2019-IP13: CCUS AND EIIS WORKSHOP – 7TH NOVEMBER 2019

BACKGROUND

Energy Intensive Industries (EIIs) have been recognized as key elements in the global economy, for both developed countries and emerging regions. However, EIIs are also recognized as significant emitters of CO_2. Cutting down emissions in the EIIs is essential to achieve the decarbonization goals.

The EIIs analysed in this report are the steel, cement, chemicals, refining, hydrogen, natural gas, heavy oil, fertilizers, and waste to energy sectors. Core participants in the Carbon Capture, Utilisation and Storage (CCUS) Task Force from the Carbon Sequestration Leadership Forum (CSLF) Technical group delivered a report in September 2019 [1], which was the main input to this workshop.

In summary, this report:

- Covers the role of EIIs in current and future global and regional economies
- Suggests a prediction of the role of CCUS in EIIs to reduce CO_2 emissions
- Discusses the interactions between different EIIs and how those can contribute to the development of CCUS
- Examines the role of stakeholders on the near-future deployment of CCUS in EIIs

A steering committee was formed to organise this workshop, held on November 7th 2019, and hosted by EDF and Club CO_2. Steering group members included representatives from Total (Dominique Copin), IEAGHG (Monica Garcia Ortega), and CSLF (Lars Ingold Eide). This workshop was held for half day, including a plenary session addressing four general topics, and including 61 attendees from 16 countries. Each session included individual or several presentations, followed by a roundtable including representatives from international organisations, governments, and industries.

This document presents a brief summary of the report [1] and the workshop discussions.

Immediate actions: Knowledge transfer between the power and industrial sector; Policies framework

Medium-term actions: Implementation of industrial clusters; Learnings by doing

Long-term actions: Large deployment

CCUS and EIIs Workshop

Organised by Total, CSLF and IEAGHG. **Hosts:** EDF and Club CO_2

Date and time: 7th November 2019, 09:00- 12.15

09:00-09:10	**WELCOME AND INTRODUCTION** **Dominique Copin** –Total – head of the CSLF taskforce: CCUS in EIIs
09:10-09:20	**THE ROLE OF EIIS FOR THE ECONOMIC DEVELOPMENT OF DEVELOPED AND EMERGING COUNTRIES. GROWTH AND GEOGRAPHICAL TRENDS** **Monica Garcia Ortega** - IEAGHG
09:20-09:30	**CO_2 EMISSIONS FROM EIIS** **Lars Ingolf Eide -** Research Council of Norway
09:30-10:30	**DECARBONISING EIIs (Chair: Aicha El Khamlichi-ADEME/Club CO_2)** *Opportunities in the Refining Sector* **Damien Valdenaire**- CONCAWE *CCUS in the Cement Sector* **Claude Lorea** - Global Cement and Concrete Association *Technology status of hydrogen production from fossil fuels with CCUS* **Lars Ingolf Eide -** Research Council of Norway *Discussion* **All speakers**
10:45- 12:00	**ROUNDTABLE: THE ROLE OF STAKEHOLDERS IN THE IMPLEMENTATION OF CCUS IN EIIs (Chair: Didier Bonijoly- BRGM/Club CO_2)** **Åse Slagtern**- Research Council of Norway **Per Sandberg**- Equinor **Monica Garcia Ortega** - IEAGHG **Eddy Chui** – Natural Resources Canada **Keith Whiriskey-** Bellona **Colin McGill**- BP (Clean Gas Project) **Angus Gillespie-** GCCSI
12:00- 12:15	**CONCLUSIONS: THE FUTURE OF CCUS IN EIIs** **Dominique Copin**

SUMMARY FROM THE CSLF REPORT [1] AND WORKSHOP DISCUSSIONS

THE ROLE OF EIIS FOR THE ECONOMIC DEVELOPMENT OF DEVELOPED AND EMERGING COUNTRIES. GROWTH AND GEOGRAPHICAL TRENDS

EIIs are essential in today's economies. Depending on the sector, the share would be stronger in one region or another, but most of the EIIs considered in this report are expected to grow (steel, cement, chemicals, refining, hydrogen, natural gas, heavy oil, fertilizers, and waste to energy). Their products are key for infrastructures, commodities, and consumers goods, and will impact on the living standards of a significant part of the world population.

CO_2 EMISSIONS FROM EIIs

Currently, CO_2 emissions from EIIs represent approximately 25% of the total global CO_2 emissions. Based on the expected EIIs growth, those emissions are also expected to increase, unless decarbonising measures are put on place. Within the predictions of the 2 degrees scenario (2DS) or beyond 2 degrees scenario (B2DS), the industrial emissions must be reduced by 50 or 70% respectively.

In contrast to the power sector, industries emit CO_2 in the production processes (based on chemical reactions and the fossil fuel or biomass combustion), and indirectly through the use of electricity from the electricity grid. The individualities of the production processes result in various characteristics of CO_2 streams in a given site, offering several opportunities of CCUS implementation either at partial or full capture rate.

DECARBONISING EIIs

EIIs can be decarbonised through several pathways, such as implementing new production systems, energy efficiency, fuel switching, use of renewables for energy supply, and carbon capture. While the solution is a mixture of all those instruments, the optimum route would be tailored for each industry and region.

