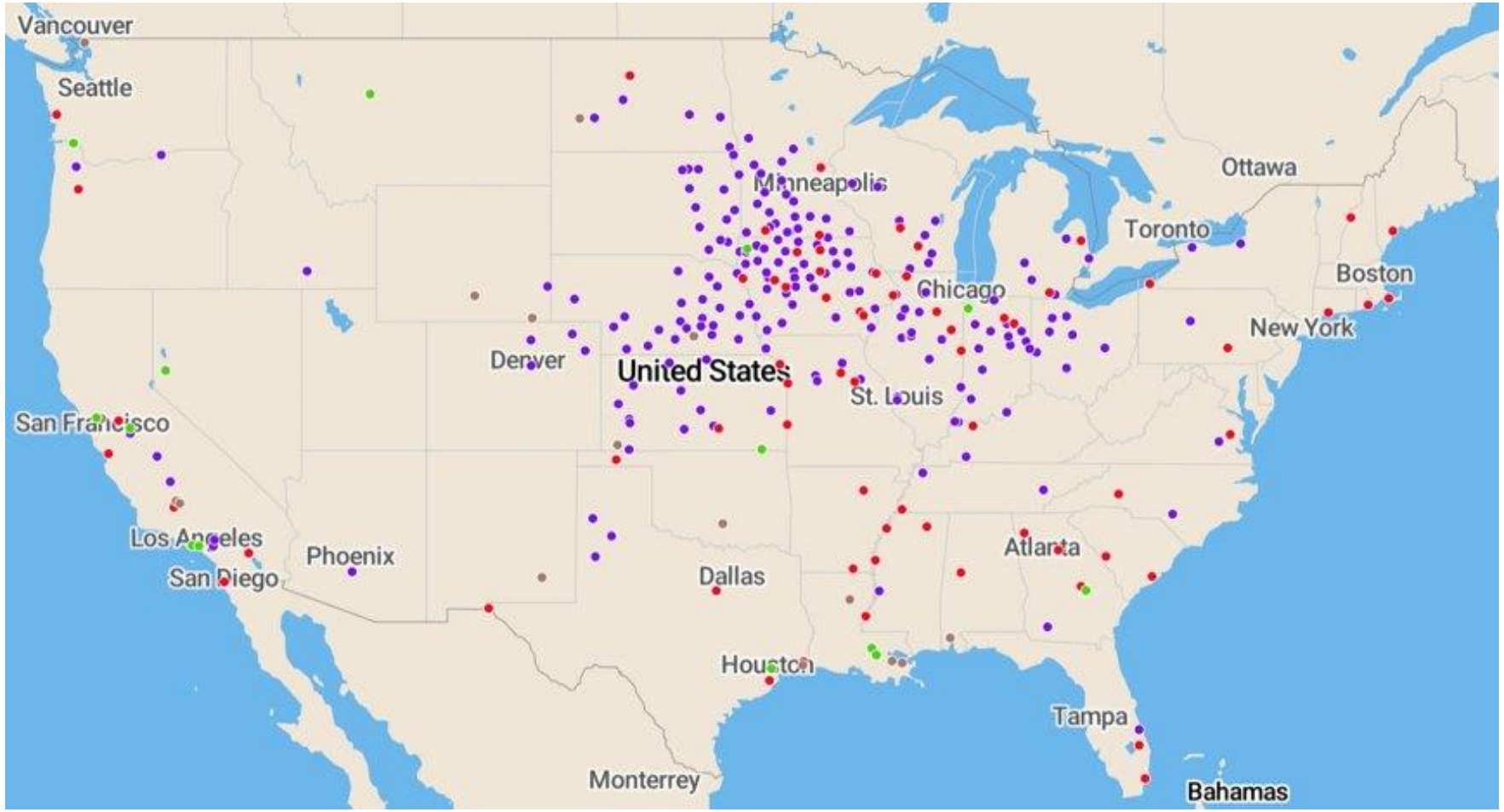
- Domestic Supply
- Energy Addition
- Export Markets
- Rural Economies
- Waste Disposal
- Energy Security
- National Security
- Global Competitiveness
- Supply Chain Resilience
- Good Paying Jobs
- Forest Fire Prevention

