Offshore CO_2 Storage in Korea: Progress, Future Plans and Needs

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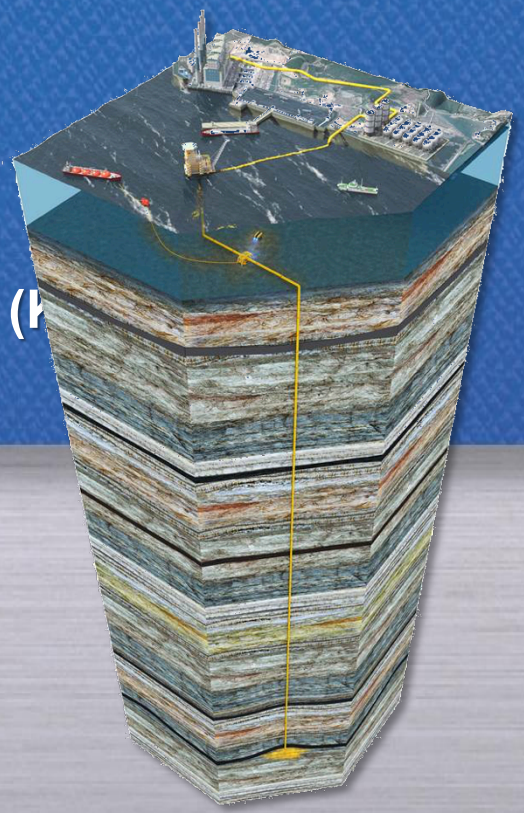


International Workshop on Offshore Geologic CO_2 Storage
19 21 April 2016
Austin, Texas, US

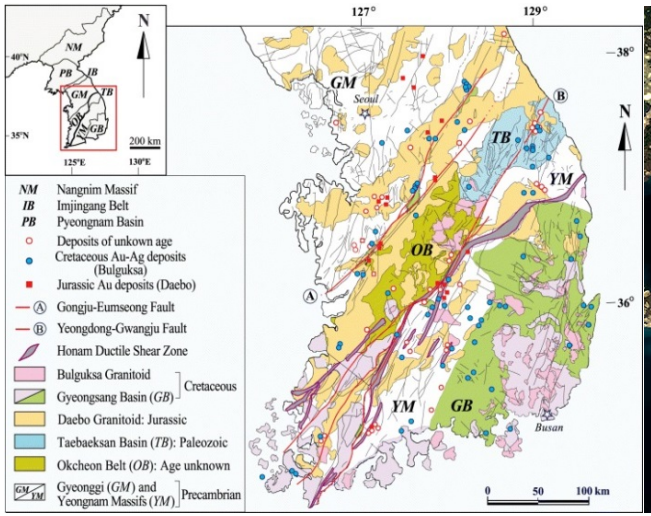
Functions of Ministries and R&Ds in CCS

- Four ministries involved in CCS (including R&Ds)

미래창조과학부	Ministry of Science, ICT & Future Planning	**Basic science & technology on CCS** Korea CCS 2020 Project (2011~2019): Development of next generation CCS technology
산업통상자원부	Ministry of Trade, Industry and Energy	**CO_2 capture and transportation/storage (land)** CO_2 capture Tech. Project (2011~): 0.1 Mt CO_2 capture (2014, completion); 1 Mt CO_2 capture (2017/18~)
해양수산부	Ministry of Oceans & Fisheries	**Offshore CO_2 storage, transportation & environmental management** R&D Project for preparing offshore CO_2 storage, transportation & environment management (2010 ~ 2016)
환경부	Ministry of Environment	**Environmental management (land)** CO_2 Environmental Management Project (2014 ~)

Condition for Conducting Large-Scale Offshore CO_2 Storage

- Difficult to store large amount of CO_2 in land because of bad geological conditions, high population density and less public acceptance



Geologic Map

Satellite image (Night)

