



Capturing Leadership

Policies for the US to advance Direct Air Capture technology

WASHINGTON, D.C. | MAY 9, 2019

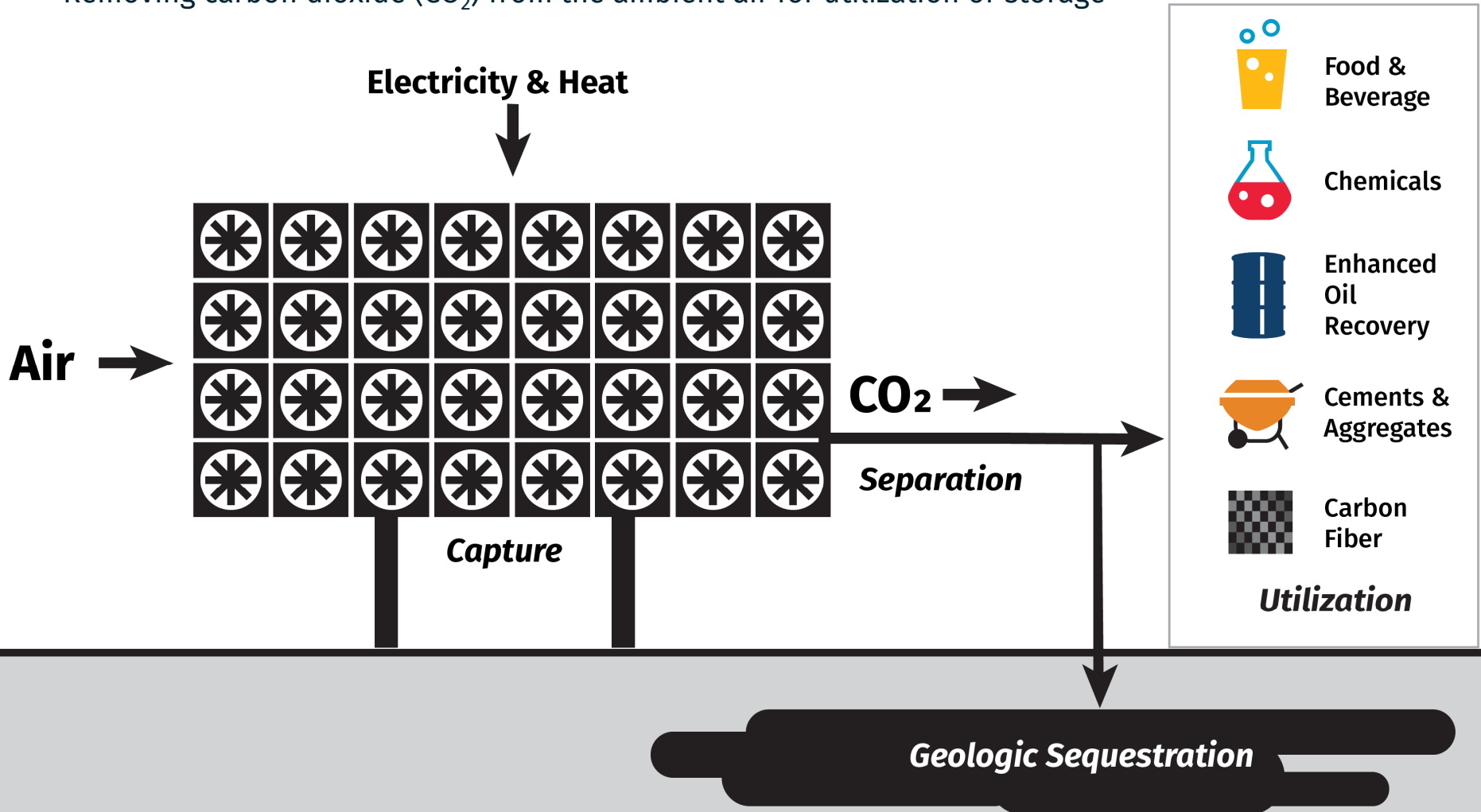
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Direct Air Capture (DAC) technology