U.S. Bioenergy

Photo by iStock

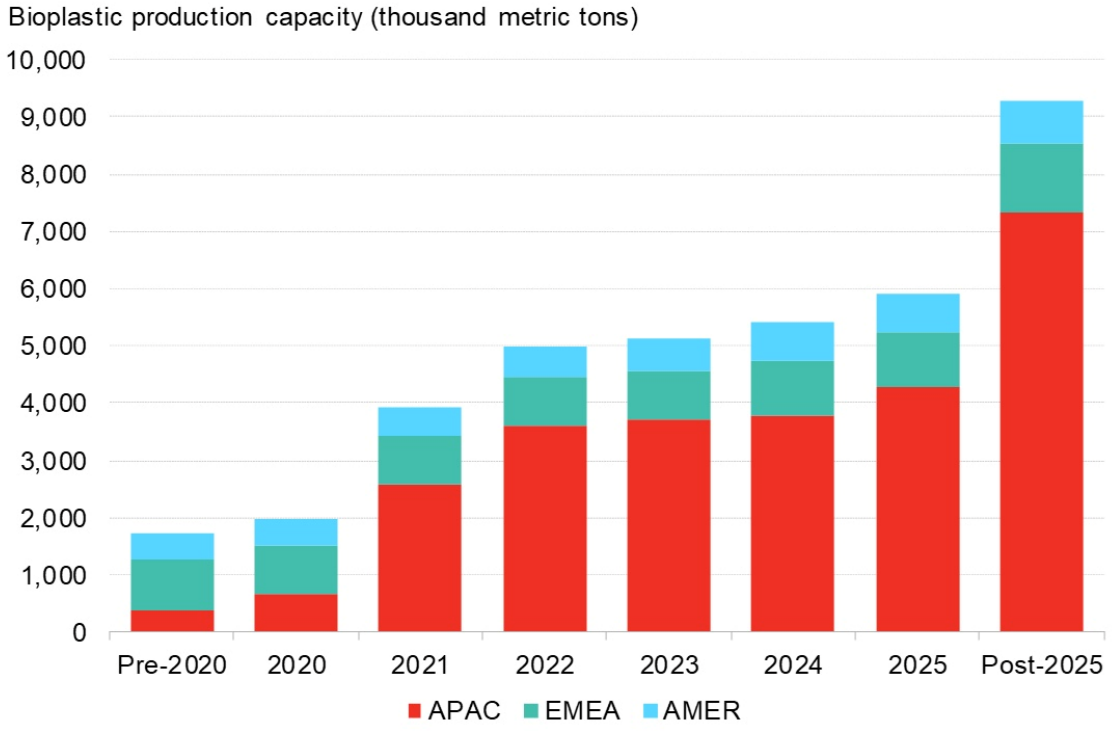
The U.S. is the largest producer of biofuels in the world

American farmers and agriculture industry are the backbone of the U.S. biofuel supply chain

