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Status of CCUS in China

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The Administrative Centre for China's Agenda 21

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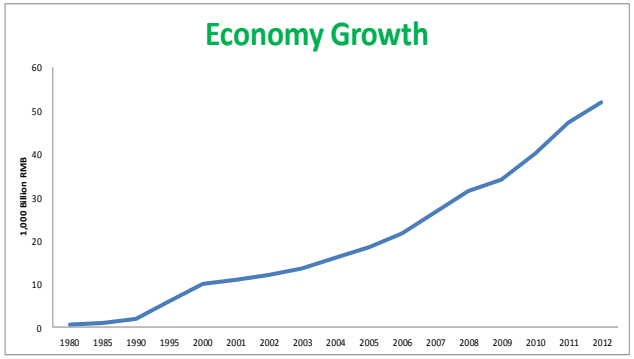
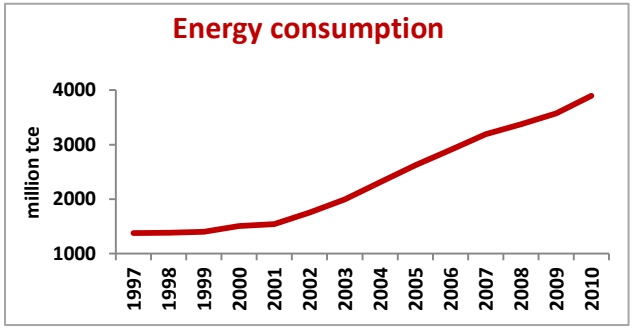
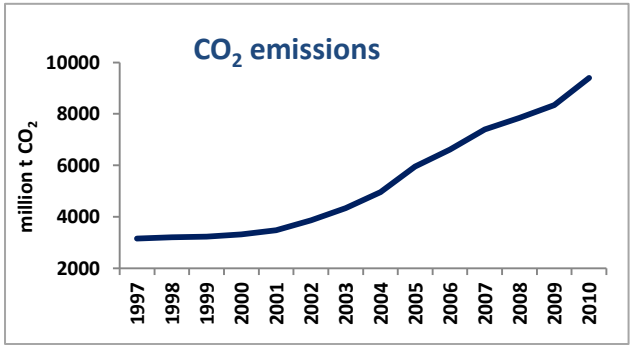
OVERVIEW OF ECONOMY, ENERGY AND EMISSIONS

