



U.S. DEPARTMENT OF
ENERGY

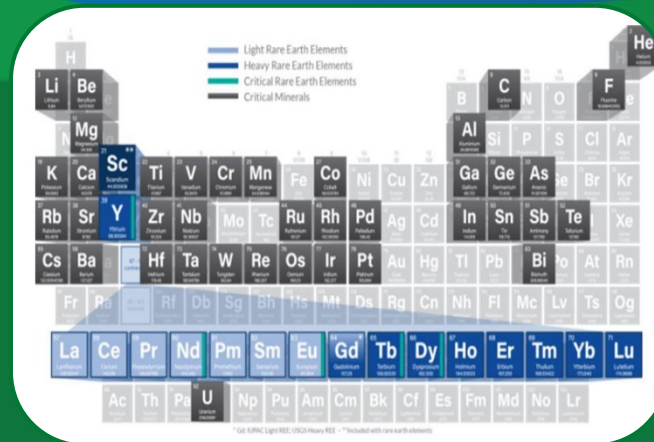
Fossil Energy and
Carbon Management

Carbon Capture Demos and DAC Hubs

Dan Hancu

Senior Program Manager, Point Source Carbon Capture
FOSSIL ENERGY AND CARBON MANAGEMENT

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Bipartisan Infrastructure Law

\$10+ billion in new carbon management funding over 5 years through the Infrastructure Investment and Jobs Act (Bipartisan Infrastructure Law).

Carbon Dioxide Removal - Direct Air Capture

Regional Direct Air Capture Hubs: \$3.5 billion
DAC Technology Prize Competition: \$115 million

Carbon Capture Demonstrations and Large Pilots: \$3.5 billion

Front-End Engineering Design Studies

Carbon Capture Technology Program: \$100 million

Carbon Dioxide Utilization and Storage

Carbon Storage Validation and Testing: \$2.5 billion
Carbon Utilization Program: \$310 million

Hydrogen Hubs

\$8 billion (for at least four projects, including at least one using fossil fuels with carbon management)

Carbon Capture Demonstrations – Key Provisions



Demonstration projects (16 962(b)(2)(C) of the Energy Policy Act of 2005 (42 U.S.C. 17 16292(b)(2)(C))



\$2.5B

- Establish a demonstration program through a competitive, merit-reviewed process,
- Enter into cooperative agreements for demonstration projects to demonstrate the construction and operation of 6 facilities to capture carbon dioxide from coal electric generation facilities (2 projects), natural gas electric generation facilities (2 projects), and industrial facilities (2 projects).

Each demonstration project shall be designed to further the development, deployment, and commercialization of technologies to capture and sequester carbon dioxide emissions from new and existing coal electric generation facilities, natural gas electric generation facilities, and industrial facilities;

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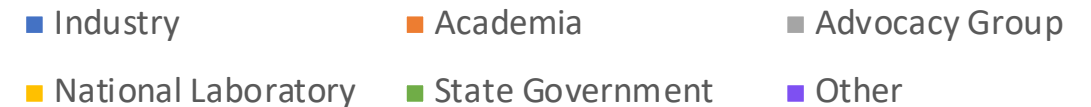
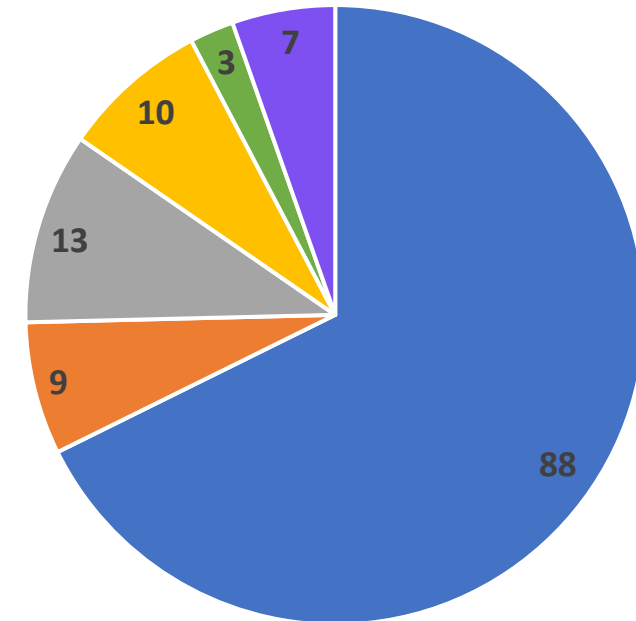


RFI Response.. Point Source Capture

Response Overview

- 130 respondents
 - Industry (88)
 - Academia (9)
 - Advocacy Group (13)
 - National Laboratory (10)
 - State Government (3)
 - Other (7)
 - Test center; consulting firm; service provider; venture capital firm

Respondents for TA1



RFI Response.. PSC Overall Summary



Major Ideas

• PSC Technology

- **Applications..** power generation and industrial sectors.
- **Technology Maturity..** Even distribution between lab/bench scale, pilot scale, and demo/commercial scale
- **Scale..** 0.5 – 4 MTA CO₂

• Host sites Location

- Rural & industrial areas, with varying demographics and local interests
- Nearby fuel resources and/or storage options beneficial to limiting additional emissions and lowering costs.