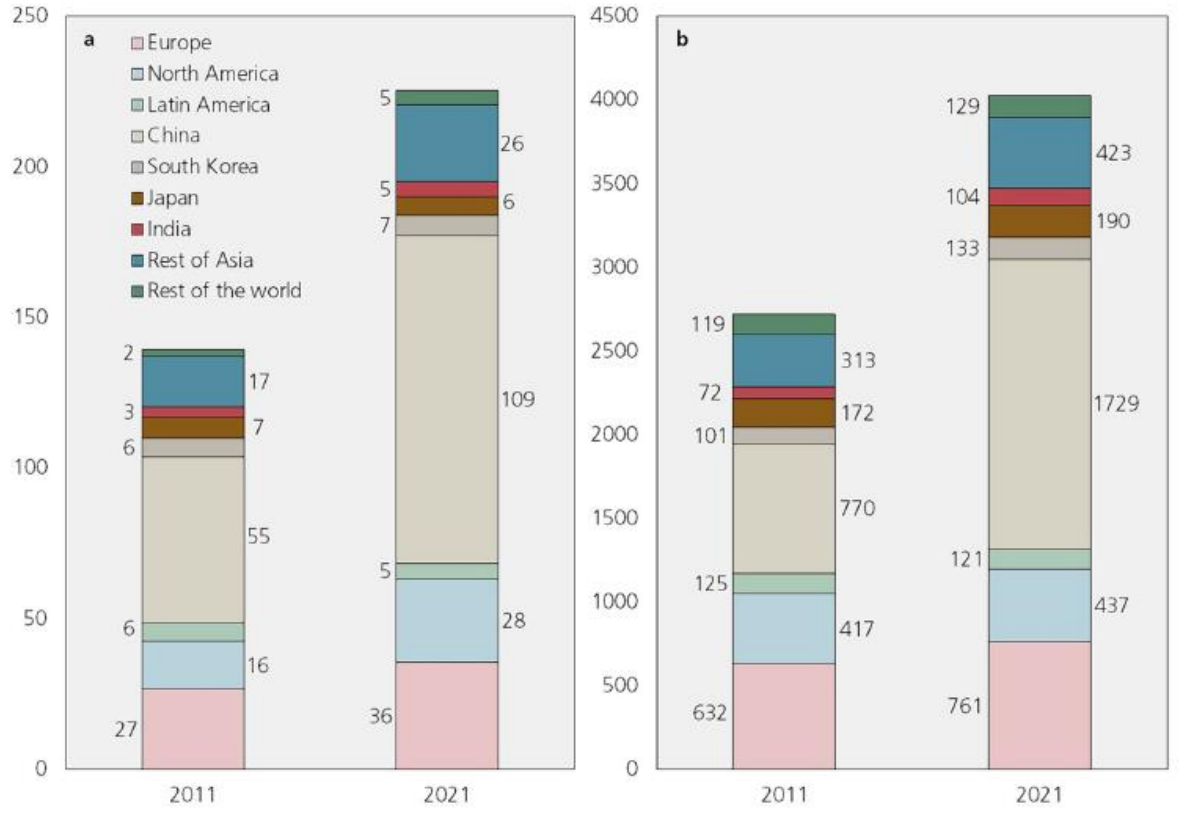


- ETHANOL
- BIODIESEL
- RENEWABLE DIESEL
- SAF & RENEWABLE DIESEL

Bioplastic Production by Region + Capital Investment In Chemical Production



China has overtaken the EU and US for bioplastic production



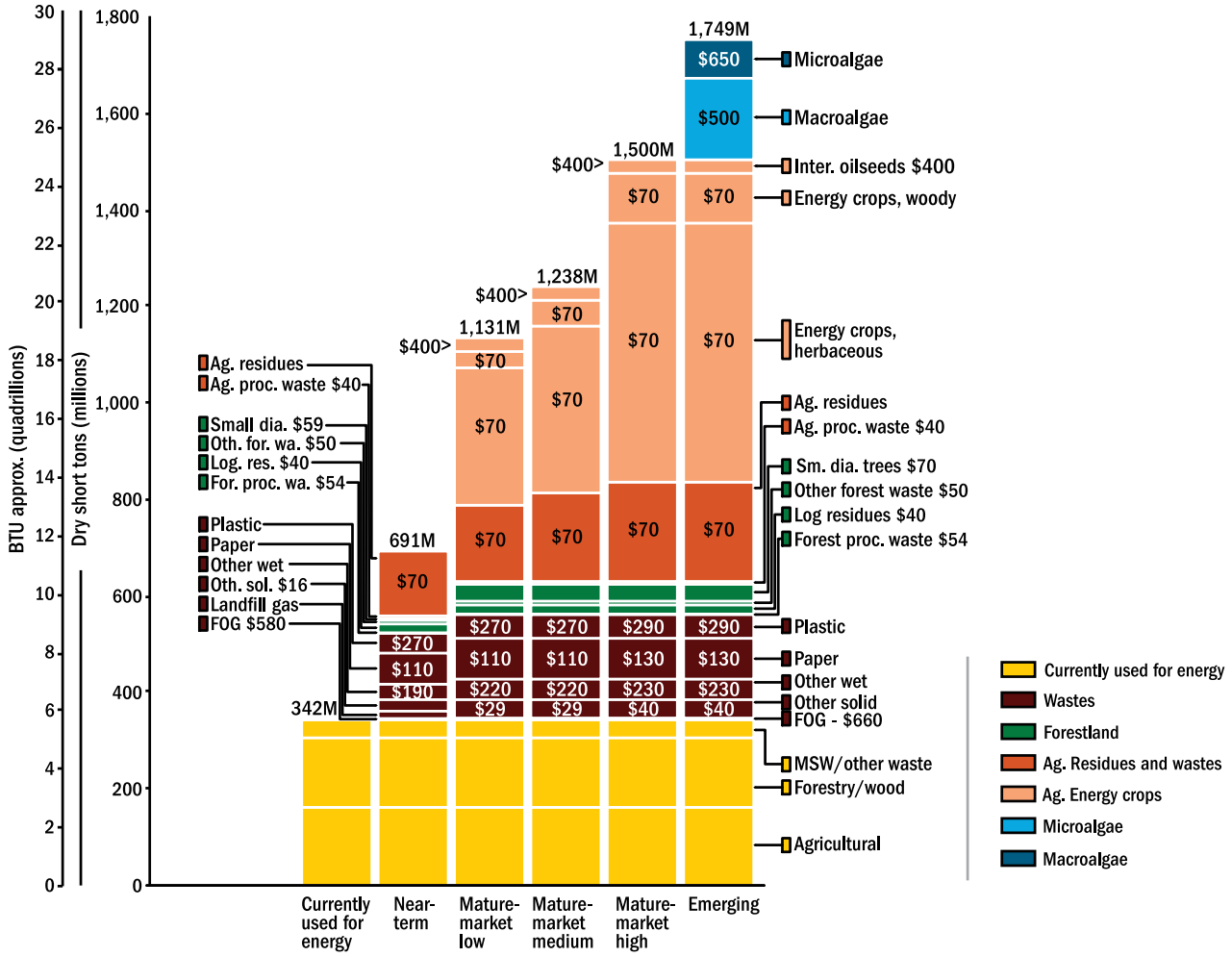
Chemical Capital Investment

Chemical Sales ($B euros)

