The webinar will start in a few moments.

Thank you for joining us.
Clean Energy Ministerial CCUS Initiative Webinar:

Direct Air Capture of CO₂:
Helping to Achieve Net-Zero Emissions

Tuesday 21 April 2020
10:00 EDT | 16:00 CET | 22:00 CST
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  https://www.youtube.com/user/cleanenergypolicy

  https://cleanenergysolutions.org/training/carbon-capture

**Some Housekeeping Items (continued)**
**AGENDA**

## Welcome & Introductory Remarks
- **Jarad Daniels**  
  Director, Office of Strategic Planning, Analysis, and Engagement  
  U.S. Department of Energy

## Presentation
- **Dr. Julio Friedmann**  
  Senior Research Scholar  
  Center on Global Energy Policy, Columbia University
- **Lori Guetre**  
  Vice President of Business Development  
  Carbon Engineering
- **Christoph Beuttler**  
  CDR Manager  
  Climeworks
- **Dr. Peter Eisenberger**  
  Chief Technology Officer  
  Global Thermostat
- **Mark Ackiewicz**  
  Director, Division of CCUS R&D  
  U.S. Department of Energy

## Question and Answer Session
Jarad Daniels leads the Office of Strategic Planning, Analysis, and Engagement within the Department of Energy (DOE) Office of Fossil Energy, including domestic programs and international engagements conducted in close collaboration with industry, academia, and multi-lateral organizations.

Mr. Daniels has twenty-five years of experience with the DOE, managing advanced technology programs and working in several national laboratories throughout the United States. His expertise includes domestic and global energy and environmental technologies, policies, and programs.

Mr. Daniels holds a Master of Science degree in Chemical Engineering from the University of California at Berkeley.
Dr. Julio Friedmann is a Senior Research Scholar at the Center for Global Clean Energy Policy at Columbia University, where he leads a new initiative in carbon management. He is also CEO of Carbon Wrangler, LLC. Recently, he served as Principal Deputy Assistant Secretary for the Office of Fossil Energy at the Department of Energy, where he held responsibility for DOE’s R&D program in advanced fossil energy systems, carbon capture, and storage (CCS), CO2 utilization, and clean coal deployment. His expertise includes Large-Scale Carbon Management, CO2 removal, CO2 recycling, Oil and Gas systems, international engagements in clean energy, and inter-agency engagements within the US government. He has also held positions at Lawrence Livermore National Laboratory, including Senior Advisor for Energy Innovation and Chief Energy Technologist, is a Distinguished Associate at the Energy Futures Initiative, and serves as a special advisor to Total SA and the Global CCS Institute. He was recently named as a Senior Fellow to the Breakthrough Institute and a Stanford Precourt Scholar.

Dr. Friedmann is one of the most widely known and authoritative experts in the U.S. on carbon removal (CO2 drawdown from the air and oceans), CO2 conversion and use (carbon-to-value), and carbon capture and sequestration. Dr. Friedmann received his Bachelor of Science and Master of Science degrees from the Massachusetts Institute of Technology (MIT), followed by a Ph.D. in Geology at the University of Southern California. He worked for five years as a senior research scientist at ExxonMobil, then as a research scientist at the University of Maryland.
Lori Guetre  
*Vice President of Business Development*  
Carbon Engineering

Lori has been with Carbon Engineering since April 2018 and brings more than 28 years of experience in the engineering, business development, and financing of complex, mission-critical systems. At CE she leads the development of DAC-based decarbonization solutions in the United States.

Before joining CE, Lori held a variety of senior executive positions in the aerospace sector including General Manager and VP Business Development. Lori holds a Bachelor’s in Computer Engineering and a Master’s in Electrical Engineering.
Christoph Beuttler is Carbon Dioxide Removal Manager at Swiss Direct Air Capture pioneers Climeworks. He is also deputy director of Risk Dialogue Foundation, a Swiss NGO, and visiting lecturer in Risk Perception and Communication in Science and Policy at the Swiss Federal Institute of Technology (ETH) in Zürich.

Christoph is an expert on Negative Emissions as well as CO2 utilization with several years of experience in the field. He was educated in Heidelberg and London. His background is in Economics, Management and Sustainability.
Dr. Peter Eisenberger is a renowned scientist, corporate research executive, business entrepreneur, and leading academic. He started his career at Bell Labs during its heyday, where he pioneered the use of particle accelerators to produce intense X-rays to conduct basic research on the fundamental properties of materials. Dr. Eisenberger was then recruited by Exxon following the oil shocks of the late seventies to lead their Physical Sciences R&D laboratory, where he led a team of international scientists looking at alternative energy technologies including solar energy.

