

# The Progress of the CCS Demonstration Project in the Shenhua Group

China Shenhua Coal to Liquid & Chemical Engineering Company, July 9, 2012  
2012 NETL CO<sub>2</sub> Capture Technology Meeting, July 9-12, 2012 in Pittsburgh, PA.



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# Overview of the Shenhua Group Corporation

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## Shenhua Business 2011



- The largest coal company in China and the largest coal supplier in the world
- One of the State-Owned Enterprises (SOEs), established in 1995

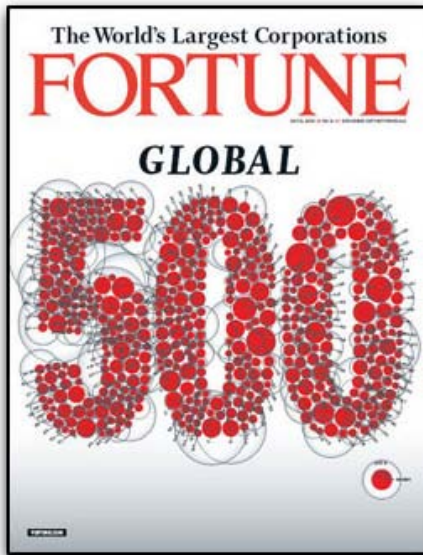
- An integrated mega-large energy company with the businesses covering mining, power, railway, port and coal to liquid and chemicals
- 47 subsidiaries, over 200,000 employees and USD 100 billion in assets



# Overview of Shenhua Group Corporation

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## Shenhua Business 2011



- Coal Production: 400 million tons
- Coal Trading: 500 million tons
- Power Generation: 211 billion kWh
- Revenues: \$ 48 billion
- Profit: \$ 12 billion





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# China Shenhua Coal to Liquid and Chemical Co., Ltd, one of the main subsidiaries of the Shenhua Group

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As a wholly owned subsidiary of Shenhua Group, China Shenhua Coal to Liquid and Chemical Co., Ltd. is:

- a sole-owned limited liability company established in Beijing on June 12, 2003 with approval of the State Administration for Industry and Commerce;
- responsible for managing the CTC (Coal to Chemical) and CTL (Coal to Liquid) - related business of Shenhua Group;
- involved in producing products such as polyethylene, polypropylene, methanol, diesel, naphtha and LPG, etc.





# China Shenhua Coal to Liquid and Chemical Co., Ltd,

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In 2011, the capacity of coal-to-liquid & chemical and coking production amounted to 9,900 kta

- Shenhua Direct Coal Liquefaction (DCL) Plant (1000 kta, fuel oil)
- Shenhua Indirect Coal Liquefaction (ICL) Plant (180 kta, fuel oil)
- Shenhua Coal to Olefin (CTO) Plant in Baotou (600 kta, PP and PE)
- Shenhua Coal-to-Methanol plants
- **Shenhua Shenning Coal to Chemical (CTC) Plant (500 kta, PP) \***
- **Shenhua Coking Plant in Wuhai (5,000 kta) \***
- Shenhua 100 kta CCS Project associated with Shenhua DCL plant in Erdos

*\* Note: The plant that does not belong to China Shenhua Coal to Liquid and Chemical Co., Ltd.*



# China Shenhua Coal to Liquid and Chemical Co., Ltd,

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## Shenhua DCL Plant (1000 kta)







China Shenhua Coal to Liquid and Chemical Co., Ltd,

## Shenhua ICL Plant (180 kta)



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# Shenhua 100 kta CCS Demonstration Project

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## **China Central Government Policy related to the CCS project:**

- On Feb. 9, 2006, the State Council released the “National Outline for Medium and Long Term Science and Technology Development (2006-2020)”, in which developing high efficiency, clean and near-zero CO<sub>2</sub> emissions fossil energy technology is listed as a key component in the advanced energy area.
- On June 4, 2007, the National Development & Reform Commission (NDRC) issued “China’s National Climate Change Program”, which proposes to vigorously develop CO<sub>2</sub> capture, utilization and storage technologies.



# Shenhua 100 kta CCS Demonstration Project

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## **China Central Government Policy related to the CCS project:**

- On June 14, 2007, the Ministry of Science and Technology and NDRC jointly released “China’s Scientific and Technological Actions on Climate Change”, in which CO<sub>2</sub> capture, utilization and storage is emphasized as one of the key tasks.
- On Oct. 29, 2008, the State Council Information Office published a white paper entitled “China’s Policies and Actions for Addressing Climate Change”, which points out that China is determined to emphasize the importance of CCS technologies.