China is out-investing and outproducing the US in chemicals

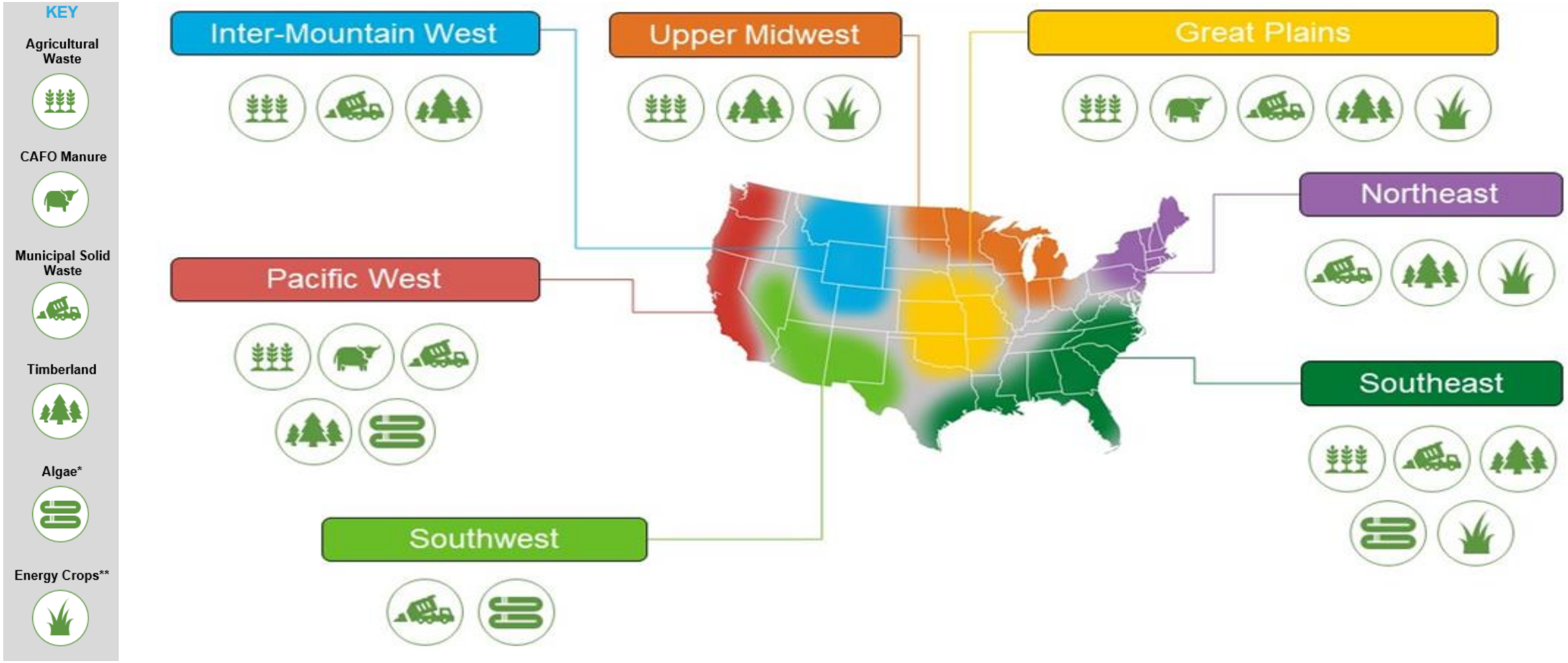
BNEF 2022 + European Chemical Industry Council

