POLICIES FOR THE DEPLOYMENT OF CCS

Providing Policy Confidence: The Role of the LCFS CCS Protocol and 45Q

LEE BECK
Senior Advisor
### THE GLOBAL CCS PIPELINE IS GROWING…

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<td>WASTE INCINERATION</td>
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<td>Iron &amp; Steel Production</td>
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<td>Fertiliser Production</td>
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<td>Natural Gas Processing</td>
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**1 Mtpa CO₂ CIRCLE AREA PROPORTIONATE TO CAPACITY**

- **IN OPERATION**
- **IN CONSTRUCTION**
- **ADVANCED DEVELOPMENT**

- **Boundary Dam**
- **Petra Nova**
- **CarbonSafe Illinois Hub**
- **Dry Fork**
- **Project Tundra**

- **Shute Creek**
- **Terrell (formerly Val Verde)**
- **Century Plant**
- **Uthmaniyah**
- **Gorgon**
- **CNPC Jilin**
- **Petrobras Pre-Salt**
- **Sleipner**
- **Lost Cabin**
- **SNØHvit**
- **Sinopec Qilu**
- **Yangchang**
- **Lake Charles Methanol**
- **Integrated Mid-Continent Hub**
- **Enid Fertiliser**
- **Coffeyville**
- **ACTL Agrium**
- **Wabash**
- **Abu Dhabi Phase 1**
- **Abu Dhabi Phase 2**
- **CarbonNet**
- **Air Products**
- **Quest**
- **ACTL Sturgeon**
- **Porthos**
- **Illinois Industrial**
- **NORWAY FULL CHAIN**

**1 Mtpa CO₂ CIRCLE AREA PROPORTIONATE TO CAPACITY**

- **IN OPERATION**
- **IN CONSTRUCTION**
- **ADVANCED DEVELOPMENT**
... BUT POLICY PRESENCE IS KEY.

1. A value on carbon
2. Reducing risk and enabling investment
3. Infrastructure and geologic storage

<table>
<thead>
<tr>
<th>POLICIES &amp; PROJECT CHARACTERISTICS</th>
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<tbody>
<tr>
<td>Carbon Tax</td>
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<td>Tax Credit or emissions credit</td>
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<td>Grant Support</td>
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<td>Provision by Government or SOE</td>
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<td>Regulatory Requirement</td>
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<tr>
<td>Enhanced Oil Recovery</td>
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<td>Low Cost Capture</td>
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<td>Low Cost Transport and Storage</td>
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<tr>
<td>Vertical Integration</td>
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The facilities in light blue are under construction.
## LCFS CCS Protocol

**Overview:**

**Direct Air Capture Projects:**
- **Location:** Anywhere in the world
- **Storage Site:** Onshore saline or depleted oil and gas reservoirs, or oil and gas reservoirs used for CO₂-EOR
- **Credit Method:** Project-based
- **Earliest Date:** Any
- **Requirements:** Project must meet requirements specified in the CCS Protocol
- **Additional Restrictions:** None

**CCS at Oil & Gas Production Facilities:**
- **Location:** Anywhere, provided they sell the transportation fuel in California
- **Storage Site:** Onshore saline or depleted oil and gas reservoirs, or oil and gas reservoirs used for CO₂-EOR
- **Credit Method:** Project-based, under the Innovative Crude Provision
- **Earliest Date:** 2010
- **Requirements:** Must achieve minimum Cl or emission reduction
- **Additional Restrictions:** None

**CCS at Refineries Projects:**
- **Location:** Anywhere, provided they sell the transportation fuel in California
- **Storage Site:** Onshore saline or depleted oil and gas reservoirs, or oil and gas reservoirs used for CO₂-EOR
- **Credit Method:** Project-based, under the Refinery Investment Credit Program
- **Earliest Date:** 2016
- **Requirements:** Project must meet requirements specified in the CCS Protocol
- **Additional Restrictions:** None

**All Other CCS Projects (e.g. CCS with Ethanol):**
- **Location:** Anywhere in the world
- **Storage Site:** Onshore saline or depleted oil and gas reservoirs, or oil and gas reservoirs used for CO₂-EOR
- **Credit Method:** Project-based or fuel pathway
- **Earliest Date:** Any
- **Requirements:** Project must meet requirements specified in the CCS Protocol
- **Additional Restrictions:** None

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*Innovative, but limited to transportation.*
Enacted in 2008 under the Energy Improvement and Extension Act in the US