Economy, Energy and Emissions in China

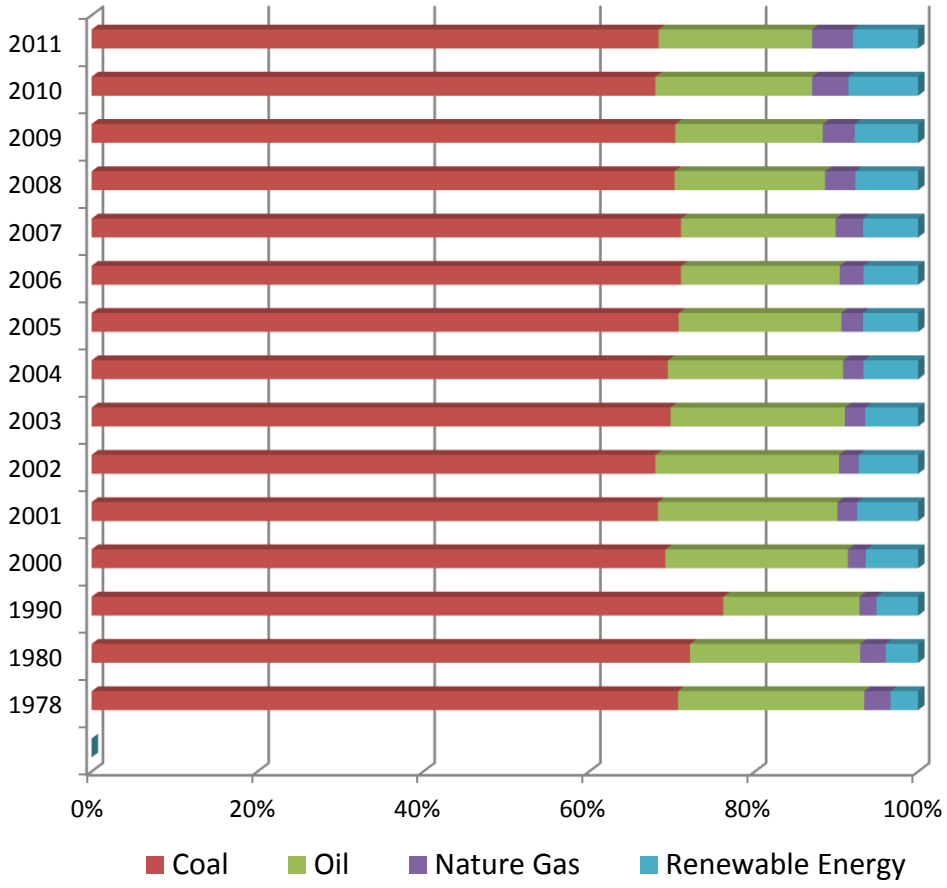
- During the period of rapid industrialization and urbanization, the GDP from high energy-intensive industries accounted for a big proportion in China.
- The energy demand increases by 200 million tce annually in the recent years.
- From 1990 to 2010, the GDP grew by 7.3 times, while energy consumption and CO2 emission increased by 3.3 and 3.0 times.
- From 1990 to 2010, CO2 intensity declined by 57%, that is rare all over the world.
- CO2 emission intensity to drop 40-45% by 2020 according to the 2005 level.



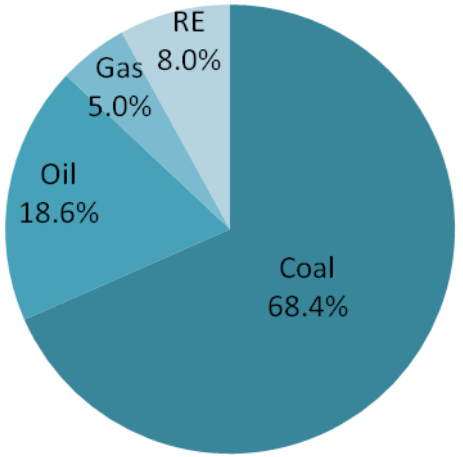




Coal accounts for around 69% of Primary Energy Consumption in the past 30 years.



2011's Energy consumption structure in China



Renewable and nuclear energy development is remarkable, the share of which in primary energy mix keeps increasing, but still could not meet the new incremental demand for energy services in quite a long time.

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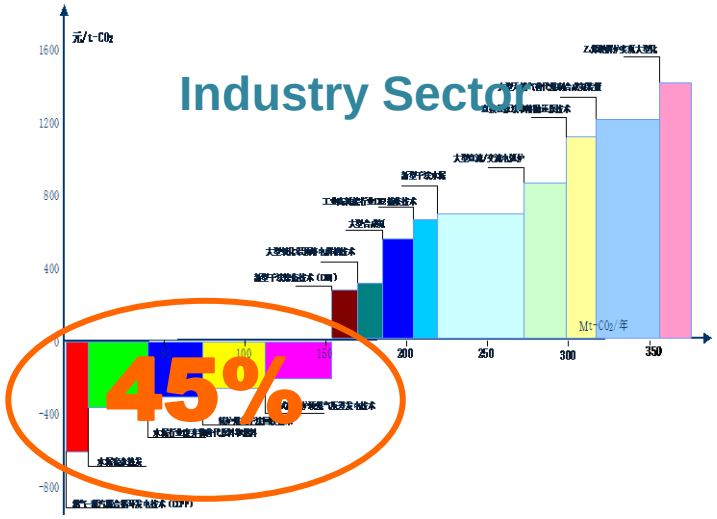
ROLE AND POTENTIAL OF CCUS IN CHINA