Koreans strong opposition

Large-scale CO_2 storage in offshore areas

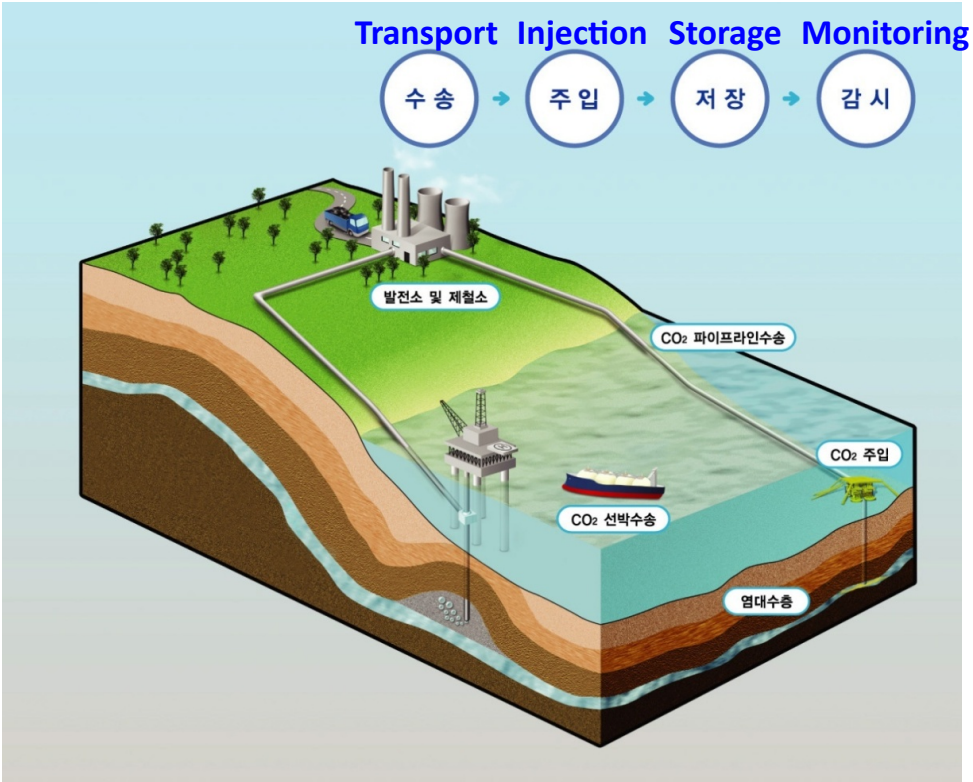
Status of CO_2 Source and Capture Identification

- Major coal-used power plants in the western and southern coastal area of Korea
- 0.1 Mt CO_2 capture facilities at Boryoung (wet-style) and Hadong (dry-style) power plants (2014)