We are only scratching the surface of our potential

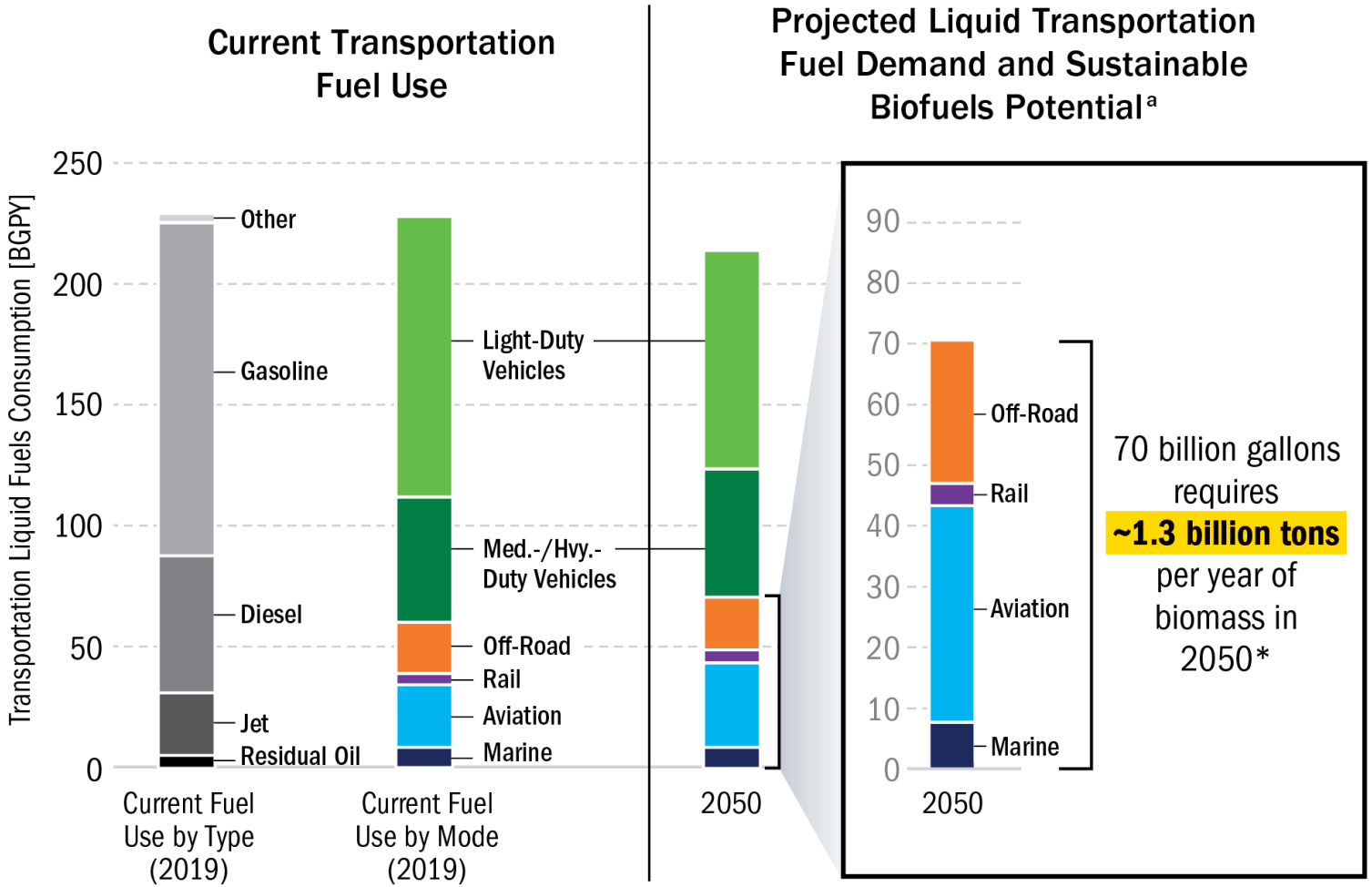


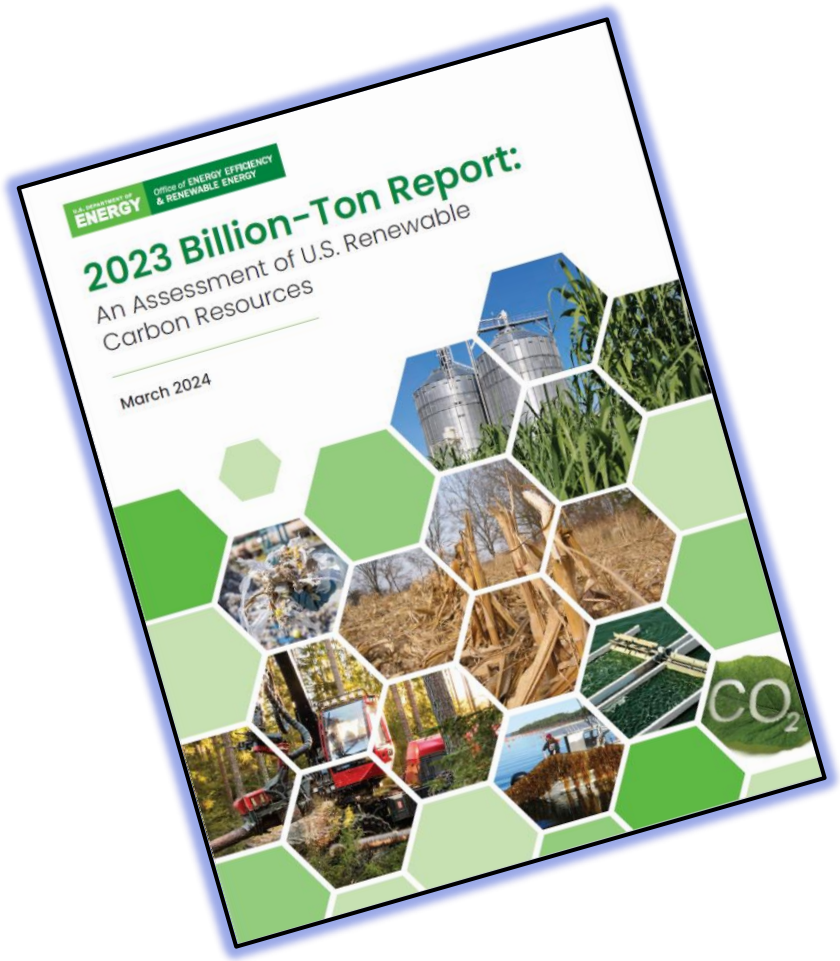
- Bioeconomy currently provides 342 million tons biomass (5 Quads or 5% total)
- Currently available resources can double biomass in **near-term**
- **Mature market** induces another 440-800 million tons biomass depending on yield assumptions
- Emerging resources can supply another 250 million tons
- All estimates include sustainability constraints

