Carbon Sequestration leadership forum

www.cslforum.org

Highlights from CSLF Technical Group Meeting

Åse Slagtern

Technical Group Chair

Highlights from Technical Group Meeting

Technical CSLF topics:

- Update on CCS activities in the Japan
- Engaging CSLF projects
- Report on results from CSLF-recognized project
  - CO_2 Separation from Pressurized Gas Stream Project

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Invited presentations:

- Presentation on life-cycle emissions estimates for bio-fuels with CCS
- Presentation on possible pathway to low-carbon lignite utilization
- Presentation on possible ways of transforming CO_2 into commercial products

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Updates CSLF Activities

- Updates from 3 Technical Group task forces
  - Off-Shore CO_2-EOR
  - Bioenergy with CCS
  - Improved Pore Space Utilisation

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Other updates

- IEAGHG
- GCCSI
- ISO/TC265/WG1 on CO_2 capture

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2017 CSLF Technology Roadmap (TRM)

- TRM Working Group chaired by Australia
- Update is in progress and will “refresh” existing TRM rather than to do a major re-write
- Will incorporate outcomes from COP21
- Final draft expected at 2017 CSLF Mid-Year Meeting
- Finalized TRM will be deliverable at 2017 CSLF Ministerial Meeting

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Meeting Outcomes

- New task force on Industrial CCS formed (chaired by France)
- Possible new task force on regulation (proposed by Japan)
- Developed strategy for engaging CSLF-recognized projects
- Two new projects recommended for CSLF recognition

Highlights from Technical Group Meeting

Tomakomai CCS Demonstration Project proposed for CSLF Recognition

- Nominated by Japan, the United States, Australia, Canada, France, Norway, Saudia-Arabia, the United Kingdom
- Project sponsor is Japan CCS Co., Ltd.
- Project located at Tomakomai City, Hokkaido, Japan

Highlights from Technical Group Meeting

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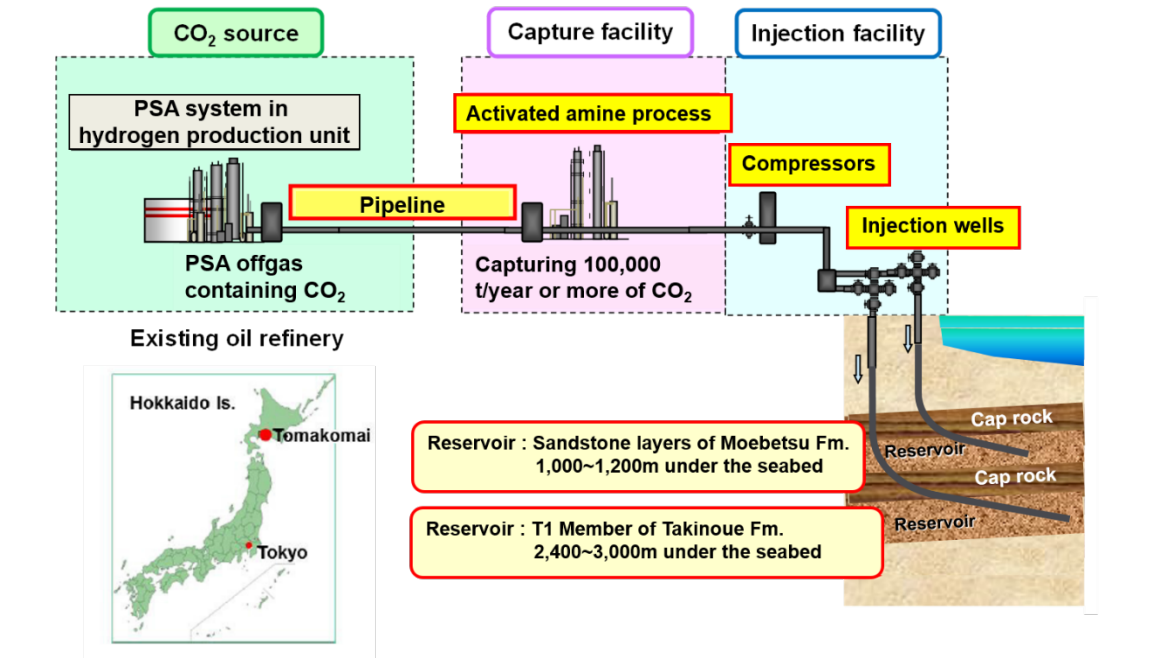
Project Overview



