U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Advanced Manufacturing at EERE

Dr. Carolyn Snyder, Deputy Assistant Secretary for Energy Efficiency in the Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Advanced Manufacturing Office

September 14, 2022 | ACEEE

Agenda

- Advanced Manufacturing in the U.S.
- Advanced Manufacturing Office (AMO) Today
- Two Missions and Two New Offices
  - Advanced Materials and Manufacturing Technologies Office (AMMTO)
  - Industrial Efficiency and Decarbonization Office (IEDO)
- Recent Release: Industrial Decarbonization Roadmap
- Upcoming Events
- Career Opportunities

U.S. Industrial Sector and Advanced Manufacturing

EERE invests in manufacturing innovation
to accelerate and strengthen the clean economy for all.

INDUSTRY

- Uses roughly 33% of the nation's primary energy
- Accounts for one-third of U.S. primary energy-related CO_2 emissions

MANUFACTURING

- Represents about 80% of energy-related industrial CO_2 emissions
- Generates 11% of the U.S. GDP and 11.4 million jobs
- Contributes more than $2.35 trillion to the U.S. economy

Advanced Manufacturing Office Today

AMO is dedicated to improving energy efficiency and reducing carbon emissions of the industrial sector while delivering innovations to drive manufacturing of next generation energy technologies.

Industrial Efficiency and Decarbonization

- Reducing Greenhouse Gas Emissions from industries through new manufacturing technologies

Clean Energy Manufacturing

- Solving key manufacturing challenges for clean energy technologies that are critical for achieving economy-wide decarbonization

Material Supply Chains

- Developing secure and sustainable supply chains and high-performance materials

Technical Assistance and Workforce Development

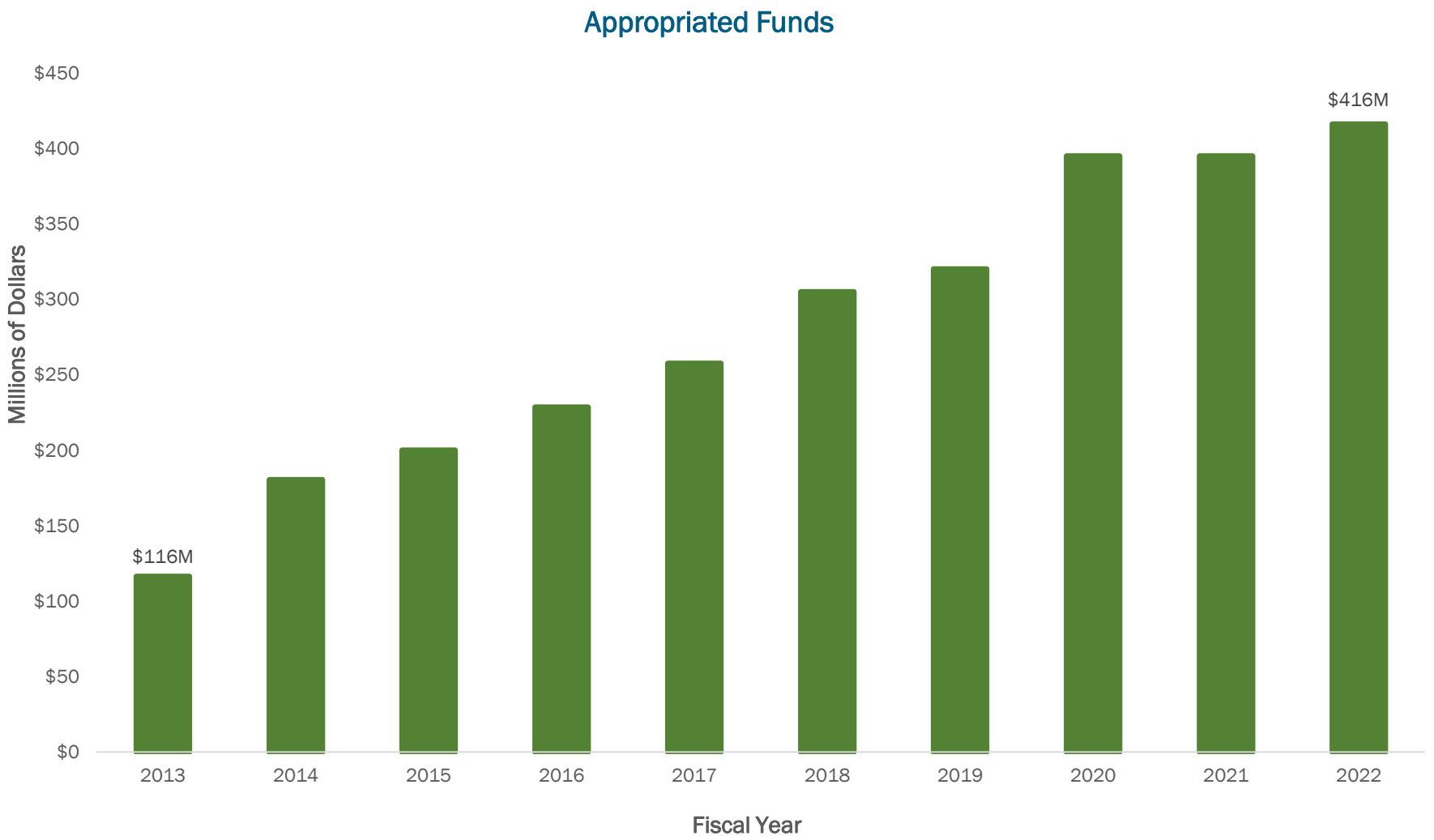
- Providing technical assistance to develop the manufacturing workforce of the future