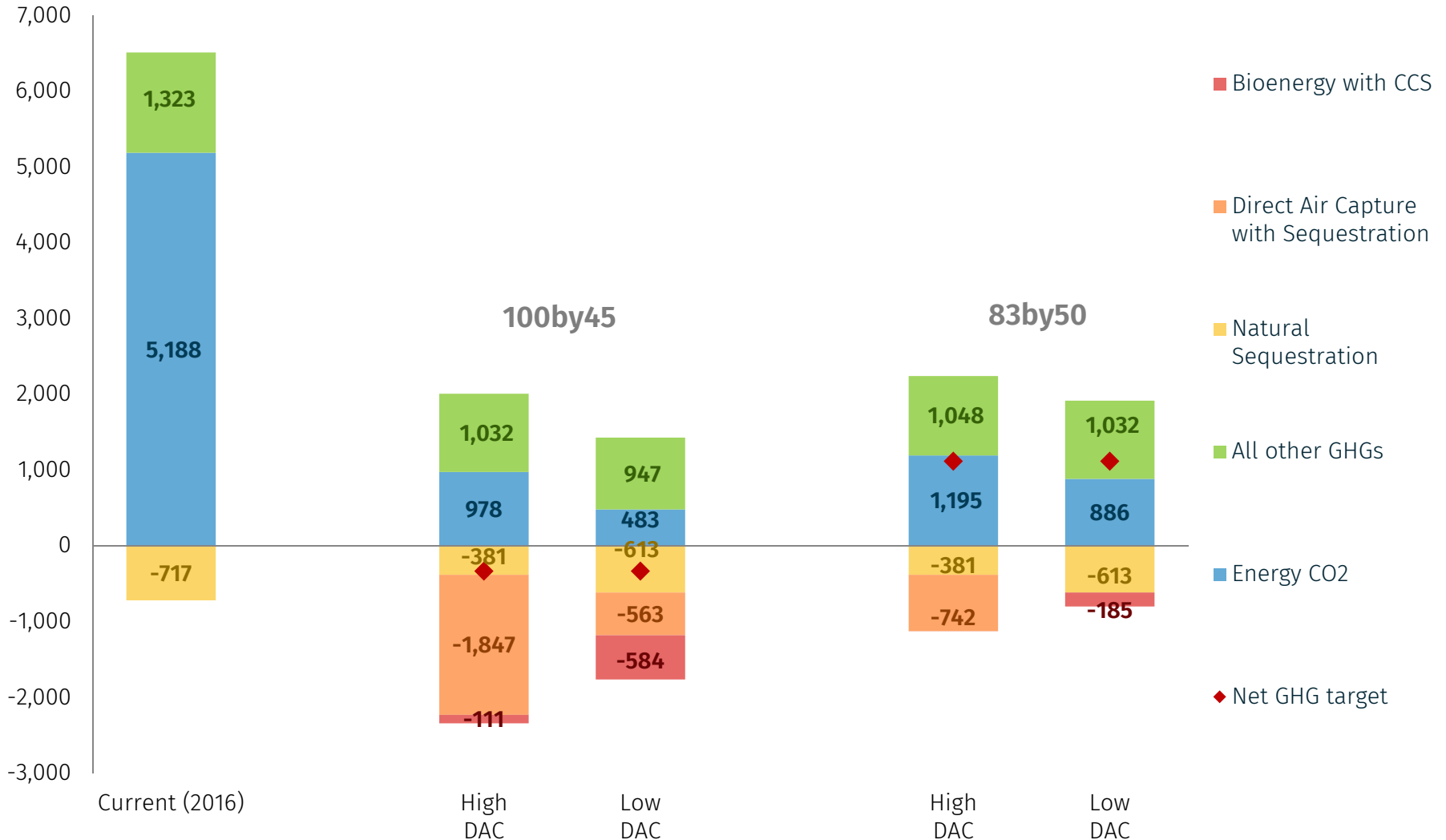
Removing carbon dioxide (CO₂) from the ambient air for utilization or storage



Source: Rhodium Group adapted from World Resources Institute

DAC is key to meeting climate targets

US greenhouse gas emissions, current and 2050 (million metric tons CO₂e)

