

China's Report

CCOP-Norway EPPM Program 3rd Seminar

Nov.11-12, 2010. Bangkok, Thailand

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EPPM Progress and CCS development in China

1.EPPM case studies progress

2.CCS development situation

3.CCS development prospect

1.EPPM case progress in China

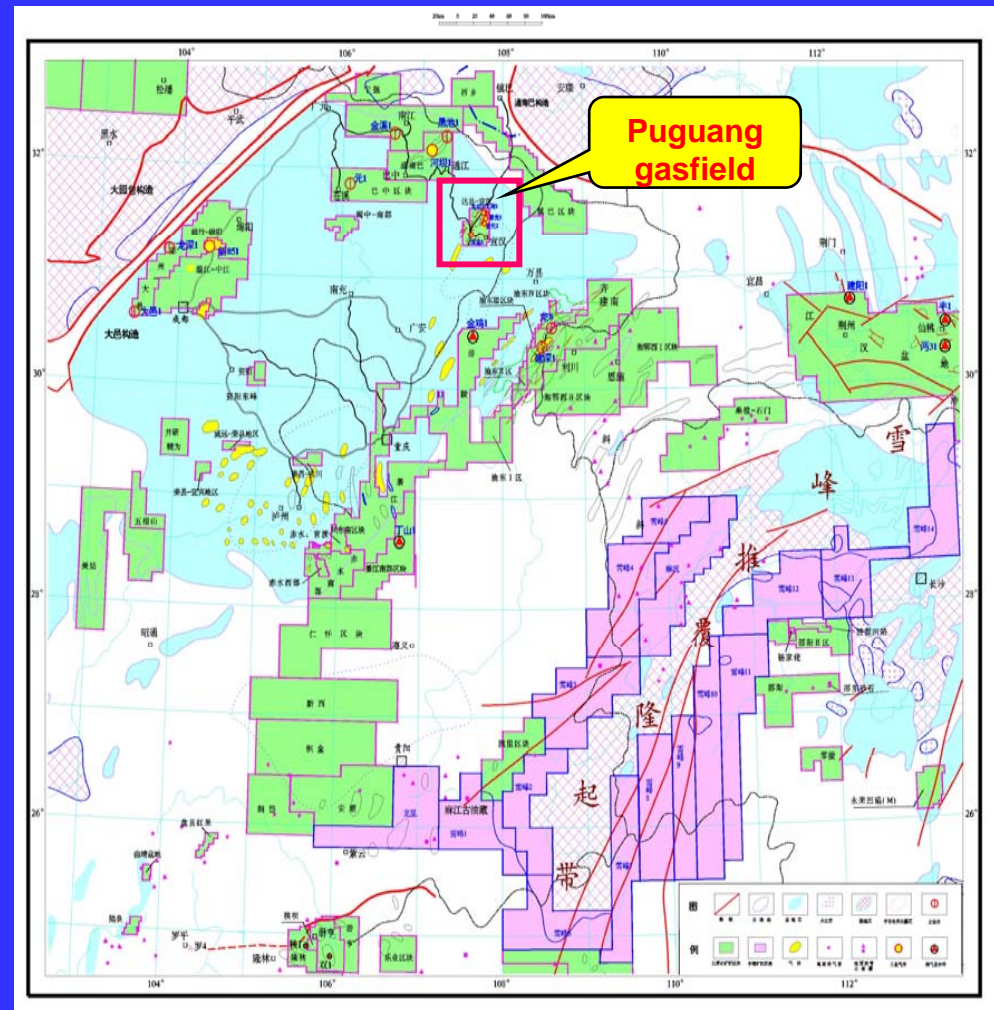
1)EPPM case

◆Puguang gas field construction

Puguang gas field is EPPM case studies.