BUDGET

$416M

FY22

Continuing Bipartisan Support for AMO



Year	FTE Count
FY13	33
FY14	32
FY15	31
FY16	36
FY17	34
FY18	33
FY19	32
FY20	48
FY21	48
FY22	54

Two Planned Offices Beginning October 9, 2022

Industrial Efficiency & Decarbonization Office (IEDO)

- Director
  - Deputy Director
    - Energy Intensive Industries
    - Cross-Sector Technologies
    - Technical Assistance & Workforce
    - Technical Project Officers
  - Chief Engineer
  - Operations

Advanced Materials & Manufacturing Technologies Office (AMMTO)

- Director
  - Deputy Director
    - Energy Technology Manufacturing & Workforce Development
    - Next Generation Materials & Processes
    - Secure & Sustainable Materials
    - Technical Project Officers
  - Senior Advisor
  - Operations

Advanced Materials and Manufacturing Technologies Office

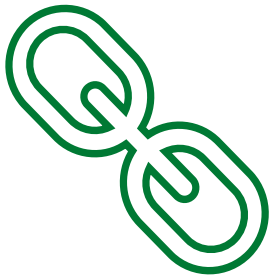
VISION FOR THE FUTURE

A competitive U.S. manufacturing sector that accelerates the adoption of innovative materials and manufacturing technologies in support of a clean, decarbonized economy.

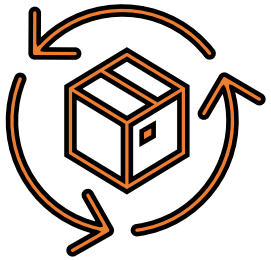
MISSION

We advance energy-related materials and manufacturing technologies to increase domestic competitiveness and build a clean, decarbonized economy.