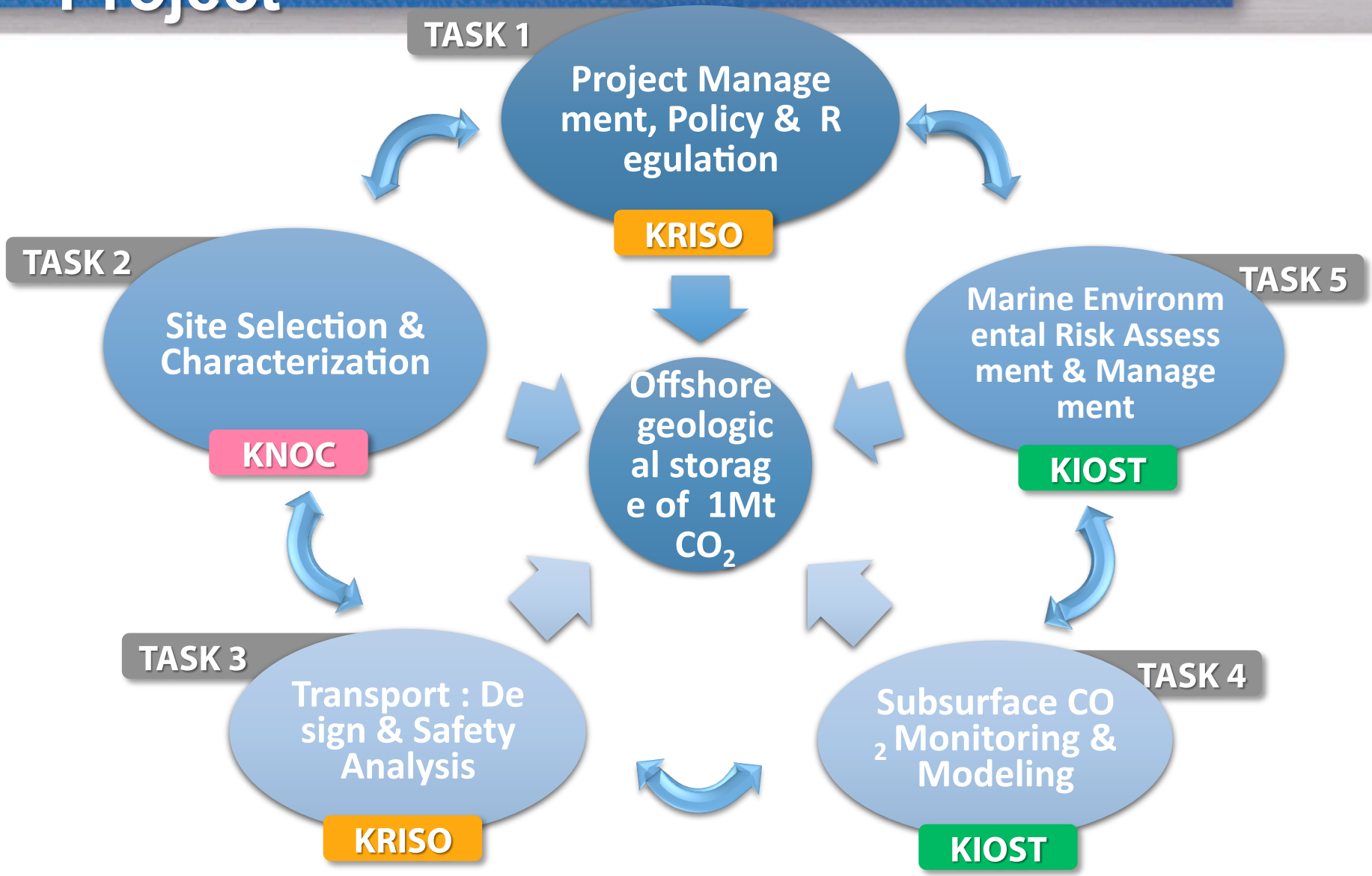
- **1 Mt CO_2 capture (wet-style?) demonstration project (from 2018)**
  - ✓ One (Boryoung or Hadong?) of major coal-used power plants
  - ✓ Cost assessment (2016 ₩ 2017) by Korean Government (MTIE)
  - ✓ Funding: Korean Government (major) with some industrial companies (minor)

Offshore CO_2 Storage/Transportation R&D Project (2010 2016) by MOF

- Prepare for core technologies to transport and store CO_2 captured from large-scale (1 Mt/year) sources (coal-used power plants) into the subsurface geological formations
- Budget : about US$40M

