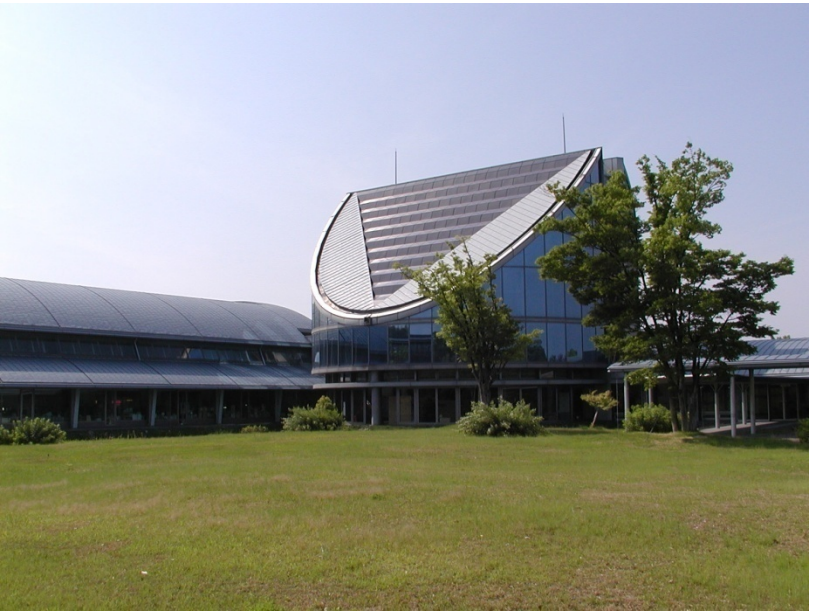
CSLF Policy Group Meeting
7 October 2016, Tokyo, Japan

Research Institute of Innovative Technology for the Earth

Summary of CSLF Workshop

7 October 2016



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Key Features in the Workshop

- Technology-oriented workshop
  - Discussion on whether or not to include policy-oriented contents
  - Left it to the CCS session in the Innovation for Cool Earth Forum (ICEF) conference, which took place on the same day.
- Three themes:
  - Input to taskforces
  - Knowledge sharing from CSLF-recognized projects
  - Specific topic: potential industrial CCS projects
- Introduction of Japan-involved projects
  - Six out of 12 presentations
- Participants
  - More than 100 – CSLF members, GCCSI Japanese members and RITE partners

Opening and Poster Sessions

- Opening Address (RITE)
  - Introduction of CCS R&D in RITE
- Poster session
  - 7 Posters on CCS R&D (RITE)
  - Tomakomai Demonstration (JCCS)
  - Osaki CoolGen: IGFC Demonstration in Japan
  - GCCSI
  - Lacq Project Reports (Total)

Input to CSLF Taskforces (1)

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- Session 1: Input to Ongoing and Potential CSLF Taskforces
  - The two-slide presentation on micro bubble CO2 injection in the last meeting in London drew strong interest from the CSLF delegates there.
  - Presentations related to ongoing and potential CSLF taskforces may facilitate the taskforce activities in a way of:
    - Deepening members' understanding on the topics, and
    - Enhancing the involvement of CSLF delegates and stakeholders in the taskforces.

Input to CSLF Taskforces (2)

- Talk 1: Overview of industrial CCS (GCCSI)
  - Input to the potential taskforce on industrial CCS
  - Smaller commercial challenge than power CCS
  - Need policy support, which leads to investment

- Talk 2: Offshore CO2-EOR Pilot Project in Vietnam (JX Nippon Oil & Gas Exploration)
  - Input to the ongoing Offshore EOR Taskforce
  - Japan-led project not well-known in the CCS community
  - Offshore CO2-EOR is technically feasible, but commercially challenging – HCG-EOR is more viable than CO2-EOR
  - How to deliver CCS in developing countries

Input to CSLF Taskforces (3)

- Talk 3: Micro bubble CO2 injection (RITE)
  - Input to the ongoing Improved Pore Space Utilization Taskforce
  - Lab-scale tests indicate its potential to improve pore space utilization in saline aquifer storage and to improve sweep efficiency in CO2-EOR
  - Need field tests to make it commercially viable

CSLF Recognized Projects Knowledge Sharing (1)