MAJOR PROGRAM PILLARS



NEXT GENERATION MATERIALS & PROCESSES



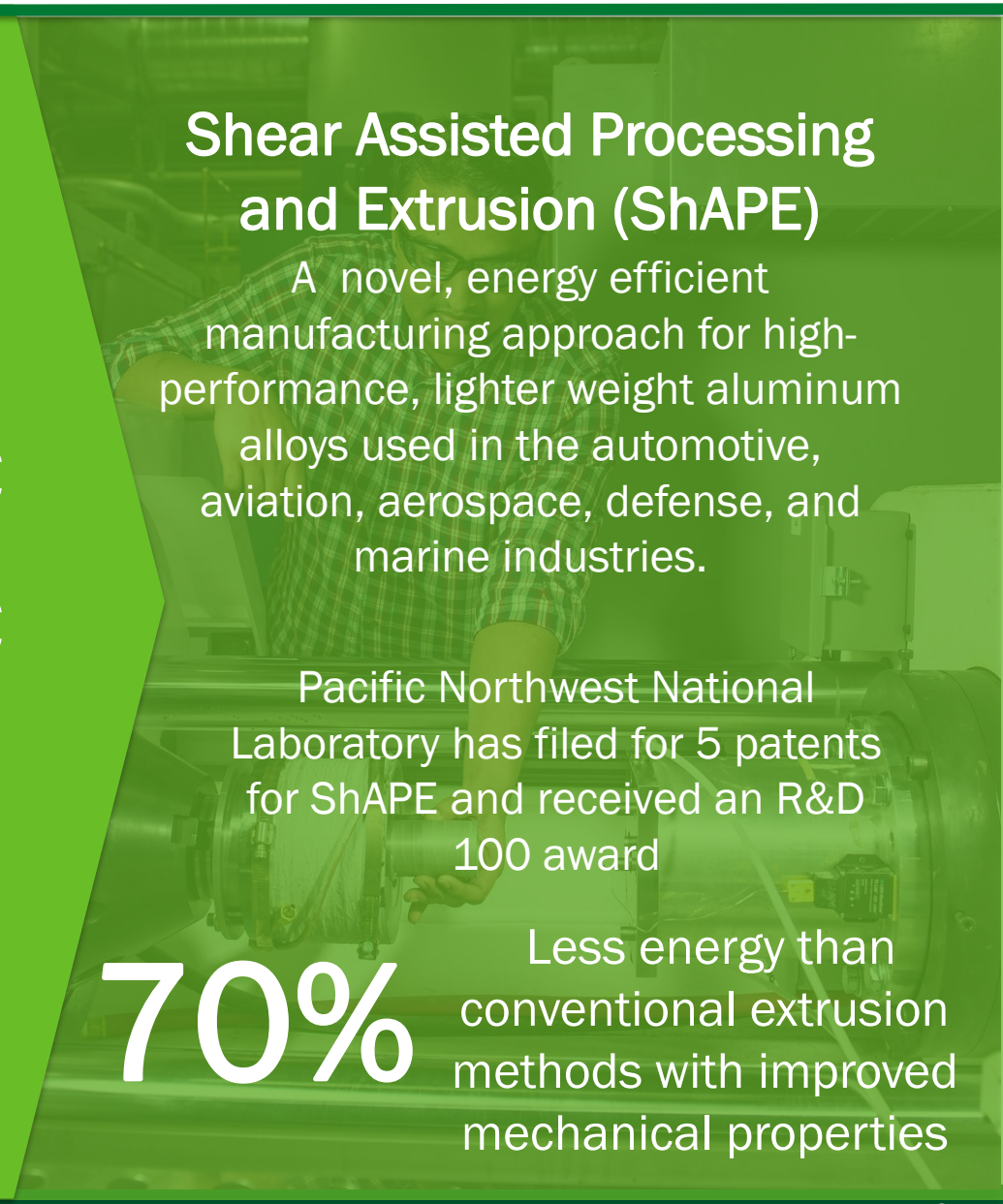
SECURE AND SUSTAINABLE MATERIALS

ENERGY TECHNOLOGY MANUFACTURING AND WORKFORCE

AMMTO: Next Generation Materials & Processes

- **Accelerating foundational, cross-cutting clean energy materials and manufacturing process technologies**
- Focusing on **novel materials that have improved properties**, such as high strength, high-temperature performance, and/or enhanced conductivity
- Investing in manufacturing process innovations to increase manufacturing and subsequent **scale-up of new materials and technologies**, including support for information technology innovations
- Enabling materials and manufacturing innovation deployment by multiple industries **to improve U.S. competitive advantage**

S U C C E S S



Shear Assisted Processing and Extrusion (ShAPE)

A novel, energy efficient manufacturing approach for high-performance, lighter weight aluminum alloys used in the automotive, aviation, aerospace, defense, and marine industries.