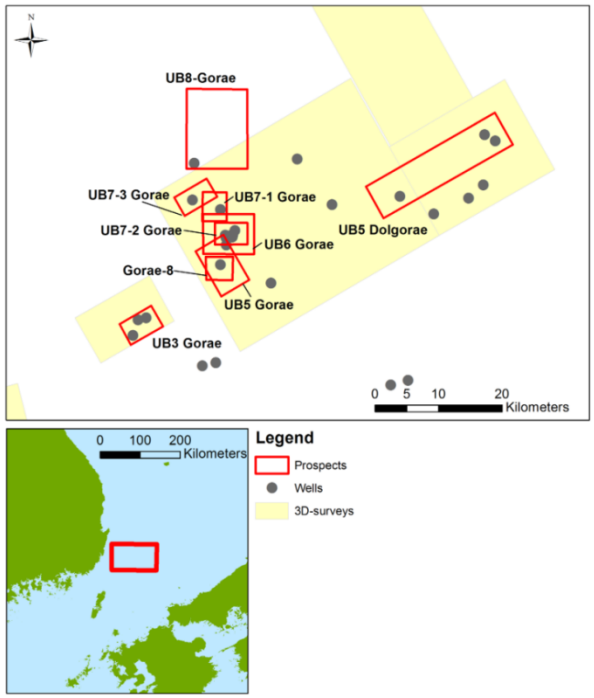


Framework of R&D Project

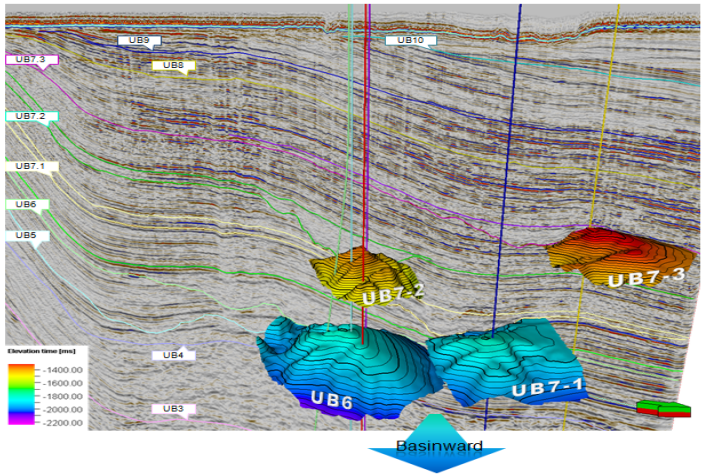


Status of Offshore Geologic Storage Assessment

- SE continental shelf of Korea based on the regional-scale studies for potential CO_2 storage sites using previous oil/gas exploration data by KNOC

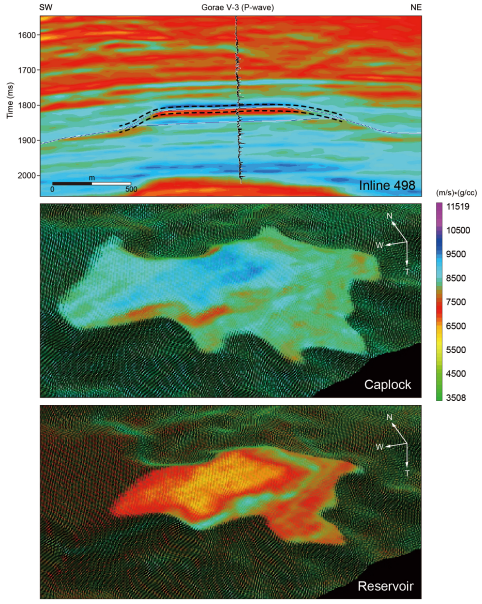


- 9 prospects (oil & gas targets in previous exploration stages) for CO_2 storage
- 2 prospects (depleted gas fields): Priority sites for large-scale (1 Mt/year) CO_2 storage demonstration project for ca. 20 [redacted] 30 years

