

China's Policies and Actions on Carbon Capture and Storage (CCS)

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Outline

- Background
- CCS related Policies in China
- CCS Activities in China
- Our Perspectives on CCS

1. Background

Climate change is an increasingly prominent issue that brings about profound impacts on human societies

- Human activities have led to the climate change characterized with global warming over the past five decades.
- Climate change is characterized with 'full ranges, large scales, multi-levels and long-term'.
- This change has affected and will continue to affect the natural ecosystem and human socio-economic systems in an adverse manner, posing one of the most critical challenges to mankind in his effort to pursue sustainable development.

International response to climate change

- Establishment and development of international system on climate change
 - *United Nations Framework Convention on Climate Change*
 - *Kyoto Protocol*
- Policies and actions by individual countries, involving significant adjustment in policies of industry, energy, technology and trading
- Enhancement of international collaboration on climate change

Chinese Government attaches importance to the issue of climate change and have enacted policies and actions to address it

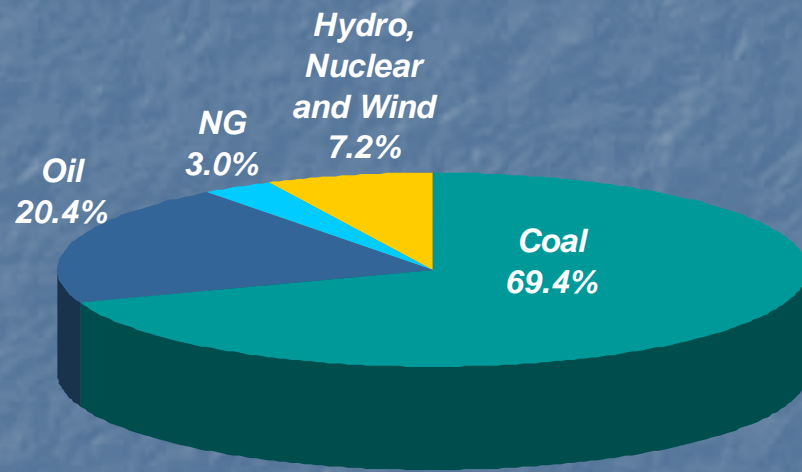
- The outline of the 11th Five-Year Plan for National Economic and Social Development: *Striving to make achievements in controlling GHG emissions.*
- The State Council decides to establish the *National Leading Group to Address Climate Change and Energy Conservation & Pollutant Discharge Reduction*
- *Middle and Long Term Program of Renewable Energy Development*
- *The General Work Plan for Energy Conservation and Pollutant Discharge Reduction*
 - **20% reduction of energy intensity and 10% reduction of major pollutant discharge** during the 11th 5-year period
- Public action on energy conservation and pollutant discharge reduction
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Role of CCS in Climate Change

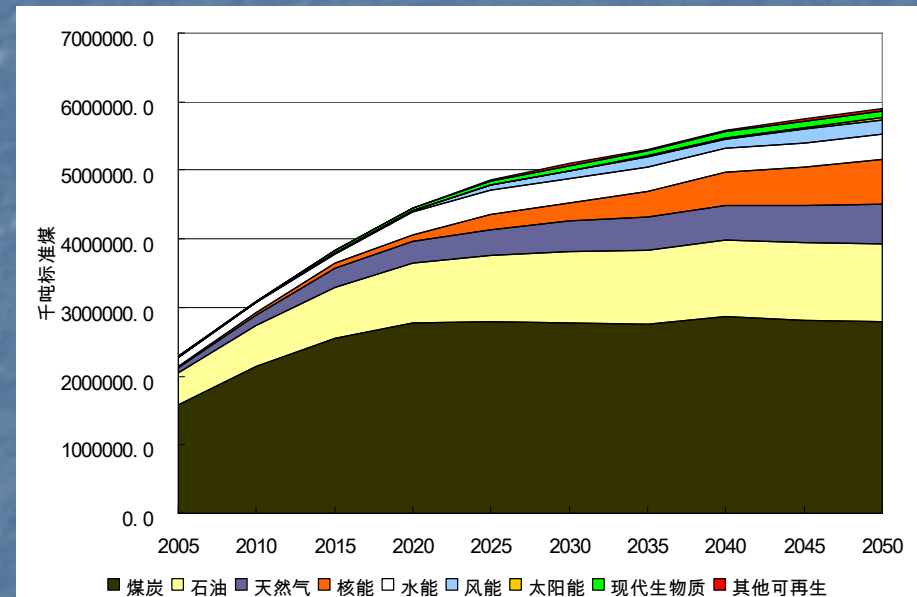
- To address climate change needs comprehensive measures, the international community and countries have adopted many actions.
- Responses to and solutions of the climate change issue, after all, depend on the advances in science and technology.
- CCS, as a leading-edge technology with great CO₂ reduction potential, calls for wide attention of the international community.