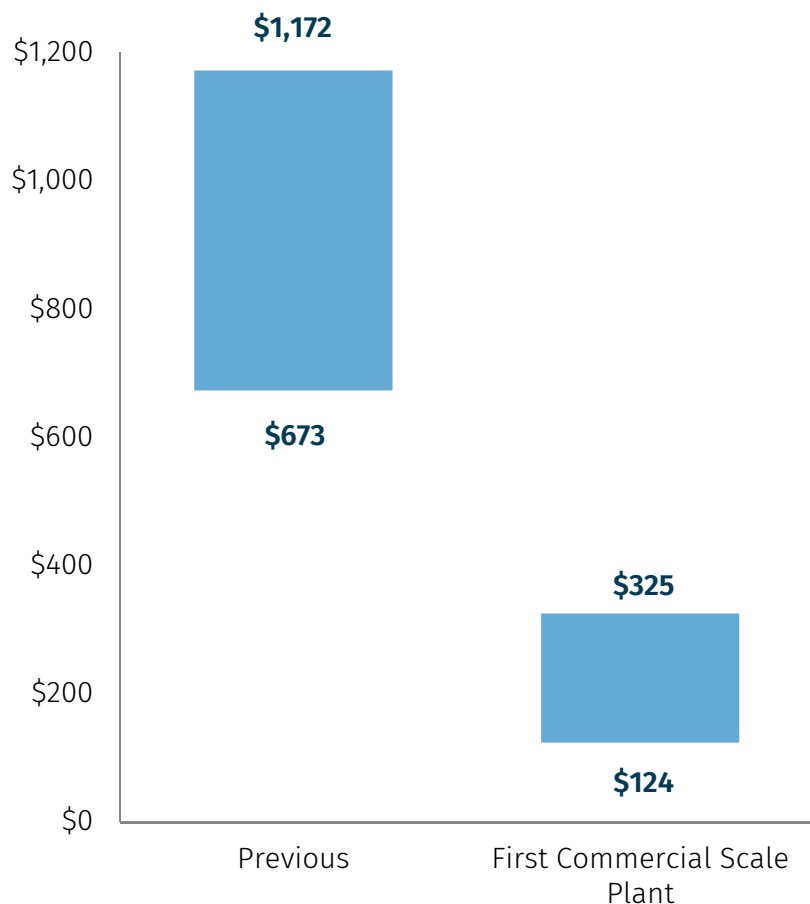


Source: Rhodium Group and Evolved Energy Research analysis.

DAC technology is ready to break through

DAC cost estimates have declined

Levelized \$ per ton CO₂ removed from the atmosphere



DAC State of play

- Three DAC companies with commercial-ready technology



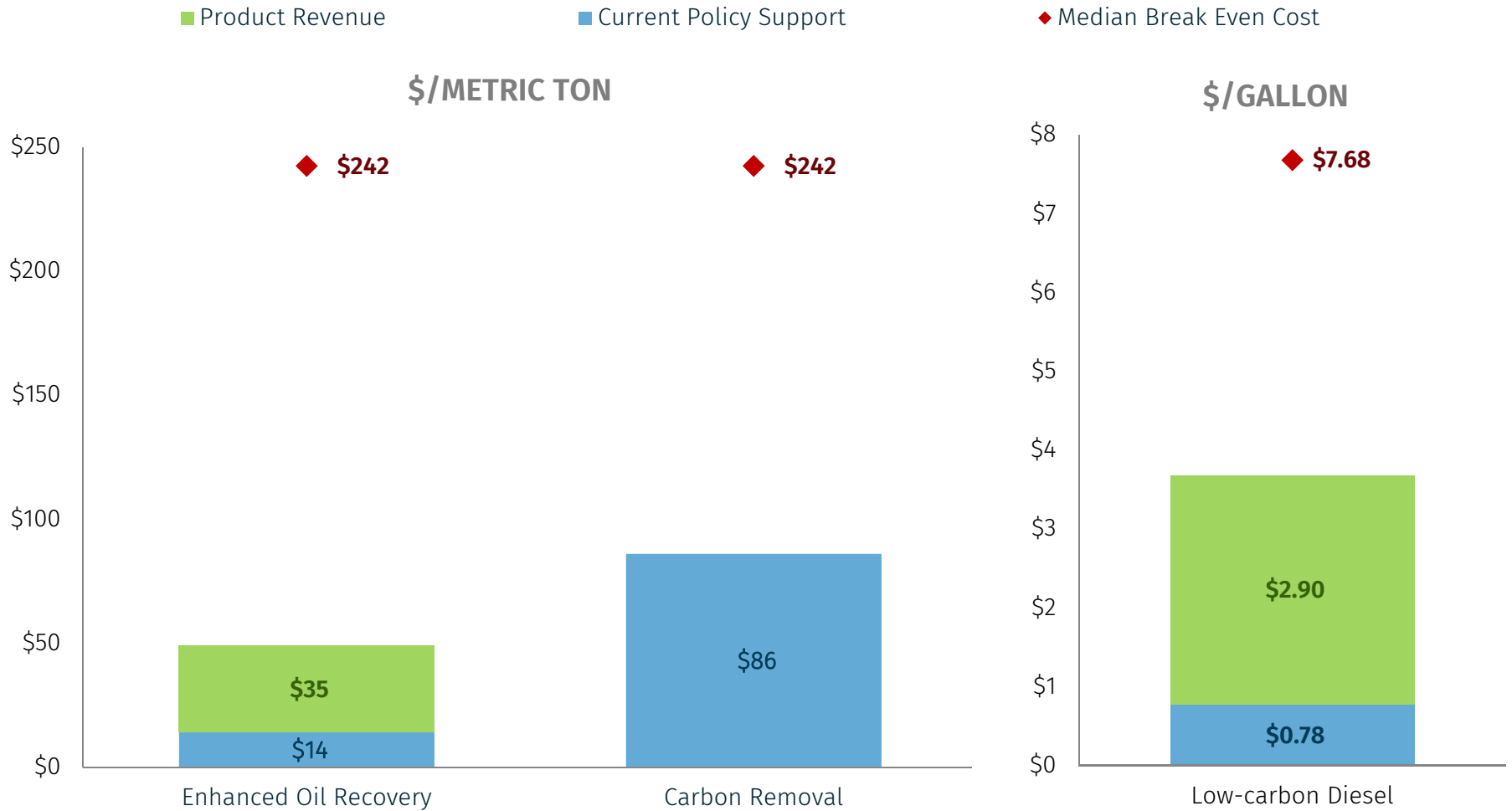
- 11 plants deployed, max capacity: 4,000 tons/year
- Initial policy support: Federal Section 45Q Tax Credit and California Low Carbon Fuel Standard
- Potential \$5 trillion worth of products could be produced globally with CO₂
- Nearly 400 million ton global demand for CO₂ as a commodity

