ZEP Advisory Council 53

6th December 2017

Agenda Item 9: ERG update

9.a ERG Update

Appended to this paper is an update for the ZEP External Relations Group.

The AC is invited to ratify Sarah Kempe's candidacy and elect her as the new ERG Co-chair.

9.b CSLF EU region stakeholder messages

Appended to this paper is a document setting out the EU region stakeholder messages which were agreed at the CSLF stakeholder meeting on the 6th October.

9.c Clean Hydrogen workshop summary note

Appended to this paper is a summary note of the Clean Hydrogen Workshop which took place on the 8th November.

European Zero Emission Technology and Innovation Platform

ZEP Secretariat,
Carbon Capture and Storage Association
6th Floor, 10 Dean Farrar Street, London, UK
www.zeroemissionsplatform.eu

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Agenda Item 9.a: ERG update

ERG Co-chairs: Jonas Helseth (Bellona), Sarah Kempe (Shell)

Nomination for new ERG Co-chair

Unfortunately, Mark Downes has stepped down as ERG Co-chair. He has nominated Sarah Kempe (also Shell) as his replacement. Sarah's candidacy is supported by Graeme Sweeney and Jonas Helseth and she was appointed as interim Co-chair at the ACEC October Teleconference. In order for Sarah to officially take up the role as Co-chair, her candidacy must be ratified by the AC.

A CV of Sarah Kempe is available.

Nominations from other AC members for ERG Co-chair are also invited.

The AC is invited to consider all nominations and elect the new ERG Co-chair.

External Engagement

On the 21st November, the Secretariat attended an event in the European Parliament hosted by Sean Kelly MEP. The event featured a presentation by Ervia on their proposed CCS project in Cork, Ireland.

Luke Warren (Secretariat) made an intervention at the event, on behalf of both ZEP and CCSA.

ZEP Publications

During November, ZEP has published the following papers:

- Response to report "Deployment of an industrial Carbon Capture and Storage cluster in Europe: A funding pathway"
- Response to European Court of Auditors consultation
- Position Paper: 2050 Perspective for Energy Governance

Media

Editorials

ZEP has recently submitted editorials to two publications:

- Pan European Networks – this editorial was published on the 27th September
- European Energy Innovation – this editorial was submitted on the 20th November, and will be published in the winter issue of the publication in December

With regard to the op-ed for Energy Post, the ERG agreed that this should focus on the CCS and CCU SET-Plan Implementation Plan which will be published at the high-level SET-Plan conference taking place on the 29th November – 1st December. Furthermore, it was recommended that as it is extremely difficult to successfully land an op-ed with Energy Post, EurActiv should be approached first.

The AC is invited to note these media activities.

International collaboration

COP23

COP23 took place in Bonn from the 6th – 17th November. ZEP partnered with CO_2GeoNet (lead organiser), Bellona, CCSA, EERA CCS, GCCSI and the IEA GHG on a side event in the EC pavilion on the 6th November.

The following ZEP representatives attended/presented:

- Charles Soothill: presentation on the ZEP ME5 report
- Rob van der Meer: presentation on CCS in industry
- Marie Bysveen: presentation on CCS in Norway
- Keith Whiriskey: chaired the panel discussion

The event was well attended, with good discussion. Following the presentations, Charles Soothill and Marie Bysveen held a session with two Japanese representatives on how the Japanese Government agency can build joint projects with Norway or other countries in the field of natural resource use risk management via CCS.

CSLF

The CSLF stakeholder meeting took place on the 6th October. ZEP supported CCSA and CO_2GeoNet who led the EU region process for developing stakeholder messages ahead of the CSLF Ministerial meeting in December. Following the stakeholder meeting, a document has been produced setting out the EU region stakeholder messages.

This document can be found as pre-read 11.c.

The 7th CSLF Ministerial Meeting is taking place on the 3rd – 7th December in Abu Dhabi, UAE. ZEP has been invited to give a presentation on the 6th December and the ACEC agreed that Gardiner Hill would accept this invitation and present on behalf of ZEP.

The AC is invited to note these developments.

Clean Hydrogen workshop

The ZEP Clean Hydrogen workshop took place on the 8th November in Brussels. A summary note of the event has been developed and be found as pre-read 9.c.