• Business Case

- Many proposed projects rely on federal and state policies that encourage investment in capture technologies.
- 45Q provides a critical benefit for many, but it is still considered inadequate by most.

• Permitting

- Critical limiting step, especially with Class VI well permits from EPA.
- Well-defined and reliable policy is key to ensuring investor confidence in large-scale projects.



Carbon Capture Large Pilots.. Key Provisions



\$387M FW 22
\$200M FW 23
\$200M FW 24
\$150M FW 25.

The term “large-scale pilot project” means a pilot project that—

(A) represents the scale of technology development beyond laboratory development and bench scale testing, but not yet advanced to the point of **being tested under real operational conditions at commercial scale**;

(B) represents the scale of technology necessary to gain the operational data needed to understand the technical and performance risks of the technology before the application of that technology at commercial scale or in commercial-scale demonstration; and

(C) **is large enough**—

(i) to **validate scaling factors**; and

(ii) to demonstrate the interaction between major components so that control philosophies for a new process can be developed and enable the technology **to advance from large-scale pilot project application to commercial-scale demonstration** or application.

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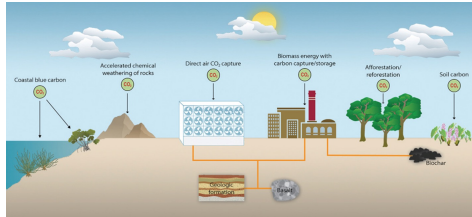
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DAC Hubs– Key Provisions



Direct Air Capture Hubs

SEC. 40308. CARBON REMOVAL; *Amended Section 969D of the Energy Policy Act of 2005 (42 U.S.C. 16298d)*



HUB DEFINITION:

a network of direct air capture projects, potential carbon dioxide utilization offtakers, connective carbon dioxide transport infrastructure, subsurface resources, and sequestration infrastructure located within a region.

Regional DAC Hubs

\$3.5 B

FY 22 – FY 26: \$700M / yr.

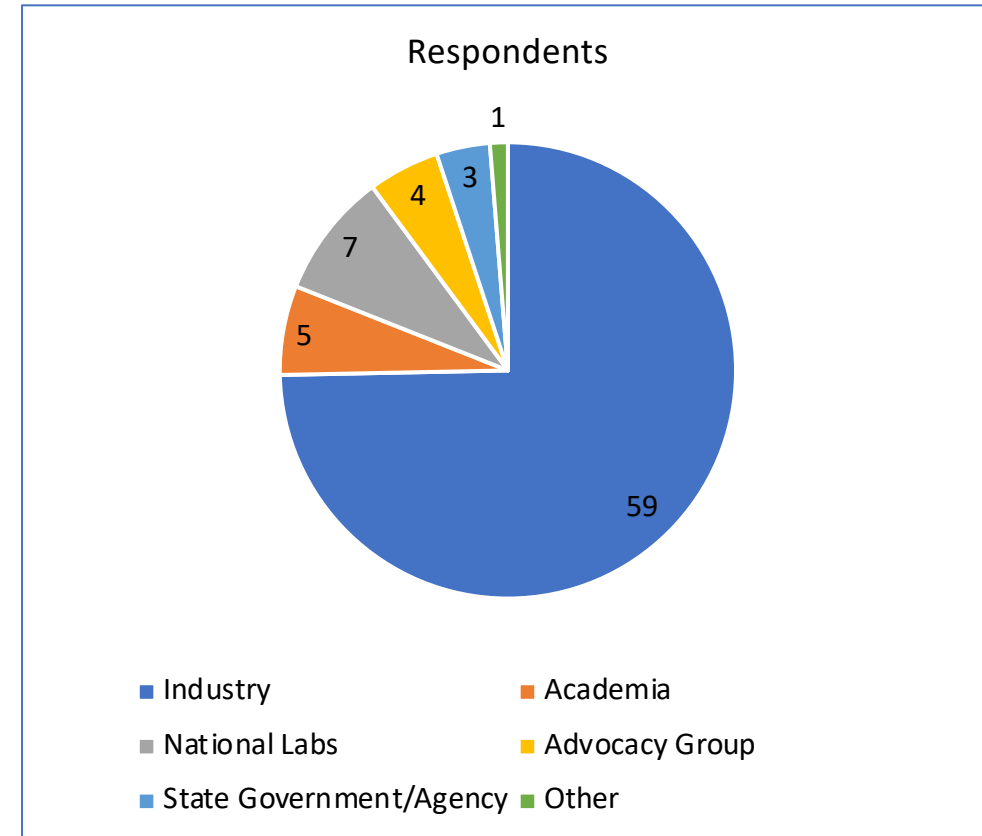
Each of the 4 regional direct air capture hubs developed shall be a regional direct air capture hub that has the capacity to capture and sequester, utilize, or sequester and utilize at least 1,000,000 metric tons of carbon dioxide from the atmosphere annually from a single unit or multiple interconnected units.