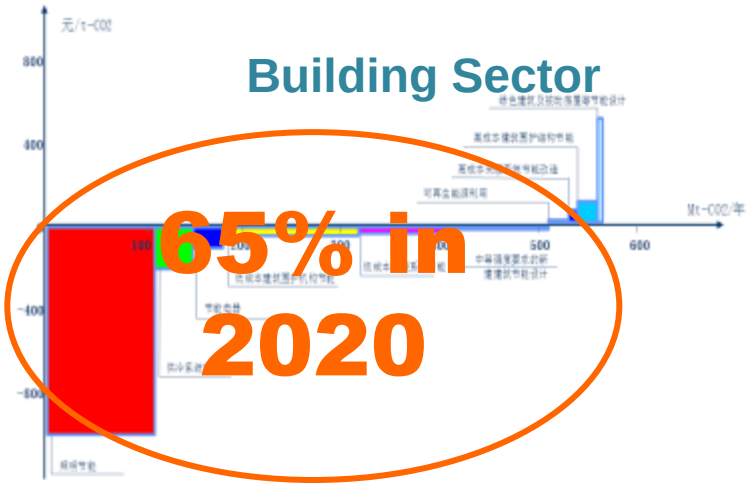
Normal mitigation technologies have great potential for CO2 reduction in China currently, and are cost effective.

- **Mitigation Potential**

	2020	2030	2050
Mitigation tech. in Industry, Transport and Building	2.2Gt	3.8Gt	5.0Gt
Non-Fossil Energy Tech.	1.5Gt	3.0Gt	5.3Gt

