

Overview of CCUS Activities in China

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Outline

- CCS Related Policies in China
- CCS R&D in China
- Industry activities in China
- Collaborative projects
- Our Perspectives on CCS

1. CCS Related Policies in China

- **The Outline for National Medium and Long-term S&T Development Plan towards 2020**
- **China's National Climate Change Program (CNCCP)**
- **China's Scientific and Technological Actions on Climate Change**

1. CCS Related Policies in China

- **The Outline for National Medium and Long-term S&T Development Plan towards 2020**
 - 9th Feb. 2006, issued by State Council
 - CCS was mentioned in “Frontier Technologies” and as “a key element in high-efficient, clean and near-zero CO₂ emission fossil energy development and utilization technology”.
- **China’s National Climate Change Program (CNCCP)**
- **China’s Scientific and Technological Actions on Climate Change**

1. CCS Related Policies in China

- The Outline for National Medium and Long-term S&T Development Plan towards 2020
- China's National Climate Change Program (CNCCP)
 - 4th June 2007
 - State Council
 - The State will develop coal gasification-based co-production technology, CO₂ capture, utilization and storage technology.
- China's Scientific and Technological Actions on Climate Change

1. CCS Related Policies in China

- The Outline for National Medium and Long-term S&T Development Plan towards 2020
- China's National Climate Change Program (CNCCP)
- China's Scientific and Technological Actions on Climate Change
 - 14th June 2007
 - MOST, NDRC, etc.
 - CCS is mentioned as one of key tasks and the government will strengthen the R&D, roadmap drawing, capacity building and demonstration projects of CO₂ capture, utilization and storage

2.1 National S&T Programs

- **National Basic Research Program (973 Program)**
 - The 973 Program will emphasize on the basic theory of CO₂ long term storage, high efficiency and cost effective separation, new theory and method of transportation, etc.
- **The National High Tech Program (863 Program)**
- **National Science Foundation of China (NSFC)**

2.1 National S&T Programs

- **National Basic Research Program (973 Program)**
 - “Resource utilization and underground sequestration of greenhouse gas for enhancing oil recovery ”
- **The National High Tech Program (863 Program)**
 - Capture: Absorption technologies
 - Storage: Capacity assessment, safety assessment, and monitoring of saline aquifers
 - “R&D of CO₂ capture and aquifer storage”
- **National Science Foundation of China (NSFC)**
 - “Fundamental Researches on CO₂ storage”

Fundamental Researches

- **Fundamental study of migration of supercritical carbon dioxide in porous media under conditions of saline aquifers**
 - *Tsinghua Univ.*
 - *Pore-scale researches*
 - *Laboratory experiments*
 - *Modeling simulations*
- “Trapping Mechanism of Injection Supercritical CO₂ into Porous Media with Saline Water” [National Youth Fund from the National Natural Science Foundation of China](#)
- [Sino-Australia Cooperation](#) on Geological Storage
- Key international research project funded by Tsinghua Univ. (cooperated with [the Lawrence Berkeley National Laboratory](#))
- Submitted an application to NSFC-EPSRC CCS cooperation research plan (cooperated with the [Univ. of Leeds](#))

3. Industry activities

- **Some Chinese enterprises have already started CCS related research and project activities in their own initiatives.**
 - **PetroChina – EOR**
 - **Huaneng Company – Capture (post-combustion)**
 - **SinoPec - Shenli Oilfield, CCS, post-combustion capture & EOR**
 - **Shenhua Group – DCL & Aquifer storage**
 - **CAS (Clean Energy Technology Development Facility) - IGCC+EOR**

3. Industry activities

- **PetroChina**

- Carry out China's first project of CO₂ storage and usage
- EOR at Jilin Oil Field from 2006
- 300-400t CO₂ injection in Jilin Oilfield
- Investment: 200 million RMB
- CO₂ injection at 10 wells
- Combined with the project under 973 Programme (basic research) supported by MOST

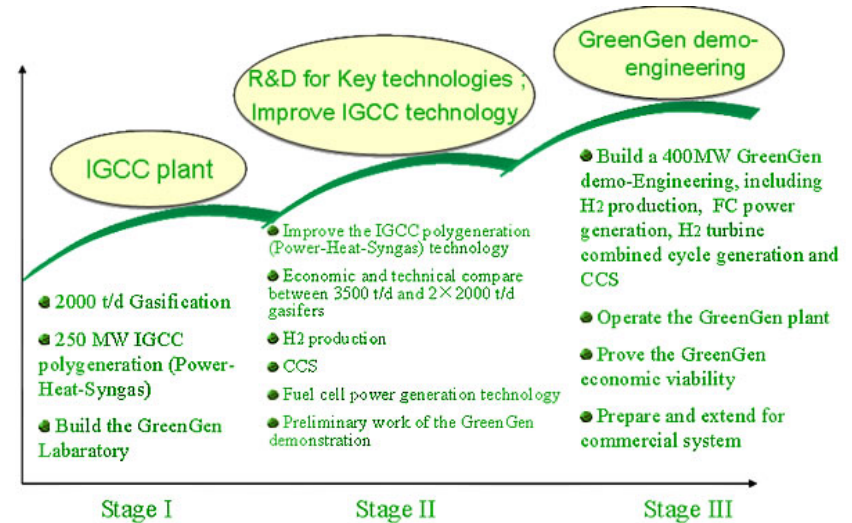
3. Industry activities

• Huaneng Group

– GreenGen

- Stage I: 2006-2011
- Stage II: 2012-2014
- Stage III: 2015-2020

Phase I is under construction



– CO₂ Capture Pilot and Demonstration

- China Huaneng Group constructed the first demonstration project in Beijing Thermal Power plant with 3000 t CO₂/y, which was in operation before 2008 Olympic
- A 100,000 ton/a demonstration has been completed in Shidongkou Power plant in Shanghai and 96 hours continuous test run successfully in Jan, 2010.