Resource types vary geographically



Demands for Alternative Fuels





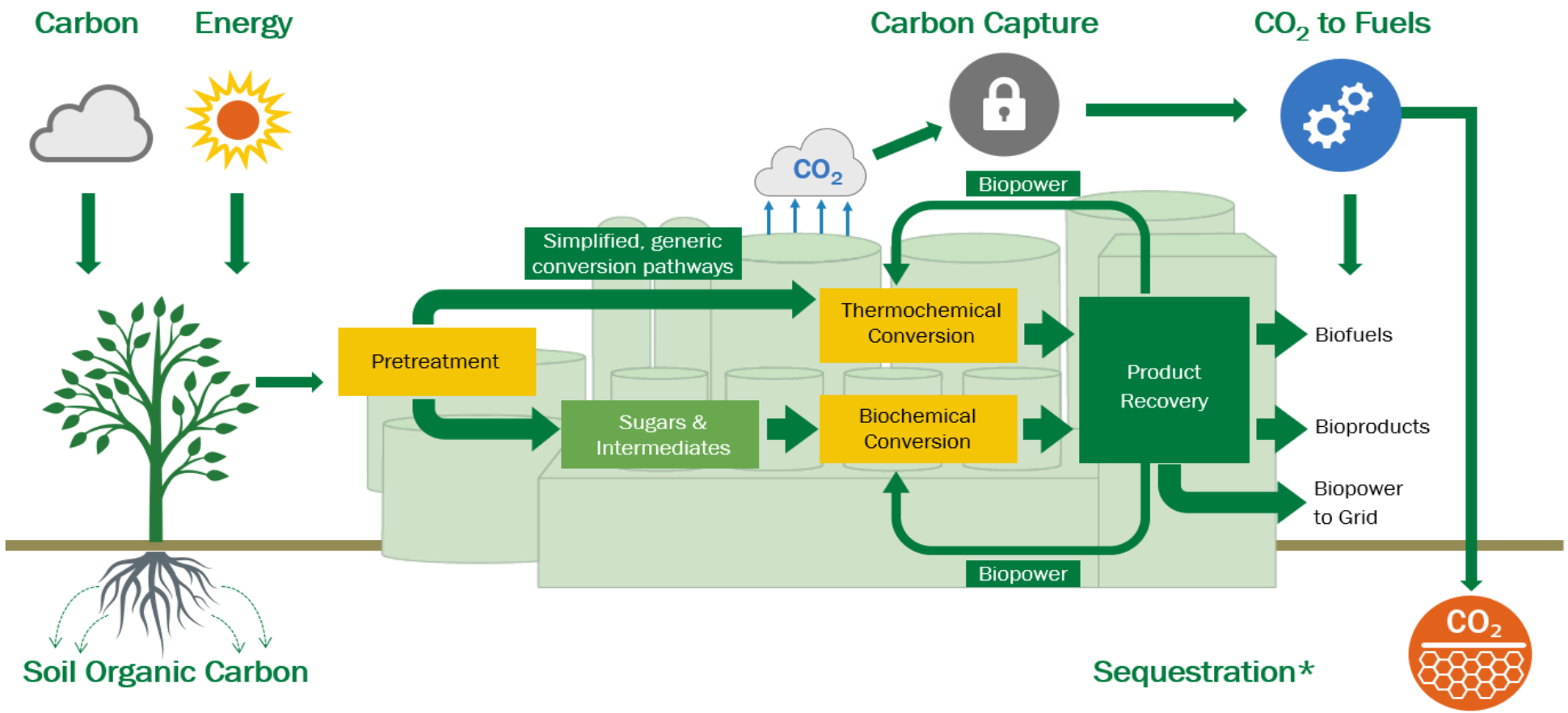
[a] The Base case and Expanded scenario bars above are reported on a GGE basis

* Assumes a conversion rate of 55 gallons per ton

BETO Strategy and Structure

Photo by iStock

BETO Program Structure Supports Biorefinery Design



* *Office of Fossil Energy R&D on technologies of relevance to bioenergy industry.*

BETO Subprograms

Renewable Carbon Resources

- Reduce cost, improve quality, and increase availability of domestic resources
- Improve efficiency and reliability of production, harvesting, storage, preprocessing, and transportation of resources

FY25 $77,900k

Conversion R&D

- Deconstruction of biomass/waste to intermediate production (sugars, oil, gases)
- Upgrading intermediates into bioenergy and renewable chemicals and materials

FY25 $100,000k

Systems Development & Integration

- Reduce risk through piloting and demonstration of first of a kind technologies
- Perform systems research to verify readiness for industry-led commercialization

FY25 $87,600k

Data Modeling & Analysis

- Track technology progress
- Identify opportunities and challenges related to the economic and environmental impacts of bioenergy systems

FY25 $9,500k

BETO's Funding Mechanism Strategy

Consortia

- Centralized knowledge, capabilities, cooperation to solve big problems
- Strong industry relevance
- Simplified industry engagement mechanisms
- Agile and problem-oriented
- Capabilities from >3 labs needed

AOPs

- Critical medium-long term R&D needs; OR
- Targeted strategic projects lasting ≤ 3 years

