

American Manufacturing Renaissance: Productive, Prosperous, and Increasingly Clean

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Agenda

- Industrial Sector: Can't Live Without It, Can't Live with the Emissions It Creates
- Industrial Decarbonization Pathways
- An All-of-DOE Approach
 - Research, Development, and Pilot-Scale Demonstrations
 - Full-Scale Demonstrations and Deployment
 - Technical Assistance and Workforce Development for Adoption Across Industry
- Critical Role States Can Play

Building a Net-zero, Clean Energy Future

The U.S. industrial sector (manufacturing, agriculture, mining, and construction) accounts for:

33% of the nation's primary energy use

 $\begin{array}{c} \textbf{30\%} & \text{of } \text{CO}_2 \\ \text{emissions} \end{array}$

Anticipated industrial sector energy demand growth of 30% by 2050 may result in a:

17% CO₂ emissions increase*

309 Industria 35% Transportation 16% 19% Commercial Residential

> Energy-Related CO₂ Emissions By Sector

*EIA, Annual Energy Outlook 2021 with Projections to 2050.

Decarbonizing Industry is an Opportunity for America's Economy

U.S. manufacturing ...

CONTRIBUTES

\$2.35 trillion to the U.S. Economy

GENERATES 11% of U.S. GDP

CREATES 11.4 million jobs



Industrial facilities are located across the U.S., often in disadvantaged communities

Map of select U.S. point source CO₂ emissions and US Disadvantaged Communities, 2021



2,500+

Industrial facilities in sectors of focus

1,145+

Studied sectors' industrial facilities located within U.S. Disadvantaged Communities

Source: EPA Flight, Climate and Economic Justice Screening Tool

Systemic Barriers to Industrial Decarbonization

Risk to Industry's Bottom Line

Invest	ment scale	\rightarrow In the rang	ge of
\$1	1-21	Trilli	DN
	just for 4	l sectors:	
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cement	steel	ammonia	ethylene
	(McKin	sey, 2018)	





by 2050 will come from technologies that are **not currently market ready** (IEA, 2022)

Targeted RDD&D investments can help U.S. industry overcome these barriers

DOE Industrial Decarbonization Roadmap



Industrial Decarbonization Pillars

U.S. DEPARTMENT OF ENERGY OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY | INDUSTRIAL EFFICIENCY & DECARBONIZATION OFFICE

Path to Net-Zero Emissions by 2050



Remaining GHG Emissions
Emissions Reduction by CCUS

Emissions Reduction by Industrial Electrification & LCFFES
 Emissions Reduction by Alternate Approaches (e.g., Negative Emissions Technologies)

DOE's All-Hands-On Deck Approach



DOE Offices Operate in a Common Strategic Framework



Fostering Emerging Technologies Through R&D

The Industrial Efficiency and Decarbonization Office (IEDO) accelerates the innovation and adoption of cost-effective technologies that eliminate industrial GHG emissions.



IEDO Funding Opportunity Announcements: \$260 million in R&D funding in the last two years for cross-cutting decarbonization technologies and technologies within five energy-and-emission-intensive industries.



Industrial Heat Shot[™]: Aims to develop cost-competitive industrial heat decarbonization technologies with at least 85% lower greenhouse gas emissions by 2035.



EPIXC: New \$70M DOE Clean Energy Manufacturing Innovation Institute focused on to electrifying process heating and decarbonize the industrial sector.



RAPID: DOE Clean Energy Manufacturing Innovation Institute focused on redesigning industrial processes to optimize production and increase sustainability within the chemicals and fuels industries.

Industrial Decarbonization Liftoff Reports: Key Takeaways

- The time is now: U.S. industrial players are at risk of lagging behind net-zero targets; however, this narrative is changing with public sector support in BIL / IRA, increasing customers' expectations to address emissions, and early private sector movers.
- Up to 40% of studied emissions could be abated with existing net-positive decarbonization levers (10%+ IRR with IRA incentives) or external factors (e.g., grid decarbonization, recycling, transport electrification).
- Potential capital deployment of \$700B-\$1.1T from public and private sector investment and leverage of industrial materials' small portion of end-products price would be required to decarbonize with emerging technologies.
- Early commercial deployments of decarbonization technologies in sector-specific applications could drive cost reductions and cross-sector learnings to boost the value proposition of similar, future projects.
- Clear end-customer demand would speed industrial decarbonization requiring action across supplier value chains to compete for market share and customer segments that value low-carbon products.

DOE Offices Operate in a Common Strategic Framework



Industrial Demonstrations & Deployment Programs

Getting Technologies on the factory floor through D&D

Advancing technologies past final market risks through large investments in deployment and full-scale demonstrations projects, including execution of work funded through the <u>Bipartisan Infrastructure Law</u> and <u>Inflation Reductions Act</u>.

The Industrial Demonstrations Program (IDP): Office of Clean Energy Demonstrations (OCED) is investing \$6.3B in widespread demonstration and deployment of decarbonization technologies.

State Manufacturing Leadership Program: Office of Manufacturing and Energy Supply Chains (MESC) is investing **\$50M** to partner with states in accelerating the deployment of smart manufacturing and high-performance computing technologies across their small- and medium-sized manufacturing (SMM) firm base.

Advanced Energy Manufacturing and Recycling Grant Program: MESC is providing \$750M in grants to small- and medium-sized manufacturers to enable them to build new or retrofit existing manufacturing and industrial facilities to produce or recycle advanced energy products in communities where coal mines or coal power plants have closed.



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IEDO Onsite Energy Program

The Onsite Energy Program will provide technical assistance for industrial facilities and other large energy users to increase the adoption of onsite clean energy technologies.

battery storage | combined heat and power | district energy | geothermal | industrial heat pumps | renewable fuels | solar PV | solar thermal | thermal storage | wind





State Industrial Working Group

In partnership with NASEO, IEDO hopes to:

- Enhance communication with states, across DOE, and other federal agencies
- Support peer exchange and regional dialogue on key topics impacting states and manufacturers
- Highlight best practices across networks that address targeted needs in the industrial sector
- Identify mutual priorities areas and enable coordination

industrial decarbonization | energy intensive industries | education & workforce development energy equity & justice | water and wastewater | recycling and waste management

- Provide data, technical, and program assistance in support of state energy plans and priorities
- Share information about funding, tools, resources, and engagement opportunities



The Role of States: What You Can Do Today

- 1. Grow your state's manufacturers' awareness and interest in the federal programs available today.
- 2. Provide additional incentives and help industrial facilities secure the capital needed to make upgrades and switch to cleaner processes
- 3. Ensure community benefit plans are robust, designed with regional needs in mind, and implemented with fidelity.
 - DOE-wide funding opportunities, resources, and technical assistance: <u>https://www.energy.gov/industrial-</u> <u>technologies</u>



IEDO is Hiring – Join Our Team!

- Oak Ridge Institute for Science and Education (ORISE) Science, Technology and Policy (STP) Program Fellowship
- IEDO Deputy Director
- Technology Manager, Technical Assistance and Workforce Development
- Technology Manager, Cross-Sector Industrial Efficiency and Decarbonization Technologies
- Sr. Technology Manager, Iron, Steel, Aluminum, and Other Metals

IEDO Careers: www.energy.gov/eere/iedo/iedo-careers DOE Careers: www.energy.gov/CleanEnergyCorps





Thank you!