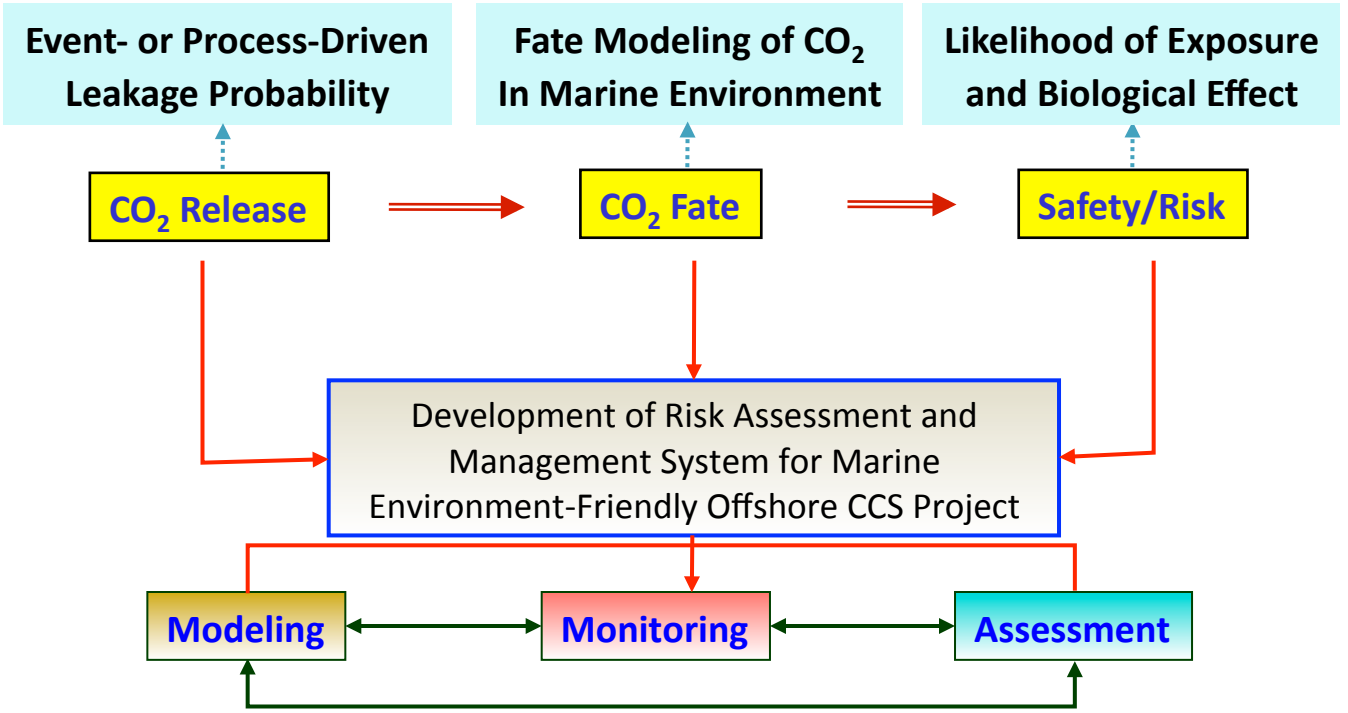


Status of Offshore Geologic Storage Assessment

- Monitoring strategy in subsurface and sea-water column for large-scale (1 Mt CO_2) storage demonstration project: nearly set up
- Risk assessment for large-scale (1 Mt CO_2) storage demonstration project: less in the subsurface, more in sea-water column