Pacific Northwest National Laboratory has filed for 5 patents for ShAPE and received an R&D 100 award

70% Less energy than conventional extrusion methods with improved mechanical properties

AMMTO: Secure & Sustainable Materials

- Ensuring **secure and sustainable supply chains for the clean economy**
- Investing in technologies that encourage domestic supply of **critical materials** needed for clean energy manufacturing.
- Establishing a **circular economy** for a broad range of materials through material and product design, recycling technology development, and reverse supply chain logistics.

S U C C E S S

Critical Materials Technology Transition

Rare Earth Element Separation

A cost-effective, environmentally sustainable process to extract rare earth elements used in high-performance magnets that are vital to clean energy technologies.

CMI AWARDS

26 U.S. patents - 10 licensed technologies
5 Federal Laboratory Consortium Awards - 6 R&D 100 Awards

Circular Economy of Plastics

Several pathways for chemically recycling polymers are under development, driven by rigorous analysis. An enzymatic pathway to make PET monomers from waste PET has been developed that lowers the supply chain energy by **69%** and emissions **17%.**

AMMTO: Energy Technology Manufacturing and Workforce

ENERGY TECHNOLOGY MANUFACTURING

- Focusing on RD&D for innovative manufacturing that advance the clean energy economy
- Investing in manufacturing innovations to improve performance and address barriers to reducing costs and accelerating market deployment

WORKFORCE

- Supporting entrepreneurial programs, TA, and workforce development to adopt novel manufacturing processes
- Provide workers the training and education needed to deploy new tools for manufacturing

S U C C E S S

Transforming Ideas into Revolutionary Technology

Lab-Embedded Entrepreneurship Program alumna Megan O'Connor founded Nth Cycle to extract critical metals from batteries, waste, and other materials we can reuse to make clean energy products. Nth Cycle received $1 million continue her work on electrochemical recycling technology

The Lab-Embedded Entrepreneurship Program Model

+120 successful startups

$918 M follow-on funding

1,000 U.S. jobs

Industrial Efficiency and Decarbonization Office

VISION FOR THE FUTURE

An efficient and competitive industrial sector with net-zero greenhouse gas emissions by 2050.

MISSION

IEDO accelerates the innovation and adoption of cost-effective technologies that eliminate industrial GHG emissions.

MAJOR PROGRAM PILLARS

ENERGY- AND EMISSIONS-INTENSIVE INDUSTRIES

CROSS-SECTOR TECHNOLOGIES

TECHNICAL ASSISTANCE AND WORKFORCE DEVELOPMENT

IEDO: Energy- and Emissions-Intensive Industries

- Prioritizing technology investment strategies to reduce emissions in industrial subsectors informed by **analysis and stakeholder engagement**
- Focusing initially on **chemicals; iron and steel; food and beverage; cement; and forest products.**

SUCCESS

A Better Process for Ethylene Production

Ethylene, a high-volume chemical, is produced by steam cracking one of the most energy-intensive steps in the chemical manufacturing industry.

EcoCatalytic and Southwest Research Institute successfully scaled this technology to the pilot scale and demonstrated an

80% reduction in CO_2 emissions

IEDO: Cross-Sector Technologies

Focusing on RD&D for technologies that address emissions across a broad range of industries. Including:

- H_2 and other low carbon fuels and feedstocks,
- Direct electrification of reaction processes,
- Combined heat and power,
- Energy and emissions reductions from water and wastewater treatment, and
- Other approaches

S U C C E S S

A Novel Flash Ironmaking Process

Breakthrough process that produces iron for steelmaking using natural gas and/or hydrogen to both heat the iron ore concentrates in the furnace and to remove oxygen, converting the ore to iron metal.

