### CCUS ACTIVITIES AND OPPORTUNITIES IN CHINA

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## The Role of CCUS: Global View

- Paris Agreement reaffirms the long term goal to hold the temperature increase well below 2 °C
- In the IEA 2 degree Bluemap Scenario, CCS is estimated to contribute to 13% of GHG emission reduction in 2050
- Among the carbon abatement technologies, CCUS is only one viable technology to enable large-scale carbon reduction from the usage of fossil fuel.
- Applying CCUS would help decarbonize fossil fuel and improve resources management



CCUS is a long-term measure to achieve the absolute reduction of GHG

## The Role of CCUS: Perspective from China

CCS is regarded as a long-term option for carbon mitigation especially under the consideration of Chinese coal-dominate energy structure

#### Concerning Technology

CCS is still in the demonstration stage and has less co-benefits compared with other low-carbon technologies such as wind and solar technology

#### Concerning Global Climate Regime

> Paris Agreement established the "bottom-up" regime, provided parties more flexibilities

#### Concerning Mitigation Demand

> Paris Agreement reaffirms the 2°C long term goal, catalyze the development of low carbon technology

#### Concerning Chinese National Circumstances

- China is one of very few countries with energy resources dominated by coal, contributing to more than 60% of China's primary energy consumption.
- China is still in the process of urbanization and industrialization, and its high emission will continue in the foreseeable years
- In its INDC, China commit to achieve the peaking of CO2 emissions around 2030 and to make best efforts to peak early

### **CCUS Development in China**

- From single-component pilot to full-chain integrated demonstration
- More than 20 projects are implemented or planned
- Most large-scale energy companies started CCUS related pilot and demonstration
  - ✓ Capture 600ktCO2/a CO2 in total
  - ✓ Storage site includes onshore and offshore.
  - The phase I of Yanchang project (360ktCO2/a) will start construction in 2016 and the 1MtCO2/a project will be completed by 2020 and will be the first 1MtCO2/a integrated CCUS project in China.
  - China Resource Power and CNOOC post-combustion capture and offshore storage project has been planned with multiple capture technologies tested.

### CCUS Technology Status (1) Capture Technology:

- Relatively mature, but high cost and energy penalty are main barriers for deployment
- Post combustion capture: 100ktpa project operated
- Pre-combustion capture : 60
  -100ktCO2/a project under construction
- Oxyfuel combustion capture: 35MWt project operated

Shanghai Shidongkou Power Pant COR Sttorage Project



# CCUS Technology Status (2)

### **Carbon Transport Technology**

#### vehicle transport:

 Apply for most demonstration projects and industry use but still costly for largescale transportation

#### Ship transport:

- ✓ Still at the R&D and early industry design stage
- Ship transportation is identified by CRP-CNOOC offshore project

#### Pipeline transport:

- One is operated by CNPC Jilin oilfield project
- Supercritical pipeline transport will be constructed by Yanchang CCUS phase 1 project

# CCUS Technology Status (3)

### **Storage Technology**

- China started CO2 storage site selection, storage potential assessment, site characterization, and source sink match research.
- The preliminary results show China has substantial CO2 storage potential in saline formation.
  - ✓ 100ktCO2/a saline formation storage demonstration has been operated by Shenhua project
  - ✓200ktCO2/a CO2-EOR storage has been developed by CNPC project



Storage Site of Shenhua CCS project, Inner Mongolia

## **Policy Measures to Promote CCUS Development in China**

- From focusing on technology R&D to both on technology R&D and industrial pilot and demonstration
  - CCUS technology is included in major R&D programms and action plans as a climate change mitigation technology
  - The "Greenhouse Gas Control Working Plan for the 12<sup>th</sup> Five-Year-Planning period" clearly indicates that deploying and constructing CCUS demonstration projects is an important component for greenhouse gas emission reduction

# **Challenges for CCUS development in China**

- Economy: biggest challenge; high investment and operation cost; 140-600RMB/tCO2 for storage, less competitive than renewable energy and less co-benefit;
- Technology: energy punishment 10-20% under current technology condition; still in demonstration stage and lack of cost-effective, reproducible and commercialized cases; weak in infrastructure construction;
- Experience: most projects just started with limited experience, projects mainly focus on capture and EOR, less experiences in CO2 geological storage, CO2 monitoring and large scale transportation
- Environment: lack of systemic assessment on environment impact and risk; incomplete monitoring and pre-warning scheme;
- Regulation: lack of clear classification of CO2, legal positioning and relevant regulations and standards;
- Policy: lack of special policies; existing policies are more directive but not compulsory; lack of incentive and funding; large number of stakeholders involves, lack of coordinative scheme;

# Latest CCUS related policy

2015.05 Action Plan on Clean and High-efficiency Use of Coal (2015-2020) by NEA

 Encourage cooperation between coal chemical enterprises and oil companies, to develop demonstration on EOR, geological storage, to accumulate experiences for large scale demonstration

2015.11 Enhanced Actions on Climate Change: China's Intended Nationally Determined Contributions by NDRC

 Enhance the technology R&D and industrialization demonstration of CCUS, promote CO2 EOR and ECBM technology

2015.12 National Key Low-carbon Technology Catalogue (II) by NDRC

 2 CCUS technologies were included, another 2 technologies were included into the National Key Low-carbon Technology Catalogue (I) in 2014

# **International Collaboration (1)**

#### **Bilateral Collaboration**

#### US-China Collaboration

- CCUS Initiative was included in the China US Climate Change Working Group (CCWG), and 6 collaboration projects between China and U.S. enterprises and research institutes were lunched
- In the 2015 China-U.S. Joint Presidential Statement on Climate Change, Yanchang Petroleum project was selected as major CCUS collaboration projects between the two countries

#### UK-China Collaboration

✓ Set up UK-China (Guangdong) CCUS Centre in 2013

Develop bilateral projects with EU, Australia, Italy, and Japan

# **International Collaboration (2)**

#### **Multilateral Collaboration**

#### Collaboration with ADB

- Developed the Roadmap for CCS Demonstration and Deployment in China Jointly and released the report during Paris COP
- Discussing new technical assistant projects



Attend the 4<sup>th</sup> CSLF



The ADB CCS Roadmap report was released in Paris during COP21

#### Collaboration with GCCSI

- National member of GCCSI
- Host CCUS joint workshop annually

### Other Collaboration

- Actively participate in CSLF and
- Clean Energy Ministerial Conference

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## **Final Remark: Future Prospect**

### China' Opportunity

Excellent CO2 storage geological condition

High degree of source sink match

Technology Advantage

Low capital cost, EOR & EWR utilization opportunity

#### Priority CO2 Emission Sources and Storage Sinks in China



Source: Roadmap for CCS Demonstration and Deployment in China , ADB, 2015



# **Thank You**