Energy Resources and Energy Structure of China

- Abundant coal reservation: 13% of world total
- Energy Structure:



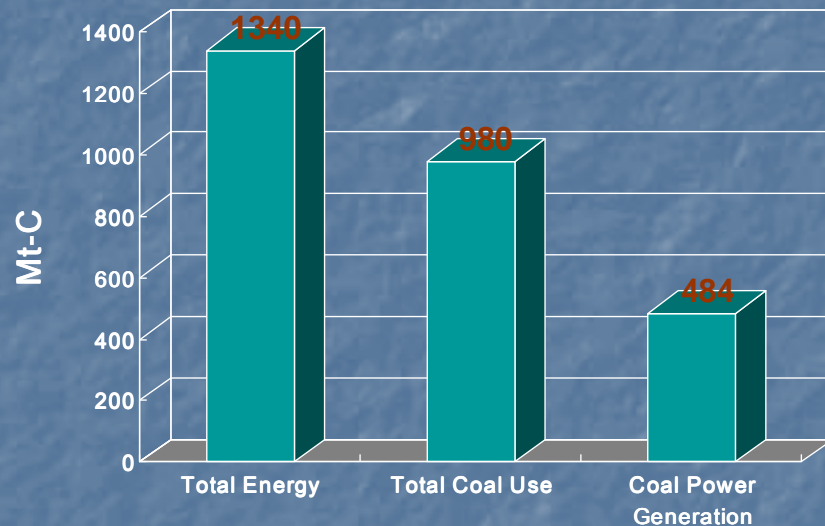
Energy Structure in 2006



Referring to the simulation results based on an energy system model, if follows today's tendency of energy technology development and energy policy, the fraction of coal in primary energy consumption will decrease after 2015, but still be high: 54.5% in 2030, and 47.2% in 2050. Coal will still be the major primary energy.

CO2 Emissions and Storage Potential in China

■ CO2 Emissions in 2004



■ Storage potential

(Very preliminary estimation)

- 46 oil & gas reservoirs, 7.2 billion t-CO2
- 68 unmineable coal beds with methane recovery, 12 billion t-CO2
- 24 saline aquifers, 1,435 billion t-CO2

2. CCS related Policies in China

Outline for National Medium and Long-term Science and Technology Development Plan towards 2020

- CCS was integrated into *The Outline for National Medium and Long-term S&T Development Plan towards 2020* as leading-edge technology;

“To Develop high efficiency, clean and near zero emissions fossil energy development and use technologies.”

China's National Climate Change Program (CNCCP)

- Issued by the State Council on 4 June 2007
- Gives the target, principles, key areas and policies of addressing climate change
- China's first policy document to address climate change, and the first national climate change program among developing countries

CNCCP includes developing CCS in the key area of GHG reduction.

China's Scientific and Technological Actions on Climate Change

- Issued by MOST with other 13 departments on 14 June 2007
- to coordinate climate change-related scientific research and technological development
- and to enhance the comprehensive science and technology capacity in response to climate change

It includes CCS as a key task of GHG control technology development.

3. CCS Activities in China

National S&T Programs (1)

■ National Key Technology Program

- During the 10th five-year period, the national key technologies R&D program has supported strategic studies on CCS by Chinese research institutions
- Emphasis is placed on the applicability of CCS in China, and its impact on energy system and GHGs emission reductions

National S&T Programs (2)

- **National Basic Research Program (973 Program)**
 - 4 key projects are developed
 - Research on enhancing oil recovery, use as resource and storage of GHG
 - Basic Research of Polygeneration System with syngas co-produced from coal gas and coke oven gas
 - Basic research of high efficient catalytic conversion in reforming reaction of natural gas and syngas
 - Research of thermal-to-power conversion processes in gas turbine
 - In the following years during 11th 5-Year Plan period,
 - 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.