The University of Utah, Berry Metal, and the American Iron and Steel Institute developed this technology that has the potential to **reduce energy consumption by up to** 15%

IEDO: Technical Assistance and Workforce Development

TECHNICAL ASSISTANCE

- Delivering TA and developing partnerships with industry to increase the adoption of decarbonization technologies, programs and practices across the industrial sector.
- Engaging manufacturers with tools, best practices, assessments, and training resources to help overcome barriers to technology implementation and meet targets.

WORKFORCE DEVELOPMENT

- Prepare existing workers and attract a diverse mix of workers to the industrial jobs of the future.

Through BIL funding, Industrial Assessment Centers are now supported through DOE's Manufacturing and Energy Supply Chains Office (MESC)

SUCCESS

The Better Plants Program Yields Sustainability Benefits

A leadership initiative for manufacturers and industrial organizations to set and achieve long-term energy, water, waste, and carbon reduction goals.

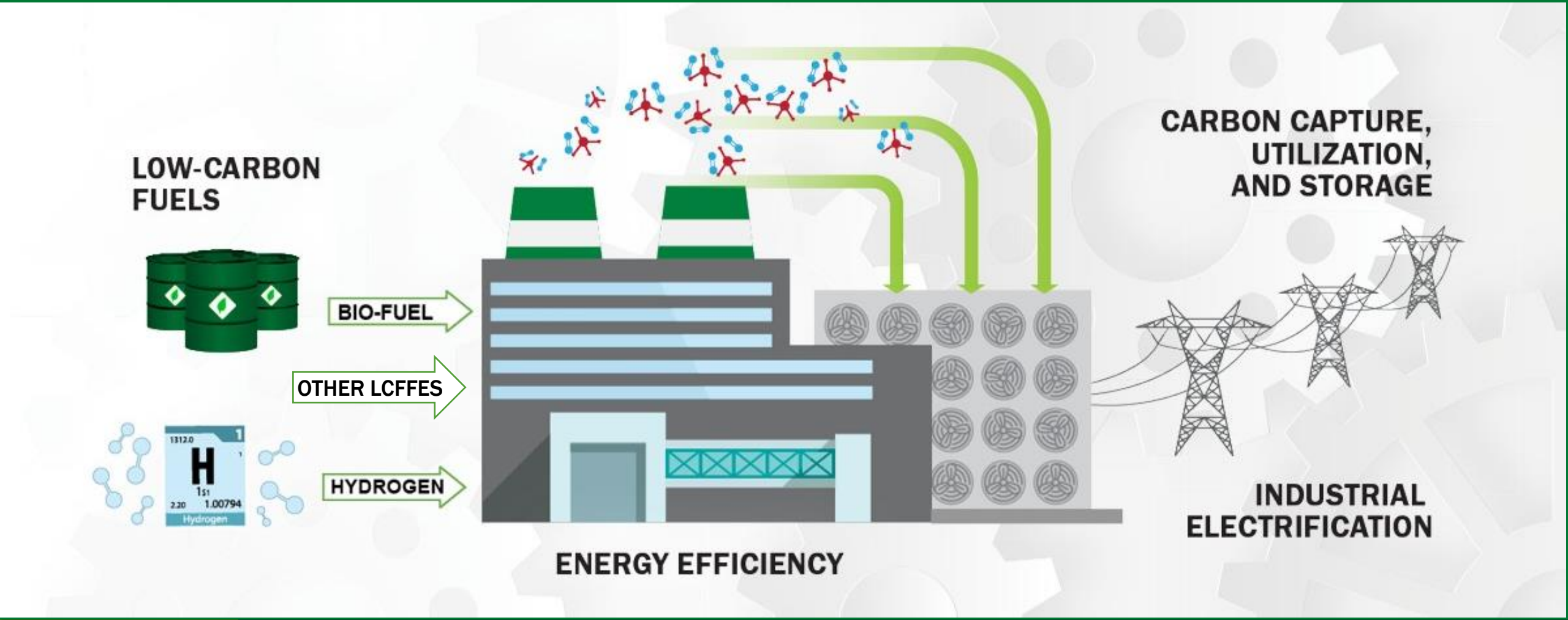
270+ partners

>$10B cumulative energy cost savings

>2.2 quadrillion Btu saved

Recent Release: Industrial Decarbonization Roadmap

Four Main Strategies to Decarbonize the Manufacturing Sector



Major Decarbonization Approaches for 5 Key Subsectors

Industrial Subsector	Important Context	Major Decarbonization Strategies
Iron and Steel	2/3 U.S. steel already electrified (secondary: recycled scrap)	• Address primary iron/steel emissions through low-carbon, iron ore reductants; Electrolytic RD&D • Transition heating operations to low carbon solutions • Improved heat management and waste recovery
Cement	CO_2 Emissions sources: 60% process; 40% energy	• CCUS to capture both emissions sources • Alternative heating/fuel switching; new processes/cement materials
Food and Beverage	Wide geographic diversity; grain/oilseed milling and meat largest emitters	• Electrify process heating, drying, dewatering to extent possible • Transition remaining heating operations to low carbon solutions • Reduce food waste and energy losses throughout the supply chain
Chemicals	Largest GHG footprint; diverse – 70K chemicals	• Electrification or low carbon fuel process heat • Low carbon feedstocks (bio, H_2, etc.); CO_2 utilization • Advanced catalysts, process intensification, biological processes