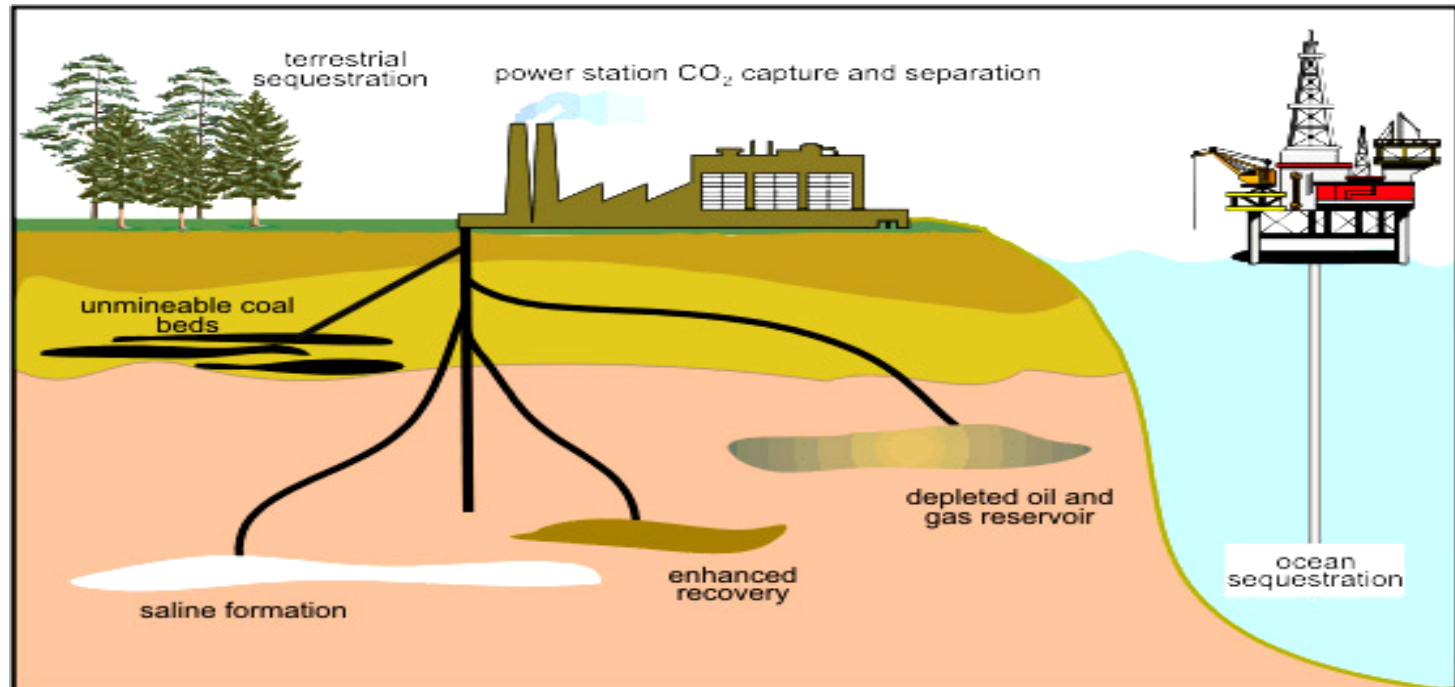
# Shenhua 100 kta CCS Demonstration Project

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- It is inevitable to produce and emit CO<sub>2</sub> from coal mining, transportation and conversion (such as CTL, CTC, etc.), as a coal mining based company.
- As a state-owned company and the leader of the coal industry in China, Shenhua needs to actively take on its social obligation and responsibility to reduce the emission of CO<sub>2</sub> during coal production and its consequent processing.

# Shenhua 100 kta CCS Demonstration Project

Prior to large-scale application of renewable and new energies, CO<sub>2</sub> Capture and Sequestration may be one of the most efficient ways to reduce atmospheric hazards due to CO<sub>2</sub> emission.





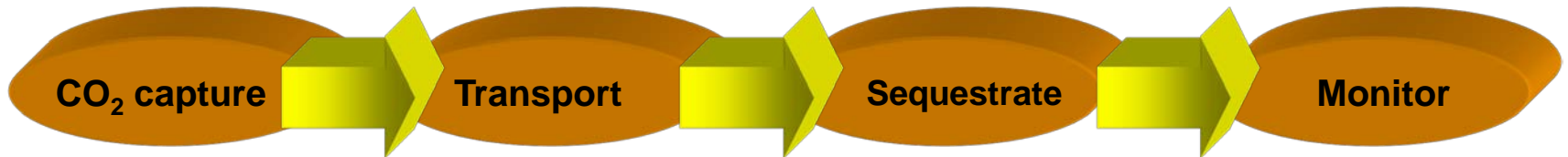
# Shenhua 100 kta CCS Demonstration Project