National S&T Programs (3)

- The National High Tech Program (863 Program)
 - 863 Program will also support the development of CCS technology.
 - Project will start to design soon and be implemented in the 11th 5-Year Plan period.

Enterprises' Activities (1)

Some Chinese enterprises have already started CCS related research and project activities on their own initiatives.

■ PetroChina

- Carry out China's first project of CO₂ storage and usage (EOR) at Jilin Oil Field from 2006
- Investment: 2 billion RMB
- CO₂ injection at 10 wells

Enterprises' Activities (2)

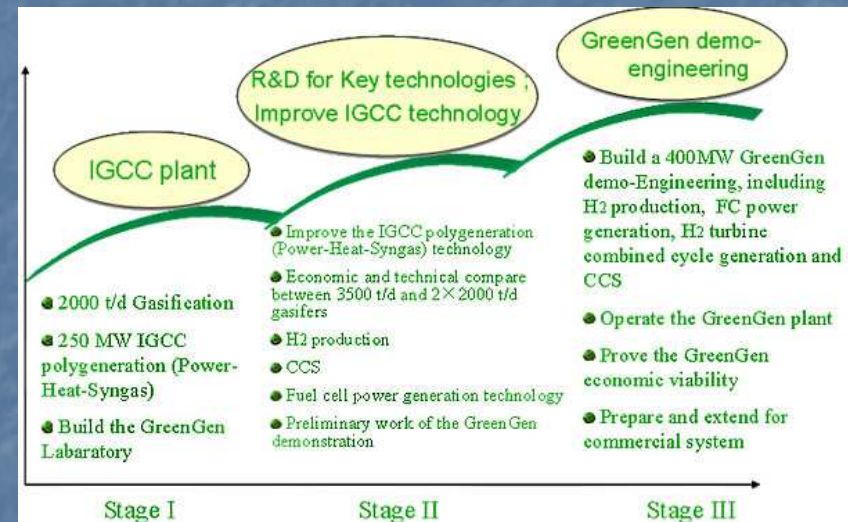
■ Huaneng Group

■ GreenGen

- Stage I: 2006-2009
- Stage II: 2010-2015
- Stage III: 2016-2020

Feasibility study and bidding of key equipment completed

To start up at the end of 2007



■ CO₂ Capture Demonstration

- *MoU of Cooperation on clean coal technology and CCS* was signed between China Huaneng Group and CSIRO in Sydney, which is to push the cooperation of coal and CCS
- Co-funding of the first demonstration project in Beijing Thermal Power plant with 3000 t co₂/y, in operation before 2008 Olympic

International Collaboration (1)

- China was one of the initial members of the Carbon Sequestration Leaders 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* ”

International Collaboration (2) : 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 MoU foresee 3 phases 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.

Shared Objects of China-EC-UK Cooperation

- Update on the status and development of CCS initiatives in China and internationally;
- Review the status and progress of current CCS activity in China;
- Facilitate and strengthen links between Chinese and the international CCS community;
- Generate a 'road map' for assessing the potential of CCS in China;
- Identify key actions and milestones for development and deployment of CCS technologies in China.

International Collaboration (3) : Projects under EC/UK MoU on CCS

- China-EC-UK MoU Result in two parallel but complementary projects:
 - *COACH project funded by the EC FP6*
 - 2006-2009
 - €1.6 M
 - 8 Chinese partners & 12 EU partners
 - *UK Near Zero Emissions Coal Initiative (NZEC)*
 - Under designing, expected to start this year
 - Up to €3.5M in phase 1
 - 20 Chinese partners involved

International Collaboration (4) : Others

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

4. Our Perspectives on CCS

1) CCS is one of the potential important technological options to address climate change

CCS, with significant potential for GHG reduction, is a strategic high technology in the long run. R&D should be continually strengthened to promote and improve CCS technology .

2) There still remains many difficulties in the development and deployment of CCS technology

Given the high cost and energy penalty of the large-scale deployment, the main effectiveness of CCS is mitigating GHG reduction. there are many difficulties in prioritizing CCS technology in developing countries, because of their specific national situations.

3) To promote the development of CCS calls for broad international collaboration.

Positive efforts have been made by international society concerning development of CCS technology. In the future, further enhancement of international collaboration on CCS should be strengthened, especially the establishment and improvement of the financial mechanism in promoting the development of CCS technology, so as to jointly promote technology transfer and the development of CCS technology.

Thank you all!