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Office of Clean Energy Demonstrations

THE OFFICE OF

CLEAN ENERGY DEMONSTRATIONS

Industrial-related Funding Updates

Office of Clean Energy Demonstrations

U.S. Department of Energy

May 14, 2024

INDUSTRIAL DEMONSTRATIONS PROGRAM SELECTION SNAPSHOT

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$20+ BILLION
Total Funding
(Federal and private cost shares)

OVER
14 MILLION METRIC TONS
of avoided emissions annually

85% would reduce criteria air pollutants
(28) PROJECTS

TENS OF
THOUSANDS
total jobs

with
19 committed to union labor
PROJECTS

Industrial Demonstrations Program Overview

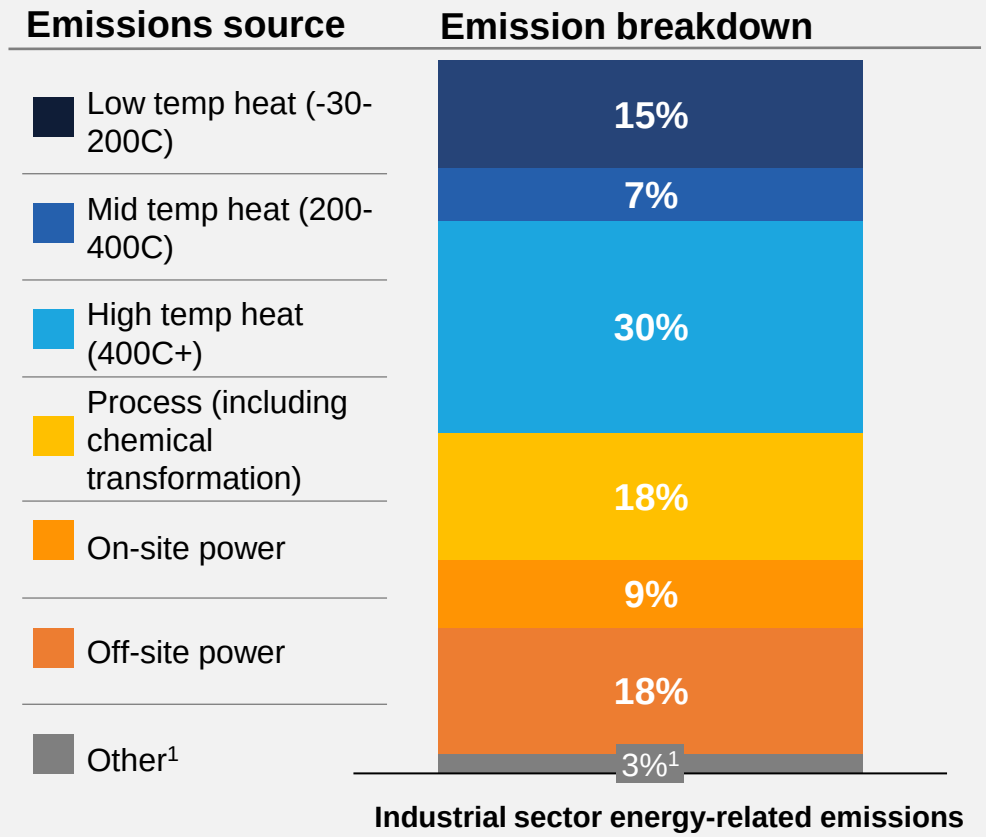
Industry Poses a Substantial Decarbonization Challenge

The production of iron and steel, cement, chemicals and refining, glass, paper, aluminum, and other durable materials form the **foundation of our economy**—our roads, bridges, homes, buildings, cars, clothes and fabrics – and **clean energy infrastructure** like wind, solar, battery, and transmission components.

The industrial sector accounted for approximately one third of U.S. CO2e emissions* and is considered **difficult to decarbonize** due to**:**

- wide array of industrial operations
- diversity of energy inputs
- range of emissions sources, including heat, power, feedstocks, and processes.

Emissions breakdown for industrial sectors of focus
2021, MT CO_2e



*Source: “Annual Energy Outlook 2021 with Projections to 2050,” U.S. Energy Information Administration, Feb. 3, 2021.

