Decarbonization through Fund Investments
Adopting High Technologies including CCUS
Fund Overview

**The Facility**

- **Direct Investment**
- **Local Funds**
- **Technology/Industry Specific Funds**
- **Regional Fund**

Qualified subprojects located in the greater BTH region, China

Deploy high-level technologies to support air quality improvement & decarbonization

EA - CECEP, a leading enterprise in clean energy, environmental protection & energy conservation in China

- Provide loan EUR 428 mn
- Mobilize investments from local governments, industries and institutional investors
- Comply with ADB’s SPS & ESMS requirements
- Meet fund’s investment criteria
Progress and Performance

**Funds Established**
4 funds, total scale CNY 5 billion
innovative use of FIL to establish fund financing mechanism

**Subprojects Invested**
19 subprojects, CNY 3.6 billion financing from funds
leveraging investments of CNY 26 billion from co-financing

**Areas Focused**
- residual heat utilization
- integrated waste treatment and utilization
- industrial by-product hydrogen and flue-gas waste heat utilization
- large-scale use of graphene heaters
- treatment of VOCs and fugitive emissions
- new-energy vehicles, PV power generation, green building, etc.

**Environmental Benefits**
save standard coal 1.04 million tons, provide clean heating 30.02 million square meters, reduce CO$_2$ 2.1 million tons, SO$_2$ 18,100 tons, NOx 6,200 tons and PM 1.2 million tons annually
## Sample Subprojects

### Integrated Waste Treatment & Utilization

<table>
<thead>
<tr>
<th>Location</th>
<th>Tianjin City, China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing from Fund</td>
<td>CNY 290 million</td>
</tr>
</tbody>
</table>

#### Low Carbon Technology Featured
- construction of a waste and furnace slag comprehensive reutilization facility/plant, an organic waste treatment facility/plant and a biogas power plant
- collected wastes are converted into biogas and other reusable materials
- reduce the pollution and emission as well as promote the circular economy at different levels

#### Environmental Benefits
annual emissions of CO$_2$, SO$_2$, PM, NOx and CO were reduced by 16,000 tons, 2.7 tons, 1.5 tons, 67.74 tons and 33.94 tons respectively
## Sewage Heat Pump Heating/Cooling

<table>
<thead>
<tr>
<th>Location</th>
<th>Shandong Province, China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing from</td>
<td>CNY 50 million</td>
</tr>
<tr>
<td>Fund</td>
<td></td>
</tr>
</tbody>
</table>

### Low Carbon Technology Featured
- thermal energy is recovered from treated sewage for district heating and cooling, by utilizing temperature differences between wastewater and environment
- providing heating and cooling services for public and residential buildings with a area of 1.8 million square meters

### Environmental Benefits
- saving 5,586 tons of standard coal per year;
- 13,927 tons of CO₂,
- 92 tons of SO₂,
- 54 tons of PM and
- 87 tons of NOx emissions were reduced respectively
## Sample Subprojects

### Energy Saving, Emission Reduction and Utilization of Waste Heat and Hydrogen in a Chemical Industry Park

<table>
<thead>
<tr>
<th>Location</th>
<th>Tianjin City, China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing from Fund</td>
<td>CNY 400 million</td>
</tr>
</tbody>
</table>

#### Low Carbon Technology Featured
- International leading electrolyzer energy efficiency technology to save energy, and wastewater and gas treatment system to replace the traditional incineration of waste gas and treatment of high concentration wastewater
- VOCs are collected from the tail gas and treated within specific tank fields
- Reutilize waste heat and by-product hydrogen to replace natural gas consumption

#### Environmental Benefits
- Saving 224,000 tons of standard coal per year; reduce 24 tons of PM, 214 tons of NOx and 7,008 tons of VOCs emissions respectively
CCUS Industry at a Glance

CCUS - a suite of technologies that involves the **capture, transport, use and storage** of CO₂
CCUS Industry at a Glance

