U.S. Department of Energy Announces more than $136 Million in Projects To Develop Transformational Technologies Across America's Most Critical Industrial Subsectors

Projects will drive industrial energy use and emissions down while increasing America's manufacturing competitiveness in global markets

Office of Energy Efficiency & Renewable Energy

January 8, 2025

4 min

Today, the U.S. Department of Energy (DOE) announced more than $136 million for 66 selected projects to support the research and development of transformational technologies essential for reducing energy demand and improving American productivity in key industrial subsectors. These investments will accelerate the development of innovative technologies to ensure the resilience and competitiveness of U.S. industrial supply chains in rapidly changing global markets.

Selected projects will advance technology solutions for core portions of our nation's industrial base, including the manufacturing of chemicals and fuels, iron and steel, cement and concrete, forest and paper products, food and beverage, glass and other industries. Together, these industries account for over 75% of the U.S. industrial energy demand, employ roughly 13 million Americans, and contribute roughly $27 trillion to U.S. GDP.

"These industrial subsectors are economic engines for our nation, producing critical consumer products and inputs used to make many other manufactured goods," said Jeff Marootian, principal deputy assistant secretary for DOE's Office of Energy Efficiency and Renewable Energy. "By focusing on novel technologies and process optimization within these key subsectors, selected projects can bolster competitiveness and create a positive ripple effect for supply chains across our nation's economy."

Projects were selected in the following six topics:

1. **Chemicals and fuels**, accelerating next-generation industrial technologies for the production of chemicals and fuels by

improving energy and material efficiency, utilizing advanced energy sources, and developing technologies which utilize sustainable chemical feedstocks.

2. **Iron and steel**, advancing innovative, high-impact technology opportunities in the iron and steel industry through alternative ironmaking process technologies, ore improvements, improved steel recyclability, and advanced steelmaking technologies.
3. **Food and beverage products**, developing and demonstrating high-impact technology solutions for a wide variety of food and beverage operations across a full spectrum of applications.
4. **Building and infrastructure**, developing technologies to address industrial emissions, particularly those inherent to industrial processes, for cement and concrete, asphalt, and glass.
5. **Forest products**, leveraging high-impact technology development opportunities in energy-intensive pulp, paper, and wood products manufacturing through dewatering and drying technologies and fiber preparation, pulping, and chemical recovery processes.
6. **Industrial Pre-FEED Studies**, where preliminary front-end engineering design (pre-FEED) refers to a stage of project development—after basic feasibility study and conceptual design—which develops the initial concept into a detailed design basis and scope of work to ensure a project is economically and technically feasible as well as accurately estimated.

DOE's Industrial Efficiency and Decarbonization Office (IEDO), Hydrogen and Fuel Cell Technologies Office (HFTO) and the Office of Fossil Energy and Carbon Management (FECM) seek to reduce barriers for accelerated industrial adoption by de-risking innovative technologies integrated within realistic operational environments.

Learn about the 66 selected projects.

Pathways to U.S. Industrial Transformation: Unlocking American Innovation

Innovations in industry-specific technologies have the greatest potential for widespread impact including increasing efficiency, strengthening the manufacturing workforce, and reducing emissions. To help industry identify unique pathways to maximize their own impact, DOE will soon release a vision study, titled *Pathways to U.S. Industrial Transformation: Unlocking American Innovation*.

This report identifies strategic pathways in each of the key energy-and-emission-intensive industries for decarbonization, while ensuring well-paying jobs and clean air and water for American communities. This new vision study builds upon DOE's *Industrial Decarbonization Roadmap* and *Pathways for Commercial Liftoff* reports to identify industry-specific strategic pathways to achieve a resilient and competitive U.S. industrial sector.

To be notified of the release of the report, please subscribe to the IEDO newsletter.

Project Support

These investments are part of the Technologies for Industrial Emissions Reduction Development (TIEReD) Program, which leverages resources across DOE's applied research offices to invest in fundamental science, research, development, initial pilot-scale demonstrations projects, and technical assistance and workforce development.

These projects are funded by DOE's IEDO, HFTO, and FECM.

Selection for award negotiations is not a commitment by DOE to issue an award or provide funding. Before funding is issued, DOE and the applicants will undergo a negotiation process, and DOE may cancel negotiations and rescind the selection for any reason during that time.