1. Includes quarry and logistics emissions (Cement)

$20+ billion investment

for transformational, advanced industrial facilities to

Solidify a first-mover advantage for U.S. industry in low- and net-zero carbon manufacturing

Substantiate the market for clean products through high-impact, replicable solutions

Build broadly shared prosperity for workers and communities

Across **hard-to-abate sectors** including:


Aluminum & Metals


Cement & Concrete


Chemicals & Refining


Process Heat


Food & Beverage


Glass & Ceramics


Iron & Steel


Pulp & Paper

Industrial Demonstrations Funding Opportunity: By the Numbers

411 concept papers reviewed

>$60B federal funding requested

~$100B in matching private cost-share

130 concept papers encouraged to submit full applications

110 full applications submitted

33 projects selected

For up to **$6B** federal funding

Matched by **$14B** in private cost-share

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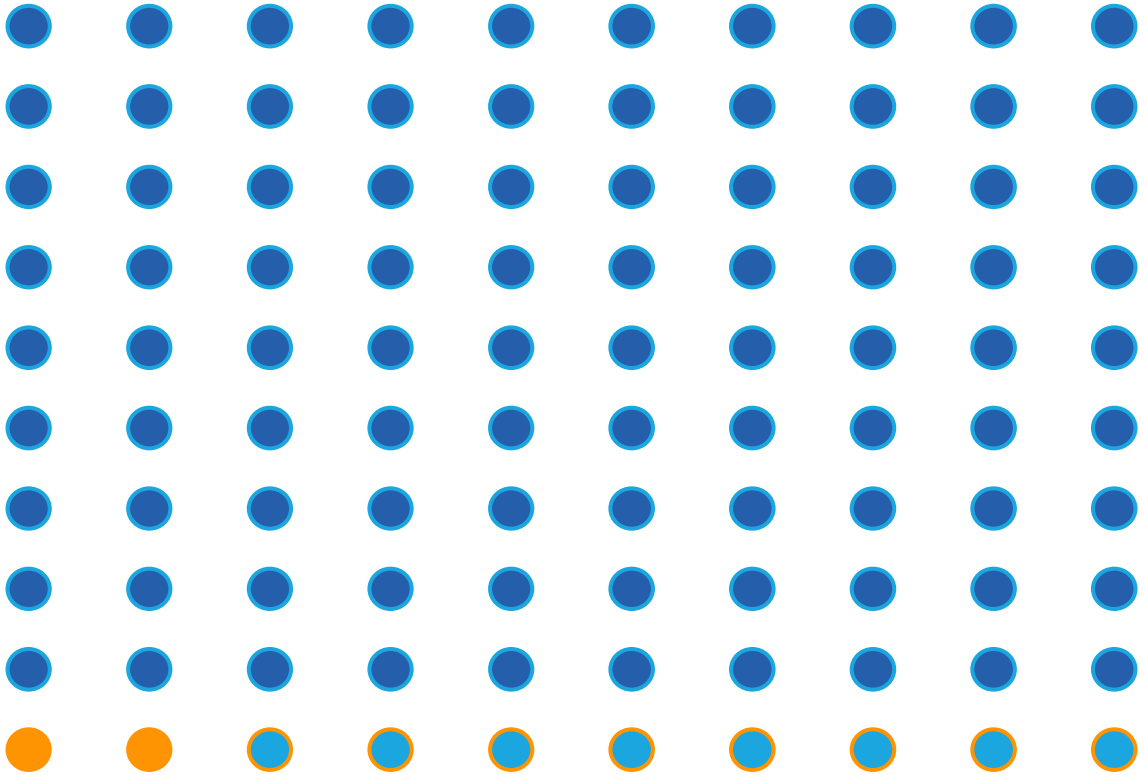
Selectees Delivered on Ambitious Program Priorities

Deep Decarbonization	**Target:** 50 – 75% emissions reductions per project	**Result:** Average **77% reduction** in carbon intensity & ~**14+ million MT CO2e reduced** annually
Timeliness	**Target:** Accelerate decarbonization into this decade	**Result:** Average performance period of **less than 6 years**
Market Viability	**Target:** Spur follow-on investment in lower-embodied carbon goods	**Result:** **35+ products** to be produced with lower embodied emissions; multiple with premium offtake agreements in place today
Community Benefits	**Target:** Select projects with the greatest benefit for the greatest number of people	**Result:** **85% of projects** improve air quality; investment will create **tens of thousands of jobs** across the United States

Unlocking a $1 Trillion Investment

$20+ billion government-enabled total investment represents important **early 2%** of the $700B - $1.1T investment required to **decarbonize the industrial sector using emerging technologies.***