He left Exxon for Princeton University, where he was appointed Professor of Physics and founded the Princeton Material Institute, which focused on multidisciplinary applied research in environmental technologies, among others. In 1996, Dr. Eisenberger joined Columbia University where he was appointed Professor of Earth and Planetary Sciences, Vice-Provost, and founding Director of the Columbia Earth Institute and Director of the renowned Lamont-Doherty Earth Observatory.

In 2006, he co-founded Global Thermostat, which has developed a unique technology for the capture of carbon dioxide from air. Dr. Eisenberger holds degrees in physics from Princeton and Harvard.
Mr. Mark Ackiewicz is the Director for the Division of Carbon Capture, Utilization and Storage (CCUS) Research and Development (R&D) at the Department of Energy (DOE). He is responsible for planning, management, and administration of the division’s R&D portfolio. In this role, he leads a team of scientists and engineers that are collaborating and working domestically and internationally with industry, national laboratories, and universities on developing advanced and transformational CCUS technologies.

Before joining DOE in 2007, he worked as a consultant, providing technical, analytical, and strategic planning services to the DOE and its technical research programs. Early in his career, Mark worked in the private sector in various industrial research and engineering positions, where he was responsible for process development and scale-up activities.

Mark has a B.S. in Chemical Engineering from Johns Hopkins University, and a Master’s in Engineering Management from George Washington University.
CARBON CAPTURE, UTILIZATION & STORAGE
ACCELERATING CCUS TOGETHER
AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL
Clean Energy Ministerial: global process to accelerate clean energy

90% Clean energy investments

75% Global CO$_2$ emissions

26 CEM Members
CEM CCUS Initiative Member Governments

Saudi Arabia
United States
South Africa
Norway
Japan
United Arab Emirates
Mexico
China
Canada
Netherlands
Accelerating CCUS Together by:

1. Actively **including** CCUS within global clean energy agenda
2. Bringing **together** the private sector, governments and the investment community
3. Facilitating identification of both near and longer-term **investment opportunities**
4. Disseminating **best practice** in CCUS policy, regulation and investment
Direct Air Capture: What it is & why we need it

Dr. S. Julio Friedmann
Center for Global Energy Policy, Columbia Univ.
Clean Energy Ministerial Webinar, April 21st, 2020
Already at 95% lock-in. All IPCC pathways 2°C or less require CCS

IEA: World Energy Outlook 2018
CO2 removal will become one of the world’s largest markets

Climate math asks for 10-20 Gt CO2/yr

At $50-100/ton, that’s a HUGE market

“...project the use of carbon dioxide removal (CDR) on the order of 100–1000 GtCO2 over the 21st century.”
– IPCC 1.5°C Report (2018)
Direct Air Capture: separating CO$_2$ from the air for either use or storage

ICEF Roadmap, 2019
DACCS has no resource constraint and “uniform” costs for application

Cost curve is flat, so cost should vary chiefly as a function of deployment
Happy Talk
We know the problem

We need to rethink our approach

Beyond “moral hazard”
• All options are acceptable and likely required
• Be humble and generous

Clear-eyed on carbon
• TONS are the metric – reduce, remove, recycle
• Avoided emissions $\neq$ reduced or returned emissions

We need more
• Innovation: in technology, policy, finance, and business
• Learning through doing works

Not what should we do – what CAN we do
CLEAN ENERGY MINISTERIAL CCUS
WEBINAR
Direct Air Capture of CO2: Helping to
Achieve Net-Zero Emissions

PRESENTED BY
Lori Guetre, VP Business Development

DATE
April 21, 2020

Copyright © 2020 – Carbon Engineering Ltd.
Carbon Engineering Brings…

- Negative emissions by removing CO₂ from the atmosphere.
- Drop-in compatible fuels that reduce the carbon intensity of transportation fuels by recycling atmospheric carbon.
Carbon Engineering’s Direct Air Capture Technology

PROVEN, SCALABLE, AND COST-EFFECTIVE REMOVAL OF ATMOSPHERIC CARBON DIOXIDE

**INDUSTRIALLY SCALABLE**
A combination of pre-existing technologies have been adapted and combined with patented innovations and proprietary know-how, which has allowed us to scale rapidly to the full commercial size of 1 Mt/yr.