Competitive Funding

- Directly fund industry to create innovative solutions and commercialize tech.; OR
- Academic/ industry /Natl. Lab collaborations in new areas; OR
- Specific technology to drive forward in a 3-year project

BETO mission relevant; Analysis-guided R&D; Focus on innovation, IP generation

Key Federal Collaborations

- FECM – CO_2 Utilization and Sequestration
- AMMTO/IEDO – Chemicals and Plastics
- Office of Science – BioEnergy Research Centers
- DAS-T Pillar – Modal Plans (VTO, HFTO)
- OCED & LPO – Critical Emerging Technologies

- USDA – Biomass R&D Bioproducts and Fuels

- DOT – Aviation and Marine Fuel

- EPA – Biofuels and LCA

Recent Successes in Transportation

LanzaJet Grand Opening

- In 2024, LanzaJet unveiled the world's first ethanol-based alcohol-to-jet (sustainable aviation fuel (SAF)) commercial production plant in Soperton, GA.
- The LanzaJet facility will produce nine million gallons of SAF and one million gallons of renewable diesel in its first year of operations.
- The local Soperton and Treutlen County, GA, economy is expected to see:
  - $5 million in new wages and benefits
  - $70 million in annual economic activity
  - 250 direct jobs during construction
  - 30 direct and 50 indirect jobs.