U.S. need

IDP proposed projects

411 applicants requested over $60B in DOE funding with ~$100B in matching private sector cost share

IDP selected projects

33 projects will match $6B in federal funds with $14B in private cost share for a total investment of $20B

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*Source: DOE Pathways to Commercial Liftoff Industrial Decarbonization Report. $700B to 1.1T represents the estimated potential capital investment required to decarbonize the eight industrial sectors of focus in the IRA, including chemicals, refining, iron and steel, food and beverage, cement, pulp and paper, aluminum, glass and reach net zero by 2050. This number was calculated by estimating the capital expenditure for scaling select deployable and demonstration-stage decarbonization levers (e.g., CCS, clean on-site power generation from renewables, energy efficiency measures) for each industry.

Sector and Project Overviews







IRON & STEEL

6
projects

$1.5B
federal investment

2.5M
metric tons CO_2 avoided annually

Note: Anticipated based on information provided to the Department of Energy as of March 2024

	Traditional Production	Demonstrations	Real World Impact
Ironmaking	Blast Furnace + Metallurgical Coke (from coal)	Direct Reduced Ironmaking + Hydrogen	High Grades of Steel
Finishing Process	Heat from Fossil Fuels	Induction + Flexible Fuels + Electricity	Resilient Infrastructure

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CEMENT & CONCRETE

6
projects

$1.6B
federal investment

4M
metric tons CO_2 avoided annually

Traditional Production

Limestone with embodied carbon – released to the atmosphere during manufacturing

Cement plant releases emissions to atmosphere

Demonstrations

Silicate-based rocks like basalt replace limestone

Clay calcined and blended to produce cement, decreasing the need for carbon-intensive limestone

Cement plant with carbon capture

Real World Impact

Multiple decarbonized options for the most widely used building material in the world

Note: Anticipated based on information provided to the Department of Energy as of March 2024

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CHEMICALS & REFINING

& SEPARATIONS PROCESSES FOR PULP & PAPER

8
projects

$1.3B
federal investment

3M
metric tons CO_2 avoided annually

Note: Anticipated based on information provided to the Department of Energy as of March 2024

	Traditional Production	Demonstrations	Real World Impact
Carbon Capture and Utilization	 Carbon process emissions released to the atmosphere	 Carbon captured and routed to a new process for upcycling	 Fuels for marine transport Polymers for apparel Electrolytes for lithium ion batteries
Value-Added Recycling	 Waste landfilled or incinerated	 Chemical byproducts and textiles recycled	 High-quality plastics for food and medical applications Decarbonized fuels
Process Heat	 Fossil-based high-temperature heat	 Specialized, decarbonized burners Thermal batteries powered by renewables Membrane separation	 Major CO_2 emissions reductions and improved air quality for communities

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ALUMINUM & METALS

5
projects

$900M+
federal investment

4M+
metric tons CO_2 avoided annually

Note: Anticipated based on information provided to the Department of Energy as of March 2024

	Traditional Production	Demonstrations	Real World Impact
Primary Aluminum	Energy-intensive technology that struggles to compete in the global marketplace	State-of-the-art, energy-efficient smelter designed to run on 100% renewable energy	High-purity aluminum critical to defense, aerospace, electricity and transportation applications
Recycling	Material landfilled or shipped overseas for recycling	U.S.-based recycling adds value for consumers	High-purity copper for semiconductors and electric vehicles
Process Heat	Fossil-fired heat needed for multiple process steps	Fuel switching and new processes improve efficiency and remove heating steps	Decarbonized aluminum for tech companies, beverages, and packaging