A call is scheduled for 13th December to discuss how a collective piece of work, aimed at strengthening the case for hydrogen in Europe, could be progressed following on from discussions at the workshop.

The AC is invited to note these developments.

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CSLF EU region stakeholder message

Zep
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Outcome statement of CSLF European event: stakeholder message to the Ministers

Recommendations to Ministers:

1. **Recognise the importance of CCS to meeting Paris Agreement targets** by providing a clear message of long-term political support. CCS is an essential part of the routes to decarbonisation because it specifically addresses CO_2 emissions for which there are no clear alternatives including a significant share of the emissions from energy intensive industries, and negative emissions. CCS can also complement other low carbon solutions in power and heat generation.

    a. All countries to assess the role for CCS in achieving national 2030 and 2050 emission targets with comparative costs for different routes, including for energy and commodity sectors. In countries where it is concluded CCS has a key role to play, CCS should be specified in national climate, energy, industry and infrastructure plans as well as the Paris Agreement mandated Nationally Determined Contributions.

    b. Identify national sources of CO_2 emissions that can best be reduced through the use of CCS, along with CO_2 storage sites that could be commissioned within a decade, noting in particular geographical clusters of emitting sources that can be served by shared CO_2 transport and storage infrastructure.

2. **Develop tailored financial mechanisms to support CCS rollout to deployment, recognising its unique role in decarbonising multiple sectors.**

    a. Consider most appropriate financial mechanisms to drive CCS forward given the current state of CCS in each country, ensuring income and costs are distributed appropriately (and including the role for utilisation in advancing long term CO_2 storage where appropriate).

    b. Funding should be ring-fenced specifically for CCS from e.g. green taxes. Financial support such as government grants, will be needed for early CCS projects.

    c. Prioritise CCS in, and provide funding via, mechanisms such as H2020, Mission Innovation and ERDF/INTERREG to target remaining barriers to large scale implementation of CCS.

3. **Reflect in policy messaging that we should not wait to implement CCS**. Action is urgently required. CCS is ready for roll-out and significant investment is needed now to achieve deployment by 2030.

    a. Include CCS in next iteration of national infrastructure plans, recognising the likely need for a public sector body to supervise/build core transport and storage infrastructure. Lessons from national and transnational transport of energy commodities to be considered.

4. **Establish relationships between regulators and CCS project developers/operators in their Member State** to build trust by sharing knowledge on developing large-scale projects

    a. Establish national ministerial body with mandate to engage with CCS project developers/operators to build long term relationship and to share knowledge and experience

5. **Provide policy support for collaboration with industrial companies and industrial regions on CCS to overcome commercial barriers to implementation of CCS.** This can help support development of national industries that will underpin sustainable jobs and growth for future decades
    a. Establish mechanisms and funding to encourage close private-public-partnerships in areas with clusters of industrial sources that could be decarbonised with CCS

Recommendations to the CSLF

1. **Stakeholders support the new regional approach and urge CSLF to further develop this strategy.**
    a. Hold CSLF regional stakeholder meetings once a year. Stakeholders expressed that regional issues are their main topics of interest for future meetings.
2. **Assess the need for a new CCS advocacy/campaigning group** that can help build support in Europe by engaging with members of the European Parliament and ministers of national governments.
    a. European Stakeholder Group champions to explore how best to action this alongside participants in the 2017 stakeholder meeting.
    b. The advocacy group needs to establish a common platform using key messages from the CSLF stakeholder events and international advisory bodies such as IEA on integrating CCS alongside other low carbon solutions for a net zero emission future.
3. **The CSLF Policy Group Communications Task Force to reframe the messaging on CCS to gain wider support.**
    a. Communicate more widely that CCS is ready to be scaled up to deployment. Recognise and build on the decades of operational experience proving CO_2 can be captured, transported and stored in a safe manner.
    b. An open dialogue with the broader climate community (e.g. NGOs, action groups) to address issues and build support for CCS as a necessary climate tool is a key *first* step to enabling CCS. CSLF Policy Group Communications Task Force to engage in an open dialogue with the wider climate community.
    c. Communicate CCS success stories and its integral role as part of the climate solution to the public recognising that communication and narrative are country-specific. Set out the near-term benefits of CCS, e.g. safeguarding and creating jobs.
4. **CSLF Technical Group to enable knowledge sharing on practical approaches to dealing with risks and liabilities for CCS projects.**
    a. Establish how risks and liabilities have been dealt with by projects that are in operation. Strategies that could satisfy both project operators and the Competent Authority could also be explored through 'dry run' applications for test cases in a number of countries. Group to report to the CSLF ministerial meeting in 2019.
5. **Explore synergies for CCS and CO2 utilisation** (while ensuring net negative emissions). Utilisation could enable large scale storage by, for example, providing an incentive to industry to invest in CCS technologies thereby reducing costs for CCS projects.
    a. Set up a regional working group focused on utilisation of CO_2 in Europe and the necessary regulatory framework to fully explore this issue and to make specific recommendations to the CSLF