Global

Facilities and Trends
◆ 196 projects in the CCS facilities pipeline
◆ 244 million capture capacity in development
◆ 44% growth in the number of CCS facilities over the past 12 months
◆ 34% compound growth rate per annum of the capture capacity since 2017

- US - 34 new projects since 2021
- Canada - 19
- UK - 13
- Norway - 8
- Australia, Netherlands and Iceland - 6 each
Figure: Pipeline of commercial facilities since 2010 by capture capacity (Mtpa)

Table: Commercial CCS facilities by number and total CO₂ capture capacity (mid-September 2022)

<table>
<thead>
<tr>
<th></th>
<th>Operational</th>
<th>In construction</th>
<th>Advanced development</th>
<th>Early development</th>
<th>Operation suspended</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Facilities</td>
<td>30</td>
<td>11</td>
<td>78</td>
<td>75</td>
<td>2</td>
<td>196</td>
</tr>
<tr>
<td>Capture Capacity (Mtpa)</td>
<td>42.5</td>
<td>9.6</td>
<td>97.6</td>
<td>91.8</td>
<td>2.3</td>
<td>244</td>
</tr>
</tbody>
</table>
China’s CCUS projects started in 2003
• mostly small-scale demonstration projects in petroleum, coal chemical, electric power industry
• Shengli CCUS in 2022 marks China's CCUS entered commercial operation stage

<table>
<thead>
<tr>
<th>Facility</th>
<th>Country</th>
<th>Status</th>
<th>Operation Date</th>
<th>Industry</th>
<th>Capture Capacity (Mtpa CO₂)</th>
<th>Utilization</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINOPEC QILU-SHENGLI CCUS</td>
<td>China</td>
<td>Operational</td>
<td>Aug 2022</td>
<td>Chemical Production</td>
<td>1</td>
<td>Enhanced Oil Recovery</td>
<td>China’s 1st integrated million ton (1 Mtpa) CCUS</td>
</tr>
<tr>
<td>CNOOC SOUTH CHINA SEA CCS</td>
<td>China</td>
<td>In Construction</td>
<td>Predicated in 2023</td>
<td>Natural Gas Processing</td>
<td>0.3</td>
<td>Enhanced Oil Recovery</td>
<td>China’s 1st CO₂ offshore storage</td>
</tr>
<tr>
<td>HUANENG LONGDONG BASE CCS</td>
<td>China</td>
<td>Advanced Development</td>
<td>Predicated in 2023</td>
<td>Power Generation</td>
<td>1.5</td>
<td>Dedicated Geological Storage</td>
<td>Expected to be the world’s largest coal power CCUS project</td>
</tr>
</tbody>
</table>
In 2020, China announced its 30/60 climate policy framework
- achieving carbon peaking by 2030 and carbon neutrality before 2060
- 1+N framework lays the groundwork for CCUS policy directions

in 2021, The central bank launched a carbon emissions reduction facility
- structural monetary policy instrument with low-cost loans to support decarbonization projects including CCUS
CCUS Industry at a Glance

**CCUS in China-Demand Potential**

CCUS may account for reductions by **2050**: 0.6-1.45 billion tons of CO\(_2\) per annum, including 0.05-0.07 billion from **iron and steel** by **2060**: 1-1.82 billion tons per annum, of which 0.09-0.11 billion from **iron and steel**

Steel industry is facing rising pressure to reduce carbon footprint, **CCUS will play a critical role** in the transformation of steel industry