- **Mitigation Cost (big portion of negative cost)**

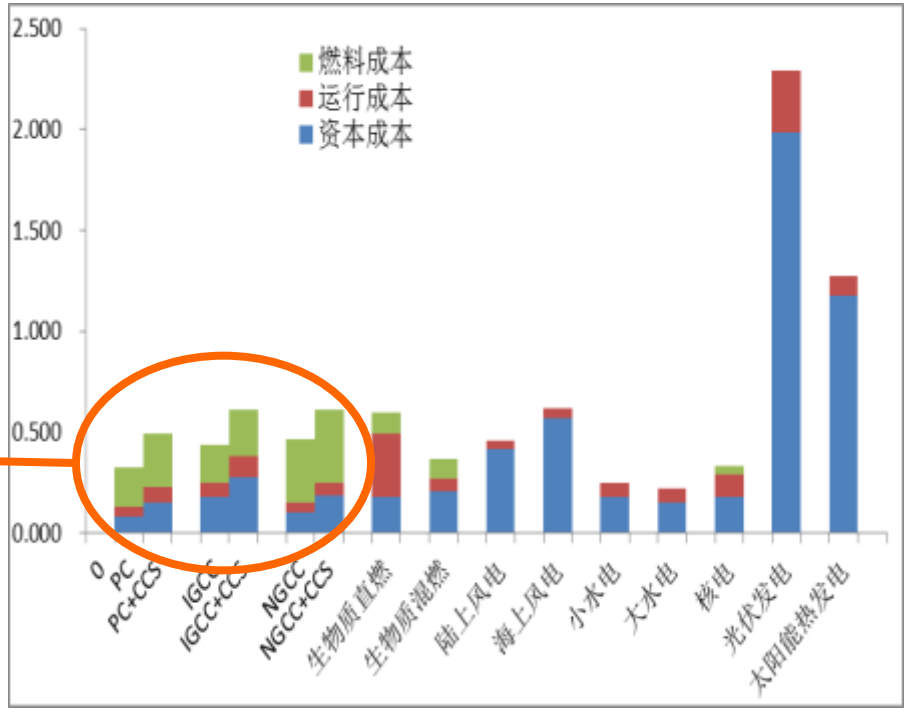




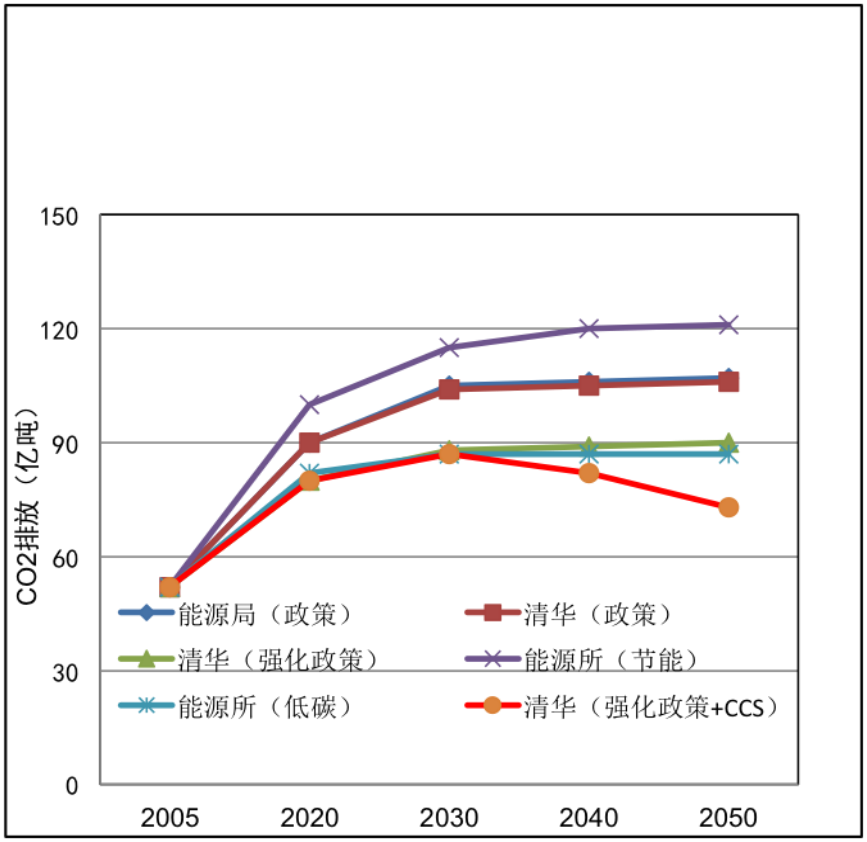
CCUS is not mature and is expensive

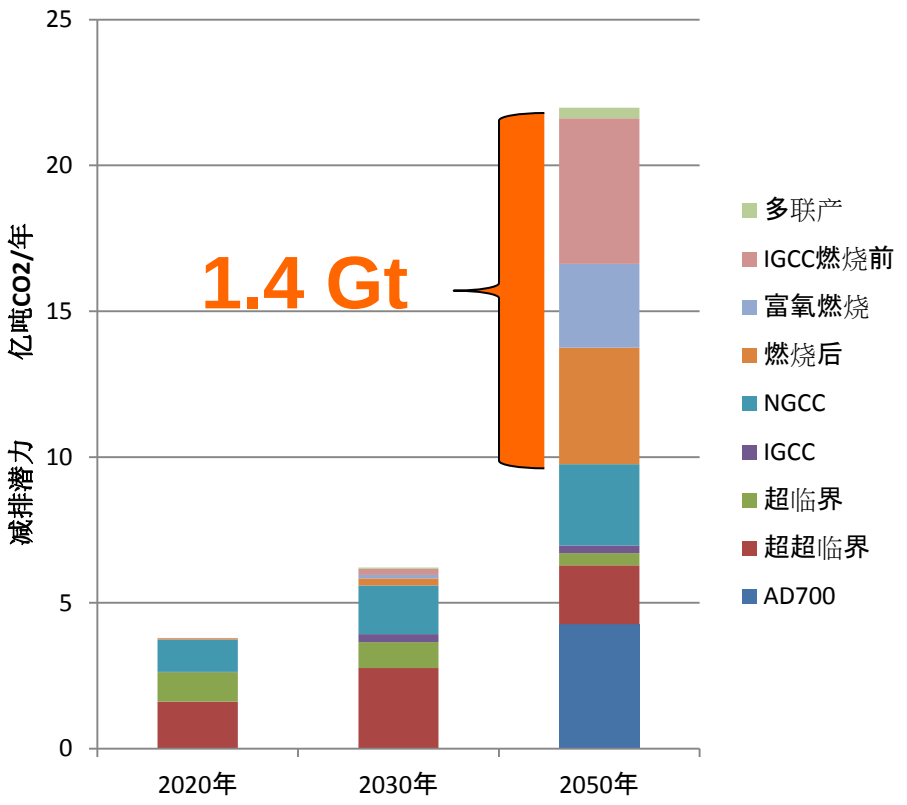
- High costs
- High energy penalty
- High risk