ministerial meeting in 2019, taking into consideration the abatement potential of individual utilisation value chains.

6. **Provide technical information to support decisions on the role of CCS in meeting Paris Agreement targets**
   a. It is recommended that the CSLF Technical Working Group provides a summary for ministers on where CCS specifically addresses CO_2 emissions for which there are no clear alternatives (e.g. cement and steel manufacture, energy intensive industries), where it can complement other low carbon solutions in power and heat generation and the role for CCS in negative emissions (BECCS).

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CSLF EU region stakeholder message

Supporting Statements from the 2017 CSLF European Stakeholder meeting

The messaging on climate needs to be clear. IPCC 2°C scenarios rely heavily on emission reduction in all sectors and on negative emissions and therefore on CCS. We need to do whatever we can now to reduce our emissions. CCS is ready now, low carbon cement can be manufactured now. Today there are 21 CCS projects constructed or under development globally, with applications in most of the key CO_2 emitting sectors. Successes over the past decades have proven the technical viability of CCS; the focus of ministers in coming years must be on overcoming the non-technical barriers to implementation of CCS.

Long term political support for CCS was rated as the most important enabler of CCS projects. Survey respondents ranked stronger political commitment to decarbonisation as the most significant issue to their organisation.

CCS does not require policy parity with low-CO_2 energy technologies. Instead specific mechanisms to enable CCS should be implemented, recognising that CCS is a unique decarbonisation tool applicable in multiple sectors including heavy industry, power, heat, transport and waste. CCS is currently the only way to reduce process emissions from the manufacture of essential commodities such as cement and steel. CCS is also currently the only way to achieve large-scale negative emissions (via bioenergy with CCS). Without CCS, extensive electrification of all sectors will require significant upgrades to the European electricity infrastructure, and a currently unfeasible amount of new renewable generation.

Straightforward regulatory mechanisms such as firm regional/national/local targets and emission performance standards can provide important long term signals needed for investment in CCS. A requirement from the EU Parliament to initiate mechanisms for deep decarbonisation could be a key driver. However, regulation alone will not drive CCS, financial support mechanisms/incentives for investment need to be developed.

Demonstrating a sustainable business case was ranked as a key enabler for large scale storage projects by survey respondents. Certificate systems to reward CO_2 stored, grants for large scale projects, and carbon valuation (cap and trade, CO_2 tax) were rated as the most effective financial mechanisms for enabling CCS projects. A range of financial mechanisms will be needed depending on maturity of CCS in each country. Different business models will be required for the separate parts of the CCS chain.

In the early pre-commercial phase governments should deliver grants and risk guarantees to get projects to a stage where an investment decision can be made. Such cooperation must be supplemented with incentives to secure transition towards a market-based approach in the longer term. Stakeholders recommended that funding should be ring-fenced specifically for CCS from e.g. CO_2 tax incomes. This reflects that a CO_2 tax should be seen as a transitional mechanism to drive economy-wide decarbonisation.

The issue of long term liability was identified as a barrier to large scale implementation that could be overcome through knowledge sharing from existing projects. Case studies are needed to demonstrate liability and risk sharing through the CCS chain over the lifetime of a CCS project.

Messaging needs to be clear and understandable to all. Promote CCS success stories to show 'CCS is real and ready now'. Engaging more fully with the public and wider climate community is essential to moving CCS forward.

