CCS Regulation and Demonstration in Japan

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Ministries involved in CCS

- Ministry of the Environment (MOE)
  2007: Amendment to “the Marine Pollution Prevention Act”
    - to ratify the 1996 London Protocol
    - to regulate offshore storage for CCS projects

- Ministry of Economy, Trade and Industry (METI)
  2009: “For Safe Operation of a CCS Demonstration Project”
  2012: Tomakomai CCS Demonstration Project to be operated in 2016
1. Tomakomai CCS Demonstration Project
2. Offshore CO\textsubscript{2} Storage Regulation
3. Environmental Impact Assessment for Tomakomai CCS Project
4. Monitoring Plans for Tomakomai CCS Project
5. Future Plan of Tomakomai CCS Project
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Overview of CCS Demonstration Project

2012: METI commissioned the Tomakomai CCS Project to JCCS
2016: The project to start 3-year operation

Source
- Refinery
- CO2 Capture
- Separate/Compress
  > 100,000t/y (Gas CO2)

Capture
- CO2 Capture
- Land Pipeline
- Injection Wells
- Aquifers
- Reservoir: Sandstone layers of Moebetsu Fm.
  1,000~1,200m under the seabed
- Reservoir: Volcaniclastic rocks of T1 Member of Takeinoue Fm.
  2,400~3,000m under the seabed

Transport
- Land Pipeline
- Compress
  > 100,000t/y (SC-CO2)

Injection
- Injection Wells

Store
- Reservoir
- Cap rock

Courtesy from Japan CCS Co., Ltd. (JCCS)
For safe operation of a CCS demonstration project released by METI in 2009.

1) Safety consideration for placing CCS-related facilities (Mining Safety Act)
2) Transportation Standard (High pressure regulation)
3) Concentration standard of CO2 to be injected (Marine Pollution Act)
4) Safety consideration for the drilling, completion and P&A (plugging and abandonment) for CO2 injection and storage wells (Mining Safety Act)
5) Safety considerations for CO2 injection and operation (Planning of injection and operation)
6) Things to be assessed for CO2 storage from geological aspects (Geological structure model)
7) Monitoring (Simulation, History matching)
8) Measures to be taken when abnormalities occur (Standard of detecting, Guideline for coping)
9) Environmental Impact Assessment (EIA) (Scenario of CO2 seepage, Risk change)

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Key Provisions for Offshore CO₂ Storage:

(1) Anyone intending to dispose CO₂ stream under the seabed must obtain a permit from Minister of the Environment (Article 18.8)

(2) The Minister of the Environment shall not issue a permit for CO₂ stream storage under the seabed unless ......, the way of storing CO₂ stream will not harm the conservation of the marine environment at the storage site ...... (Article 18.9)

(3) Those who hold a permit for CO₂ stream storage under the seabed must monitor status of the pollution at the storage site and report monitoring results to Minister of the Environment. (Article 18.12)
**Offshore CO₂ Storage Regulation System**

- **Marine Pollution Prevention Act**
- **Cabinet Order on Marine Pollution Prevention**
- **Ordinance of MOE for the determination of methods for measuring concentration of CO₂ stream**
- **Ordinance of MOE for dumping permit**
- **Notification of MOE for offshore CCS permit**
- **Guideline of MOE for CO₂ sub-seabed dumping**

**Prohibition of sub-seabed storage of hazardous substances**

**Criteria for exception**
- Areas licensed for mineral exploitation
- Purity standard (99% CO₂ using Amine)

**Application for Permit**
- Project Plan
- Monitoring Plan

**Attachments to Application**
- Site selection report
- Environmental Impact Assessment Report
- Explanation for no other options available
- Financial capability
- Technical capability
- Outline of the entire project (beyond permitting period)

**Valid period for permit:**
5 years or less
(Renewal of permit to be required every 5 years)
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Major Items to be Covered in Environmental Impact Assessment (EIA) Reports (Article 4 in Ordinance)

1. Characteristics of CO\textsubscript{2} stream to be disposed
2. Location, area and amount of CO\textsubscript{2} leakage predicted based on leak scenarios
3. Items to be investigated as potentially affected by the assumed CO\textsubscript{2} leakage
4. Baseline data of the items to be investigated
5. Evaluation of impacts of the assumed CO\textsubscript{2} leakage on the items to be investigated
Leak Scenarios and EIA

- Potential leakage assessment, based on multiple scenarios for CO$_2$ leak from reservoir to the surface of the seabed

- Multiple predictions of CO$_2$ dispersion in the sea, based on the most critical results from the CO$_2$ leak scenarios; and a severer setting

- Environmental impact Assessment, based on the following thresholds:
  
  ✓ Threshold for impacts on marine creatures: \( \Delta p_{CO_2} > 200 \mu \text{ atm} \)

  ✓ Threshold for CO$_2$ detecting: \( \Delta p_{CO_2} > 10 \mu \text{ atm} \)

  > 24-hour average values

  Within around 2km x 2km
Marine Environmental Survey

Survey Areas:

- Main survey areas: ~ 2km x 2km
- Planned survey area: ~ 7km X 7km
- Injection Zones

Major Planned Surveys:

- Survey of seabed surface by Side-Scan Sonar and Sub-bottom Profiler
- Sampling of seawater by Water Sampler for concentration of CO$_2$ and plankton observation etc.
- Sediment survey by Bottom Sampler
- Benthos observation by Bottom Sampler, divers, ROV and Dredge

Pre-injection (for EIA) : 4 seasonal surveys  
- completed from Summer 2013 to Spring 2014
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Monitoring Plans

Monitoring plans to be submitted on permit application:

(Article 1-3 in Ordinance)

1. Monitoring under normal situation
2. Monitoring for possible CO₂ leakage
3. Monitoring for adverse impact in case of CO₂ leakage
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Future Plan of CCS Demonstration Project

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OBC (Ocean Bottom Cable) : used for 2D seismic survey and monitoring of micro-seismicity and natural earthquakes.

OBS (Ocean Bottom Seismometer) : used for monitoring of micro-seismicity and natural earthquakes.

As of Apr. 9, 2014
Thank you for your attention.