A big portion of fuel costs in total cost.



Scenario analysis suggests CCUS will play important role in mid- and long-term.





Theoretical Storage Capacity

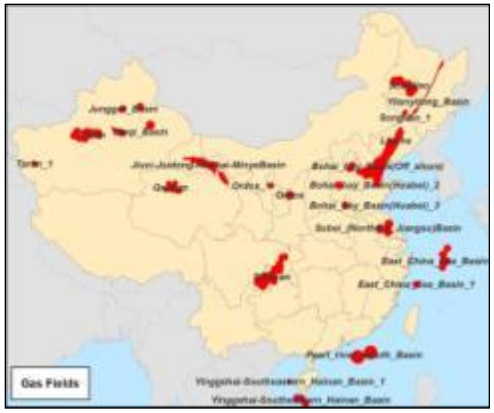
Saline Aquifer

- Examined 17 onshore basins and 10 offshore
- Applied specific storage volume method based on
- Capacity: **3.1Tt**CO_2
  - 2.3 $GtCO_2$ onshore
  - 0.8 $GtCO_2$ offshore

EOR

- Examined 29 onshore basins and 21 offshore
- Capacity **4.8Gt**CO_2
  - 4.6 $GtCO_2$ onshore
  - 0.2 $GtCO_2$ offshore
- Up to 7.0 BBO additional oil recovery

Depleted Gas Reservoirs



- Examined 23 onshore basins and 6 offshore
- Capacity **5.2 Gt**CO_2 storage potential
  - 4.3 $GtCO_2$ onshore
  - 0.9 $GtCO_2$ offshore

ECBM (600-1500m)

- 10% of OCIP for storage
- Examined 69 onshore coal-bearing regions
- **12.1Gt**CO_2 capacity
- 1.6 Tm^3 additional coal bed methane recovery

(Source: Li et al, 2007)

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CCUS ACTIVITIES: POLICY, R&D AND DEMO

Policies are getting into details gradually

- National Medium- and Long-Term Program for Science and Technology Development (2006-2020) *by State Council, 2006*
- China's scientific actions on climate change, *by MOST, 2007*
- 12th National Scientific and Technological Plan on Climate Change *by MOST, May 2012*
- Work plan for 12th 5-year National GHG Control *by State Council, 2012*
- S&T roadmap of China's CCUS development *by MOST/ACCA21, 2011*
- Special Plan for CCUS technology development *by MOST, 2013*

General statement

"to develop CO2 near zero emission technology"

Detailed development measure

Targets, actions in capture, storage, utilization and storage, full-chain demo, etc

