



Recommendations for Implementing a Clean Industrial Demonstration Program

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Purpose

This memo provides recommendations for implementation of a clean industrial demonstration program within the U.S. Department of Energy (DOE).

Background

Technological innovation is key to strengthening America's domestic manufacturing competitiveness. This is particularly true in regard to trade-exposed industries such as iron and steel, cement and concrete, and chemicals. U.S. manufacturers face stiff competition from China and others, which engage in unfair trade practices and have poor environmental standards. Though U.S. manufacturers are cleaner than many competitors around the world, the industrial sector still accounts for 27% of all U.S. emissions.¹

To spur industrial innovation, the Infrastructure Investment and Jobs Act (IIJA) included \$500 million for industrial emission demonstration projects that were authorized by the Energy Act of 2020 (Energy Act).² The Energy Act authorized a research, development, and demonstration (RD&D) program focused on increasing the technological and economic competitiveness of domestic industry, enhancing the viability and competitiveness of industrial technology exports, and reducing emissions across the industrial sector. The Energy Act also directed DOE to focus on a wide range of industrial processes and technologies, with an emphasis on heavy industrial sectors such as iron and steel, cement and concrete, and chemicals. As such, DOE should focus on developing a demonstration program that is both **sector specific and technology inclusive**.

IIJA funds are made available in the following amounts:

- Fiscal year 2022 - \$100,000,000;
- Fiscal year 2023 - \$100,000,000;
- Fiscal year 2024 - \$150,000,000;
- Fiscal year 2025 - \$150,000,000.³

The industrial demonstration investments in the IIJA provide a unique opportunity to accelerate emission reduction technologies across the U.S. industrial sector. Since DOE has not yet established an industrial demonstration program, setting clear goals that focus on sector-specific and technology-inclusive solutions will best position the program for maximum impact and long-term success.

Recommendations

The recommendations below are focused on establishing a demonstration program that 1) prioritizes investments in heavy industrial sectors that are the most difficult to decarbonize; 2) includes a broad portfolio of technologies with deep emission reduction potential; 3) leverages synergies with related DOE demonstration programs, particularly carbon capture and hydrogen; 4) conducts robust stakeholder engagement; and 5) coordinates the demonstration program with the Advanced Manufacturing Office's (AMO) proposed Manufacturing USA Institute.

Sector Specific

The industrial sector is diverse and key sub-sectors are particularly energy and emissions intensive. To maximize impact and meet the Energy Act, DOE should prioritize demonstration projects for the highest-emitting, hard-to-abate heavy industrial sectors that are prevalent in domestic industry, including metals (emphasis on iron and steel), cement and concrete, and chemicals.

Metals production alone accounts for 8% of global emissions, of which iron and steel are a main driver.⁴ In the U.S., steel production accounts for 81% of total metals emissions.⁵ Cement production accounts for 7% of global emissions, while the chemicals sector accounts for 4% of global emissions, but 7% of total U.S. emissions. These cleaner technologies, and the clean materials they produce, have a high export potential because heavy industry is one of the highest emitting sectors in foreign countries.

A sector-based approach is new to DOE, but equally important. Historically, DOE's industrial RD&D programs have focused on improving the energy efficiency of manufacturing processes that cut across sectors. While successful in reducing emissions in the short-term, a comprehensive portfolio of technologies is needed to drive deep emission reductions in heavy industrial sub-sectors. In Fiscal Year 2021, Congress directed DOE to develop sector-specific industrial decarbonization roadmaps. DOE should finalize those roadmaps as soon as practicable and incorporate them into the industrial demonstration program.

Technology Inclusive

After the DOE has used a sector-based approach to establish the highest impact sub-sectors, they should take a technology-inclusive approach when considering solutions to those sub-sectors. There is no silver bullet technology to decarbonize heavy industrial sectors, particularly iron and steel, cement and concrete, and chemicals. Reducing emissions requires a portfolio approach,⁶ including low-hanging fruit such as energy efficiency and electrification, which can be deployed today. However, in industries with large heat requirements that make electrification infeasible, driving deep decarbonization likely requires advances in technologies that are not fully commercial, including carbon capture, hydrogen, and clean heat from geothermal, nuclear, and bioenergy.

Therefore, DOE's industrial demonstration program should advance a broad portfolio of technology pathways, prioritizing those with deep emission reduction potential and matched to heavy industrial sub-sectors.

Synergy with Other IIJA Programs

The IIJA provided significant funding for hydrogen, carbon capture, and CO₂ infrastructure, which should complement the industrial demonstration program. The IIJA provided \$2.1 billion for the build-out of CO₂ transportation infrastructure, \$2.5 billion for carbon capture demonstration projects, \$3.5 billion for regional direct air capture (DAC) hubs, and \$8 billion for regional clean hydrogen hubs. The funding in IIJA specifies that two of the six carbon capture demonstration projects must be for industrial facilities outside of the power sector.

Given the potential of carbon capture and hydrogen to drive deep emission reductions in the industrial sector, DOE should leverage opportunities across these programs to ensure maximum impact of taxpayer dollars. For example, DOE could issue a joint solicitation under the industrial demonstration program and the carbon capture program to fund industrial carbon capture projects with the combined resources of both programs. DOE could also leverage the industrial program to supplement the regional hydrogen hubs. Through close coordination, DOE can integrate industrial demonstration projects into the development of regional networks to share infrastructure and realize economies of scale.

Stakeholder Engagement

The industrial demonstration projects funded through the Office of Clean Energy Demonstrations (OCED), a new entity that was also authorized by the IIJA, will provide a new opportunity for stakeholder engagement. DOE must ensure that OCED is engaging all relevant stakeholders throughout the demonstration process, and provide clear guidance and expectations to project developers on the full lifecycle of stakeholder engagement, from the initial development of the funding opportunities through project selection, construction, and operation. Ensuring that project developers thoughtfully engage with host communities, and that communities directly benefit from these projects, are of particular importance.

Manufacturing USA Institute

In July 2021, DOE issued a Request for Information to consider establishing a new Manufacturing USA Institute.⁷ The RFI sought feedback on two potential topic areas: metals and electrification. Whichever topic is chosen, DOE should finalize a decision on the next institute and issue a funding opportunity announcement within the next three months to facilitate collaboration between the institute and demonstration applicants.

Conclusion

The industrial investments in the IIJA provide the opportunity to demonstrate a portfolio of technologies to reduce industrial emissions. By prioritizing the aforementioned recommendations, with particular emphasis on sector-specific and technology-inclusive solutions, DOE can maximize the benefits of its industrial demonstration program to drive deep decarbonization across the industrial sector.

Sources

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2. *Infrastructure Investment and Jobs Act*, Pub. L. No. 117-58, (2021). <https://www.congress.gov/bill/117th-congress/house-bill/3684>
3. *Infrastructure Investment and Jobs Act*, Pub. L. No. 117-58, (2021). <https://www.congress.gov/bill/117th-congress/house-bill/3684>
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6. ClearPath. *Steel 101*. March 2021. <https://clearpath.org/tech-101/steel-101>
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