"Renewable Energy and CCU: What are the interconnections?"

January 29th 2021, virtual workshop

Q&A session

Questions for Alan Croes (AC), TenneT

Q1: Does TenneT consider offshore electrolysis in their calculation (as one option)?

AC: Short answer: Yes, we do. The long answer is, that offshore electrolysis can be a meaningful option to reduce cost for linking offshore assets to the coast – especially if a conversion of the transported energy to Hydrogen on-shore is anyhow foreseeable. Nevertheless, we are aware of the technological (adaption of existing technologies to this environment), technical (actually building such assets) and logistical (Maintenance, transport of the H2 to onshore) challenges. We are working together with many industrial partners to keep track on the developments and to estimate the probability for a go-live.

Q2: What needs to be done to retrofit existing gas infrastructure to transport H_2? The properties of H_2 is very different from NG - auto ignition, flame colour, etc.?

AC: While not my area of expertise, my current understanding is that the main cost drivers are cleaning (cost depends on the required quality level), replacement of (some) valves and new compressors. While the properties are different from NG, the risk profile is considered more or less equal given NG stays low and H2 quickly dissolves in the air. So several measures have to be taken, but are not seen as blocking issues.

Questions for Christian Breyer (CB), LUT university

Q3: Is a plant producing H2 from offshore wind, and then biofuel with CO_2 from CCU on biomass boilers, using heat from the biofuel production would be realistic today?

CB: Almost all components make sense, maybe except the H_2 from offshore wind, since that electricity is too costly for such processes. Better to have low-cost onshore wind and low-cost PV electricity and large-scale electrolysers, then the lower utilisation of the electrolysers is less costly than offshore wind. However, heat from biofuel production may have the challenge that the competitiveness of biofuels may be limited and thus the heat source not long-term stable. However, due to the massive climate change pressure, also high cost biofuels may remain longer in the market.

Q4: Recycling CO_2 into higher value products such as lipids, alcohols, sugars takes about 6 kWh/kg_CO_2 captured and transformed; a cement factory emits 1 million tons yearly. do we have the means to do this?

CB: I cannot comment on the 6 kWh/kgCO_2 for the mentioned routes. We have analysed CO_2-to-SNG/FT/Methanol. The CO_2 of cement mills have to be managed in any case, either in the way of CCU or CCS. For society the CCU route should have more value in the near- to mid-term. In the long-term we need to become a net-negative society in any case, thus the limestone-related emissions are critical in any case. There are respective first projects right now, such as the Lappeenranta (CO_2 from cement) & Joutseno (H_2 and synthesis) project. About the means: civilisation collapse due to climate change is more costly, thus we have the means to get rid of fossil emissions.

Q5: Do you consider mineralisation just as permanent as CCS?
CB: I do not consider gaseous and acid CO_2 underground storage as permanent, given the geological risk with leakage. This is one of the key reasons why society is highly sceptical on this route, in particular for fossil CCS, as it follows the bad habit of profit privatisation and loss socialisation. Mineralisation in underground formations should have a higher probability for long-term stability. The CarbFix project in Iceland clearly indicates this view.

Questions for Daniel Marenne (DM), ENGIE

Q6: What e-fuel can be more feasible when produced by green H_2 and captured CO_2?
DM: Currently e-methane and e-methanol are clearly the most technically feasible and the less primary energy consuming, e-crude has a quite interesting potential especially as aviation fuel. Looking to water cycle, e-crude is better, then e-methane then e-methanol. So to answer to the question all fuels have interest, so there is place for the 3.

Q7: Producing, storing, transporting hydrogen is an issue and rises costs. The future is avoiding the two step strategy (produce H_2 and use it for CO_2 reduction) and move to co-processing of water and CO_2. Where we are with this approach?
DM: Co processing is an interesting way but you increase the technological complexity because you need to handle the purity of 2 products (H_2O as for hydrogen production and CO_2 which need to be very pure). On top of that the process is less flexible in load. So for some application the co processing will be interesting, but hydrogenation of CO_2 will remain also competitive thanks to its higher flexibility

Q8: Is gasification of biomass for H_2 production the wrong direction?
DM: For me yes, hydrogen is the most expensive way to achieve carbon neutrality, because it requires a complete new infrastructure, plus to change completely the majority of the industrial processes , and on top of that we have some security issue. If we use Biomass to produce H2 it also means that we are wasting the C inside the biomass that can be valorised in all thermal processes. C is not the climate enemy, fossil fuel is the enemy. CO_2 circular economy is the cheapest way to achieve carbon neutrality, because you can use all the existing infrastructure, and all the development made since 100 years to use at an optimal way the hydrocarbon.
CB: Yes, I agree. Biomass is simply too valuable to waste it only for hydrogen, while hydrogen can be easiest obtained via water electrolysis. Sustainable biomass is limited, as energy crops induces major threats to food production and ecosystems, and energy crops are not known as low-cost. Biomass wastes/ by-products / residues are limited, but useful and valuable for many use cases.

Questions for Patrick Clerens (PC), EASE

Q9: How about biological energy storage? for example in microalgae? do you look at it as a feasible contribution to storage?
PC: For the moment no company has come forward to us with this concept, so it is not taken up in our Energy Storage Families. But I would be delighted to get more information from the companies doing this kind of storage.

Questions for Jan Steinkohl (JS), DG ENER

Q10: I would like to know whether the Commission still foresees to publish a legislative proposal for decarbonizing the gas market in June?

JS: A revision of the Third Energy Package for gas (Directive 2009/73/EU and Regulation 715/2009/EU) to regulate competitive decarbonised gas markets is in the work programme for 2021. This is for later in 2021.

Q11: What is the perspective on the interdependence of increased CCU with the ETS and the CO_2 price? Will a regulatory framework be presented for CCU, and if yes, when?
JS: This is under the responsibility of DG CLIMA. In order to incentivise the uptake of carbon removal and increased circularity of carbon, the Commission has announced its intention to propose a regulatory framework for the certification of carbon removals by 2023. The Commission will consult stakeholders on this initiative in 2021. Stakeholders are welcome to take part in this consultation.

General question

Q12: On a personal level, what is the most exciting practical development that you have seen, where CCU is already in use on the ground?
CB: The father of CCU, the Power-to-Gas plant in Wertle, where CO2 from biogas is converted to SNG on MW scale, and in recent time the CCU project in Helsinki-Vantaa using CO2 from a waste incinerator.