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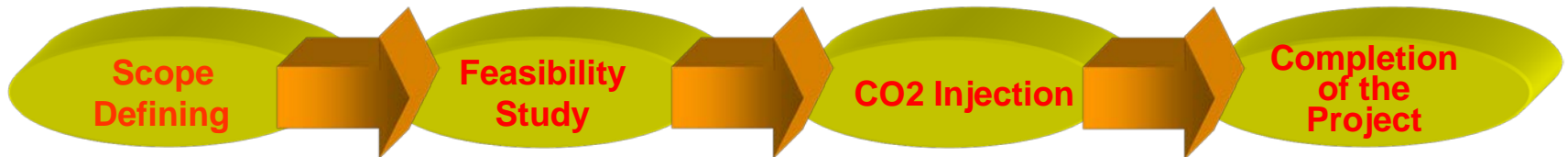
- All of the main sectors of Shenhua Group emit CO<sub>2</sub> during their running or operation;
- Considering the convenience of gaining relatively higher CO<sub>2</sub> concentration emitted from the syngas purification unit of CTL or CTC plants, the subsidiary of Coal to Liquid and Chemical Company, Ltd., was chosen to conduct the Shenhua CCS Demonstration Project;
- The CTL Demonstration Plant of Shenhua Coal to Liquid and Chemical Company, Ltd., is located in Erdos Basin;
- There are suitable underground structures and conditions for choosing Erdos Basin as the CO<sub>2</sub> injection area.

# Shenhua 100 kta CCS Demonstration Project

## Key Links of CCS



## Steps of CCS Project Conduction







# Shenhua 100 kta CCS Demonstration Project

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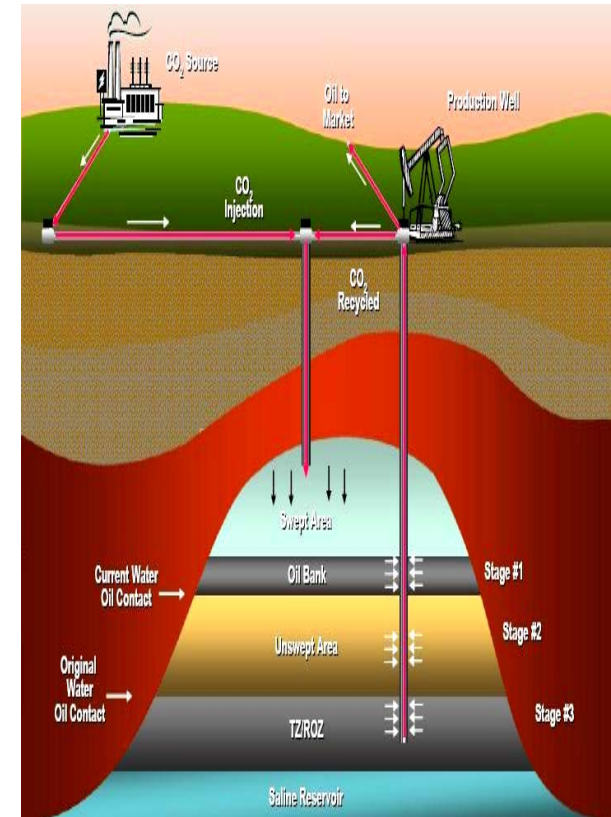
## **International support and collaboration during Pre-feasibility Study of the Project**

With the support of the US Department of Energy (DOE), National Development & Reform Commission (NDRC) and State Environmental Protection Administration (SEPA) of China, the Shenhua Group and the West Virginia University began the Pre-feasibility Study for the Shenhua Demonstration CCS Project in 2007.

## Optional area for CO<sub>2</sub> injection and sequestration:

- Optional area for enhancing rate of oil and gas recovery;
- Optional area for burying of deep coal seams;
- Optional area for burying of saline aquifer.

Conclusion: Saline aquifer is the appropriate option for CO<sub>2</sub> injection and sequestration of the Shenhua CCS Demonstration Project.