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HEAT

3 GLASS |
3 FOOD & BEVERAGE |
2 PROCESS HEAT

8
projects

$700M+
federal investment

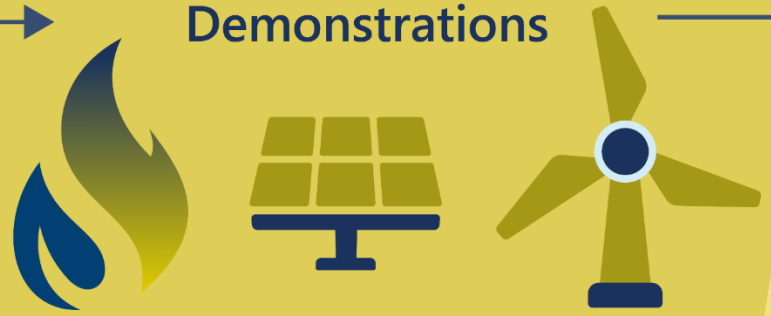
1.5M
metric tons CO_2 avoided annually

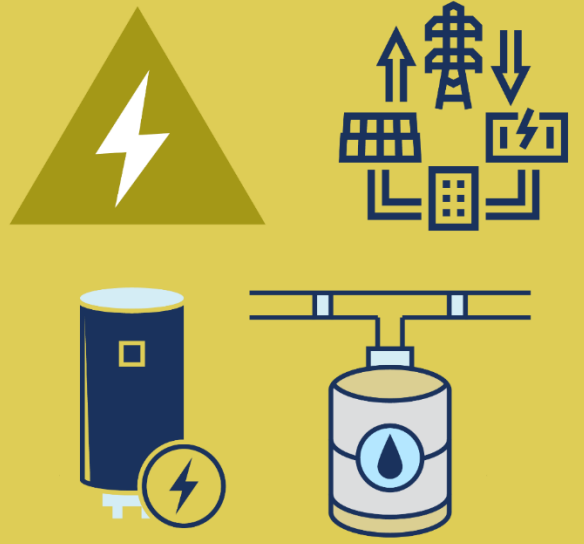
Note: Anticipated based on information provided to the Department of Energy as of March 2024

Traditional Production

Heat is critical for many manufacturing processes – and today most plants rely on fossil fuels

Demonstrations





Specialized decarbonized burners
Thermal batteries powered by renewables
Electrification approaches including microgrids, electric boilers, heat pumps, and more

Real World Impact

Decarbonized versions of products Americans use every day

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Portfolio Snapshot – Pathways to Commercial Liftoff

IDP Projects Substantially Address the Liftoff Opportunity Space

Decarbonization Levers

	Chemicals	Refining	Iron & Steel	Food & Beverage	Cement & Concrete	Pulp & Paper	Aluminum	Glass
Carbon capture, utilization, & storage	✓	✓			✓			
Industrial electrification	✓		✓	✓	✓		✓	✓
Energy efficiency	✓	✓	✓	✓	✓	✓	✓	✓
Electrolytic hydrogen	✓		✓					
Raw material substitutions	✓		✓		✓			✓
Alt. fuel (non-H2)				✓	✓		✓	✓
Alt. production methods	✓		✓		✓	✓	✓	

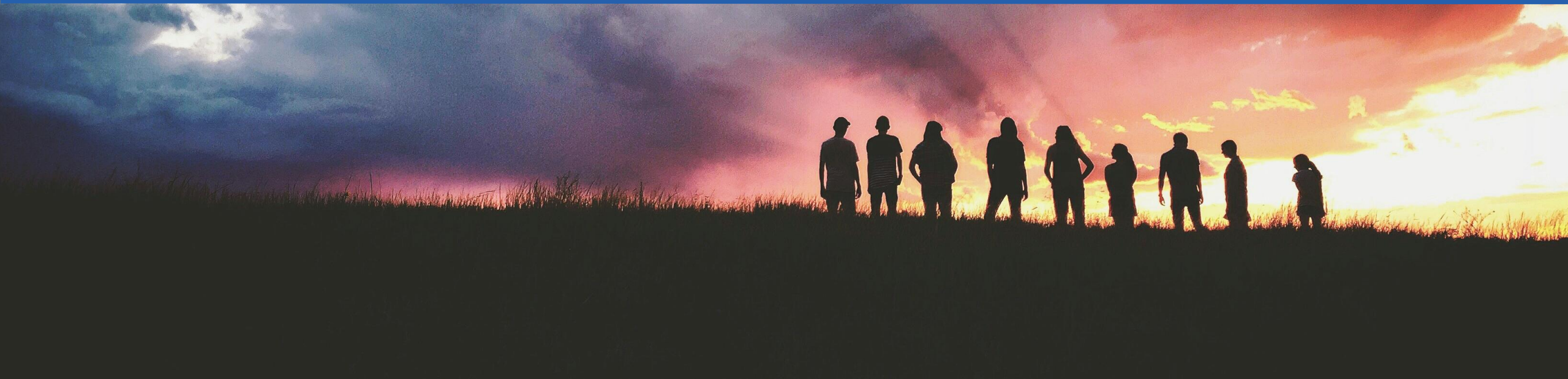
Lever demonstrated in project(s)

Lever not demonstrated in project(s)

Blank represents limited relevance to sector decarbonization

visit liftoff.energy.gov

Community Benefits



Community Benefits

Selectees described strategies and methods of accountability to ensure:

- Meaningful, two-way community and labor engagement
- Diversity, equity, inclusion, and accessibility
- Benefits to the surrounding community
- Quality jobs and workforce development
- Furthering the Justice40 Initiative

By **prioritizing community benefits**, we can ensure the next chapter in America's energy story is marked by greater justice, equity, security, and resilience.

