Status of Offshore CO2 Storage in China

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Outline

1. CCUS status in China
2. Assessment of offshore storage potential
3. Towards storage demo offshore Guangdong
4. Knowledge gaps and future plan
1. CCUS status in China
90% energy consumption in China is coal-based. By 2030 still >2/3 energy is expected from coal (Global average 24%).

“Clean and efficient utilizations of coal” is listed as the 8th of the 100 key projects of the “13th Five-year Plan” of China.


A phased approach is suggested:
- Low-cost CCS, coal-chemical capture + CO2-EOR;
- Wider CCS deployment beyond 2030.
Major emission sources are in NE, and inland storage sinks are in N China.
Sedimentary basins and CO2 Storage Projects in China

Current storage projects are mostly in northern China.

CO2 storage projects:
- Operating
- Constructing
- Planning
2. Assessment of offshore storage potential
• 2012 project: Assessment of CO2 storage potential in China on a basin-level.

• The effective storage potential in China Seas are 1655 Gt CO2, among which the 10 near-shore basins has potential of 656 Gt CO2.
3. Towards storage demo offshore Guangdong
• Coastal sources match well with offshore storage sites
• The first CCUS Demo Project of Guangdong province:
  – 1 MtCO2/a from coal-fired power plant and petrochemical plant
  – Store in offshore oil fields for EOR and sequestration
Unit 1: Testing platform
(10 tCO2/d generic and flexible solvent test unit)

Unit 3 & 4: Capture Ready Design

Multinational Partners:
- Guangdong CCUS Centre, UK CCS Research Centre
- National Carbon Capture Center - NCCC (USA), CO2CRC (Australia)
16 producing oil fields screened, three were selected as candidates.
Near depleted field

HZ21-1

- Dome of 10.5 km²
- OOIP ~16 Mt
- 8 oil reservoirs, 2820~3000m sub-seafloor
- Producing oil & gas since 1990; now oil production is small
- 4-leg platform with 15 well slots + gas processing platform
- A 233km 20” pipeline to coastal terminal
Injection modeling

- Primary modeling indicates it is capable of injecting CO2 at 2MtCO2/a for 20 years
- Maximum CO2 dispersion <3km
- Maximum pressure buildup <1% of original reservoir pressure
HZ32-3 Oil Field

- Structural & lithological trap of 24 km²
- OOIP 30 Mt, recoverable 20 Mt
- 8 oil layers, with one major layer with 43m oil column height
- 1955~2522m sub-seafloor
- 4-leg platform with 12 well slots
- Producing oil since 1995 at high rate
Overlying Saline Formations

**XJ24-3**

- Saline aquifers above reservoirs:
  - Depths 1300-1700m
  - Total aquifer thickness ~280m
- Large lateral extension >40 km
- Overlain by 200m thick regional seal
The LF2-1 structure

- A large dome structure of >200km² trap area and >200m aquifer thickness.
- Good aquifer-seal combinations.
- An effective storage capacity of 360MtCO₂ is estimated based on estimated gas resource.
- Only one well drilled; detailed data are lacking.
4. Knowledge gaps and future plan
Next Step: Focused studies of ZH21-1 (ZH32-3 as backup)

1. Potential of CO2-EOR, collaboration with BEG, UT-Austin
2. Storage capacity and injectivity modeling
3. Containment quality
4. Conceptual design of test injection (including transport and monitoring)
   • Engineering flow chart
   • Preliminary cost estimation
5. Suggested timetable
   • Test injection (by 2020)
   • Demo project design (by 2025)
   • Demo project operation (by 2030)
Major knowledge gaps:

1. Offshore CO2-EOR, techniques (pattern, CO2 separation, platform retrofitting) and economics

2. Offshore CO2 transportation, techniques (shipping, underwater devices, retrofitting existing pipelines) and economics

3. Incentive policies, regulations for cost and liability sharing
Thank you for listening!

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