JCCS Company Profile and CCS Project Framework

Company Profile

Date of Incorporation: May 26, 2008

Business Description:
Comprehensive investigation for and implementation of CCS Demonstration Projects in Japan

Capital: 243 MM JPY

Shareholders: 35 companies
11 electric power, 5 engineering, 4 petroleum, 3 petroleum resource developing, 4 general trading, 2 iron and steel, 2 city gas, 1 chemical, 1 non-ferrous metal and cement, 1 steel pipe, 1 special trading

President: Shoichi Ishii, JAPEX

Directors: 8 representing the shareholders’ industries

No. of Staff: approx. 100

Project Framework - Functions of JCCS

Ministry of Economy, Trade and Industry (METI)

Research Organizations (Domestic and Overseas)

Universities

Ministry of the Environment (MOE) *

Private Companies

JAPAN CCS Co., Ltd.

Investment

Personnel

Subcontract

Execution

CCS Related Companies, (Domestic and Overseas)

Implementation of CCS Demonstration Projects

* MOE is a co-sponsor of “Investigation of Potential Sites for CO2 Storage, Offshore Japan”.

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Outline of Presentation

- Overview of Tomakomai Demonstration Project
- Demonstration Facilities
- Monitoring
- Test Injection and Public Outreach
Overview of Tomakomai Demonstration Project
Tomakomai CCS Demonstration Project Schedule

※Years are in Japanese Fiscal Years (April of calendar year thru March of following year)
### Demonstration Project Operation Schedule

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<td><strong>ONSHORE MONITORING FACILITIES</strong></td>
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<td><strong>Injection Wells</strong></td>
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<td>Observation (Observation Well OB-1~3)</td>
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<td>(Temperature, Pressure, Natural Earthquakes, Micro-seismicity)</td>
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<td><strong>Observation</strong></td>
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<td>3D Seismic Survey (*)-1</td>
<td>2D Seismic Survey</td>
<td>3D Seismic Survey</td>
<td>2D Seismic Survey</td>
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<td>(Natural Earthquakes, Micro-seismicity)</td>
<td>(Current, Water Quality, Seabottom Conditions, Marine Life, etc.)</td>
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<tr>
<td><strong>Marine Environmental Survey (Seasonal)</strong></td>
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<tr>
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<td>2D Seismic Survey</td>
<td>3D Seismic Survey</td>
<td>2D Seismic Survey</td>
<td>3D Seismic Survey</td>
<td>2D Seismic Survey</td>
</tr>
<tr>
<td></td>
<td>(Current, Water Quality, Seabottom Conditions, Marine Life, etc.)</td>
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<td>(Current, Water Quality, Seabottom Conditions, Marine Life, etc.)</td>
</tr>
</tbody>
</table>

(*)-1 2D·3D Seismic Survey: survey method utilizing seismic reflection waves discharged from a seismic source of a seismic exploration vessel in order to delineate the subsea geological structure and/or formation characteristics. In this case, the data acquired is used to estimate the CO₂ storage distribution by 2D cross sections or arbitrary planal diagrams in 3D space.
Flow Scheme of CCS Demonstration Project

- **CO₂ source**
- **Capture facility**
- **Injection facility**

**CO₂ source**
- PSA system in hydrogen production unit
- PSA offgas containing CO₂
- Pipeline
- Compressors
- Injection wells

**Capture facility**
- Activated amine process
- Capturing 100,000 t/year or more of CO₂

**Injection facility**
- Reservoir: Sandstone layers of Moebetsu Fm. 1,000~1,200m under the seabed
- Reservoir: T1 Member of Takinoue Fm. 2,400~3,000m under the seabed

**Existing oil refinery**
- PSA (Pressure Swing Adsorption)
【Project Goal】

- Demonstrate the technical viability of a full cycle CCS system from capture to injection and storage in saline aquifers on a practical scale, contributing to the establishment of CCS technology for practical use by 2020 and future deployment of CCS projects in Japan

【Objectives】

- In order to demonstrate technical viability, safety and reliability of CCS system;
  - Capture and inject 100,000 tonnes/year or more of CO₂ for 3 years
  - Monitor by the installed monitoring system and surveys for 5 years