Source: House, et al. APS, NASEM and Rhodium Group analysis. Note: Values do not include the cost of transportation, injection, and storage of CO₂. All values are adjusted for inflation. Expected costs reflected estimates

Federal action is needed for US leadership

DAC costs exceed current revenue opportunities

30-year levelized \$2018 per metric ton CO₂



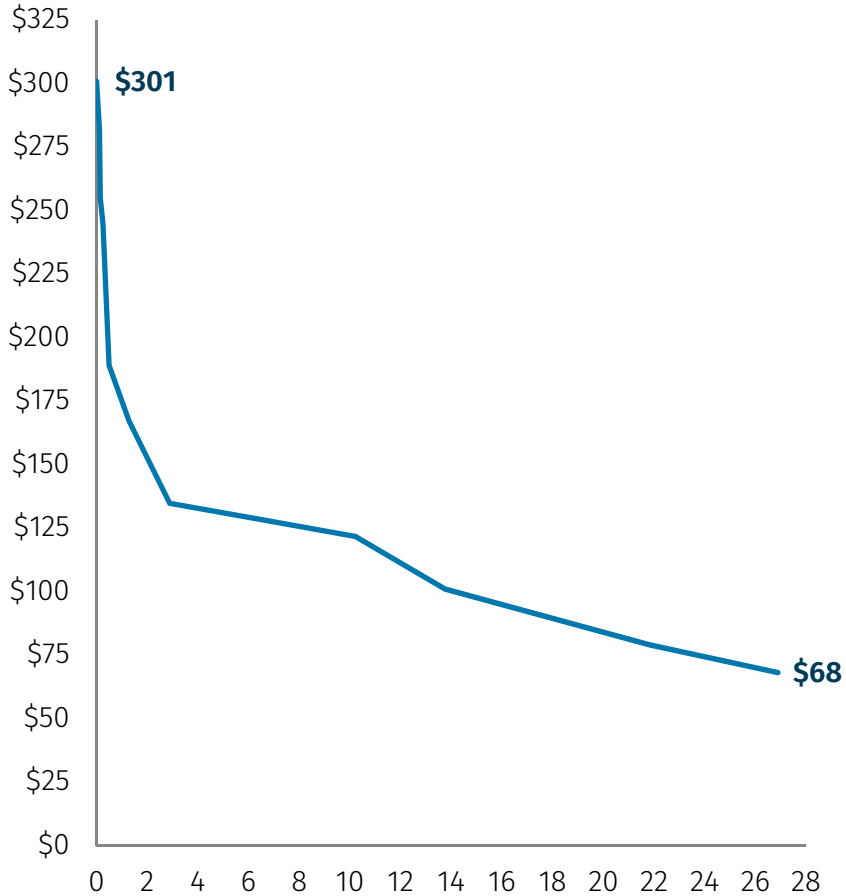
Source: Rhodium Group analysis. Note: all values reflect median DAC costs.