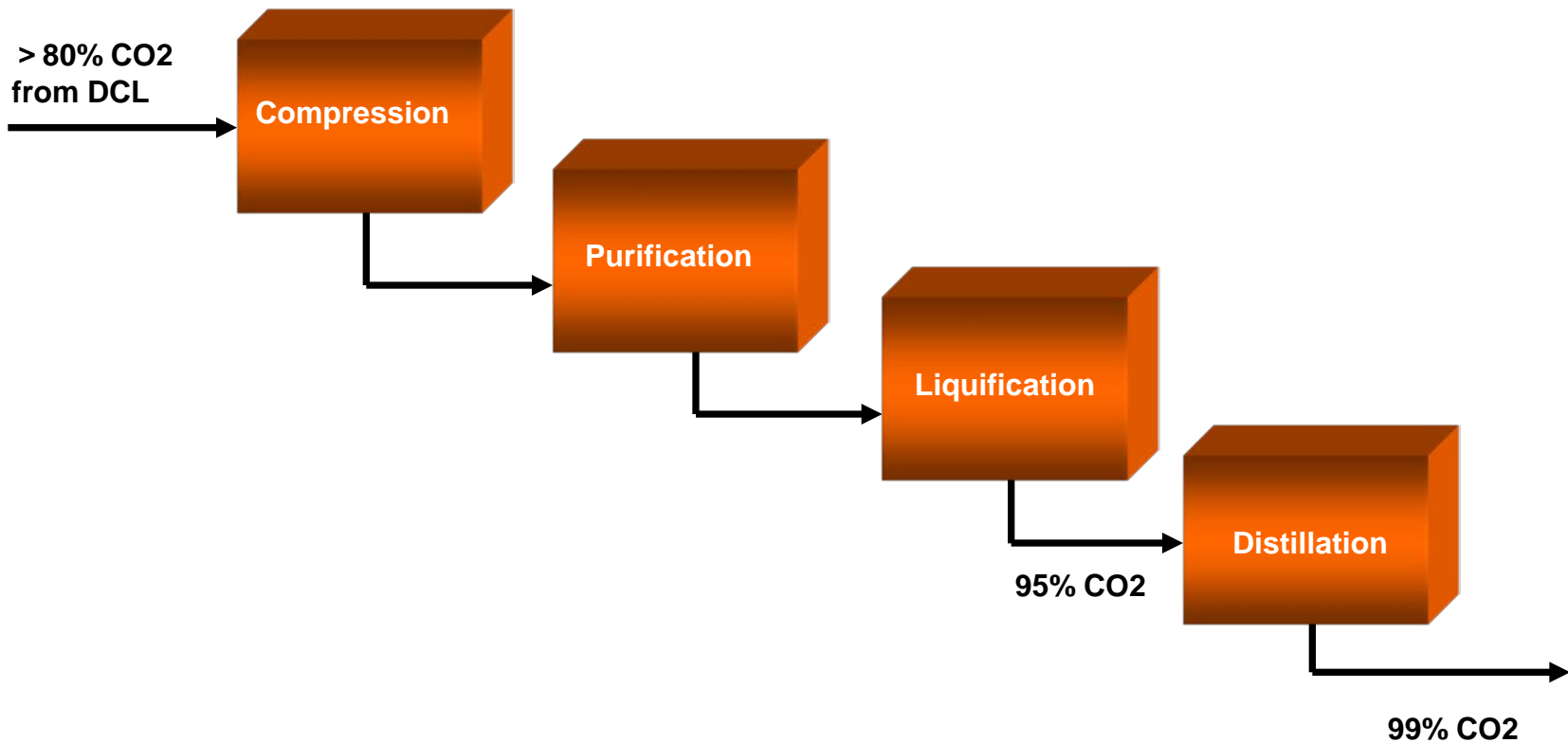
# Shenhua 100 kta CCS Demonstration Project

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## **Feasibility Study and the Implementation of the Project**

Supported by the joint pre-feasibility study mentioned previously, the Shenhua Group conducted a feasibility study of the project and then decided to implement a 100 KTA CCS Demonstration Project—injecting the CO<sub>2</sub> from Erdos Direct Coal Liquefaction (DCL) Plant into the saline aquifer of Erdos Basin.

## CO<sub>2</sub> Concentration Process





# Shenhua 100 kta CCS Demonstration Project

**The site construction started in Jun 2010 and was completed by Dec 2010:**

## **Compression zone**

- Pipeline construction completed on Nov. 22, 2010;
- Building construction for compressor completed on Nov. 24, 2010;
- Equipment insulation completed on Dec. 5, 2010;
- Commissioned on Dec. 25, 2010;



## Injection zone

- Foundation construction for control room and equipment completed before Jan. 2011;
- Drilling for injection well completed with depth of around 2000 m;
- Drilling for two monitoring wells completed before Jan. 2011.



# Shenhua 100 kta CCS Demonstration Project

- Tests for CO<sub>2</sub> Injection well started in Jan. 2011;
- Trial injection of CO<sub>2</sub> was done successfully on Jan 2nd, 2011;
- Till Jun. 10th, 2012, the largest CO<sub>2</sub> injection was 360 tones per day;



# Shenhua 100 kta CCS Demonstration Project

- Till now, over 10,000 MT CO<sub>2</sub> has been injected into the saline aquifer;
- The parameters of CO<sub>2</sub> production, transportation, injection and monitoring have met the requirements of process design;
- There have not been any leakage or other undesirable results based on the data collected from the monitoring wells.







# Thanks for your attention!





# Questions ?