【Tasks】

- Prepare capture and injection facilities, injection wells with a design capacity of 200,000 tonnes of CO₂ per year
- Prepare monitoring systems and gather data for geological storage and seismicity
- Estimate CO₂ behavior in the reservoirs by analysis of seismic and well data
- Confirm that existing technologies adopted in the system work properly and efficiently
- Confirm effectiveness of site selection guideline of METI by demonstrating no CO₂ leakage
- Establish guidelines for building and improving geological models
- Prepare technical standards of operation and safety for practicalization of CCS technology
- Share information and data obtained from the project with the public and relevant community groups in order to increase awareness and understanding of the benefits and viability of CCS
Anticipated Outcomes

【Outcomes】
- Confirmation of the technical viability of a full CCS system in Japan
- Clarification of technical and social areas to be improved or solved for commercialization
- Mitigation of public concerns about earthquakes
  - Natural earthquakes do not influence or negatively impact stored CO₂
  - CO₂ injection does not cause any perceptible increase in earth tremors
- Enhancement of awareness and understanding of CCS technology and its benefits

【Other Considerations】
- Verification of onshore to offshore injection model
  - Lower drilling and maintenance costs
  - Securing public acceptance for offshore storage may be easier than onshore
  - Potentially smaller impact on environment in worst case leak scenario
  - Applicability to island nations
Main Features of Tomakomai CCS Project

- First full cycle CCS system deployed in Japan
- Two-stage CO₂ capture system providing for low energy consumption
- Deviated CO₂ injection wells drilled into offshore reservoirs from an onshore site.
- Injection interval length exceeding 1,100m to enhance injection efficiency
- Extensive monitoring system to address concerns about earthquakes
- CO₂ storage governed by Japanese law reflecting London 1996 Protocol
- First case of CCS near urban area requiring extensive stakeholder engagement
Demonstration Facilities
Positional Relation of Injection & Monitoring Systems

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.

Observation well OB-1 for Takinoue Form. converted from survey well (deviated)

Observation well OB-2 for Moebetsu Form. (vertical)

Observation well OB-3 for Takinoue Form. (vertical)

Working area of 3D seismic survey

Image: LC81070302016141LGN00, courtesy of the U.S. Geological Survey, text by JCCS
Positional Relation of Onshore Facilities

- CO$_2$ capture and injection facility
- Gas supply facility
- Gas pipeline
- Injection well for Takinoue Formation
- Injection well for Moebetsu Formation

Demonstration Facilities

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Bird’s Eye View of Capture and Injection Facilities
Conventional CO₂ Capture Process

CO₂ Absorption Tower

CO₂-containing gas

CO₂-lean gas

CO₂ Rich amine

CO₂ Lean amine

CO₂ Stripping Tower

Heat

Note: Reboiler duty
primary and secondary amine: 3.0~3.5 GJ/t-CO₂
activated amine: 2.5~3.0 GJ/t-CO₂

Reboiler duty ≈ 2.5 ~3.5GJ/t-CO₂
See note
Tomakomai CO₂ Capture Process

- In LPFT, CO₂ is stripped by depressurization; thermal energy of water vapor of CO₂ Stripping Tower is also utilized to strip CO₂
- Greater part of semi-lean amine from LPFT is returned to CO₂ Absorption Tower for CO₂ absorption; as only the remaining smaller portion is sent to CO₂ Stripping Tower, reboiler heat required can be reduced

If pressure of gas containing CO₂ and partial pressure of CO₂ are relatively high, amine reboiler heat consumption is only 1/3~1/2 of conventional capture process

Reboiler duty = 0.92 GJ/t-CO₂
Tomakomai data obtained at commissioning
Tomakomai Demonstration Project falls into “high pressure CO₂-containing gas with high CO₂ partial pressure” category.

Actual and expected operation dates for large-scale CCS projects in the Operate, Execute and Define stages by industry and storage type.

Source: GCCSI, THE GLOBAL STATUS OF CCS 2015

Note in red: added by JCCS
Schematic Geological Section

Depth in meters (bMSL)

-3600m
-3200m
-2800m
-2400m
-2000m
-1600m
-1200m
-800m
-400m

Landward(North)

Seaward(South)

Quaternary sediments
Mukawa Fm. (Sandstone, Mudstone, etc.)
Moebetsu Fm. (Mudstone)
Injection Well for Moebetsu Fm.
Injection Well for Takinoue Fm. (projected)
Cap rock
Reservoir
Cap rock
Reservoir (TD 5,800m)
(TD 3,650m)
(TD 5,800m)

Takino Fm. (Mudstone)
Biratori-Karumai Fm. (Mudstone)
Fureoi Fm. (Mudstone)
T1 Member of Takinoue Fm. (Volcanic Rocks)
Nina Fm. (Mudstone)
Moebetsu Fm. (Sandstone)

Observation Well for Moebetsu Fm.

