ZEP Advisory Council 51

5th July 2017

Agenda Item 10: Network Technology

10.a. Network Technology Update

Appended to this paper is an update for the ZEP Network Technology.

10.b. Draft terms of reference for the proposed TWG Mission Innovation

Appended to this paper is a draft terms of reference for the proposed TWG Mission Innovation.

The AC are invited to approve the proposal and draft terms of reference for a new TWG: Mission Innovation

European Zero Emission Technology and Innovation Platform

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Agenda Item 10.a: Network Technology update

NWT co-chairs: Filip Neele (TNO), Arthur Heberle (Mitsubishi Hitachi Power Systems)

Work programmes for all three existing Temporary Working Groups (TWGs) under Network Technology (NWT) are now nearing a close with reports by the TWGs; Future CCS Technologies and Clean Hydrogen approved at the AC49 meeting in December and a report by the TWG Fast Track Transport and Storage approved at the AC50 meeting in March.

Following discussions at the AC50 the next NWT meeting will be held after the ACEC away day, planned for the 4th July. This will allow the Network co-chairs to consider the ZEP priorities identified at the ACEC away day and AC51 meetings, and formulate a forward work programme for discussion at the next NWT meeting.

Temporary Working Group – Future CCS Technologies

Co-chairs: Markus Wolf (GE), Zoe Kapetaki (GCCSI), Ton Wildenborg (TNO)

The report: *Future CCS Technologies* was published in January 2017 on the ZEP website and promoted through the ZEP newsletter and twitter platform.

Further dissemination and related engagement activities have been carried out, in line with proposals outlined by Weber Shandwick and the ZEP External Relations Group (ERG). This has including using key conclusions from report as input for the joint ZEP and EERA submission to the H2020 Energy Work Programme, the SET-Plan TWG9 CCS and CCU, and the Mission Innovation Carbon Capture Innovation Challenge.

Temporary Working Group – Fast Track T&S

Co-chairs: Chris Gittins (TAQA), Ward Goldthorpe (Crown Estate)

The TWG report; *Fast Track CO_2 Transport and Storage for Europe* was approved at the AC50 meeting in March subject to a number of minor amendments regarding the language around access to data and decommissioning in the first two chapters. Following these amendments the report was published in June 2017 on the ZEP website, alongside a press release. The report has also been used as input for the SET-Plan TWG9 CCS and CCU Implementation Plan.

TWG co-chair Chris Gittins and Harriet Howe from the Secretariat presented the key conclusions and recommendations from the report at the IEA workshop on Transport and Storage infrastructure on the 15th - 16th May.

Temporary Working Group – Clean Hydrogen

Chair: Claude Heller (Air Liquide)

The TWG report: *Commercial Scale Feasibility of Clean Hydrogen* was published in April 2017 on the ZEP website, alongside a press release.

Weber Shandwick and the ERG have proposed a dissemination and engagement programme for the report, which includes holding a workshop at the European Commission on clean hydrogen in early-September. A concept note for this event is appended to the ERG update as pre-read 11.c.

The report's key conclusions have been presented two recent meetings; the 9th Trondheim Conference on CO_2 Capture, Transport and Storage, which took place on 12-14th June, and the CCSA Technical Working Group meeting on the 19th June.

Proposed new Temporary Working Group – Mission Innovation

Co-chairs: Filip Neele (TNO), Nils Røkke (Sintef)

Following discussions at the April and May ACEC meetings a call was held between the European Commission, Filip Neele, Nils Røkke, Wim Van Der Stricht (Arcelor Mittal), and the Secretariat, to discuss ZEP's engagement with the Mission Innovation Carbon Capture Innovation Challenge (IC-3) programme. It was proposed that a new ZEP TWG be established under Network Technology which could provide a means by which ZEP may input into the Mission Innovation IC-3 programme.

Draft terms of reference for a new TWG Mission Innovation are appended to this update as pre-read 10.b, and have been circulated to NWT members for feedback and expressions of interest.