**CLOSED CHEMICAL CYCLE**
Non-volatile, non-toxic, closed-loop chemical process that meets environmental health and safety standards and minimizes operating costs.

**FREEDOM OF LOCATION**
Plants can be located where economics are optimum to take advantage of low-cost local energy and proximity to geologic sequestration sites, low-carbon fuel markets, or other demand center.

### EQUIPMENT

<table>
<thead>
<tr>
<th><strong>INDUSTRIAL PRECEDENT</strong></th>
<th><strong>EQUIPMENT</strong></th>
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</thead>
<tbody>
<tr>
<td>Industrial cooling tower</td>
<td>AIR CONTACTOR</td>
</tr>
<tr>
<td>Water treatment technology</td>
<td>PELLET REACTOR</td>
</tr>
<tr>
<td>Standard equipment for converting Calcium Oxide to Calcium Hydroxide</td>
<td>SLAKER</td>
</tr>
<tr>
<td>Refractory lined circulating fluidized bed calciners are commonly used in mining for iron ore processing</td>
<td>CALCINER</td>
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</tbody>
</table>

## AIR TO FUELS™ Solution: A Convergence of Innovations
Harnessing Trends in Four Technologies

<table>
<thead>
<tr>
<th>Key Enablers</th>
<th>Advantages</th>
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<tbody>
<tr>
<td>CE Direct Air Capture Technology</td>
<td>• Collects atmospheric CO₂ at large scale and low cost.</td>
</tr>
<tr>
<td>Advances in Electrolysis</td>
<td>• Megawatt scale electrolyzers are emerging. Levelized costs in the range of $15-20/MJ.</td>
</tr>
<tr>
<td>Abundance of Low-Cost Renewable Power</td>
<td>• Solar PV and Wind have become the cheapest sources of electricity with prices falling below $20/MWh from the best generating locations.</td>
</tr>
<tr>
<td>AIR TO FUELS™ Fischer Tropsch Fuel Synthesis</td>
<td>• Proven Technology - 250,000 bbl/day of liquid fuels are produced from a variety of feedstocks from Fischer-Tropsch process.</td>
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CE’s Vision for the Next Ten Years? Tackle the Abatement Challenge…

1. There currently are no known solutions above ~38 Gt CO\textsubscript{2}eq/yr.

2. The cost of abatement rises quickly at larger volumes, to over $1,000/t-CO\textsubscript{2}eq.

3. The world is on its way to 80 Gt CO\textsubscript{2}eq/yr.

4. None of this addresses legacy CO\textsubscript{2} which is 95% of the problem.

Source: Goldman Sachs Global Investment Research

The world needs to accelerate technological solutions that are affordable and can scale.
The Missing Piece

Only one solution is available today that:

1. Can solve today’s abatement gap
2. Is affordable compared to alternatives for many emissions
3. “Has the potential to be almost infinitely scalable”¹
4. Supports climate restoration through permanent carbon removal ("negative emissions")

¹ Goldman Sachs – Carbonomics: The Future of Energy in the Age of Climate Change
Hypothetical Cost for “Net Zero” Today – With DAC+S at $150/t

The first 38 Gt would cost approximately $3 trillion / yr (capping the cost at $150/t) + The next 14 Gt would cost $2 trillion /yr (at $150/t) = Total cost for
net zero today: $5 trillion / yr

That’s ~6% of 2018
global GDP of $85 trillion

Innovation will drive
DAC+S costs lower:
• At $100/t, this drops
to ~4.5% of 2018 GDP
• At $50/t, this drops
to ~2.5% of 2018 GDP
History and Deployment Plan

- **2009**
  - Founded
  - DAC Pilot Plant

- **2015**
  - 1st Commercial Plant (1Mt/year)
  - Enabled by:
    - ~$100M private equity
    - ~$40M Government support
    - 10 years of research
  - Enabled by:
    - 45Q tax credit
    - California's Low Carbon Fuel Standard

- **2018**

- **2030**
  - Broad Plant Rollout
  - DAC and A2F plant rollout in jurisdictions with the strongest policies and highest corporate and government targets
  - Ongoing innovation

- **2050**
  - Global Operations
  - Significant role in the global effort to achieve net zero and restore safe levels of atmospheric CO₂
MORE INFORMATION CAN BE FOUND AT:

🔗 www.carbonengineering.com
🔗 @carbonengineeringltd
✉️ info@carbonengineering.com
LinkedIn: Carbon Engineering Ltd.
Twitter: @CarbonEngineer
Facebook: CarbonEngineering
DIRECT AIR CAPTURE OF CO2 – HELPING TO ACHIEVE NET-ZERO EMISSIONS

Webinar: Clean Energy Ministerial CCUS, April 21st

Christoph Beuttler, CDR Manager, chb@climeworks.com
CLIMEWORKS - OVERVIEW

- **14 plants** in operation across Europe
- **100+ FTEs** with headquarters in Zurich, Switzerland, subsidiary in Cologne, Germany
- **World’s first** company supplying atmospheric CO₂ to customers
- **Modular** CO₂ capture plants. **Scale-up** via mass production of CO₂ collectors
- **Energy Source:** waste heat at 100 °C (4/5ᵗʰ) and renewable electricity (1/5ᵗʰ)
- **Minimal carbon footprint:** 90%-95% net efficiency with cradle to grave LCA
ROADMAP FOR LARGE-SCALE CO$_2$ REMOVAL

Capacity [t/y]

- 1'000'000
- 100'000
- 3'000

Costs [$/t]

- 700
- 600
- 500
- 400
- 300
- 200
- 100

### 2019
- Optimized collector design
- Installation of a 3'000 t/y plant in Iceland, in execution

### 2020
- Production of larger plants
- Installation of a 100'000 t/y plant

### 2023
- Mass production of collectors
- Installation of a 1'000'000 t/y plant

### 2025
- Scale up production

### 2030
- Upscale to remove gigatons of CO$_2$ from the air
• **Direct Air Capture (DAC):**
  Captures CO₂ from ambient air

• **DAC** allows for near carbon neutral e-fuel production

• **No change in infrastructure needed** – closing the gap in renewable fuels
SCALEABILITY AND LAND REQUIREMENT

Surface area needed to meet the 2010 EU transportation energy demand (17,000 pJ/year)

**Corn Biofuel**
28,000,000 km²
of arable land
(yield assumption 18 g/ac/y)

**Algae Biofuel**
200,000 km²
of barren land
(yield assumption 2,500 g/ac/y)

**Renewable Synfuels**
14,200 km²
of barren land
(assumption: 1,900 kWh/m²,
$\eta_{PV} = 25\%$, $\eta_{PLX} = 70\%$)
COMPARISON OF CO₂ REMOVAL APPROACHES

**AFFORESTATION**
Large-scale tree plantations to increase carbon storage in biomass.

**BECCS**
Bioenergy in combination with carbon capture and storage.

**ENHANCED WEATHERING**
Distribution of crushed silicate rocks on soil surface to absorb CO₂ chemically.

**DIRECT AIR CAPTURE**
Direct capture of CO₂ from ambient air through engineered chemical reactions.

**AREA REQUIRED**
to remove 8 Gt CO₂ per year

- **AFFORESTATION**: 6,400,000 km²
- **BECCS**: 2,500,000 km²
- **ENHANCED WEATHERING**: 220,000 km²
- **DIRECT AIR CAPTURE**: 15,800 km²
Economics of Mitigation, BECCS & DACS

- Cost of DACS is falling (blue curve)
- Whilst costs of Mitigation and plant based CDR (BECCS) will be rising in the long run due to resource constraints (Land, Water)

Source: Reiner & Honegger 2018: Development of costs of BECCS, DACS and classical mitigation over time assuming strong political will to cover mitigation costs.

Note: Curves are indicative.
Direct Air Capture
Renewable Energy and Materials Economy
Transforming the Climate Threat into an Opportunity

Peter Eisenberger
Global Thermostat
DIRECT AIR CAPTURE SOLUTION

GT patented technology is uniquely capable of delivering low cost Direct Air Capture

**INHERENT ADVANTAGES OVER OTHER DAC SOLUTIONS**

- Lower Capex through patented use of ultra-high surface area, low cost contactor
- Lower Opex through patented breakthrough ability to use low temperature heat

**Confidential**

1. Air passes through standard industrial fans
2. Honeycomb monolith contactor selectively traps CO2 with a proprietary sorbent material
3. On-site, low-temperature process steam heat (<95°C) releases captured CO2

DIRECT AIR CAPTURE OF CO₂, HELPING TO ACHIEVE NET-ZERO EMISSIONS
Cost Impact of GT Breakthroughs:  
At scale under $50 per Tonne of CO$_2$