※ Aspect Ratio=1:1

Demonstration Facilities

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Injection well for Moebetsu Formation

Drilling: 12th March 2015 - 22nd June 2015

<table>
<thead>
<tr>
<th>KOP depth</th>
<th>Vertical depth</th>
<th>Horizontal reach</th>
<th>Maximum inclination</th>
<th>Total depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>240m</td>
<td>1,188m</td>
<td>3,058m</td>
<td>83°</td>
<td>3,650m</td>
</tr>
</tbody>
</table>

CO₂ corrosion resistant steel (Chrome)
CO₂ resistant cement

**Injection interval 1,194 m**

- **TRSV Control Line**
- **1st KOP @ 240m** (1st BUR : 3deg/30m)
- **2nd KOP @ 2,672m** (2nd DOR : 1.5deg/30m)
- **2nd EOD @ 2,780mMD**
- **7" CMTG port @ 2,456.18m / 977.8mVD**
- **Mule shoe guide @ 2,305.84mMD / 959.38mVD**
- **Injection well for Moebetsu Formation**
- **Perforated liner covered by screens at injection interval**
- **Tubing-Retrievable Safety Valve (TRSV)**

**Quaternary**
- Moebetsu Fm (Mudstone)
  - TD: 3,650mMD / 1,188mVD
- Mukawa Fm
  - MD: 464mMD / 458mMD
- TD: 1,525mMD / 864mVD

**Moebetsu Fm**
- MD: 2,395mMD / 970mVD
- TD: 3,650mMD / 1,188mVD

**Inclination**: 83°

**Injection interval 1,194 m**

- **PT sensor**
- **CO₂ resistant cement**
- **2nd KOP @ 2,672m** (2nd DOR : 1.5deg/30m)
- **2nd EOD @ 2,780mMD**
- **7" CMTG port @ 2,456.18m / 977.8mVD**
- **Mule shoe guide @ 2,305.84mMD / 959.38mVD**

Injection for Moebetsu Formation:
- Injection well for Moebetsu Formation (Injection well)
- Perforated liner covered by screens at injection interval
- **Injection interval 1,194 m**

**Perforated liner**

**Screen**

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Injection Well for Takinoue Formation

**Drilling:** 19th Oct. 2014 - 25th Feb. 2015

<table>
<thead>
<tr>
<th>KOP Depth</th>
<th>Vertical depth</th>
<th>Horizontal reach</th>
<th>Maximum inclination</th>
<th>Drill depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>925m</td>
<td>2,753m</td>
<td>4,346m</td>
<td>72°</td>
<td>5,800m</td>
</tr>
</tbody>
</table>

- **Slotted liners at reservoir injection interval**

**CO₂ resistant cement**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Quaternary**
- 440m

**Mukawa Fm**
- 880m

**Moebetsu Fm**
- 1,222m

**Nina Fm**
- 2,503m

**Biratori+ Karumai Fm**
- 3,581m

**Fureoi Fm**
- 4,824m

**Takinoue Fm T1 Member**
- TD 5,800mMD / 2,753mVD

**KO (KOP)**
- 925m

**GL**
- TRSV 55.82m

**31.5" S/P @10m**
- TRSV Control Line

**20" CSG @201m / 26" Hole @205m**

- 13-3/8" ESC @405.05m
- 13-3/8" 1st Stage TOC (by CBL) @405.05m

**9-5/8" 2nd Stage TOC (by CBL)**
- @1,120mMD / 1,116mVD

**13-3/8" CSG @1,653mMD / 1,472mVD**
- 17-1/2" Hole @1,658m

**EOB @1,658m**
- 1,461mVD

**Inclination:** 72°

**PT sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**KOP @925m**

**Slotted liners at reservoir injection interval**

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)

**Injection interval 1,134 m**

**Mule shoe guide @4,630.36mMD / 2,393mVD**

**AHC PKR @4,523.85mMD / 2,359mVD**

**P-T Sensor Cable**

**TRSV Control Line**

**3 - 1/2" TBG**

**KOP @925m**
- (BUR : 3deg/30m)

**EOB @1,658m**

**Inclination:** 72°

**Injection interval 1,134 m**

**PD sensor**

**CO₂ resistant cement**

**Injection interval 1,134 m**

**CO₂ corrosion resistance steel**
(Chrome + Molybdenum)
Demonstration Facilities

Schematic Diagram of Monitoring System

Onshore Seismometer

Observation well OB-1 for Takinoue Fm. (converted from an survey well CCS-1)

Inj. Well Takinoue Fm.