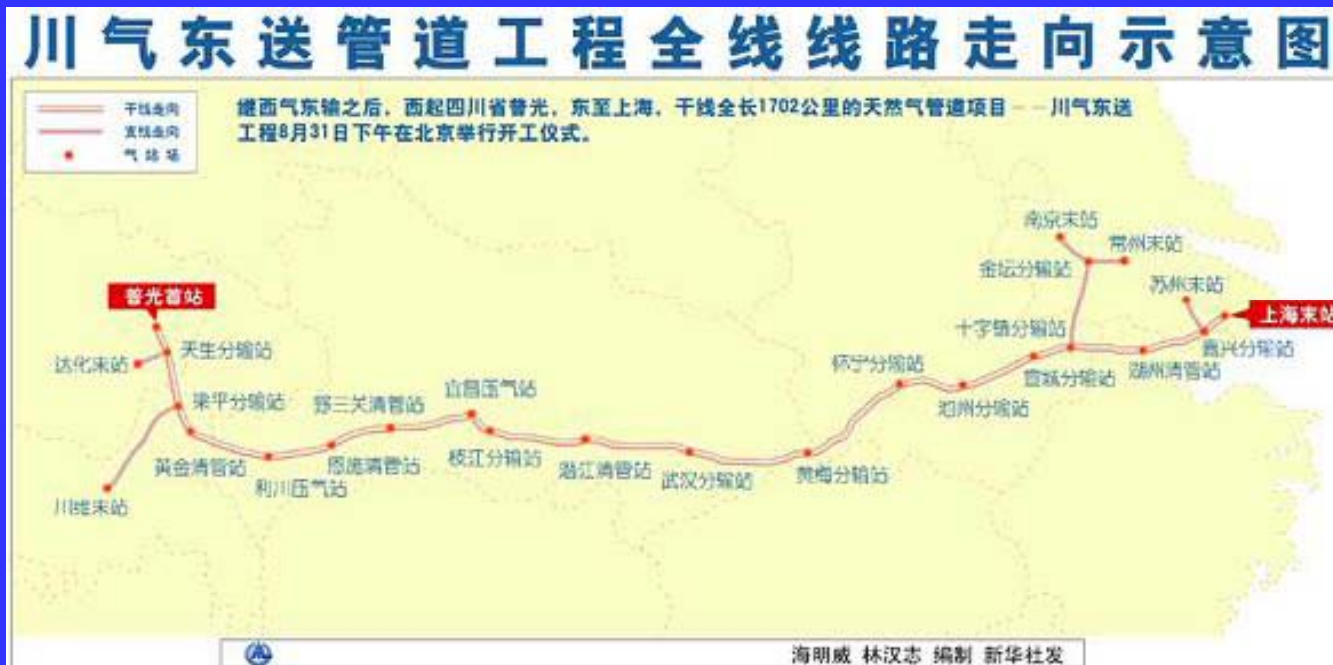
Puguang gas field is located in Sichuan province in China, it is the largest marine facies gas field with 400 billion m³ of reserves . The reservoir contains 15.16 percent of H₂S and 8.64 percent of CO₂.

Mining blocks map of Sichuan basin



1.EPPM case progress in China

Puguang gas field has put into production in 2010, the gas is transported to 8 provinces including Sichuan, Chongqing, Hubei, Jiangxi, Shanghai and so on by gas pipelines with the length to 2170 Km. The productivity is 12 billion m³ per year.



1.EPPM case progress in China

Puguang gas field construction achieved success:

- 5 criteria advanced in the world
- Create 3 new criteria in China
- Create 13 records in China
- Construct the largest acid gas field with annual productivity more than 10 billion m³
- Construct the largest purification plant in Asia
- Construct the second longest gas pipeline in China
- Form a series of acid gas field exploration and development techniques

1.EPPM case progress in China

◆ Efforts of Puguang gas field on environment protection

✓ Purification plant: prevent H₂S emission

Introduce the mature foreign technology .

Construct the purification plant with disposing acid gas about 12 billion m³ per year, and 2 million tons of sulphur output.