Contactor Efficiency

- Increased throughput at low pressure drop
  - High Air Velocity-5m/sec
  - Lowers CAPEX/tonne - more throughput per year
  - Lowers OPEX/tonne - low pressure drop-less electricity per tonne

Regeneration Efficiency & Heat Recovery

- By using steam as sweep gas and direct heat transfer fluid
  - Enables use of low temperature process/waste heat
  - Lowers CAPEX/tonne-fast kinetics –more CO$_2$ collected/time
  - Lowers OPEX/tonne – less heat and lower cost heat
GT Pilots and Commercial Demo Plant

**Menlo Park 2011**
- Initial Pilot Plant
- GT DAC 1
- 1 adsorption panel
- 1 regeneration chamber
- 2.5 m/s air velocity

**Menlo Park 2013**
- Second Pilot Plant
- GT DAC 2 / GT Carb 1
- 2 adsorption panels
- 2 regenerator chambers
- 2.5 m/s air velocity

**Huntsville 2018**
- First Commercial Demo Plant
- GT DAC 4000
- 20 adsorption panels
- 2 regeneration chambers
- 5 m/s air velocity
## Our Technology Partners

<table>
<thead>
<tr>
<th>Partner</th>
<th>Activity</th>
<th>Relationship Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRI International</td>
<td>• Pilot plant operation and R&amp;D; lab testing</td>
<td>• Contract R&amp;D</td>
</tr>
<tr>
<td>Linde</td>
<td>• Carburetor Pilot/EPC Contractor</td>
<td>• EPC Contractor</td>
</tr>
<tr>
<td>Haldor Topsoe, Corning</td>
<td>• Monolith development/supply</td>
<td>• Strategic Supplier</td>
</tr>
<tr>
<td>Applied Catalysts</td>
<td>• Contactor development/supply</td>
<td>• Joint development, Strategic Supplier</td>
</tr>
<tr>
<td>Cormetech</td>
<td>• Porous monolith development/supply</td>
<td>• Joint development</td>
</tr>
<tr>
<td>Georgia Tech</td>
<td>• Sorbent R&amp;D; contactor testing</td>
<td>• Contract R&amp;D</td>
</tr>
<tr>
<td>Air Liquide</td>
<td>• Plant development; pilot testing</td>
<td>• Strategic commercial partner</td>
</tr>
<tr>
<td>Streamline Automation</td>
<td>• System design, engineering, fabrication</td>
<td>• Contract EPC</td>
</tr>
<tr>
<td>Gastech Engineering</td>
<td>• Value engineering, mass manufacturing</td>
<td>• Contract EPC</td>
</tr>
<tr>
<td>EMRE</td>
<td>• Scaling up technology</td>
<td>• Joint development</td>
</tr>
</tbody>
</table>
Direct Air Capture
Human Controlled Carbon Cycle

CO₂ extraction from air

CO₂ Uses Carbon Negative Materials

CO₂ Uses Carbon Neutral Fuels

Carbon Neutral Fuels

Carbon Negative Materials

HELPING TO ACHIEVE NET-ZERO EMISSIONS
DIRECT AIR CAPTURE OF CO₂ HELPING TO ACHIEVE NET-ZERO EMISSIONS
Positive Feedback: Development and Environment

Social Cost = Private Cost + External Impact Cost

Natural Resource Economy – External Impact Cost High
- Increases Pollution
- Climate Change Damage
- Biodiversity Lose

The more development - more damage to the environment

REME External Costs are negative – makes things better
- Reduces Climate Change Damage
- Biodiversity Thrives
- Stimulates Economy – creates jobs

The more development - the better the environment
CARBON-BASED ECONOMY
Much of today’s economy is dependent on carbon-based products.

FOSSIL DEPENDENT TODAY
However, most of this carbon is derived from fossil fuels. This now comes with increasing downsides:

- High Cost
- Commodity Risk
- Geopolitical Instability
- Environmental Pollution
- Key Driver of Climate Change

As the cost & technology leader, GT ideally positioned to capture opportunities in these verticals.