Inj. Well Moebetsu Fm.

CO₂

CO₂

Onshore Seismometer

OBS

Wired OBS

OBS

OBS

Permanent-Type OBC

CO₂ Flow Meter

Pressure & Temperature Sensor

3-Component Seismic Sensor

Moebsuetu Fm.

Sandstone Layer

Takinoue Fm.

T1 Member

Hi-net Data (Natural EQ)

Observation Well OB-2

For Moebetsu Fm.

Observation Well OB-3

For Takinoue Fm.
Marine Environmental Survey

Marine environment shall be surveyed based on “Act on Prevention of Marine Pollution and Maritime Disaster” by which geological storage of CO$_2$ under the seabed is regulated.

1. Survey Area
   • 12 survey points in Tomakomai Port Area

2. Methods of Survey
   • Seabed survey by Side-Scan Sonar and Sub-bottom Profiler
   • Current direction and speed survey by Current Meter
   • Sampling of seawater by Water Sampler for concentration of salt etc. and plankton observation
   • Seabed mud survey by Bottom Sampler
   • Collection of benthos by Net or Dredge Unit
   • Observation of benthos by divers or ROV

3. Surveys in Three Stages
   • During EPC period
   • During demonstration operation
     - During CO$_2$ injection
     - After CO$_2$ injection
   • After demonstration operation

Environmental Survey Points

Environmental Survey Points plotted on Japan Coast Guard nautical chart.

Demonstration Facilities

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Monitoring
<table>
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<tr>
<th>Items</th>
<th>Observed objects</th>
<th>Observation frequency</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Injection well</td>
<td>◆ Downhole: Temperature and pressure</td>
<td>Continuous</td>
<td>• Injection well for Takinoue Formation</td>
</tr>
<tr>
<td></td>
<td>◆ Wellhead: Pressure, Injection rate of CO₂</td>
<td></td>
<td>• Injection well for Moebetsu Formation</td>
</tr>
<tr>
<td>Observation well</td>
<td>◆ Downhole: Temperature and pressure, micro-seismicity and natural earthquakes</td>
<td>Continuous</td>
<td>• Observation well OB-1 for Takinoue Formation</td>
</tr>
<tr>
<td></td>
<td>◆ Wellhead: Pressure, Injection rate of CO₂</td>
<td></td>
<td>• Observation well OB-2 for Moebetsu Formation</td>
</tr>
<tr>
<td></td>
<td>◆ Wellhead: Pressure, Injection rate of CO₂</td>
<td></td>
<td>• Observation well OB-3 for Takinoue Formation</td>
</tr>
<tr>
<td>OBC : Ocean Bottom Cable</td>
<td>◆ Micro-seismicity and natural earthquakes</td>
<td>Continuous</td>
<td>• OBC line passes directly above the injection points of reservoirs.</td>
</tr>
<tr>
<td></td>
<td>◆ Signal of 2D seismic survey</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBS : Ocean Bottom</td>
<td>◆ Micro-seismicity and natural earthquakes</td>
<td>Continuous</td>
<td>• One wired OBS above the injection points</td>
</tr>
<tr>
<td>Seismometer</td>
<td>◆ Signal of 2D seismic survey</td>
<td></td>
<td>• Three stand-alone OBSs at the surrounding area of injection points of reservoirs</td>
</tr>
<tr>
<td>Onshore seismometer</td>
<td>◆ Micro-seismicity and natural earthquakes</td>
<td>Continuous</td>
<td>• West region of Tamakomai city</td>
</tr>
<tr>
<td>2D seismic survey</td>
<td>◆ Distribution of CO₂</td>
<td>Periodic</td>
<td>• Utilizing OBC as seismic sensors</td>
</tr>
<tr>
<td>3D seismic survey</td>
<td>◆ Distribution of CO₂</td>
<td>Periodic</td>
<td>• A baseline survey was completed during the investigation period.</td>
</tr>
<tr>
<td>Marine environmental monitoring</td>
<td>◆ Chemical, physical and biological data</td>
<td>Periodic</td>
<td>• Monitoring plan is to be drawn up after the baseline survey and marine environmental impact assessment.</td>
</tr>
</tbody>
</table>
Layout of Seismicity Monitoring Facilities
Schematic Diagram of Permanent-type OBC