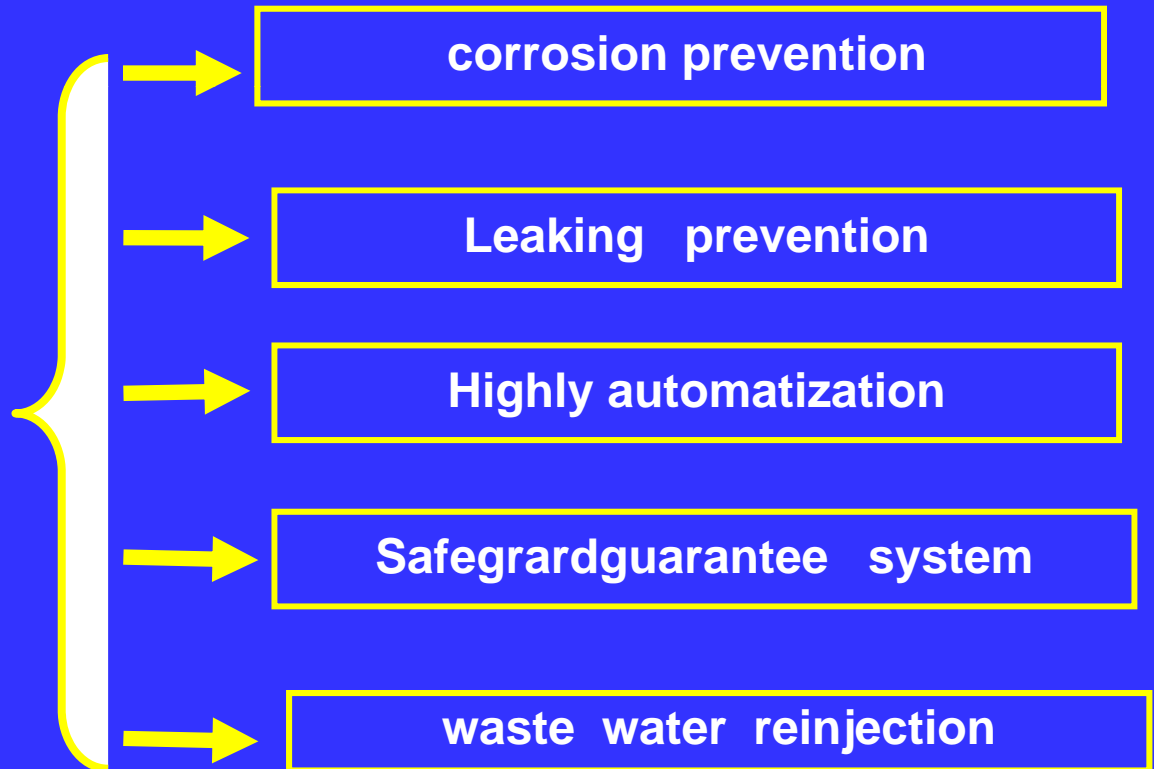


purification plant

1.EPPM case progress in China

✓ Take a series of measures to ensure safe production

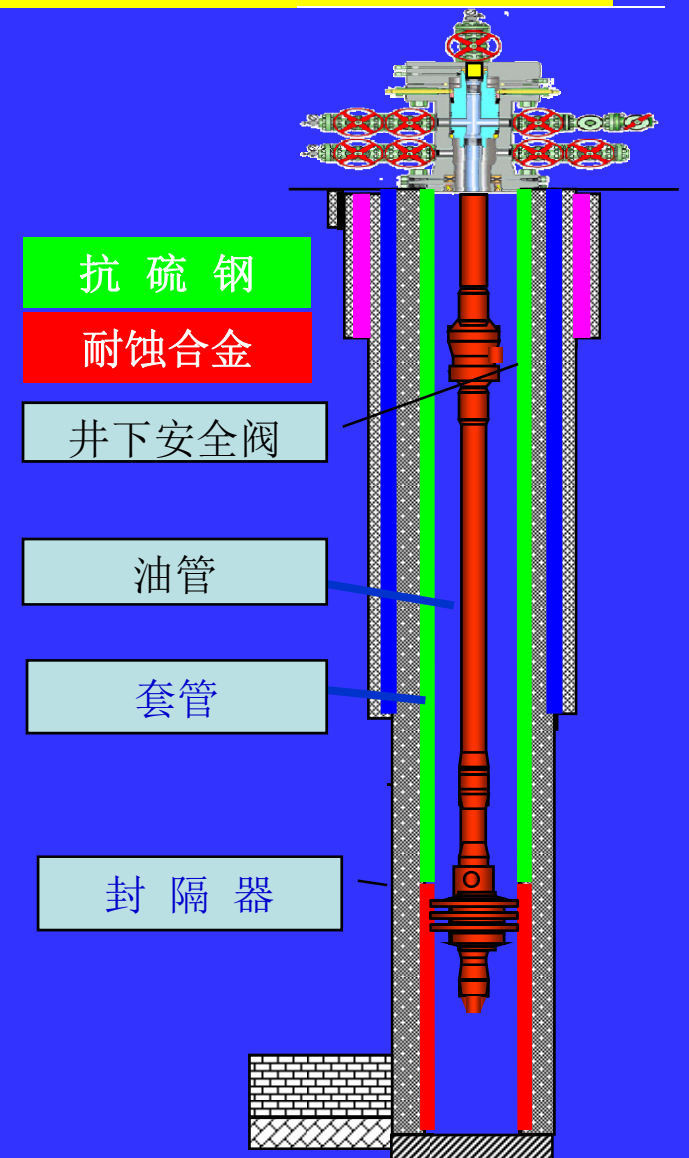
antirot material
+ safety measures
+emergency measures