European CSLF Stakeholders urge Ministers to establish relationships between regulators and CCS project developers/operators in their Member State to build trust, share knowledge and to overcome remaining

regulatory and policy barriers to CCS projects. Policies on transboundary transport of CO_2 and supporting public-private partnerships were highlighted by survey respondents as potential CCS project enablers.

Meeting attendees and survey respondents made it clear that CCS and CO_2 utilisation are viewed as different technologies, with different drivers. The role for utilisation in enabling storage and suitability of the various technologies for Europe requires further assessment.

Background

The Carbon Sequestration Leadership Forum (CSLF) has reorganised its stakeholder engagement process in advance of the CSLF Ministerial Meeting to be held in the UAE the week of December 4, 2017. A regional approach was taken with regional champions for the Americas, Europe, The Mid-East & Africa, and Asia. Each champion organised a stakeholder meeting in their region and reported the outcomes to the CSLF.

This "Message to the Ministers" represents the key stakeholder messages from the European Regional Meeting held October 6th 2017 in Brussels. About 30 stakeholders attended the meeting.

Participants and additional stakeholders were asked to complete a survey ahead of the European stakeholder meeting. Forty-three responses were received, with the main respondent groups being government stakeholders (28%), research stakeholders (28%) and private industry stakeholders (23%). Most respondents (88%) were based in Europe. Many respondents had expertise in CO_2 storage (38%) with the second largest group being CCS/CCUS project developer/operator (16%).

ZEP Clean Hydrogen Workshop

8 November 2017

Summary note

Vassilios Kougionas, DG RTD, introduced the workshop saying that it was important to explore synergies between different hydrogen technologies. He noted that ZEP had an instrumental role in producing the SET- Plan Implementation Plan and providing input to the work programme on hydrogen in the Horizon 2020 work programme.

Vassilios said that the Commission needs to think about how to integrate hydrogen technologies, noting that CCS hydrogen is currently in the H2020 as an industrial application and also under ERA NET ELEGANCY.

Katarzyna Drabicka, DG RTD presented on the EC's approach to hydrogen in the energy system, making the following points:

- Katarzyna noted that for her it was almost all new faces in the room and welcomed the opportunity to exchange views and knowledge.
- She said renewable energy sits at the heart of EU policy, however it also creates implications in terms of system stability and therefore there is a need to invest in technologies that address this. This includes long term energy storage and flexible generation capacity.
- A key instrument to achieve this is the Energy Union. Hydrogen and fuel cells support all five pillars of the Energy Union.
- A future challenge is channelling RES into other sectors that are hard to electrify- transport, buildings and industry. Hydrogen is seen to be a way to achieve this.
- There are multiple areas of policy support for hydrogen including targets for renewable energy for transport in the RED, ETS reform and the Innovation Fund, and the Clean Vehicles Directive.
- On R&I, Hydrogen is included as an activity under Mission 5 of Mission Innovation; SET-Plan actions 6,8 and 9, and the Energy Union Research, Innovation and Competitiveness Strategy. Fossil based hydrogen is currently "out of scope" of the Hydrogen and Fuel Cell Joint Undertaking.
- Katarzyna extended an invitation to the HFC JU annual stakeholder forum taking place on 22 November.

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6th Floor, 10 Dean Farrar Street, SW1H 0DX, London
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Claude Heller, Air Liquide presented ZEP's work on clean hydrogen as an early enabler for a hydrogen economy:

- Until large quantities of excess renewable energy are consistently available, the only way to get a steady supply of large volumes of hydrogen is through SMR/ATR. Coupled with CCS this can be low carbon or "clean" hydrogen.
- Currently hydrogen through SMR/ CCS can be produced at a much lower cost than from electrolysis with renewables
- Developing CCS for hydrogen could also enable access to infrastructure for industrial emitters which will need to store their CO2 in future.
- Eligibility for CCS hydrogen in EU support programmes would make large quantities of hydrogen available now.