Provides capture operators with credits for each tonne of CO₂ stored or utilised that can be used to reduce their tax liability

Reformed under the Bipartisan Budget Act in 2018, which included an increase to the tax credit value

IRS guidance and rule pending

Can be combined with the LCFS

<table>
<thead>
<tr>
<th>Tax credit value ($/tCO₂)</th>
<th>2019</th>
<th>...</th>
<th>2026</th>
<th>2026 onwards</th>
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<tbody>
<tr>
<td>Dedicated geological storage</td>
<td>31</td>
<td>...</td>
<td>50</td>
<td></td>
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<tr>
<td>CO2-EOR</td>
<td>19</td>
<td>...</td>
<td>35</td>
<td></td>
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<tr>
<td>Other CO2 utilisation</td>
<td>19</td>
<td>...</td>
<td>35</td>
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Indexed to inflation
# A COMPARISON OF THE LCFS AND 45Q ELIGIBILITY REQUIREMENTS

<table>
<thead>
<tr>
<th></th>
<th>LCFS</th>
<th>45Q</th>
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<tbody>
<tr>
<td><strong>GEOGRAPHIC SCOPE</strong></td>
<td>Anywhere provided they sell fuel into California (with exception for DAC projects)</td>
<td>Anywhere in the US</td>
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<tr>
<td><strong>TYPES OF CCS PROJECT</strong></td>
<td>Any fuel production facility or DAC facility that captures and either stores CO₂ or injects for CO₂-EOR onshore</td>
<td>Any industrial or DAC facility that stores CO₂ or uses it for EOR or other utilisation purposes</td>
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<tr>
<td><strong>MINIMUM PROJECT SIZE</strong></td>
<td>None</td>
<td>Minimum thresholds for all projects exist</td>
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<tr>
<td><strong>EMISSIONS COVERED</strong></td>
<td>CO₂, CH₄, N₂O, VOCs and CO</td>
<td>Carbon oxide*</td>
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<tr>
<td><strong>QUALIFICATION PERIOD RESTRICTIONS</strong></td>
<td>None</td>
<td>Construction must begin by 1 Jan 2024</td>
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<tr>
<td><strong>CREDIT GENERATION DURATION</strong></td>
<td>Duration of injection</td>
<td>12 years</td>
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<tr>
<td><strong>CREDIT BUFFER &amp; INVALIDATION</strong></td>
<td>CCS projects must contribute to the Buffer Account</td>
<td>IRS is currently consulting on the approach to the recapture of tax credits in the event of leakage</td>
</tr>
<tr>
<td><strong>PERMANENCE REQUIREMENTS</strong></td>
<td>Demonstrated through receiving and maintaining Permanence Certification under the LCFS</td>
<td>IRS is currently consulting on the permanence requirements</td>
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*Carbon oxide refers to any of the three oxides of carbon: carbon dioxide, carbon monoxide, and carbon suboxide*
POLICY CONFIDENCE LEADS TO PROJECTS

- Added 10 projects to the Global CCS Institute database recently
- 8 projects are in the US, and include projects with different feedstocks and technologies, driven by 45Q and the LCFS including
  - First large-scale DAC Facility – negative emissions technology
  - Ethanol facilities – fuel emission reduction
  - Industrial carbon capture
  - Hubs & clusters
- Further project intentions have been announced and are expected

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>Wabash CO₂ Sequestration</td>
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<tr>
<td>Dry Fork Integrated Commercial Carbon Capture</td>
<td>Carbon Storage Hub</td>
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<td>CarbonSAFE Illinois – Macon County</td>
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<td>Project Tundra</td>
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<td>Integrated Mid-Continent Stacked Carbon Storage</td>
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<td>OXY and White Energy Ethanol EOR Facility</td>
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<td>OXY and Carbon Engineering Direct Air Capture</td>
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<tr>
<td>Project ECO₂S: Early CO₂ Storage Complex in Kemper County</td>
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POLICY OPTIONS

- Policies covering the industrial sector and incentivizing innovation
  - Global need for CCS technology deployment at large-scale facilities in cement, steel, natural gas & coal-fired power
  - Eligibility of CCS under the Cap-and-Trade System
  - IEA: “As much as 450 Mt of CO$_2$ could be captured, utilized and storage globally with a commercial incentive as low as US$40 per tonne of CO$_2$”
  - Demand-side policies e.g. buy clean
  - No new, unabated sources of emissions & regulation of emissions

- Investment support mechanisms: Grants, investment tax credits

- Support for hubs & clusters
Policies for the Deployment of CCS

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