The AC are invited to approve the proposal and draft terms-of-reference for a new TWG: Mission Innovation

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Agenda Item 10.b: TWG Mission Innovation Draft Terms of Reference

The TWG Mission Innovation will establish a process by which ZEP can engage with the ongoing activities of the international Mission Innovation programme. The stated objectives of the Mission Innovation: Carbon Capture Innovation Challenge (IC–3), co-led by the United States and Saudi Arabia are threefold:

1. To establish a long-term collaborative platform to share information regarding research and development opportunities;
2. to develop a report to help guide future R&D activities;
3. and to guide future research and strategic planning efforts.

The initial focus is on low TRL levels, as opposed to deployment and/or CCUS policy issues. Further background information on Mission Innovation (IC – 3) can be found appended to this Terms of Reference document.

The European Commission has proposed three panel leads for each of the core activities under IC–3: Nils Røkke (Sintef), Filip Neele (TNO), Wim Van Der Stricht (Arcelor Mittal), who will represent capture, storage, and utilisation topics respectively. Additionally the ZEP report: Future CCS Technologies - published in January 2017 – has been circulated to the Mission Innovation Technical Committee, which is currently developing a literature base for the programme.

A workshop will be held on 25-29th September 2017, in Houston Texas to examine CCUS research needs at low TRL levels. The workshop will convene international CCUS experts to discuss R&D opportunities and developments, with a focus on defining the future Mission Innovation work programme and providing input for a report.

Key activities for the Temporary Working Group are likely to include:

- Coordinating input and recommendations for the September workshop and report from ZEP members and industrial partners
- Ensuring that the Mission Innovation programme is aligned with key messages from ZEP reports and the recommendations of the SET-Plan TWG9 CCS and CCU.
- Establishing an ongoing process by which ZEP may provide input to the planned Mission Innovation IC-3 information sharing platform
- Providing updates to the ZEP Advisory Council, ACEC, and Networks on Mission Innovation activities and meetings

Carbon Capture Innovation Challenge – Progress Summary

The Issue

Carbon capture, utilization, and storage (CCUS) research and development (R&D) portfolios have grown, international collaboration has expanded, and CCUS projects in the power and industrial sectors continue to come online with 17 large scale projects currently operating and additional projects nearing completion. The science and technologies supporting CCUS have greatly advanced over the last two decades, yet opportunities remain for reducing costs, improving performance, consolidating global storage capacity, creating better business and regulatory models, and discovering new uses for carbon dioxide (CO_2).

The Objective

The objective of the Carbon Capture Innovation Challenge (IC-3) is to:

- Establish a long term collaborative platform to share information regarding research and development opportunities
- Develop a report to help guide future R&D activities
- Guide future research and strategic planning efforts

Organization

The Carbon Capture Innovation Challenge is co-led by the United States and Saudi Arabia. The challenge is organized into three major groups:

- **Steering Group:** Responsible for providing framing of the overall challenge and developing the work plan. This includes approving the CCUS experts' workshop structure and meeting specifics (location and date), as well as developing and establishing next steps post-workshop. As more activities are added to the scope of this challenge, the Steering Group may take on additional activities.

- **Planning Committee:** Responsible for planning and executing the CCUS experts' workshop, including decisions about broad framing and timing of the workshop; disseminating information to the Steering Group; and planning and organizing the site visit (as needed). The Planning Committee is primarily focused on logistics and planning for the CCUS experts' workshop and is currently meet bi-weekly or as needed.

- **Technical Committee:** Responsible for the development of the CCUS technology innovation workshop agenda and speakers list and includes representatives from the United States, Saudi Arabia, Canada, China, European Commission, Finland, France,

Germany, Mexico, Norway, the United Arab Emirates, the United Kingdom as well as the Chairs and Co-Chairs of the workshop.

The Approach

IC-3 will seek to advance CCUS technology development with the goal of reduced costs and improved performance. Key activities under this challenge include:

1) Building an improved, shared understanding knowledge gaps and opportunities and technological progress;
2) Promoting opportunities to researchers, innovators, and potential investors; and
3) Strengthening and expand collaboration between key partners (government-government, researcher-researcher, public-private, etc).

Work conducted under this challenge will be directed towards low technology readiness levels (TRLs). The focus will be on R&D breakthrough technologies as opposed to deployment and/or CCUS policy issues, which will avoid a duplication of effort with the Carbon Sequestration Leadership Forum.