<table>
<thead>
<tr>
<th></th>
<th>Year</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td></td>
<td>0.06</td>
<td>0.2</td>
<td>0.5-1</td>
<td>2-5</td>
<td>2-5</td>
<td>2-5</td>
</tr>
<tr>
<td>Gas</td>
<td></td>
<td>0.01</td>
<td>0.05</td>
<td>0.2-1</td>
<td>0.2-1</td>
<td>0.2-1</td>
<td>0.2-1</td>
</tr>
<tr>
<td>Iron &amp; Steel</td>
<td></td>
<td>0.01</td>
<td>0.02-0.05</td>
<td>0.1-0.2</td>
<td>0.2-0.3</td>
<td>0.5-0.7</td>
<td>0.9-1.1</td>
</tr>
<tr>
<td>Cement</td>
<td></td>
<td>0.001-0.17</td>
<td>0.1-1.52</td>
<td>0.2-0.8</td>
<td>0.3-1.5</td>
<td>0.8-1.8</td>
<td>1.9-2.1</td>
</tr>
<tr>
<td>BECCS</td>
<td></td>
<td>0.005</td>
<td>0.01</td>
<td>0.18</td>
<td>0.8-1</td>
<td>2-5</td>
<td>3-6</td>
</tr>
<tr>
<td>DACCS</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0.01</td>
<td>0.15</td>
<td>0.5-1</td>
<td>2-3</td>
</tr>
<tr>
<td>Petro-chemical &amp; chemical</td>
<td></td>
<td>0.05</td>
<td>0.5</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total in China</td>
<td></td>
<td>0.09-0.3</td>
<td>0.2-4.08</td>
<td>1.19-8.5</td>
<td>3.7-13</td>
<td>6-14.5</td>
<td>10-18.2</td>
</tr>
</tbody>
</table>

China CCUS CO\(_2\) emission reduction demand potential by industry from 2025 to 2060 (100 million tons per year)
CCUS Project Profile

Brief Description

Promote CCUS decarbonization technology in the highly polluted steel industry

demonstration project covering whole CCUS value chain including capture, transportation, storage & utilization

• located in northern China
• built by one of China’s major steel manufacturer
• expected to start operation by end 2025
• first phase of the project captures 0.5 million tons of CO₂ every year
CCUS Technologies Adopted

Capture

The CCUS project capture CO₂ from Maerz Lime Kiln Flue Gas

Lime
- an important raw material for producing iron and steel
- obtained by thermal decomposition of limestone into quicklime and carbon dioxide in Maerz Lime Kiln

Two kinds of CO₂ emissions during lime production:
- CO₂ from limestone decomposition
- CO₂ from fuel combustion.

Chemical absorption system
- capture CO₂ in flue gas from Maerz Lime Kiln, capture rate 92%

Alcohol amine
- as a CO₂ absorbent and react with CO₂ in the flue gas to form a weakly bonded compound which is further broken down by heat and produce a concentrated CO₂ stream

The desorbed product(CO₂) is compressed and dried to a supercritical condition and sent to storage, transport and utilize.
How to deal with steel slag & CO₂ has been a difficulty for iron and steel makers

CO₂ mineralization (CM) provides a solution and doubles emission reduction benefits

- use CO₂ and steel slag for chemical reactions to generate new compounds such as calcium carbonate and magnesium carbonate
- the compounds could be widely used in plastics, paper, paint, rubber and steel making process
CO₂ fertilization could enhance photosynthesis, proved highly efficient in greenhouse agriculture

cultivate vegetables out of season, such as the cultivation of grapes and strawberry

When CO₂ concentration increased to 1000-1300 ppm:
• production increase 25-50% for fruits and vegetables, 60% for leafy vegetables
• disease incidence rate reduce 40%, use of pesticides decrease 40-50%
• organic nutrients increase 15-25%, improves the quality and taste
The project is actively cooperating with local agricultural department to develop ecological agriculture bases.
The project is cooperating with universities to develop methods producing chemicals, including use CO₂ to manufacture methanol, synthesis gas and sodium carbonate.
The project will construct CO₂ capture and liquefaction plants, compression system, pipelines, circulating water station and purchase necessary facilities, etc.

<table>
<thead>
<tr>
<th>ADB Category</th>
<th>Environmental B, Social C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>In Construction</td>
</tr>
<tr>
<td>Financing from Fund</td>
<td>CNY 200 million in 2023</td>
</tr>
</tbody>
</table>

Financial Indicators

- Total investment cost: CNY 613 million
- Operating revenue: CNY 276 million per year
- Operating cost: CNY 234 million per year

Financially viable
聚合约滴·创生无限
Going Green Investing Green