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Funding Selections: FY24 Energy and Emissions Intensive Industries FOA

Office: Industrial Efficiency and Decarbonization Office
FOA Number: DE-FOA-0003219
Available Funding: $136 million

On Jan. 8, 2025, the U.S. Department of Energy (DOE) announced more than $136 million for 66 selected projects to support the research and development of transformational technologies essential for reducing energy demand and improving American productivity in key industrial subsectors. These investments will accelerate the development of innovative technologies to

ensure the resilience and competitiveness of U.S. industrial supply chains in rapidly changing global markets.

The selected projects will advance technology solutions for core portions of our nation's industrial base, including the manufacturing of chemicals and fuels, iron and steel, cement and concrete, forest and paper products, food and beverage, glass and other industries. Together, these industries account for over 75% of the U.S. industrial energy demand, employ roughly 13 million Americans, and contribute roughly $27 trillion to U.S. GDP.

Projects were selected in the following six topic areas:

1. Chemicals and Fuels
2. Iron and Steel
3. Food and Beverage Products
4. Building and Infrastructure
5. Forest Products
6. Industrial Pre-FEED Studies

Topic Area 1 – Decarbonizing Chemicals and Fuels

Single-Pass Ammonia Synthesis

Decarbonized Nitrogen Fixation for Production of Nitrogenous and Phosphatic Fertilizers

Decarbonization of Polyesters via Bio-Based Furan Pathway

Olefin Purification Membranes with High Separation Performance and Stability

Optimization of the United States' First Biological Textile Recycling Pilot Plant to Decarbonize Polyester Production

A Compact, Modular Membrane Reactor for >10 kg/day, High-Efficiency Ammonia (NH3) Synthesis at Moderate Temperatures and Pressures

Renewable Dimethyl Ether Synthesis from Waste

Enabling A Reliable Pathway for the Conversion of Municipal Solid Waste to Cost-Competitive Low-Carbon Methanol

CRUCIAL: Catalyst Regeneration Using Carbon Dioxide and Induction to Advance the Low Carbon Value Chain

Biomanufacturing Ethyl Acrylate Utilizing Decarbonized Biobased Sustainable Feedstock

Enabling Carbon-Efficient Production and Utilization of Dicarboxylic Acids from Polyolefins

Topic Area 2 – Decarbonizing Iron and Steel

Transformative Taconite Beneficiation Flowsheet of the Future

MagneLite: A Novel, Low-Cost Process for Magnetite Production from Low-Grade Ores

Iron Reduction and Refining of Ores with Zero Emissions (FERR0)

Selective-Carburization-Based Separation of Cu from Shredded Scrap

Circular and Intensified Recovery of Iron Oxide from Abundant Oxidized Tailings for Sustainable Direct Reduced Iron Technologies (Circular Iron)

A Decarbonized Iron Ore Reduction Process Through Sodium Looping

Modular System for Removing Copper Contaminants in Steel Scrap Using Artificial Intelligence

Energy Efficient Comminution and Advanced Separation Technology for the Production of Direct Reduction (DR) Grade High-Quality Iron Ores

Low-Carbon Ironmaking Technique through Electrochemical Re-mining of Red Mud in Alkaline Solutions

Reduction of Iron Ore Fines & Concentrates Using Non-Thermal Hydrogen Microwave Plasma

Electrochemical Hydrometallurgy for Carbon-Neutral Ironmaking

Evaluating Performance of Electrolytic Iron for Steelmaking in an Electric Arc Furnace

Graphite Core Induction Smelting Technology for Production of CO2-Free Carburized Pig Iron

Production of Improved DRI Feed from Diverse Iron Ore Sources by Reductive Bioleaching

Topic Area 3 – Decarbonizing Food and Beverage Products

Decarbonizing Dairy Protein Production Using Precision Fermented Alternative Proteins and Dairy Waste Valorization

Antimicrobial Fiber-Based Packaging as a Decarbonization Solution to the Single-Use Plastic Clamshell for the Produce Supply Chain

Demonstration of Energy Flows Redistribution for Carbon Reduction of Industrial Poultry Rendering

Advancing Commercial Food Service Decarbonization: A Hybrid Electric-Fuel Infrared Innovation

Commercial Foodservice Decarbonization and Cooking Performance

Plant-Based Packaging

Sustainable, Net-Zero Biopolymer Films for Food Packaging to Decarbonize the F&B Industry

Efficient Fiber Spinning for Alternative Protein Texturization

Sustainable Production of Plant Protein through Biological Decarbonization

Intelligent Modular Solid-State Microwave Technology to Revolutionize Commercial Kitchens in Foodservice

Topic Area 4 – Decarbonizing Building and Infrastructure Materials: Cement and Concrete, Asphalt, and Glass