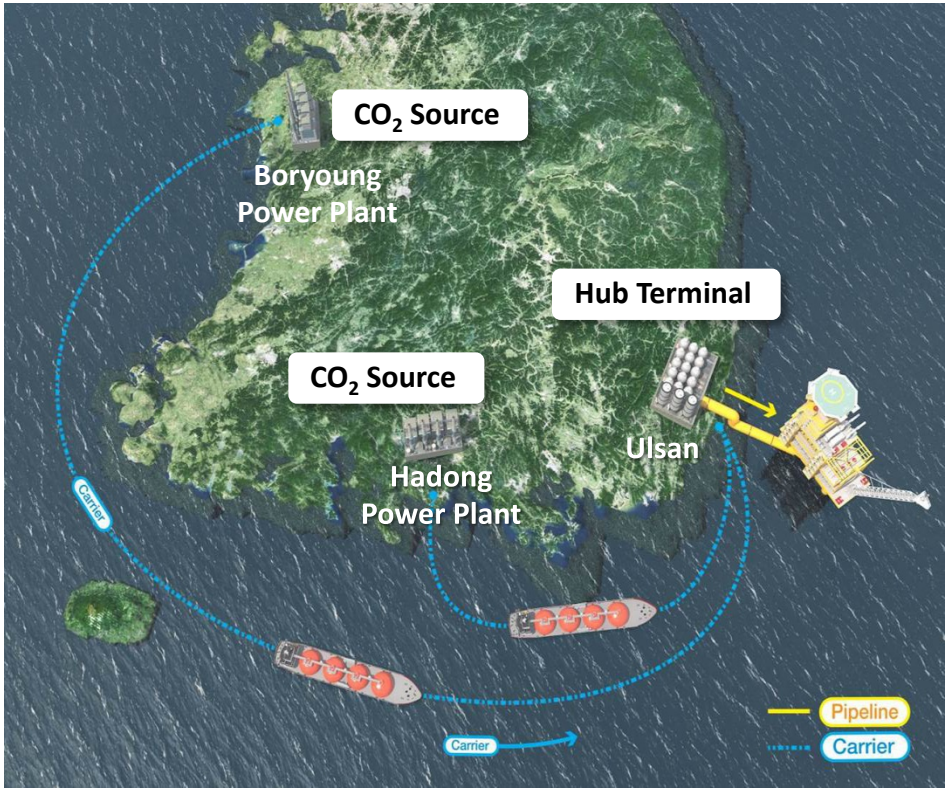


Colored inversion



Status of Transportation Assessment

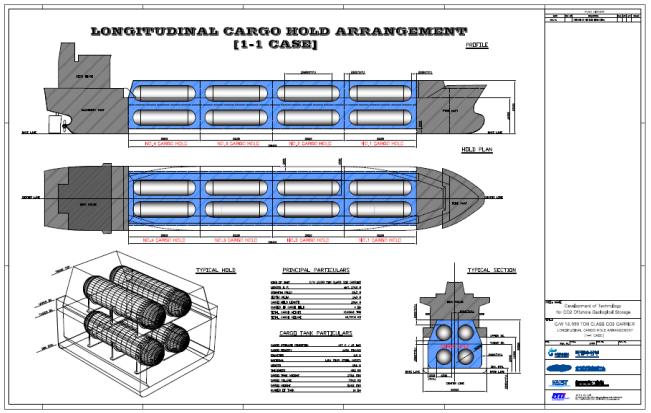
- Major coal-used power plants for large-scale CO_2 source in the western and southern coastal areas: long distance to promising storage sites
- Less public acceptance about CO_2 transportation/storage in land



- Onshore pipeline transportation: expensive cost and less public acceptance
- Ship transportation from CO_2 sources to Hub terminal
- Offshore pipeline transportation from Hub terminal to storage sites