- **OBC Length**: 3.6 km
- **3-Component Sensors at every 50m** (total 72 Locations)
- **OBC is buried ca. 2m below the Seabed**
- **3C sensor module**
  - Length: 1.37 m
  - Diameter: 9 cm
  - Weight: 12.6 kg
- **Cable burying machine (water-jet tool)**
**OBS : Ocean Bottom seismometer**

- One unit of wired OBS: Replacing at one year interval for maintenance
- Three units of stand-alone OBS: Replacing at four months interval for data acquisition and maintenance

- Max water depth: ca.35m
- Wired OBS
- Concrete container for OBS
Onshore Seismometer

- Set at the well bottom of 200m-deep drillhole.
- The same specifications conform to “Hi-net: High-Sensitivity Seismograph Network” of National Research Institute for Earth Science and Disaster Prevention.
• Survey well Tomakomai CCS-1 was refurbished to an observation well.

<table>
<thead>
<tr>
<th>KOP depth</th>
<th>Vertical depth</th>
<th>Horizontal reach</th>
<th>Maximum inclination</th>
<th>Drill depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>870m</td>
<td>3,047m</td>
<td>1,757m</td>
<td>42°</td>
<td>3,700m</td>
</tr>
</tbody>
</table>

Observation Well OB-1 for Takinoue Formation

- **Quaternary**: 458mDD, Mukawa Fm (873mDD), Moebetsu Fm (1,124mDD), Nina Fm (1,635mDD), Biratori + Karumai Fm (2,224mDD), Fureoi Fm (2,840mDD), Takinoue Fm (3,700mDD)

- **Survey Well Tomakomai CCS-1**: 870m (KOP depth), 3,047m (Vertical depth), 1,757m (Horizontal reach), 42° (Maximum inclination), 3,700m (Drill depth)

- **Observation Well OB-1**: KOP depth 870m, Vertical depth 3,047m, Horizontal reach 1,757m, Maximum inclination 42°, Drill depth 3,700m
Test Injection and Public Outreach
Test Injection to Moebetsu Fm. in April, May 2016

Cumulative Injection of 7163 tons

Test injection at a rate of 200,000 CO₂-tons/year x 100%

Test injection at rate of 200,000 CO₂-tons/year x 50%
Public Outreach Activities in 2015

① **Panel Exhibitions:** totaling 5 times in Sapporo, Tomakomai and neighbor towns

② **Site Visits:** for universities, research associations, local government, etc.

③ **Environmental Exhibitions:** booths in “Eco-Products 2015” and “2015 Global Warming Prevention Exhibition” in Tokyo

④ **Kids Science Rooms:** learn about global warming, CO₂ and CCS through games and experiments, totaling 6 times in Tomakomai

⑤ **CCS Forum:** held on March 5, 2016 in Tomakomai
Conclusion

- Full cycle CCS system from capture to storage is in operation; objective is to develop practical CCS technology by around 2020
  - Demonstrate safety and reliability of CCS system
  - Remove concerns about earthquakes
- Unique features of project
  - Efficient two-stage capture system
  - Deviated injection wells from onshore site into offshore reservoirs
  - Extensive monitoring system
- Test results indicate superior injectivity of shallow reservoir
- Extensive stakeholder engagement being undertaken
  - Maintaining close communications with Tomakomai fishery cooperative, local government
Q: Has the project developer assessed the option to valorize the captured CO₂ to optimize the operating costs of the facility, in addition to the CO₂ storage option?

For your information, this project is almost similar with the Air Liquide project in Port Jérome, France for which all the captured CO₂ can be used to meet a variety of industrial needs for carbonic gas supply (carbonation of sparkling beverages, food preservation, freezing, etc.).

A: The Tomakomai project is not considering any usage of high purity CO₂ at this stage, and is operating as a full cycle CCS system from capture to storage. If high purity CO₂ is to be supplied to e.g., the food industry, there would be a need to attach some additional facility to remove residual effective gases, which include CH₄, CO etc.
Thank you for your attention.