Low GWP Concrete Made of Delithiated Aluminosilicates (DLAS)

'Super Green' Asphalt: Decarbonizing with Waste Carbon and Bio-Based Additives

Limestone/Activated Clay/Calcium Sulfate Blends for Low Carbon Concrete (LACCS Concrete)

Advanced Cold Recycling Pavement System with Enhanced Curing, Improved Mechanical Properties, and Asphalt Binder Reactivation

Clean Manufacturing of Cement and Zero-Carbon Concrete Enabled by Electrochemical Technologies

Sustainable and Low-Carbon Asphalt Pavements using Lignin

Recycling End of Life Glass (RE-Glass)

Decreasing Emissions with Cement Alternatives and Reactive Biocarbon SCMs (DECARBS)

Incorporating Tribology Principle into Asphalt Mix Design for Low Carbon Asphalt Pavement

Development of Ultra-Low Carbon Concretes Containing High-Volume Calcined and Mechanochemically Activated Clays and Carbonated Recycled Concrete Aggregates

AI-Guided Blending of Indigenous Alternative Supplementary Cementitious Materials toward Maximum Substitution of Cement

Topic Area 5 – Decarbonizing Forest Products

High-flux Graphene Oxide Membranes for Kraft Black Liquor Dewatering and Integration with Advanced Chemical Recovery Loop for Decarbonization

Reducing the Carbon Intensity of Recycled Fiber Recovery Using Anaerobic Digestion

Peroxyacid Pulping and Bleaching (PPB) to Replace Prehydrolysis Kraft Process for Dissolving Pulp Production

Highly Efficient Vapor-Compression-Ejector Heat Pump Wood Dryer with an Oscillating Heat Pipe Energy Recovery Dehumidifier

Decarbonizing Kraft Pulp Mills by Alternative Chemical Recovery

Decarbonizing Chemical Recovery Process in Kraft Pulping through Novel Membrane Electrolysis

Electrified Acid Hydrotropic Pulping for Decarbonizing Forest and Pulping Industries

Dewatering Wood and Pulp Products using Supercritical Carbon Dioxide (scCO2) through its Cyclical Phase Change between Supercritical Fluid and Gas

Topic Area 6 – Innovative Industrial Pre-FEED Studies

GTI Energy – Pre-FEED Study for Ammonia Plant Decarbonization with Flue Gas Carbon Capture

Carbon Capture Pre-FEED Study of Cracking Furnaces Using a Single-Component Water-Lean Solvent

Integration of Electrochemical Methane Production at a Midwest Manufacturing Plant for CO2 Conversion to E-Methane and Value Added Low-Carbon Building and Engineering Materials and Chemical Feedstocks

- **City/State:** Aurora, Illinois
- **Federal Funding:** $1,497,724
- **Project Lead:** NewCarbon, LLC
- **Partners:** Black & Veatch, Energy & Environmental Research Center (University of North Dakota), Graymont

NewCarbon, LLC, seeks to integrate carbon capture, electrolysis, and methanation technologies with an oxy-fuel parallel flow regeneratie (PFR) lime kiln, reducing CO_2 emissions while converting the captured CO_2 into low carbon-intensity synthetic fuel. For this Pre-FEED study, the CO_2 capture system will compare commercially available carbon capture facilities, including membrane filtration and conventional amine separation technologies. This technology could provide a pathway for carbon utilization in the upper peninsula of Michigan which lacks suitable geology for carbon sequestration.

Evaluating Novel Integration and Optimization of Energy Efficiency, Clean Hydrogen Production and Use, and Carbon Capture Use and Sequestration for Value-Added Low Carbon Chemicals Production

Pre-FEED Engineering Funding for Svante's Solid Sorbent Post-Combustion CO2 Capture Technology at the Ashdown Pulp Mill Facility

Integrated Green Hydrogen-Based Iron Plant to Support the Green Steel Supply Chain

Green Methanol Ascension: Transforming the U.S. Industrial Sector with Sustainable Methanol Production

Pre-FEED Study of Retrofitting a Glass Manufacturing Plant with the CycloneCC™ CO2 Capture Technology

On-Site Capture and Conversion to Formate Chemicals

Bluebell – Innovative Cement Plant Decarbonization Through Leilac Carbon Capture

Integration of Multiple Innovative Technologies to Reduce Greenhouse Gas Emissions, Energy and Waste in Lime Manufacturing

Improving Efficiency and Accelerating Decarbonization in the Pulp and Paper and Aviation Industries via an Integrated Process

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