

# COAL POWER PLANT CO<sub>2</sub> CAPTURE AND STORAGE

## Huaneng Longdong Energy Base CCS

The world's largest post-combustion CO<sub>2</sub> capture facility on a coal-fired power station began operation at Zhengning, Gansu Province, China in September 2025. CO<sub>2</sub> is captured from a 1 GW ultra-supercritical coal unit using an advanced amine-based solvent and then transported by pipeline for enhanced oil recovery (EOR) and permanent geological storage in deep saline formations.



Longdong CCS Facility

Image Courtesy of Huaneng Clean Energy Research Institute

### At a glance

**FACILITY:**

Huaneng Longdong Energy Base  
CCS

**SECTOR:**

Power - coal fired generation

**LOCATION:**

Zhengning, Gansu Province, China

**PROPOSERS:**

China Huaneng Group

**COMMISSIONED:**

2025

### 1. Project Overview

Coal-fired power remains a cornerstone of China's electricity system and is one of the largest single sources of CO<sub>2</sub> emissions. Decarbonising the existing coal fleet is therefore critical to China's carbon neutrality goals.

Huaneng, China's second largest electricity generator by installed capacity (over 300GW), has integrated a CCS system with Unit 1 of the Zhengning ultra-supercritical 1 GW coal fired power plant. The CCS facility can capture up to 1.5 million tonnes per annum (Mtpa) of CO<sub>2</sub> from the unit's flue gas. The project has been funded primarily by China Huaneng Group alongside grants from China's National Key R&D Programme. It was developed by the Huaneng Clean Energy Research Institute (HNCERI), Huaneng Gansu Energy Development Company and Huaneng Zhengning Power Plant.

The capture plant uses HNC-7, a proprietary amine-based solvent developed by HNCERI. HNCERI advises that this solvent delivers a regeneration energy of 2.0–2.3 GJ/tCO<sub>2</sub>, around a 40% reduction compared with conventional commercial solvents.

The process integrates closely with the power plant steam cycle, applying multiple energy-saving measures and heat-integration steps. HNCERI advises that these innovations make the capture facility significantly more efficient, requiring less electricity to operate.

According to HNCERI, the capture island incorporates the world's largest rectangular composite absorption tower, which integrates several process functions into one vessel. This reduces capture CAPEX by about 15%. A novel regenerator design further lowers manufacturing costs by roughly 15%.

Downstream of the capture unit, CO<sub>2</sub> is compressed to 12.6 MPa and dried to ≥99.9% purity. Approximately 1 Mtpa of this CO<sub>2</sub> will be transported via a dedicated pipeline for storage in the Changqing oil field for EOR, while about 0.5 Mtpa is piped to a nearby onshore deep saline aquifer, approximately 3km below surface.

HNCERI reports a capture cost of around US\$30 per tonne CO<sub>2</sub> (excluding compression), below many international benchmarks for large-scale projects demonstrating a cost-competitive pathway for decarbonising coal-fired power. The technology package is intended for replication across China's coal fleet, with operational data feeding into future CCUS policy, standards and deployment plans.

## Huaneng Long Dong CCS Key Facts

| Capacity & Transport                                                                                                                                                                                                                                                                                                                                  | Storage & Utilisation                                                                                                                                                                                                                                                                                                                                        | Commercial & Financial                                                                                                                                                                                                                                                                                                                                        | Strategic Significance                                                                                                                                                                                                                                             |
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| <p><b>Capture Capacity:</b><br/>1.5 Mtpa CO<sub>2</sub></p> <p><b>Capture Technology:</b><br/>HNCERI HNC-7 post-combustion chemical absorption (amine-based solvent)</p> <p><b>Transport:</b><br/>Supercritical CO<sub>2</sub> pipeline to Changqing oil field for EOR</p> <p>Short onshore pipeline (~500 m) to local saline aquifer for storage</p> | <p><b>Utilisation (EOR):</b><br/>~1 Mtpa CO<sub>2</sub> stored in the Changqing oil field for EOR</p> <p><b>Dedicated Geological Storage:</b><br/>~0.5 Mtpa CO<sub>2</sub> injected into a nearby onshore deep saline formation</p> <p><b>Storage Type:</b><br/>Saline formation</p> <p><b>Injection Depth:</b><br/>Saline formation is ~3km underground</p> | <p><b>Capital Expenditure:</b><br/>Reported ~800–1100 million yuan (approx. USD 120–160 million)</p> <p><b>Estimated Abatement Cost:</b><br/>Reported ~220 yuan per tonne CO<sub>2</sub> (approx. US\$ 30/tCO<sub>2</sub> excluding compression)</p> <p><b>Funding Sources:</b><br/>China Huaneng Group<br/>China's National Key R&amp;D Programme grants</p> | <p>World's largest post-combustion capture project on a thermal power plant</p> <p>First commercial deployment of Huaneng's HNC-7 solvent technology</p> <p>Cost-competitive decarbonisation of baseload power</p> <p>Supports China's carbon neutrality goals</p> |

Huaneng's coal fired power station with CCS is an important addition to the global fleet of CCS facilities. Given rising electricity demand, driven by a multitude of factors including electrification of heating, cooking, and transport, along with the rise of emerging economies, and power demands from artificial intelligence data centers, the need for all forms of low carbon power is becoming more critical than ever before. Low carbon electricity sources, including coal fired power with CCS, is essential to meet growing electricity demand whilst simultaneously achieving net-zero greenhouse gas emission objectives. The experience gained through the design and operation of the CCS-equipped Zhengning Unit 1 will contribute to the ongoing development of low carbon thermal power generation systems that will play an important role in meeting economic and climate objectives.