History can repeat itself with federal action

Policies that accelerate deployment also tend to drive down costs

Historical cost of solar energy

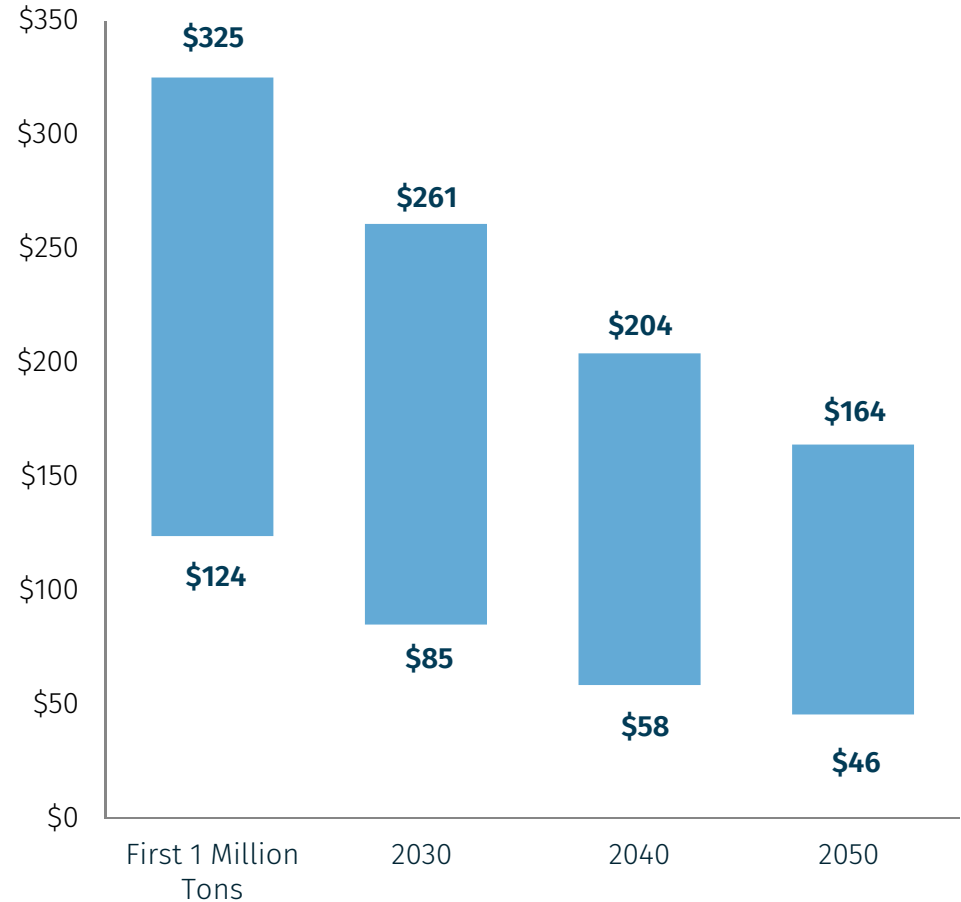
Cumulative deployment, Gigawatts (x-axis);
Levelized cost of energy, \$/megawatt hour (y-axis)



Source: Lawrence Berkeley National Lab, EIA, Rhodium Group analysis.