Nikolaos Lymperopoulos, Hydrogen and Fuel Cell Joint Undertaking gave an overview of the JU's work:

- The Joint Undertaking was formed to drive hydrogen and fuel cells for transport. However over time, it is becoming clear that we are moving towards "multi talented H2" with applications in different areas.
- The JU has funded demonstration electrolysers that have rapidly increased in size while decreasing on cost/ Mw. The first project in 2011 was 150 kw at €8 m per MW, whereas next year the JU expects to deliver a 20 MW project at €0.5 m MW.
- The JU has observed interest from industry to go to larger electrolysis projects. By 2025 the cumulative demand for power to hydrogen could be 2.8 GW.
- The JU has developed a certification scheme for "green" i.e. renewable hydrogen, and "clean" hydrogen for which the benchmark is emissions 60% below those from unabated SMR.
- A Stakeholder Platform is being set up to provide governance to the CertifHy project with working groups on key areas and a Steering Group. Nikolaos extended an invitation to the first meeting on 20 November.

Mona Mølnvik, SINTEF shared details of the ELEGANCY project:

- ELEGANCY is an ERA- NET cofounded project working with different countries to look at how hydrogen via CCS can enable a low carbon economy. Five case studies are to be explored in Rotterdam, Switzerland, UK, Germany and the Netherlands.
- The output will include pilot and lab- scale tests and an open source design tool for a full CCS chain. The study will also look at societal support for hydrogen.
- The project will be complete in the next three years.

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Lamberto Eldering, Statoil spoke about plans for a hydrogen power project in Norway:

- The Magnum power plant in Norway is currently operating as flexible backup generation although this is not what it was designed for. Statoil plans to convert the plant to run on hydrogen, integrating storage in salt caverns to manage flexibility.
- Magnum is seen as the next step to the Norway full chain project – using the CCS infrastructure to decarbonise more widely.
- The modification needed to the power plant is relatively minor, as Statoil will simply need to switch out the burners. Other parts of the chain including geological CO2 storage, hydrogen storage in salt caverns and shipping by boat and pipeline are well established.
- Lamberto compared the potential of a flexible low carbon hydrogen plant to a lithium ion battery. One of the world's largest battery projects is a 400MW battery in California. This would have peak capacity of delivering 100MW for four hours before needing to be recharged. In contrast, Magnum is a 1300 MW project that can deliver backup power constantly over 24 hours.
- Statoil sees the Innovation Fund as key to gaining funding for the Magnum project.
- There is also potential to develop enabling cross- border infrastructure through the Projects of Common Interest. Lamberto said that for PCIs to be successful some key issues including the ratification of the London Protocol should be addressed.

Discussion

- Jorgo Chatzimarkakis said that there is interest from a steel plant in Europe which was looking to replace its blast furnace with a hydrogen fuelled one, and would be willing to invest 30% of the cost if the hydrogen was available to fuel it. For projects such as this "blue" or "clean" hydrogen would be needed quickly as there is not currently the generation capacity to produce the amount needed through electrolysis.
- Lamberto Eldering commented that without a clear market for large volumes of hydrogen Magnum would be a standalone project, so it was welcome news to hear appetite from steel producers.
- It was proposed that the hydrogen steel plant, and the Magnum project, could potentially be classed as "lighthouse" projects under H2020. The Commission noted that the steel industry was asking for low carbon steel to be included in FP9, so there could be a synergy there.
- It was noted that that in the steel sector alone, the volume of energy needed would be equivalent to 60 nuclear plants, a scale that is not viable from renewable sources alone. When applied to all heating in the EU, five times the current renewable generation capacity would be needed to produce hydrogen. Participants agreed that the scale of potential market for hydrogen meant both renewable and clean sources would be needed.

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- Nikolaos Lymperopoulos said that converting to a hydrogen economy would be expensive, and if a pool could be created for all low carbon hydrogen sources this would be beneficial for society. He added that electrolysis could provide for smaller levels of demand at a regional basis.
- Questions were raised about the eligibility of clean hydrogen in the clean transport package. It was noted that currently for there to be a market for hydrogen as a transport fuel it would need to be cost competitive with diesel.
- On Carbon Capture and Utilisation, it was noted there are synergies with clean hydrogen production. Participants pointed out that CO2 reuse needed to be from unavoidable CO2 streams to be credible, and also demonstrate a clear climate benefit in terms of CO2 reduction.

Outcomes

- It was agreed that there were areas where collective activity could be undertaken to strengthen the case for hydrogen in Europe, and that a smaller meeting should be facilitates to take forward a piece of work.

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