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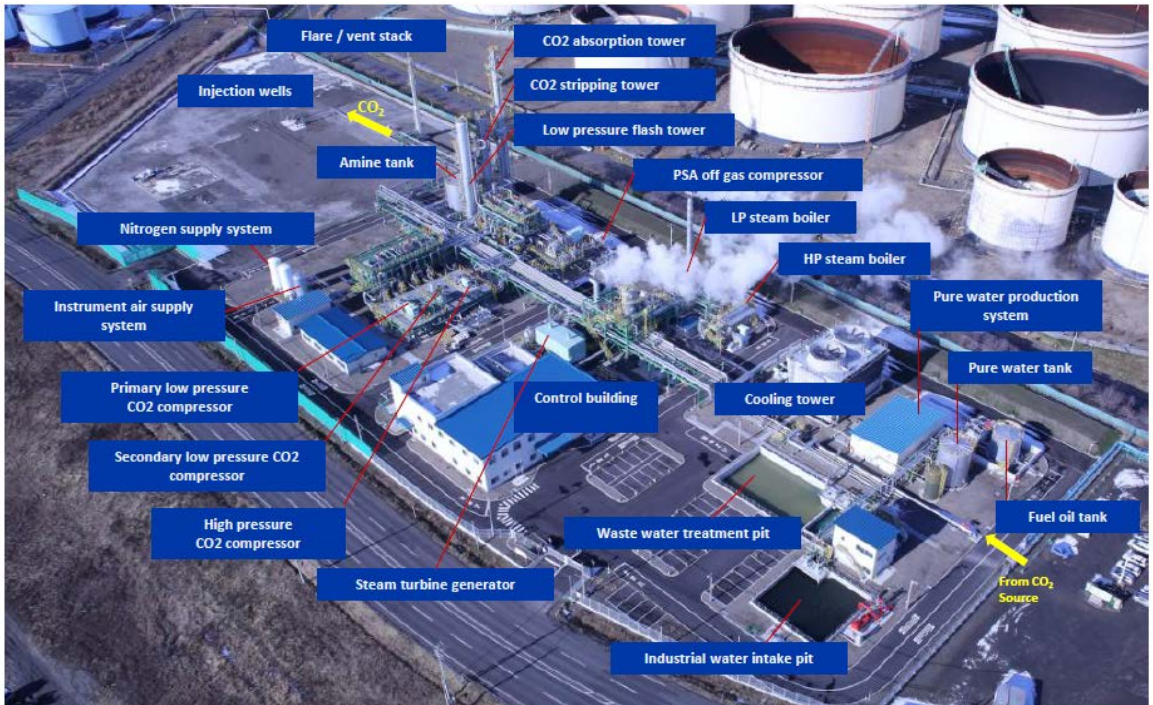
Project Overview