1.EPPM case progress in China

◆ corrosion prevention

- ◆ Anti-corrosive drill and production pipe
- ◆ Double stage emergency shut down system
- ◆ Surface gathering system: carbon steel + anti-corrosive agent



1.EPPM case progress in China

◆ Leaking prevention

-- shut down system

residents move to other areas who lives within 100 meter near to the line; shut down valve set on the two sides of line will operate when leaking occurs.

--safe distance

300 meter around well site; 800 meter around purification plant; 100 meter around surface gathering system.

1.EPPM case progress in China

◆Highly automatization control

- highly automatization gas field production system
- key set and apparatus is dispersed (DCS):

The safe apparatus system is relatively independent, and jointed with each stage's shut down valve.

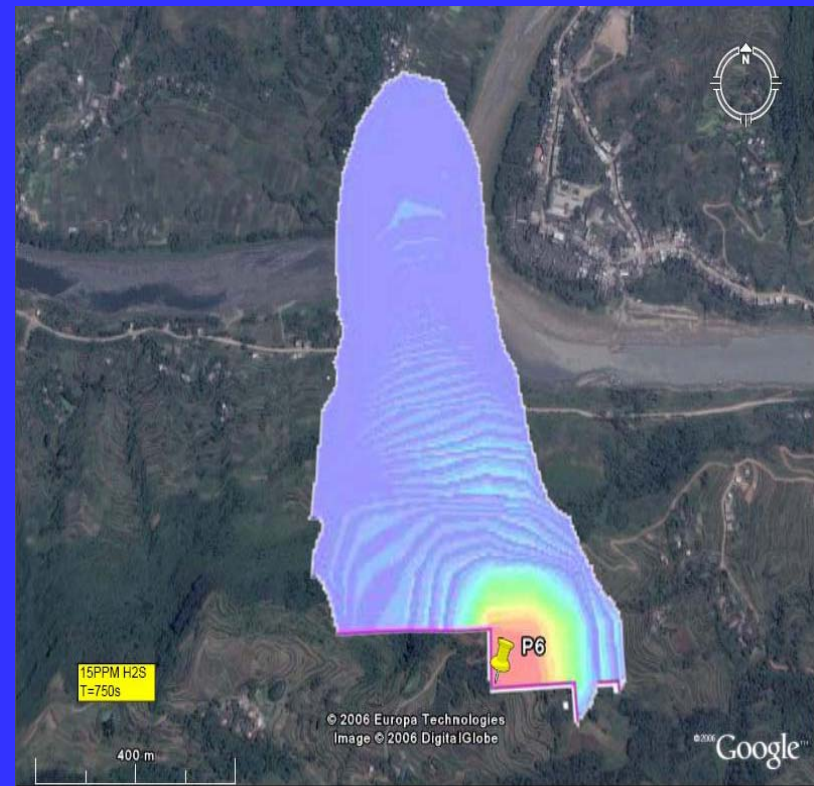
The integrated system using of H₂S warning and fire alarming etc. improves the whole safety system.

1.EPPM case progress in China

◆ Safegard guarantee system

Firing after well blow out within 5 minutes

Construct the emergency broadcasting and communication system to inform the residents living in 3 km radius area to redraw within 30 minutes.



simulation of H₂S diffusion

1.EPPM case progress in China

◆waste water reinjection

Waste water from well production and purification plant maintenance Check, mud filtrate will be reinjected into formation. Other waste will be discharged after disposing according to criterion of China.

1.EPPM case progress in China

◆ Active influence of Puguang gas field on environment

Putting into production of Puguang gas field brings great social and environment effect:

- provide 14.5 million tons of clean energy equivalent of coal per year
- reduce CO₂ emission about 17 million ton per year
- reduce SO₂, oxides of nitrogen and dust etc. about 0.8 million ton per year

1.EPPM case progress in China

2) Influence of EPPM technology on gas field

- **As a member of CCOP, China actively develop EPPM case studies . The results has been applied in Puguang gas field.**
- **The research of EPPM case bring new idea to similar gas field. It will influence the oil and gas field development in future in a degree.**

1.EPPM case progress in China

- The results from EPPM case have been transferred into all the organizations related to oil industry in China.