3. Industry activities

Shenhua Group

China's largest coal miner, is working on research and development in CCS at its coal-to-liquids plant

- **Capture from Shenhua's direct coal-to-liquids plant in Ordos, Inner Mongolia**
- **Shenhua Group has collaborated with US DOE on the research of aquifer storage in Ordos basin.**
- **Scale: 100kt/a for 10 year**
- **Start injection in 2011**
- **1 injectionor +1 monitoring well**
- **3D seismic survey in progress**



3. Industry activities

- SINOPEC
 - Post-combustion capture and purify the CO₂-rich gas from Shengli Power Plant, which is a coal-fired power plant.
 - **Absorb and purify CO₂ with high gravity equipment**
 - Launch a pilot test of CO₂-EOR in Gao-89 block. Injection: 80tCO₂/day
 - Reservoir pressure maintenance: >30MPa

CHINA UNITED COALBED METHANE'S ECBM PROJECT



CUCBM CO₂-ECBM Well Site



CUCBM CO₂-ECBM Well Site

Project Entity: China United Coalbed Methane Company

Location: Shizhuang, Qinshui County, Shanxi Province

Technique: CO₂ Sequestration/ECBM

Current Status: Ongoing

ENN GROUP'S BIO-ENERGY AND CARBON SEQUESTRATION PROJECT



Goal: To use microalgae to absorb CO₂ to produce bio-diesel and feeds.

Scale: Absorption 320,000 tons of CO₂ /year

Site: Dalate, Inner Mongolia

Technologies: Third-generation bio-energy technology

Implementation Period: To be completed in 2011

CO₂ UTILIZATION IN CHEMICAL PRODUCTION

Jiangsu Jinlong-CAS Chemical Co., Ltd. has built a production line to produce **22,000 tons of CO₂-based poly(propylene(ethylene) carbonate) annually** from CO₂ captured from ethanol plants and can be used to produce highly flame-retardant exterior wall insulation material, leather slurry, biodegradable plastics, etc. This project will use about **8,000 tons of CO₂ per year**.



10,000 ton loop reactor

CO₂ recovery and purification unit of the alcohol plant

4. International Collaboration

- China was one of the initial members of the Carbon Sequestration Leadership Forum (CSLF) and MOST actively represents China within this forum.
- EU-China Summit (September 2005)
 - Joint Declaration on Climate Change
 - “ *We will aim to achieve the following co-operation goals by 2020: To develop and demonstrate in China and the EU advanced, near-zero emissions coal technology through carbon capture and storage* ”

4. International Collaboration

China-EU-UK Collaboration on CCS

- Two complementary Memoranda of Understanding with common and shared objectives for both MoU:
 - China-UK MoU signed December 2005*
 - China-EC MoU signed February 2006*
- The two MoUs defines a 3- phase collaboration:
 - Phase 1: Exploring the options for NZEC technology through CCS in China;
 - Phase 2: Defining and designing a demonstration project; and
 - Phase 3: Construction and Operation of a demonstration project.
- China-EC MOU signed Nov. 2009 at 12th China-EU summit on NZEC Phase II Cooperation

Collaborative projects under NZEC phase I

- *GeoCapacity project funded by the EC FP6*
 - 2006-2008
 - 1 Chinese partner (Tsinghua University) & 1 EU partner (BRGM)
- *COACH project funded by the EC FP6*
 - 2006-2009
 - 8 Chinese partners & 12 EU partners
- *UK Near Zero Emissions Coal Initiative (NZEC)*
 - 2007-2009
 - 20 Chinese partners involved
- *STRACO2 (Support To Regulatory Activities For Carbon Capture and Storage) under EU/FP7*
 - January 2008-June 2009
 - Three Chinese and six European partners

International Collaboration

- China Australia Geological Storage (CAGS)
 - MoU signed in 2008
 - 3 million AU\$ under APP in near two years
 - Agree to include Future Vision and Mission in 5-10-20 year period.
 - Future work will include **TOTAL** Tech./Knowledge Sharing and Transfer in **ALL** CCS aspects.

International Collaboration

- Sino-Italy Collaborative Project on CCS
 - MOST, Italian Ministry of Environment, Land and Sea, ENEL
 - Focus on Pre-feasibility of CCS Demo
 - ACCA21, Huaneng Group, CAS, Tsinghua Univ.,...

International Collaboration

- MOST are working together with the US to develop the opportunities on CCS research cooperation.
- Some Chinese organizations are strengthening collaboration with their EU partners on CCS under EU/FP7.

Thank you for your attention!