- Session 2: Lessons Learned from Large-Scale CCS Projects
  - Lessons learned from existing projects are critically important
  - Knowledge sharing from the projects that received CSLF recognition in the past is a challenge to be addressed
  - Five presentations:
    - Four CSLF-recognized projects
    - One project to be operational in the power sector shortly

CSLF Recognized Projects Knowledge Sharing (2)

- Talk 1: Uthmaniyah CO2-EOR Demonstration Project (Saudi Aramco)
  - CSLF recognition in Washington DC in November 2013
  - First CO2-EOR project in Saudi Arabia
  - First time for CSLF to learn outcomes from CO2 injection

- Talk 2: Illinois Decatur Basin Project (University of Illinois)
  - CSLF recognition in Bergen in June 2012
  - Successful 1 Mt-CO2 injection in a saline aquifer
  - Successful monitoring but need further analyses
  - Regulatory uncertainty is more critical than other uncertainties

CSLF Recognized Projects Knowledge Sharing (2)

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- Talk 3: Lacq Integrated CCS Project (Total)
  - CSLF recognition in London in October 2009
  - Completed in 2013
  - First onshore full-chain CCS project in Europe
  - Oxy-combustion capture and depleted gas field storage
  - CO2-EGR may not be promising

- Talk 4: Petra Nova CCS Project (NRG Energy and JX Nippon Oil & Gas Exploration)
  - Retrofitted post-combustion capture power project to be operation within this year
  - Unique business model, conducting CO2-EOR by themselves
  - Receiving public financial supports, including various tax incentives

CSLF Recognized Projects Knowledge Sharing (3)

- Talk 5: Plant Barry CO2 Capture Project (Mitsubishi Heavy Industries)
  - CSLF recognition in Washington DC in November 2013
  - Post-combustion capture pilot at a capture rate of 500 tpd
  - Encouraging results in performance, amine emissions, dynamic response and long-term operation
  - Heat integration improves not only energy penalty but also energy efficiency and impurities
  - Scaling-up to commercial-scale is not so challenging

Potential Industrial CCS Projects (1)

- Session 3: Future of Industrial CCS
  - Industrial CCS is as important as CCS in the power sector
  - Further input to the potential taskforce on industrial CCS
  - Interest in Japan's hydrogen-related CCS projects shown by two members in the London Meeting

Potential Industrial CCS Projects (2)

- Talk 1: Industrial CCS Feasibility Studies in Norway (Gassnova)
  - CCS for cement, ammonia plants and waste power with an offshore aquifer storage are all technically feasible but have different reginal challenges
  - Ship transport is feasible and more flexible than pipeline transport
  - Challenges include integration of CCS in existing plants
  - Hopefully to be operational in 2022

Potential Industrial CCS Projects (2)

- Talk 2: CO2-Free Hydrogen Supply Chain (Kawasaki Heavy Industries)
  - Two members showed interest in Japan's hydrogen related CCS project
  - Hydrogen production based on brown coal gasification with CCS in Australia and hydrogen transport by ship to Japan
  - Power generation in Japan fueled by hydrogen produced in Australia may be cheaper than power from wind or PV and coal power with CCS
  - Pilot demonstration in 2020, aiming at commercialization in 2030

Potential Industrial CCS Projects (3)

- Talk 3: Hubs for Industrial CCS (Clean Air Taskforce)
  - "Hubs" are interconnected CO2 sources and sinks
  - Growth of hubs is needed for wider deployment of CCS
  - High-purity industrial CO2 is a key to build hubs
  - CSLF to pay more attention to the importance of hubs – to include it in CSLF roadmap under revision and the renewed CSLF web site

Thoughts on Organization of CSLF Workshops

- CSLF workshops are a good platform for knowledge sharing from projects, in particular, CSLF recognized projects.
- It may be good to have taskforce topic-related presentations in a workshop (or the technical/ policy group meeting).
- Inclusion of policy-oriented contents: up to organizers?
- The simple format of a presentation followed by Q&As may make it easier to have non-native English speakers than panel discussions.
- We may need indicative criteria for talks to be presented in the workshop and those for talks to be presented in the policy/ technical group meeting:

  e.g. taskforce-related: a technical/ policy group meeting

  knowledge sharing-oriented: a workshop

  specific themes: a workshop

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