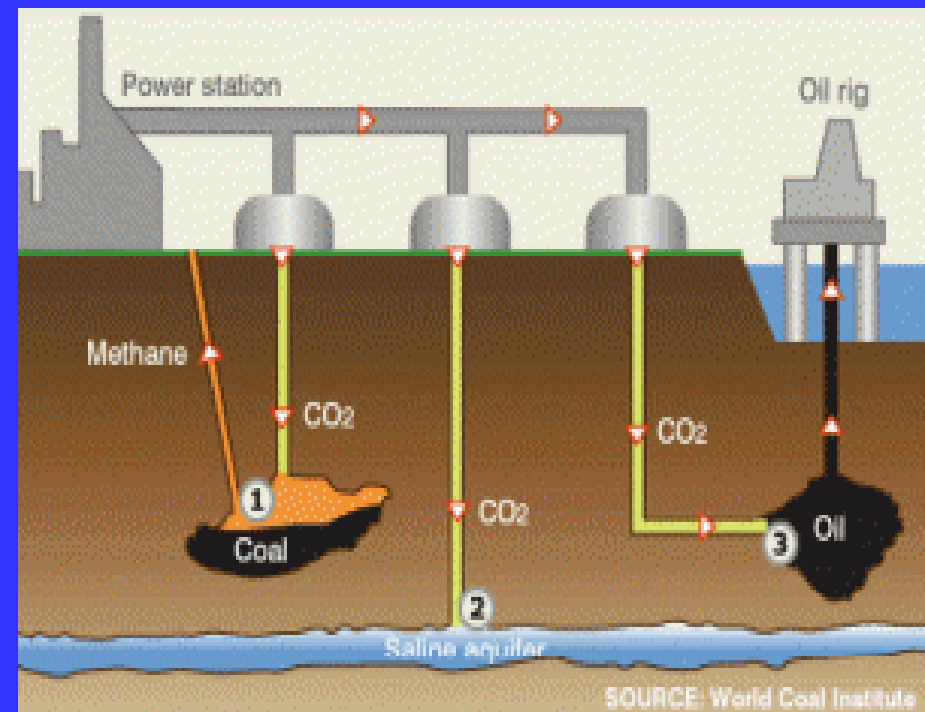
- Chinese participants have shared the information, knowledge and experience with others through many ways:

 - Intranet; reports of EPPM technical activities; workshops / training courses; annual meeting for national coordinators.

2. Current situation of CCS development in China

1) CCS technology in China

- ◆ CO₂ had been used as injection fluid in oil & gas field EOR programs since the 1960s.
- ◆ The CO₂-ECBM Project has been carried out in the Qinshui area at the beginning of the 21 century.



2. Current situation of CCS development in China

◆ Research & development of CCS technologies

The Plan 973 (the State Plan for Development of Basic Research in Key Areas)

The Plan 863 (the State Plan for High-Tech Research and Development)

◆ Carbon capture technology rank the international leading level to a certain degree, how to store carbon is still a check point.

◆ The first power plant with CCS equipment was put into operation in 2008

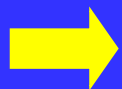
2.Current situation of CCS development in China

◆ Experts in China had carried out a preliminary study on suitable regions for CO₂ storage. We are capable of storing 1.45 trillion tons of CO₂ in regions such as Northeast, North, West, Southwest, as well as Huang Sea and East Sea

46 depleted oil or gas fields: 7.2 billion ton

68 non-commercial underground coal beds : 12 billion ton;

24 saline beds: 1435 billion ton



Research of CCS technology in China rank the international leading level to a certain degree, but still has a long way to go.

2.Current situation of CCS development in China

2) Efforts to deal with climate changes in China

- An agency was set up in 1990 to handle climate change affairs
- In 2003, China participated the leaders summit for carbon storage and signed the Charter and became one of the sponsor nations of CSLF.
- In 2005, CCS is put into the state plan for middle- and long-term scientific development for the year of 2020
- In 2006, the Measures for the Operation and Management of CDM Projects was jointly issued by the National Development and Reform Commission and the National Science & Technology Board.