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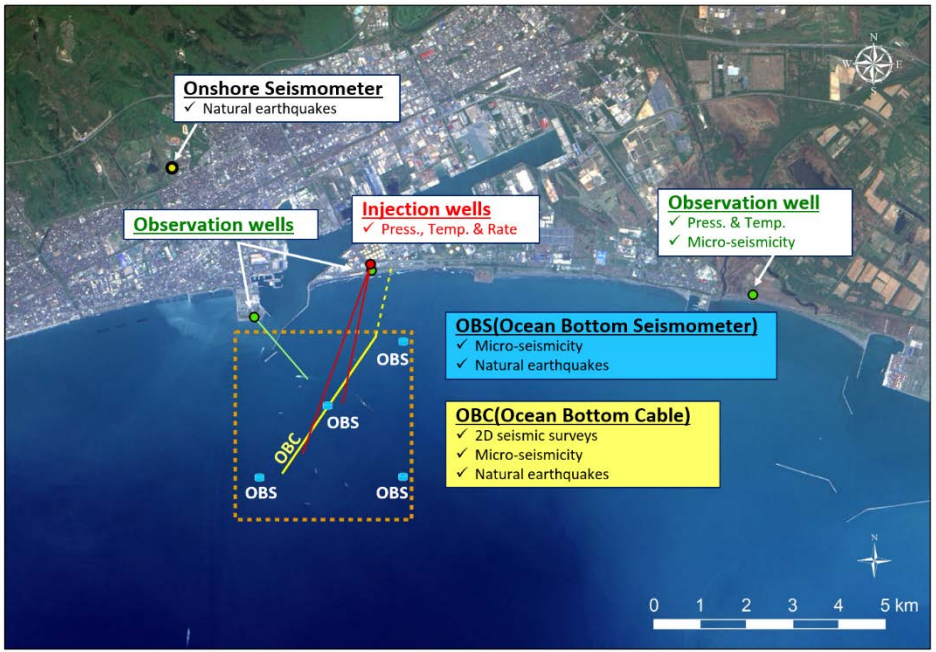
Project Overview



LC81070302016141LGN00, courtesy of the U.S. Geological Survey

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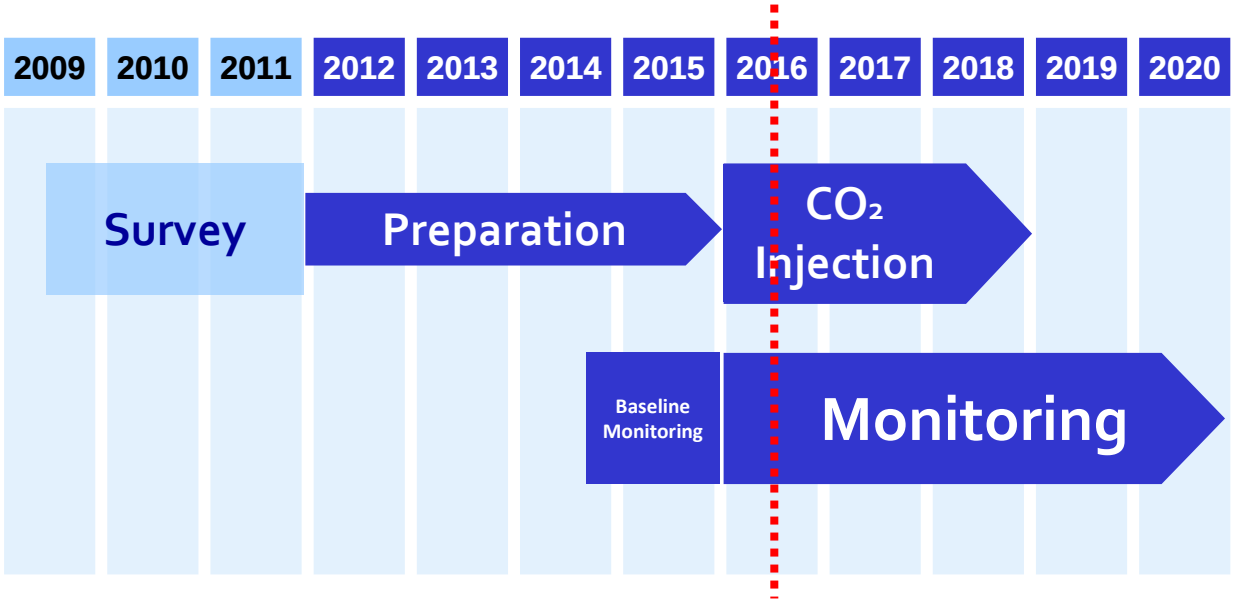
Tomakomai CCS Demonstration Project Schedule



※Years are in Japanese Fiscal Years (April of calendar year thru March of following year)