The Inflation Reduction Act supports this goal by giving priority to projects that provide the **greatest benefit to the greatest number of people in nearby communities**.

Community & Labor Engagement

Diversity, Equity, Inclusion, & Accessibility

Greatest Benefit for the Greatest Number

Investing in the American Workforce

Justice40 Initiative

Community Benefits Snapshots

Doing Well by Doing Good for Everyday Americans

Gallo Glass will support recycling education in the community and participation at local schools. The project will establish of glass collection programs – including in disadvantaged communities – and provide California Redemption Value (CRV) proceeds to support the construction of a centralized new inclusive playground.

By replacing the burning of coke with electric induction, **U.S. Pipe and Foundry** would substantially improve air quality including reductions in particulate matter, nitrogen oxides, and sulfur oxides for communities nearby the Bessemer, Alabama, site. U.S. Pipe also has collective bargaining agreements with United Steelworkers, International Association of Machinists and Aerospace Workers, and the International Brotherhood of Electrical Workers at Bessemer.

Sublime Systems is setting the stage for new entrants in U.S. manufacturing. The company's project expects to create 70-90 permanent manufacturing jobs in a Holyoke, Massachusetts, an area that that once produced nearly all the United States' writing paper. Sublime Systems and the United Steelworkers have signed a strategic partnership, and the company has also signed Memoranda of Understanding to negotiate project labor agreements with the region's building trade unions.

Constellium Aluminum plans to build a Community Benefits Building with a new training and wellness center for all employees and an onsite childcare facility to support diversity. 100% of the hourly workforce of Constellium Ravenswood is represented by United Steelworkers Local 5668.

Next Steps & Additional Resources

Next Steps – Negotiations

Award Negotiations: DOE OCED will begin the negotiations process with project selectees

After Award: ***IF the projects receive an award (successful negotiations)***

- OCED makes a cooperative agreement award
- NEPA: OCED will work with the awarded project partners to ensure compliance with the National Environmental Policy Act (NEPA)
- Local communities (state, local, and community stakeholders) will have the opportunity for ongoing engagement with OCED and the awardees(s)

Collaboration Strategies for Industrial Decarbonization

OCED Scope

- Regional Clean Hydrogen Hubs ($8 billion)
- Advanced Reactor Demonstrations ($2.5 billion)
- Carbon Management ($7 billion)
- Industrial Demonstrations ($6.3 billion)
- Long-Duration Energy Storage Demonstrations ($505 million)
- Energy Improvements in Rural or Remote Areas ($1 billion)
- Clean Energy Demonstrations on Mine Land ($500 million)
- New Demonstration Projects ($50 million – and hopefully more!)

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Significant interagency potential to maximize funding and support for related sectors

H2: BIL 40314 - $8B
45V PTC

CCUS: BIL 41004 - $2.5B
45Q TC

Small & Medium Manufacturers:
BIL 40521 - $400M
BIL 40209 - $750M

Multiple: 48C ITC - $10B
LPO Title 17
EPA Low-embodied Emissions Construction Materials
EPA Climate Pollution Reduction Grants
Buy Clean

48C – Round 2 Announced!

View Map of Energy Communities

- On April 29th, the U.S. Department of the Treasury, the U.S. Department of Energy, and the Internal Revenue Service announced an upcoming **$6B tax credit allocation round, including approximately $2.5B reserved for historic energy communities**.

- Round 2 will have a similar application process to Round 1, including submitting a concept paper prior to a full application. Those who submitted concept papers or applications in Round 1 must still submit a concept paper and full application to be considered for Round 2.

- The **§48C portal will open** and allow users to register and submit Round 2 concept papers starting **no later than May 28th, 2024**, with a deadline 30 calendar days after the portal opens.

- DOE and Treasury will host a **virtual informational webinar** for potential applicants on **May 16, 2024** at 12:00 PM Eastern Time. You can register for this webinar on MESC's website: energy.gov/mesc

Thank you!

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energy.gov/OCED

For more information, please contact oced@hq.doe.gov