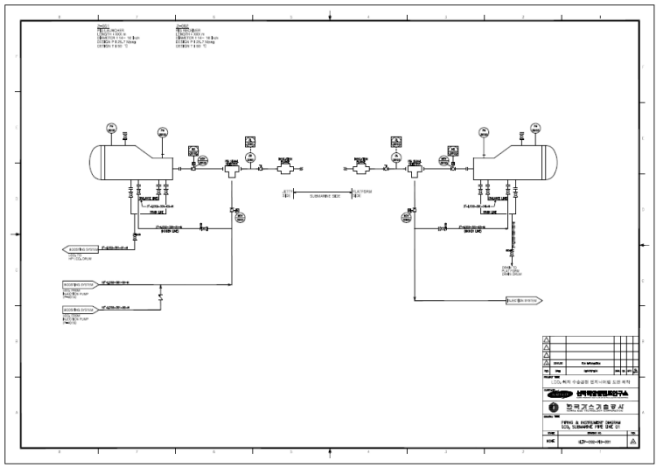
Status of Transportation Assessment

- PreFEED Package (transportation) for Offshore CO_2 (1 Mt/year) Storage



Design of CO_2 tank in ship

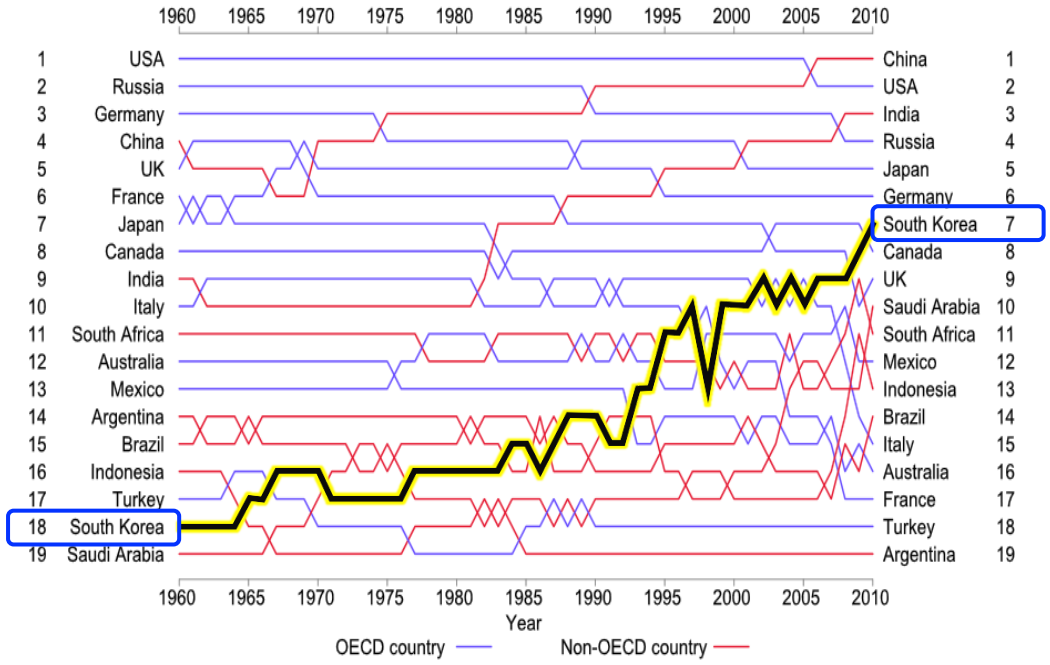
Engineering drawing of offshore CO_2 pipeline



Contents (Draft)

National Policy and Status of Large-Scale CCS Projects

- Increase in CO_2 emission rate because of Korean economic system dependent on export-industry structure
- CCS: one of the national strategies to reduce CO_2 → National plan in 2015: ca. 8~10 Mt CO_2 reduction by CCS until 2030



CO_2 emission (IEA, 2014)

National Policy, Status and Plans of Large-Scale CCS Projects

- Korean Government examines all aspects (cost, value, etc.) of CO_2 reduction projects including large-scale CCS projects in 2016
- Korean Government will decide whether large-scale CCS will be started or stopped in 2017
- Make a plan for large-scale CCS projects in 2017~2018
- Try to conduct large-scale offshore CO_2 storage demonstration projects (1 Mt/year) as soon as possible (from 2018)
- Draft of regulation for (large-scale) CCS: prepared by MOF, ME and MTIE since 2015

Public Knowledge and Acceptance

- Reduction of CO_2 (emission): very important issue in Koreans because of rapid climate change and environmental issues (e.g., yellow dust, fine dust, etc.)
- About 60₩70% of Koreans were willing to pay for CO_2 reduction
- Large-scale CCS: public project
- Less public acceptance for onshore large-scale CO_2 storage & transportation, but better public acceptance for offshore large-scale CO_2 storage & transportation in Korea

Other Important National Conditions and Needs

- Pilot-scale (10,000 tons/year) CO_2 injection and storage in land: start December 2016.
- Major power-plant (e.g., KEPCO) and oil/gas companies (e.g., KNOC & KOGAS) in Korea: mostly funded by Korean Government
- Large-scale CCS projects in Korea: mostly funded by Korean Government; can be highly dependent on the policy of Korean Government, especially in the area of CO_2 storage
- Less experience, less data and small-sized research team for offshore large-scale CO_2 storage and subsurface risk assessment (or evaluation) in major oil/gas companies, research institutes, universities in Korea: need collaboration with foreign community (major oil/gas companies, research institutes, university, etc.)

Thank you very much.