Petroleum Refining	Evolution of end-use fuel demand and impact on refinery product slate	• Electrification, low carbon fuels and clean hydrogen production • Advanced catalysts, process intensification, biological processes • CCUS

Collaboration Across DOE Manufacturing Offices

These two offices work closely with other DOE offices:

- The **Manufacturing and Energy Supply Chains Office (MESC)** supports modernization, scaleup and deployment of manufacturing facilities critical to the Energy Industrial Supply Base.
- The **Industrial Efficiency & Decarbonization Office (IEDO)** will focus on RD&D, TA and workforce development for technologies that support energy efficiency, electrification and the transition to low carbon fuels and feedstocks in the industrial sector.
- The **Advanced Materials & Manufacturing Technologies Office (AMMTO)** will focus on RD&D, TA and workforce development for energy-related materials and manufacturing technologies to drive U.S. economic competitiveness and a net zero emission economy by 2050.
- The **Office of Clean Energy Demonstrations (OCED)** will mainly focus on large-scale demonstrations of clean energy and industrial decarbonization technologies.

Senior Leadership and Open Searches

Current Advanced Manufacturing Senior Leadership:

- Acting Office Director, Steve McKnight
- Acting Deputy Director, Diana Bauer
- IEDO Deputy Director, Avi Schultz (Starting October)

Open Search for Permanent Senior Leadership Positions:

- Director of the Advanced Materials & Manufacturing Technologies Office
- Director of the Industrial Efficiency & Decarbonization Office

Other Career Opportunities

Current Open Positions:

- Next Generation Materials & Processes Program Manager
- Senior Supply Chain Strategic Advisor (General Engineer/Physical Scientist)
- Energy- and Emission-Intensive Industries Program Manager
- Energy Technology Manufacturing and Workforce Program Manager
- Stakeholder Engagement/Tech Partnerships Technical Manager (General Engineer/Physical Scientist)

Learn more: www.energy.gov/eere/amo/careers-amo

Upcoming Events

Stakeholder Workshops and Q&A Opportunity for AMMTO and IEDO

- Today @ ACEEE
- September TBD @ Council on Competitiveness
- September TBD @ American Association for the Advancement of Science (AAAS)

STEMtember Sessions: Careers in Clean Energy (September 22)

- Networking opportunity where EERE team members will discuss their diverse roles in energy efficiency.
- Register: www.zoomgov.com/meeting/register/vJItdO6trjktHITupMB4mf0LFpJwVSOuhUI

Thank you

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