RFI Response.. DAC Hubs Overall Summary

Response Overview

- 79 respondents
 - Industry (59)
 - Academia (5)
 - National Labs (7)
 - Advocacy Group (4)
 - State Government/Agency (3)
 - Other (1)





RFI Response.. DAC Hubs Overall Summary

Overview of Major Ideas

- Hub Location

Most of the respondents recommended hubs located in the Gulf Coast and Pacific Coast regions close to:

- CO₂ storage reservoirs
- Zero carbon energy sources (nuclear, wind, solar)
- Existing infrastructure: Pipelines and Transportation & Carbon utilization technologies
- Heat sources for regeneration of capture media

- Technology Readiness

- Most Mature Tech (TRL 6-9): solvents and solid sorbents
- Least Mature Tech (TRL 1-3): membranes and electrochemical
- Wide range for cost and current scale indicated for the respondents' DAC technologies

- DAC Hub Strategies Proposed

- Develop a large DAC system with access to infrastructure, CO₂ pipeline and storage, and zero carbon energy, which would anchor the hub and encourage other lower TRL DAC technologies and smaller DAC systems to join in the future
- Design hub using the most mature and lowest cost DAC technologies to achieve large-scale deployment
- Design hub using multiple technologies at each hub over a range of TRL levels to speed hub development



Four Regional Clean Direct Air Capture Hubs

Bipartisan Infrastructure Law



Bipartisan Infrastructure Law » Four Regional Clean Direct Air Capture Hubs

Office: Office of Clean Energy Demonstrations

Funding amount: \$3,500,000,000

Period of Availability: \$700,000,000 annually for the period of fiscal years 2022 through 2026 (to remain available until expended)

Funding Mechanism: Grant, Cooperative Agreement, or Other

New Program: Yes



NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA



Notice of Intent No.: DE-FOA-0002746

DISCLAIMER: The “Notice of Intent to Issue” is for informational purposes only; the Department of Energy is not seeking comments on the information in this notice and applications are not being accepted at this time. Any information contained in this notice is subject to change.

**This is a Notice of Intent to issue
Funding Opportunity Announcement No.: DE-FOA-0002735**

Bipartisan Infrastructure Law (BIL): Regional Direct Air Capture (DAC) Hubs (Section 40308):

The Department of Energy (DOE) National Energy Technology Laboratory (NETL) intends to issue a Funding Opportunity Announcement (FOA) on behalf of the Office of Fossil Energy and Carbon Management (FECM). The FOA is anticipated to be issued in the fourth quarter of Fiscal Year 2022 and will be funded by the BIL.

BACKGROUND

On November 15, 2021, President Joseph R. Biden, Jr. signed the Infrastructure Investment and Jobs Act (Public Law 117-58), also known as the BIL. The BIL authorizes and appropriates a total of \$3.5 billion for the five (5) year period encompassing fiscal years (FYs) 2022 through 2026 for Regional Direct Air Capture (DAC) Hubs (Section 40308). If issued, this FOA will implement Section 40308 of the BIL to contribute to the development of regional DAC Hubs while incorporating environmental justice, community engagement



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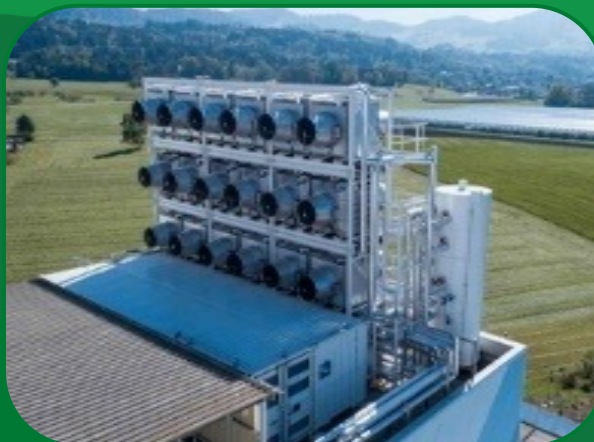


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Questions?

dan.hancu@hq.doe.gov



Legend:

- Light Rare Earth Elements
- Heavy Rare Earth Elements
- Critical Rare Earth Elements
- Critical Minerals

H																	He
Li	Be											B	C	N	O	F	Ne
Mg												Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr			

* Ga, In, Sn, Pb, Bi, Po, At, Rn, Fr, Ra, Ac, Th, Pa, U, Np, Pu, Am, Cm, Bk, Cf, Es, Fm, Md, No, Lr are included with rare earth elements.