2. Current situation of CCS development in China

- In 2007, the National Climate Change office was promoted to the National Climate Change Group with the Prim Minister Wen Jiabao as the leader. The CDM Commission comprising seven members was also set up at the same time.
- In 2007, the State Council compiles and issued the China National Plan for Coping with Climate Change, and later it initiated the Special Sci-Tech Campaign to Cope with Climate Changes.
- So far, 16 CCS projects, including green coal-based power generation, has been initiated in China.

2.Current situation of CCS development in China

3) International cooperation in dealing with climate change

➤ **China has established cooperation relationship with EU, India, Brazil, South Africa, Japan, U.S.A, Canada, England, Australia, and etc, on climate change.**

➤ **China has been helping some developing countries in Africa to improve their ability on dealing with climate change.**



2.Current situation of CCS development in China

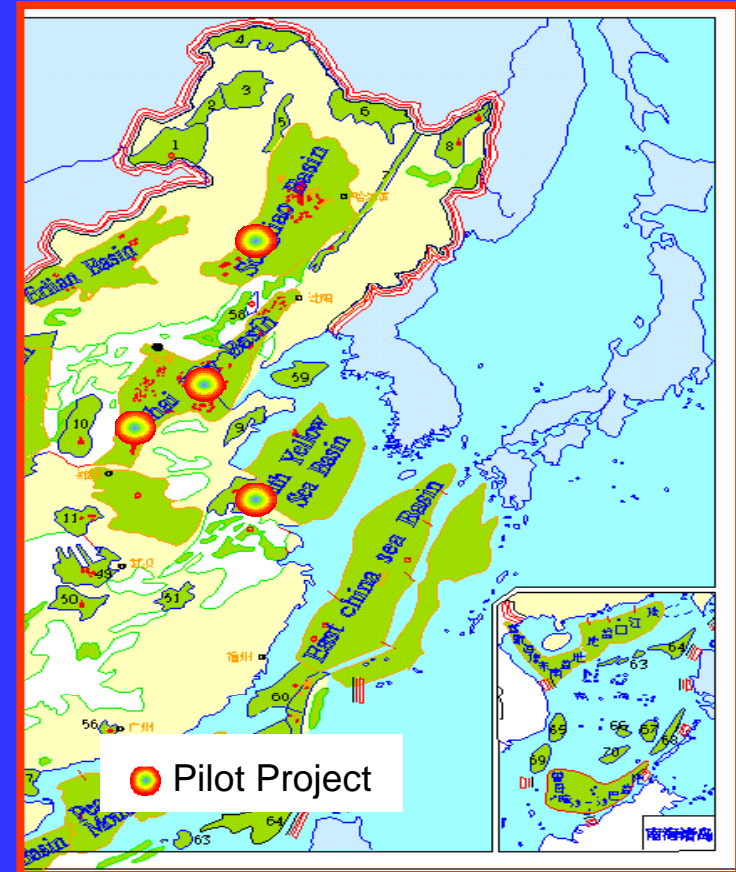
4) CCS Projects in China

Sinopec:

launched 4 CO₂ for EOR Pilot

Projects in recent years:

- Songnan gas field, South Songliao Basin
- Block Gao89-1, Jiyang Depression, Bohai Bay Basin
- Block Wen88, Dongpu Depression, Bohai Bay Basin
- Caoshe oil Field, Subei Basin



Sinopec CO₂ for EOR Pilot Project Map

2.Current situation of CCS development in China

For example:

Songnan gas field will handle 0.5 million tons of CO₂ per year through CO₂-flooding and reinjection.

CO₂-flooding to improve oil field recovery:



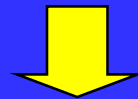
Daily gas injection: 1440 t/d

Annual treatment volume: 0.48 million t/a

Within 15 years: oil production increase 0.8 million ton, EOR will be improved 8%

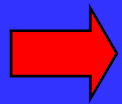
2. Current situation of CCS development in China

CO₂ reinjection



An estimated 20% of formation pressure can be resumed.