CCUS Progress Summary: R&D

- **R&D Activities in the 11th FYP**

Project Title	Funding by	Duration	Type of projects
The Project of CCS–EOR, Utilization and Storage	973	2006-2010	Basic Research
Program of CO2 Capture and Storage technology	863	2008-2010	Technology R&D
The Key Tech Research Program on CCS-EOR and Storage	863	2009-2011	
The Key Tech Research Program on CO2-Algae-Biodiesel	863	2009-2011	
CO2- Safety Mining with CO2 Gas Reservoirs and CO2 Utilization Tech	National Major Special Project	2008-2010	R& D
Demonstration Project of Mining and Utilization Tech of Volcanic gas containing CO2 in Songliao Basin	National Major Special Project	2008-2010	

CCUS Progress Summary: R&D

- **R&D Activities in the 12th FYP**

Name of Projects	Funding by	Duration	Type of projects
Demonstration Project of CO2 capture and geological storage in Coal Liquification Plant, China Shenhua Group	National Key Technology R&D Programme	2011-2014	Technology R&D
The Key Tech Research Project of CO2 Emission Reducing on Iron-Steel Sector	National Key Technology R&D Programme	2011-2014	Technology R&D
Research and Demostration Program of IGCC +CO2 Caputure, Utilization and Storage	National Key Technology R&D Programme	2011-2013	
CO2 Storage Capacity Assessment and Demonstration in China	China Geological Survey	2011-2014	
The Program of CCS –EOR, Utilization and Storage	973	2011-2015	Basic Research

CCUS Progress Summary: Enterprise Action

Project Title	Scale	Capture Tech	Storage/ Utilization	Status
The pilot project of CO2 Capture, Huaneng Beijing Gaobeidian Thermal Power Plant	Capture Capacity:3,000 T/Y	Post-Combustion	Food Use	Operated in 2008
Demonstration Project of CO2 capture and storage in Coal Liquification Plant, China Shenhua Group	Capture Capacity:100,000 T/Y Storage Capacity: 100,000 T/Y	Coal liquefaction	Saline Aquifer	operated in 2011
Demonstration Project of CO2 capture, Storage and Utilization in IGCC Plant Greengen of Huaneng	Capture Capacity:60,000--100,000 T/Year	Pre-Combustion	EOR	Launched in 2011
Small Scale Demonstration Project on CO2 Capture and EOR in Shengli Oil Field, Sinopec	Capture/Utilization:40,000T/Y	Post-Combustion	EOR	Operated in 2010
Demonstration Project of CO2 capture, Shanghai Shidongkou Power Plant, Huaneng	Capture Capacity:120,000 T/Y	Post-Combustion	Food/ Industrial	Operated since 2010
Demonstration project of Carbon Capture, Shuanghuai Power Plant, China Power Investment	Capture Capacity:10,000 T/Y	Post-Combustion	Food/ Manufacture	Operated in 2010
Pilot Plant of CO2 capture in Lianyungang City, CAS	Capture Capacity:30,000 T/Y	Pre-Combustio	N/A	Operated in 2011

Demonstration

China Power Investment,
10,000t/a capture pilot

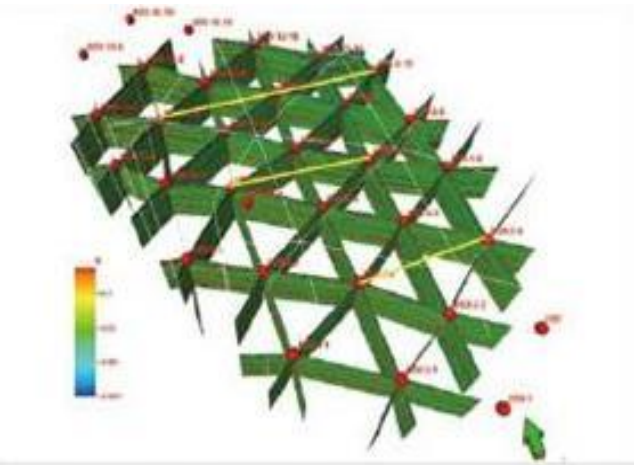
Huazhong University of S&T (HUST)
35MWt Oxy-fuel pilot,