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Tomakomai CCS Demonstration Project goals:

- Demonstrate that the full CCS system is technically viable, safe and reliable
- Capture and inject 100,000 tonnes of CO_2 per year (or more) for three years
- Monitor stored CO_2 for five years

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Tomakomai CCS Demonstration Project features:

- First full cycle CCS system deployed in Japan
- Two-stage CO_2 capture system providing for low energy consumption
- Extensive monitoring system
- Public outreach and information sharing

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Tomakomai CCS Demonstration Project features:

With the initiation of CO_2 injection in April 2016, the Tomakomai project became the world first CCS project operated in compliance with the requirement of the London Protocol.

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Tomakomai CCS Demonstration Project proposed for CSLF Recognition

- Reviewed and approved by PIRT on Monday
- Reviewed and approved by Technical Group on Tuesday

Highlights from Technical Group Meeting

The Technical Group recommends that the Policy Group provide CSLF recognition to the Tomakomai CCS Demonstration Project

Highlights from Technical Group Meeting

NET Power 50 MW_{th} Allam Cycle Demonstration Project proposed for CSLF Recognition

- Nominated by the United States, Japan, Norway, the United Kingdom
- Project sponsor is NET Power
- Project located at La Porte, Texas, USA

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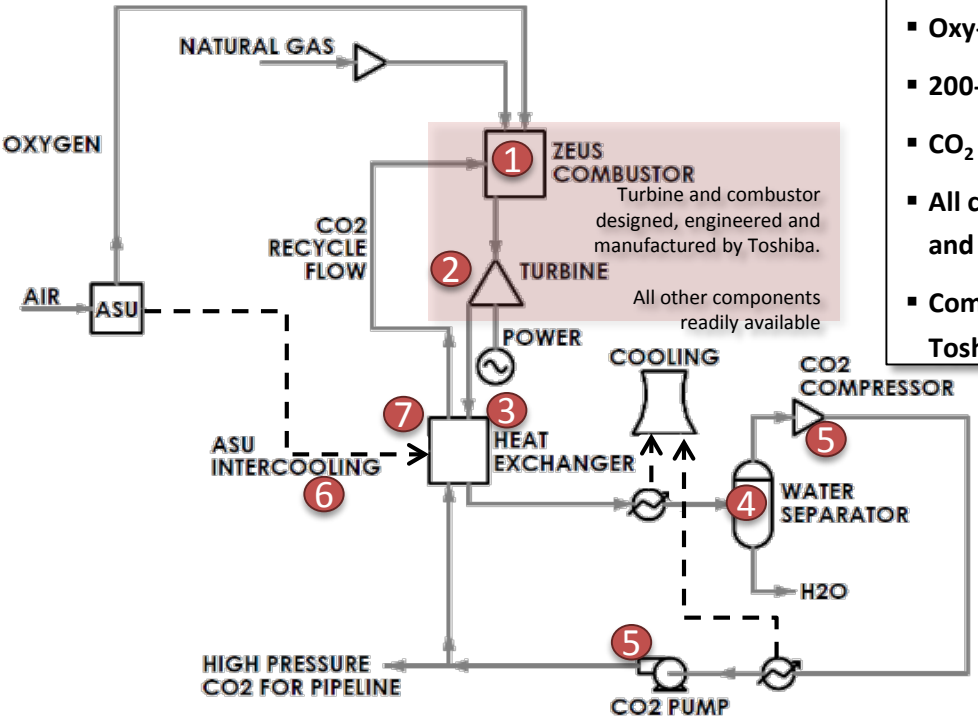
Technical Overview



- 58.9% (LHV) net efficiency, with full carbon capture
- Oxy-fuel, closed-loop, CO_2 working fluid
- 200-400 bar; 6-12 pressure ratio
- CO_2 and water are the only byproducts
- All components, other than combustor and turbine, currently available
- Combustor and turbine developed by Toshiba