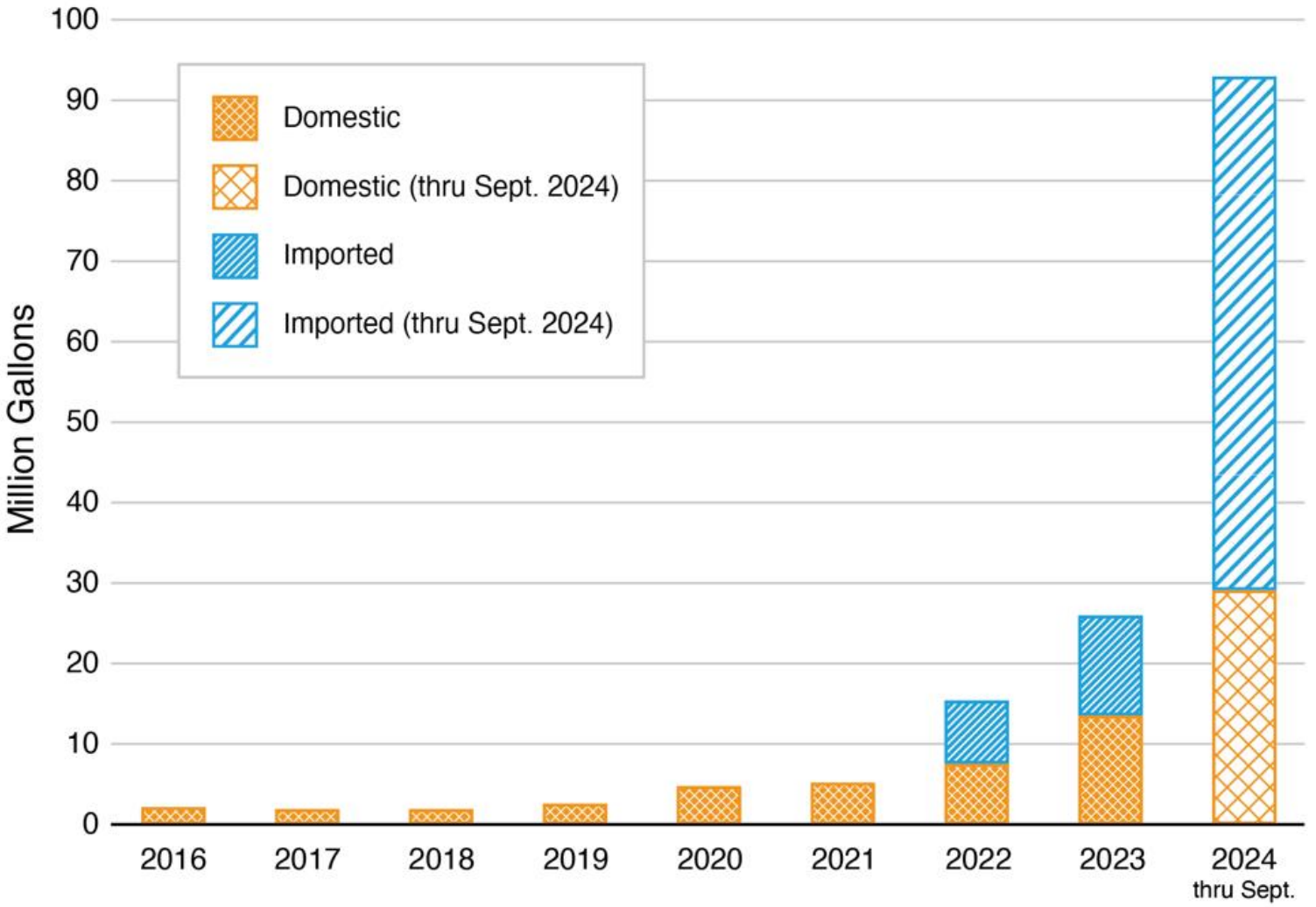
Image Courtesy LanzaJet

Continues Focus on Aviation Fuels

Demand outpacing supply

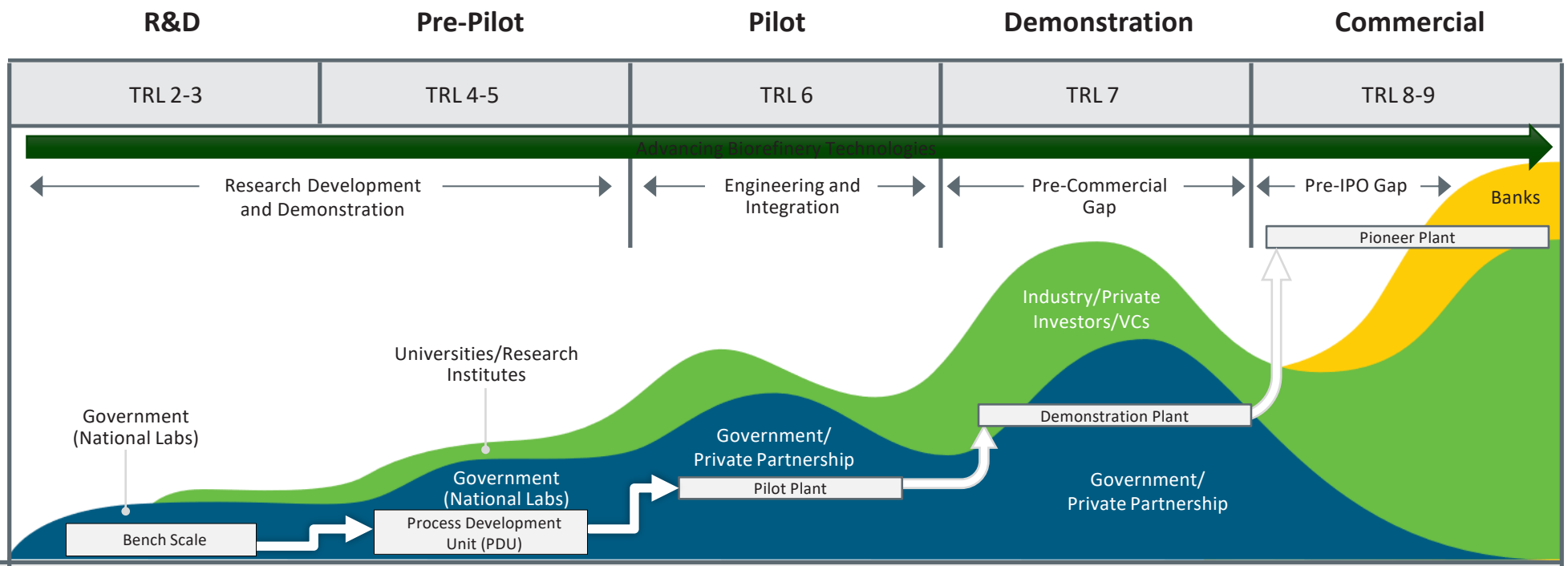
40B and 45Z

Export Markets



Source: EPA. 2024. "Public Data for the Renewable Fuel Standard." epa.gov/fuels-registration-reporting-and-compliance-help/public-data-renewable-fuel-standard

BETO Scale-Up Strategy



	R&D	Pre-Pilot	Pilot	Demonstration	Commercial
Average Total Project Cost	$1–$5 Million	$5–$10 Million	$25–$50 Million	$100–$500 Million	$250–$500 Million
Average Biomass Throughput	Grams/Day	Kilograms/Day	<50 Tonnes/Day	50–250 Tonnes/Day	+250 Tonnes/Day
Production Volumes	mL/L (batch)	Liters/Gallons (batch)	0.1–1 M GPY (campaign)	1–10 M GPY (extended campaign continuous)	50 M GPY (continuous)

Government Project Recipients and Partners Banks/Bonds/Institutional Investors

SDI Pilot and Demo Projects

Pilot					Demo				
SAF		Renewable Diesel		E-Fuels	SAF				Renewable Diesel
Biochem/ATJ	Gasification	Hydrotreating	HTL	PTL/ATJ	Fast-Py + Hydrotreating	ATJ		BC/ATJ	Fischer-Tropsch
Stover	Woody	Algae	Wet Waste	CO2	Woody		Ethanol	RNG	Biogas

Scale	Count
Pilot Phase 1	3
Pilot Phase 2	2
Demo Phase 1	3
Demo Phase 2	2

Technology	Count
Alcohol to Jet*	5
Fischer-Tropsch	2
Pyrolysis	1
Gasification	2
Biochemical Conversion	2
Hydrothermal Liquefaction	2
Power to Liquids	1