Huaneng Group
Gaobeidian & Shidongkou Power Plant Demo

Demonstration

PetroChina

CO_2 EOR ,Jilin Oilfield



ENN Group

Micro algae Bio-fuel Pilot

Capacity: 20,000t/y

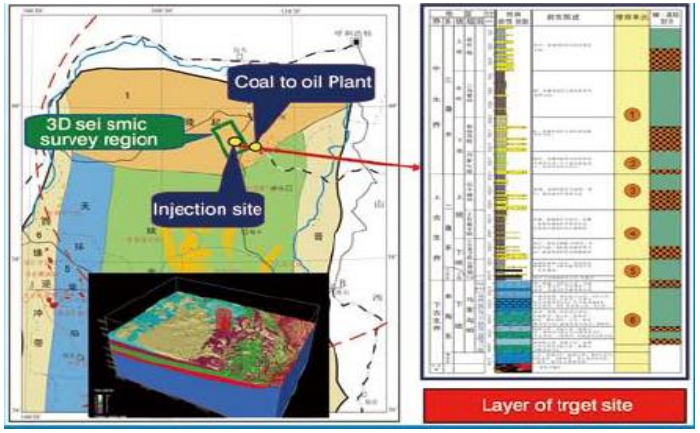
China United Coalbed Methane

ECBM Pilot Project

Qinshui, Shanxi

Demonstration

SINOPEC, Shengli Oil Field
CO2-EOR, 1Mt CO2/year



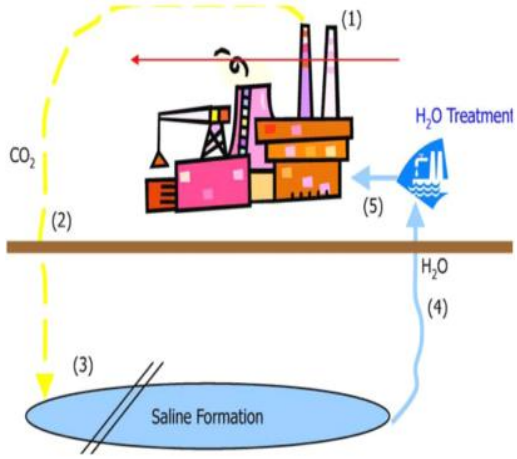
Shenhua Group
Erdos, 3Mt/a

CCUS Progress Summary: International Collaboration

Project	Partner	Duration
China-Australia Geological Storage of CO2 (CAGS)	RET, GA	2012-2014
China-EU NZEC Cooperation	UK, EU, Norway	2007-2009
China-EU Carbon Capture and Storage Cooperation（COACH）	EU	2007-2009
Sino-Italy CCS Technology Cooperation Project(SICCS)	ENEL	2010-2012
China-US Clean energy Research Center	MOST, NEA, DOE	2010-2015
CSLF Capacity Building Projects	CSLF	2012-
MOST-IEA Cooperation on CCUS	IEA	2012-

Current Work

- **An Assessment Report on CO2 Utilization Technologies in China was published at the beginning of this year, led by ACCA21.**
  - Enhanced Energy Recovery
  - Enhanced Resources Recovery
  - Chemicals production
  - Bio & Agriculture production
  - Products from industrial wastes



- **To update CCUS Roadmap with new recognition on Utilization technologies.**

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CONCLUSIONS

- CCUS is important to China
  - In the long term, an important technical option for CO2 reduction.
  - In the short term, could serve as important tool to solve energy and resource issues, e.g. enhanced exploration of shale gas, geothermal, saline water and liquid mineral.
- Besides technology R&D, enabling policies are essential for the take off of CCUS.
- The nature of CCUS technology calls for enhanced International collaboration.
- The combination of CCUS with renewable energy technology could be considered, e.g BECCS

Thanks for your attention!

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For More Information, Please Visit

www.ccusChina.org.cn