Current and projected cost of DAC with policy action

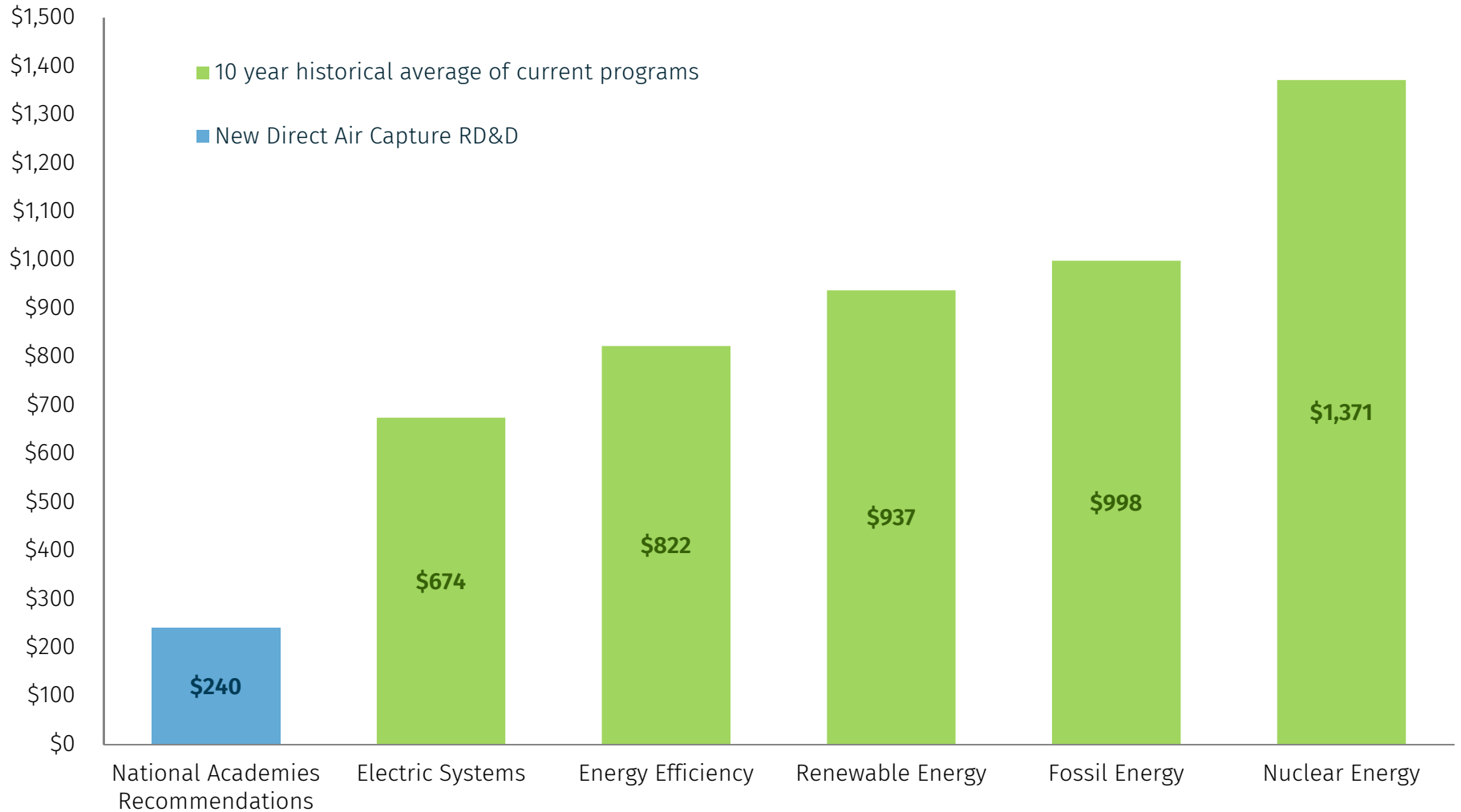
30-year levelized \$2018/metric ton CO₂



Source: Rhodium Group analysis.

Energy Department RD&D will be key

10-year average annual funding, \$millions



Source: NASEM, Congressional Research Service and Rhodium Group analysis.

Policies to deploy 9 million tons of DAC capacity by 2030

Pathway 1: Leverage government procurement

- Department of Defense can ramp up competitive procurement of DAC based fuels from zero to roughly 23% of 2017 operational fuel consumption in 2030
- General Services Administration can launch a competitive procurement program for carbon removal from DAC with sequestration, and procure low-carbon products made with DAC CO₂

Pathway 2: Improve the Section 45Q tax credit

- Congress can make several improvements to this program all focused on DAC:
 - extend the commence-construction deadline for DAC eligibility to the end of 2030
 - extend the credit payout period to 30 years
 - increase the value of the credit for geologic storage to \$180 per ton
 - lower the minimum capture and use thresholds to 10,000 tons per year