1. Fuel
2. CO_2 Turbine
3. Heat Rejection
4. Water Separation
5. Compression and Pumping
6. Additional Heat Input
7. Heat Recuperation

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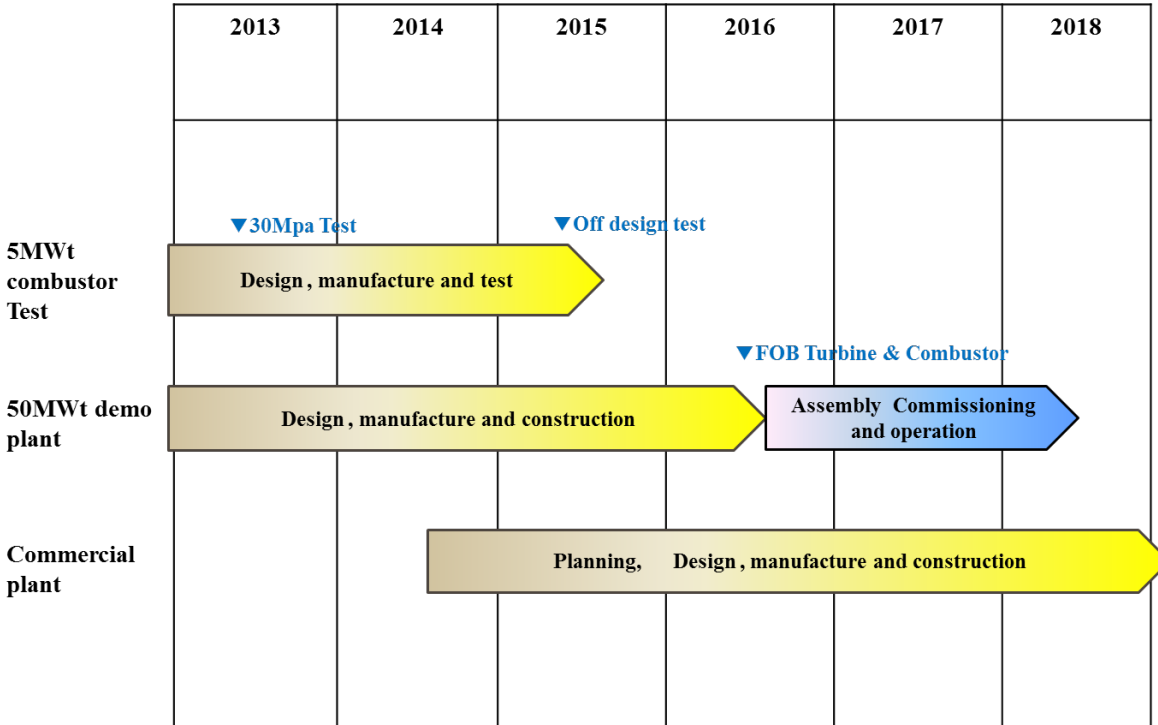
Turbine and Combustor Development Schedule



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50 MW_{th} Demonstration Plant Development Status

March 3, 2016 - Most Major Equipment/Components On-Site – Turbine Ships in October

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NET Power 50 MW_{th} Allam Cycle Demonstration Project goals:

- Verify performance of the highly efficient supercritical CO_2 power cycle in operation
- Set the stage for large commercial-scale power plant

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NET Power 50 MW_{th} Allam Cycle Demonstration Project features:

- This is a capture-only project, no CO_2 storage
- Uses supercritical CO_2 as the cycle working fluid
- Uses oxy-fuel combustion of fossil fuels
- No atmospheric emissions - near 100% CO_2 capture at pipeline pressure

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sCO_2 -Allam Cycle features:

Does not lead to an increase in the cost of electricity compared to the best current systems without CO_2 capture, due to:

- High efficiency: competitive with current combined cycle systems that do not capture CO_2
- Low capital costs: simple cycle design; elimination of steam cycle components; single turbine

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The Technical Group recommends that the Policy Group provide CSLF recognition to the NET Power 50 MW_{th} Allam Cycle Demonstration Project