CO2: A BETTER SOURCE OF CARBON
The emerging CO2 utilization market is forecast to grow to $1 trillion+ by 2030 and beyond

SOURCE: https://assets.ctfassets.net/xg0gv1arhdr3/27vQZEvrxaQiQEAsGyoSQu/44ee0b72ceb9231ec53ed180cb759614/CO2U_ICEF_Roadmap_FINAL_2016_12_07.pdf

DIRECT AIR CAPTURE OF CO2
HELPING TO ACHIEVE NET-ZERO EMISSIONS
Renewable Energy and Materials Economy

MIMICS NATURE
Inputs - Sun, CO$_2$ from Air, Hydrogen from Water
Outputs - Energy and Materials we need

REME TECHNOLOGIES
Solar Energy Predicted To Cost 1-2 Cts Kwhr
Hydrogen $1/Kilogram
$50 Per Tonne CO$_2$ = $20 Per Barrel Oil

REME OUTPUTS
$3 Per Gallon Gasoline
Competitively priced Hydrocarbons
Competitively priced Building Materials
Sequesters Enough Carbon To Meet Paris Targets

DIRECT AIR CAPTURE OF CO$_2$
HELPING TO ACHIEVE NET-ZERO EMISSIONS
RENEWABLE ENERGY AND MATERIALS ECONOMY
A Sustainable Solution

The Industrial Version Of Photosynthesis
Positive Environmental Externalities - Addresses Climate Change Threat
No Resource Constraints - Sun, Air, and Water

Positive Feedback Between Development And Environment
The more REME the more carbon is sequestered - increased CLIMATE CHANGE PROTECTION
The more REME the more jobs are created – increased PROSPERITY
The more REME the more locally produced energy – increased energy SECURITY

Mobilize To Implement REME Now!
Creating Global Prosperity While Addressing the Climate Change Threat.
Peter Eisenberger  
Chief Technology Officer & Co-Founder  
Global Thermostat  
www.globalthermostat.com

Download latest Paper:  
reme - Renewable Energy and Materials Economy  
by Peter Eisenberger, April 2020  
https://elkinstitute.files.wordpress.com/2020/04/reme-1.zip
Future R&D Focus Areas for Direct Air Capture

April 21, 2020
CEM CCUS Initiative Webinar

Mark Ackiewicz
Director, Division of CCUS R&D
U.S. Department of Energy
KEY R&D OPPORTUNITIES

The Challenge: Dilute CO$_2$ streams challenging and more costly to separate compared to more concentrated systems

The Opportunity
- Materials development
- Process optimization
- Resource and logistic challenges (water/land use; siting)
- DAC integration with capture/conversion operations
- Lifecycle (LCA) and techno-economic (TEA) analyses
DRAFT R&D PLAN FOR ADVANCED DAC TECHNOLOGY DEVELOPMENT

- **Basic R&D: New system concepts**
  - Simulate, synthesize and test new materials
  - Design and test novel components at pilot-scale
  - Laboratory-scale tests and materials evaluation

- **Support FEED studies**

- **Build and complete DAC tests at >10,000t/y scale**
  - Scale siting factors to optimize DAC performance at larger scale
  - DAC Tech ready for Commercial Deployment

2020

- Complete pilot-scale tests of DAC (>1000t/y)

2024

- Use test results and FEED studies to select larger-scale capture units for testing

2025

- Adapt and apply standard LCA and TEA methodology for technology assessments (throughout the period of the DAC activities)

2027

- Information management and dissemination: Includes data from trst units, large-scale testing, a DAC materials database, and TEA and LCA studies

2029

- ...

2030

- ...

2035

- ...

*FEED – Font-End Engineering Design
45Q tax credit

- $35/tonne for utilization, $50/tonne saline
- Thresholds for DAC to qualify: 100 ktCO$_2$/year for storage and EOR; 25 ktCO$_2$/year for utilization

Funding Opportunity Announcements

- $22 million announcement from DOE for basic science and applied R&D
- For details: https://www.energy.gov/articles/department-energy-provide-22-million-research-capturing-carbon-dioxide-air
Upcoming webinars by the CEM CCUS Initiative:

**Carbon Capture, Utilization and Storage in the Gulf Region**

*May 2020*

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**Carbon Capture, Utilization and Storage in Japan**

*June 2020*
Want to know more?

CEM CCUS INITIATIVE

https://www.linkedin.com/company/clean-energy-ministerial-ccus-initiative/

@ccuscem

cemccus@outlook.com

TODAY’S SPEAKERS

• https://energypolicy.columbia.edu/
• https://carbonengineering.com/
• https://www.climeworks.com/
• https://globalthermostat.com/; https://elkinstitute.files.wordpress.com/2020/04/reme-1.zip