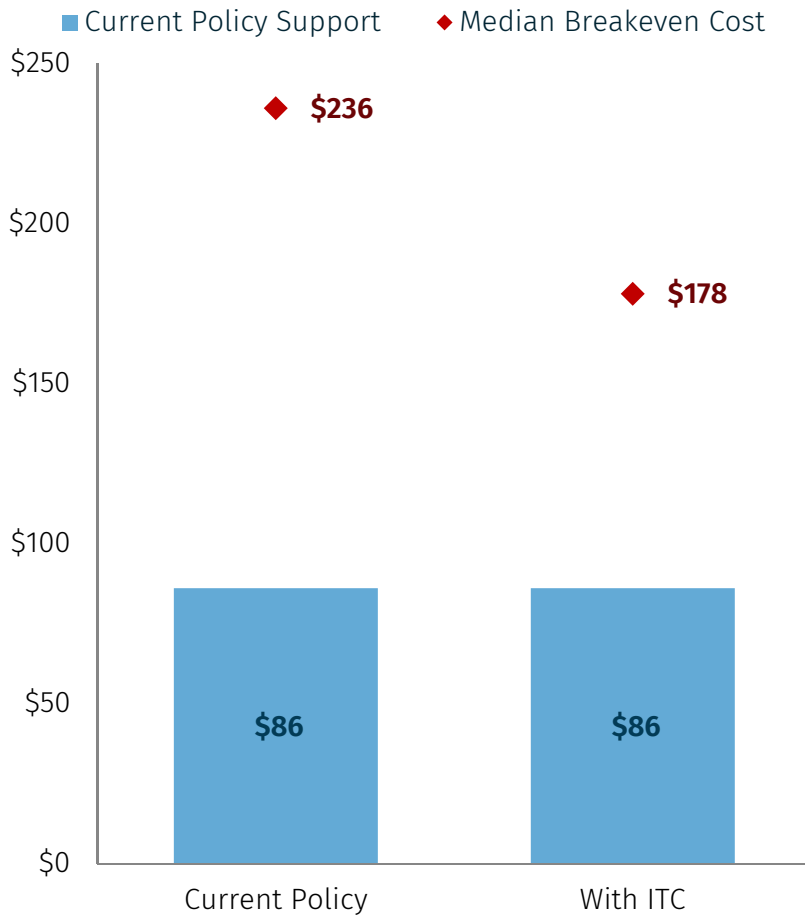
Pathway 3: Reform clean fuels policy

- Congress can expand eligibility for the Renewable Fuels Standard or establish a standalone mandate for very low-carbon, drop-in fuels to increase consumption of DAC- derived fuels
- Set a 2030 target of 0.4% of 2017 US on-road fuel consumption

Policies to complement RD&D

Investment Tax Credit could cut cost of DAC with sequestration by 25%

\$ per ton of CO₂ removed



Source: Rhodium Group analysis.

Remove non-cost barriers to DAC

- Establish clear rules for geologic storage monitoring and liability
- Streamline pipeline and CO₂ storage permitting rules
- Map and assess geologic formations for storage suitability
- Proactively set standards for CO₂-based products

Incorporate DAC into other policy goals

Clean Energy Standards

- Allow utilities to buy credits for CO₂ removed by DAC with sequestration as an offset for electric power emissions
- Create incentives similar to California's Low Carbon Fuel Standard

Infrastructure

- Require low-carbon building materials (concrete, steel, cement) for all federal construction projects
- Fast-track and fund CO₂ pipelines

Carbon pricing

- Allow DAC with sequestration to get credit for CO₂ removal under a carbon tax or cap-and-trade program
- Use revenue from carbon pricing to fund DAC research and development

Comprehensive climate policy

- Mobilize resources to get the US on track toward decarbonization
- Establish a new federal agency tasked with removing CO₂ from the air using DAC with sequestration

It's time for the US to lead on DAC

DAC technology is ready to go

DAC needs to be a part of the portfolio of zero emissions technologies required to meet climate targets

US can leverage its world-leading CO₂ infrastructure and Enhanced Oil Recovery experience as a stepping stone for DAC at scale

US needs to start now so DAC technology is available in time and at the scale needed to contribute to avoiding the worst climate impacts

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Full report available here:

<https://rhg.com/research/capturing-leadership-policies-for-the-us-to-advance-direct-air-capture-technology>

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