Our Progress

IC-3 is currently planning to host an expert's workshop, focused on low-TRL activities September 25-29, 2017 in Houston, Texas. The workshop will convene international CCUS experts from a variety of academic and industry perspectives to discuss breakthrough opportunities and international R&D synergies in carbon capture, geologic storage, and CO_2 utilization. Further work to coordinate R&D programmes, share information and best practices, and engage with international policy and technical groups will add to the body of knowledge on CCUS technology development and bolster all international platforms.

Upon completion of the workshop, a report will be published outlining the suggestions from all members and aid in the identification of future areas of international collaboration on CCUS technology R&D.

Next Steps

Beyond the workshop, IC-3 aims to coordinate and align international R&D programs to best utilize and direct funding for CCUS. This role will be heavily coordinated with other international efforts, including the policy and technical deployment efforts of the Carbon Sequestration Leadership Forum, potential work under the Clean Energy Ministerial, and the analysis and modeling capabilities within the International Energy Agency and other relevant bodies.

Carbon Capture Innovation Challenge – Work Programme

Introduction

Globally, the power and industry sectors account for about 50% of all greenhouse gas (GHG) emissions. Carbon Capture, Utilization and Storage (CCUS) can achieve significant carbon dioxide (CO_2) reductions from power plants and industrial applications. In order to achieve the Paris Agreement targets, a significant acceleration of CCUS technologies will be necessary, both to bring down the cost and lower the energy penalties. Mission Innovation will help guide research and development (R&D) efforts to ensure a coordinated response to this challenge.

Organization

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Approach

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Work conducted under this challenge will be directed towards low technology readiness levels (TRLs). The focus will be on R&D breakthrough technologies as opposed to deployment and/or CCUS policy issues, which will avoid a duplication of effort with the Carbon Sequestration Leadership Forum.

Rationale

International engagement in Mission Innovation is led by countries which also support the CSLF and are members/participants in International Energy Agency (IEA) implementing programs. To maximize the efforts of Mission Innovation, the initial efforts of IC-3 will focus on low TRL technologies, as policy and deployment activities are coordinated through the CSLF and analytical activities through the IEA and other organizations. This presents a unique and meaningful space where Mission Innovation can coordinate breakthrough CCUS technologies.

Objective & Success Criteria

The objective of the Carbon Capture Innovation Challenge is to:

- Establish a long term collaborative platform to share information regarding research and development opportunities
- Develop a report to help guide future R&D activities
- Guide future research and strategic planning efforts

The goals of the Carbon Capture Innovation Challenge are:

- Identify and prioritize breakthrough technologies;
- Recommend research and development (R&D) pathways and collaboration mechanisms.

Key Activities

Short Term:

1) Outline the role of Mission Innovation, the Carbon Sequestration Leadership Forum, and the International Energy Agency in conducting research, demonstrating technologies, and providing policy analysis.

2) Host a workshop in 2017 to examine CCUS research needs at low technology readiness levels.
3) Organize the workshop's collected knowledge and issue a report detailing focus areas, direction, and recommendations for expansion of research.

Medium Term:

1) Conduct stakeholder briefings in collaboration with the Business and Investor Engagement sub-group and engage private-sector interests.
2) Identify funding opportunities for joint collaboration and research.

Long Term:

1) Establish a standing platform for communications, information sharing, and building collaborations on R&D on breakthrough and innovative CCUS technologies that can continue beyond the CCUS experts' workshop.
2) Develop an approach to coordinate R&D strategic plans to leverage international assets and facilitate technology transfer.

Milestones Summary

Date	Milestone	Comments/Description	Participants/ Leads
09/25/2017 - 09/29/2017	Host CCUS experts' workshop	The workshop is currently planned to be held in Houston September 25-29, 2017. The meeting will have separate tracks for capture, utilization, and storage, and will host between 200 and 300 researchers.	United States and Saudi Arabia plus other IC-3 challenge countries
01/2018	Issue workshop report	The report will be essential in developing an approach for the expansion of CCUS R&D and serve as a resource for all MI member countries.	United States and Saudi Arabia plus CCUS experts' workshop chair, co-chairs and panel leads
TBD	Establish platform for information sharing	The platform will bring together researchers and decision makers to streamline strategic planning efforts.	TBD