Maximum annual reinjection capacity: 0.02 million t/a



Through flooding and reinjection, Songnan gas field will be able to handle 0.5 million tons of CO₂, achieving a zero CO₂ emission

2.Current situation of CCS development in China

CNPC:

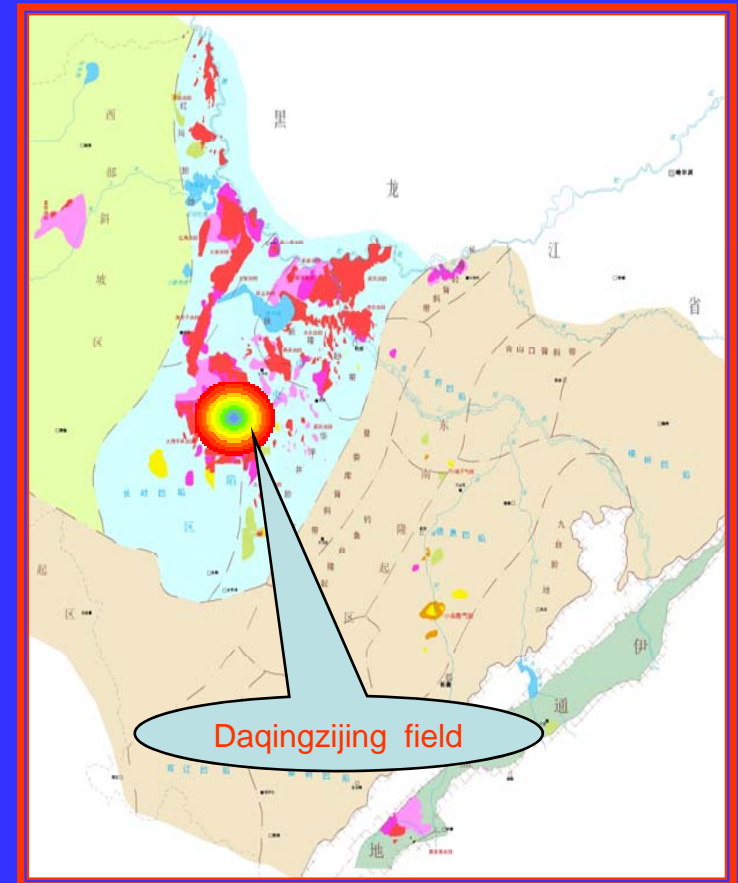
Launched an engineering demonstration project of CO₂ for EOR in Daqingzijing oil field, Songliao basin in 2007.

Block-Hei79

Depth: 2,350m OOIP : 1 million tons
CO₂ utility coefficient: 0.17ton/bbl
Theoretical storage: 0.38 Mts
Effective storage:0.19 Mts
Improved recovery fa:10%

Block-Hei59

Wells: 5 injection & 19 production wells Depth: 2,400m
Pressure: Downhole pression≤40MPa
Downhole flow pression≥7MPa
Inject rate: 30-40t/d Inject mode: continuity liquefied CO₂
MMP:22MPa



South Songliao Basin

2.Current situation of CCS development in China

Huaneng Group:

China largest power company, is actively promoting carbon capture technology. Two carbon capture projects were launched.

- Gaobeidian project in Beijing, started operation before the Beijing Olympic Games, and is now capturing 3,000 tons of CO₂ per year. The captured CO₂ is used for industrial utilizations.
- Shidongkou project was launched in July 2009 in Shanghai, it will capture 0.1 million tons of CO₂ annually. The project will follow the Gaobeidian model.



Gaobeidian power plant in Beijing

3. Prospect of CCS development in China

1) China pays much attention to the issue of climate change

Being a responsible developing country, China sticks to the principle of “common but differentiated responsibility” , actively takes part in the international campaigns against climate change, conscientiously fulfill its duties formulated in the United Nations Framework Convention on Climate Change and the Kyoto Protocol, and contributes to the international cooperation on the issue.

In 2009, China announced to reduce its CO₂ emission by 40-50 % per GDP in 2020 comparing with that in 2005.

3. Prospect of CCS development in China

China highlights the positive role of CDM playing in its sustainable development and willing to contribute to the reduction of green house gas emission through CDM.

By July, 2008, China had registered 244 CDM projects in the United Nations, and which is able to reduce **CO₂** emission about by **113 billion ton per year.**

3. Prospect of CCS development in China

2) China values highly the research and development of CCS technologies

- Incorporated it into the nation's 12th Five-Year science and technology Plan
- A study on the feasibility of a CCS center in the nation has been carried out
- The nation put emphasis on international cooperation and has been actively exploring foreign financing channels and strengthen the introduction of advanced technologies.

3. Prospect of CCS development in China

3) Brilliant future for the implementation of CCS technologies in China

Emphasizing CCS is one of the most important strategic choice for Chinese government on dealing with climate change. And China will be a market with most potential for CCS.

Thank you very much!



**Welcome to 16th Asian Games in 2010
November 12-27 in Guangzhou, China**