The main technical benefits of CCUS, compared to other decarbonising solutions, are their immediate potential to cut down process emissions at large extent, and, with specific CCUS technologies, the low impact on the production processes. However, Research, Development and Demonstration (RD&D) must be accelerated to drive down CCUS costs. Joint activities could speed it up, such as building up common transport and storage infrastructures, transferring knowledge from one industry to another, and reducing costs through deployment and experience. Utilisation could be key on developing circular business models, either by the use of CO_2 or intermediate products between the industries. In addition, due to the heterogeneity of the industrial sector and regions, solutions must be tailored to specific arrangements.

ROUNDTABLE: THE ROLE OF STAKEHOLDERS IN THE IMPLEMENTATION OF CCUS IN EIIs

Currently, the scientific community is aware about the contribution of the industrial sector to the global CO_2 emissions and the role of those in the climate change. There are several organisations, such as the International Energy Agency (IEA), analysing different current and predictive scenarios to reach international goals on CO_2 emissions reductions. Within those scenarios, CCUS has been recognised as a key tool for the power and industrial sectors.

Although this message has been spread for decades, the deployment of CCUS remains limited, despite several large-scale demonstrations. These examples have been proven to be effective, and their

implementation has been shown to be less expensive than decarbonising scenarios where CCUS is not included. Moreover, its deployment can be quicker, due to their current maturity level and easy integration.

Many factors have slowed this deployment, such as the cost, low public support, and difficulty for governments to put in place strong measures likely to facilitate the deployment of these solutions. As a result, action is now urgently needed, particularly for EIIs.

Attendees and speakers, representing international organisations, governments, and industries, had the opportunity to discuss two main questions:

- **Actions to put in place, or which must be set up as first movers, to show the way forward to contribute to the deployment of CCUS for Energy Intensive Industries**

From the international organisations perspective, the primary immediate action is advocacy for CCUS, to catalyse the transfer of information between sectors, and to contribute to improving general public acceptance. Additionally, international organisations are essential to deliver objective and transparent techno-economic studies about CCUS technologies and their integration in the power and industrial sectors, and within a complex network of decarbonising measures. International organisations are also key connecting governments, industries, and academia, implementing new initiatives, and advising on new strategies.

Governments recognised the role of CCUS, and their main action is to understand how to implement these initiatives within new policies and funding schemes. Additionally, these organisations have a key role in international agreements, which are currently under review.

Industries are the first movers on deployment, and there are several initiatives promoting collaboration between sectors and governments. Examples include the Northern Lights Project and the Teesside Industrial Cluster.

- **Social and economic objectives to promote greenhouse gas reduction policies to meet the expectations of future generations, and how CCUS is part of the solution**

The implementation of CCUS in EIIs is inevitably driven by economics. In this regard, it is important to highlight the cheaper CO_2 abatement cost shown by energy scenarios including CCUS compared to those which do not include it. However, cost assessments show that the cost of industrial products is much higher when CCUS is implemented (compared to the base scenario where there is no decarbonising strategy). In this regard, economic policies such as funding schemes, de-risking support, or tools such as carbon tax, could be beneficial to cut down CCUS costs. However, the impact of industrial products cost on end-user products cost (for example, the cost of steel on cars, or cement on houses), is very low (1-3% approximately [1]). While end-users could absorb a price increase, a mechanism for transferring the high price on the industrial product along the entire supply chain would be a key issue.

Speakers discussed the value of CCUS, which not only includes economics as a key parameter, but also the ease for integration, decarbonisation potential, and social aspects. These individual objectives could be essential to promote the implementation of CCUS-supportive policies.

Additional questions from the audience about the business case, low deployment, and climate change were also discussed. In summary, the urgency to implement measures to mitigate climate change is increasing due to the impacts on the environment and human life, tight deadlines to fulfil international agreements, and lack of early action. It is recommended that, for first movers, the business case

should be built around a supportive policy framework, and driven by future markets (consumers preference for greener products).

CONCLUSIONS

Reducing CO_2 emissions in EIIs is essential to reach regional and international decarbonisation goals. CCUS has been recognised as one key tool within a mix of measures that could be implemented in the industrial sector. In addition, some industries have processes and flue-gas characteristics that are attractive for the implementation of CCUS.

However, CCUS deployment is very low. Urgent action is needed to cut down CO_2 emissions from the industrial sector in the short term to reach decarbonisation goals. In order to catalyse deployment inter-sectorial collaboration is essential within a supportive policy framework.

IEAGHG RECOMENDATIONS

IEAGHG has explored options for the implementation of CCS in the industrial sector and has delivered techno-economic studies for the cement, steel and iron, pulp and paper, hydrogen/ammonia, methanol, and refining facilities. Due to the significant potential application of CCS in these sectors, it is recommended that IEAGHG should continue to maintain a watching brief on the developments in these industrial areas, including policies and market considerations.

FURTHER READING

[1] Carbon Sequestration Leadership Forum. Technical Group. Task Force on Industry CCUS. Carbon Capture, Utilisation and Storage (CCUS) and Energy Intensive Industries (EIIs). From Energy/Emission Intensive Industries to Low Carbon Industries, September 2019

[2] Mission Innovation. Accelerating the Clean Energy Revolution, Report of the Mission Innovation Carbon Capture, Utilization and Storage Experts' Workshop, October 2019

Mónica García Ortega

28/11/2019