

Outlook of market and political environment for CCUS in Finland

Hannes Tuohiniitty Bioenergy Association of Finland 12.10.2023

The Bioenergy Association of Finland

- Over 250 member organisations.
- We represents the entire bioenergy sector from land ownership to forest and energy companies, as well as technology and research in the field.
- Our goal: Finland is the best place in the world to create sustainable, bio-based & carbon negative solutions!
- Carbon capture and CCUS cluster+ biochar network facilitates development





Finland's key climate policy targets

- Climate neutrality by 2035 (The Climate Act). Specific emissions reduction targets for 2030, 2040 and 2050.
- LULUCF sink target 2035: 21 Mt → uncertainties regarding the future development & achieving the target!
- Currently no targets for technological sinks.



Source: Ministry of the Environment





National policy & CCUS developments

- The Finnish Climate Change Panel: Government should create a strategy for negative emissions and set separate targets for them. Also promote CCU for emission reductions. 5-6 Mt of negative emissions needed in order to reach the 2035 target.
- The Government adopted a <u>resolution</u> on hydrogen in February 2023. Finland aims to become the European leader in the hydrogen economy in the entire value chain. Finland has the capacity to produce at least 10 % of the EU's clean hydrogen in 2030.
 - The Sustainable Growth Programme for Finland allocated EUR 150 million to hydrogen and carbon capture and utilisation projects.



"Finland to lead the way in carbon capture"

- New strategic opening in the <u>Government's programme</u>: CCUS solutions as one of the key priorities in the Finnish climate policy. Highlights the role of BioCCUS.
- Government's take: competitive advantage in BioCCU.
- The Government will set a target for the use of technological sinks to a significant extent already during the 2020s.
- BioCCU combined with increased hydrogen production will create a platform for producing fuels, chemicals and materials from a sustainable carbon source and will reduce dependence on fossil raw materials.
- The programme emphasises aim to develop incentive scheme during the mandate: "The Government will explore and introduce policy instruments to ensure that carbon dioxide emissions to atmosphere from large industrial sources are eliminated by the mid-2030s. The Government is preparing to introduce sufficient incentives to advance investments. After conducting a study on the matter, the Government will introduce a reverse auction of negative emissions or a similar mechanism to encourage the capture of carbon dioxide."
 - Government states that carbon removal market should be used to fund the mechanism, where applicable.
 - "The functioning of voluntary carbon reduction and carbon sequestration market will be enabled in a way that is encouraging and transparent."
- 160 M€ for Clean Energy Finland key projects (total amount for the 4 years).



A strong and committed Finland

Programme of Prime Minister Petteri Orpo's Government 20 June 2023

PUBLICATIONS OF THE FINNISH GOVERNMENT 2023:60





Large point sources of CO2 in Finland

- Large point sources could provide about 24 Mt/a of biogenic CO2. Forest industry accounts 18,9 Mtn/a and energy industry 5,6 Mtn. → Huge potential for CCUS!
- About half of the point sources in the coast.
- Regional mismatch for CCU: renewable power vs CO2.
- No geological storage sites have been identified in Finland.
 → Partners and international co-operation a must!



Source: Hannu Karjunen, LUT, Hygcel-project



Research and public acceptance of CCUS in Finland

• CCS has been studied in Finland extensively 2010-2015 (CCSP-project), focusing on fossil-CCS. Recently research has been focused most on biogenic Carbon capture and utilisation (bioCCU).

• Why CCU?

- Finland don't have suitable geology or rock formations for storage
- High amount of low carbon electricity and outlook for more to come have paved the way for interest to invest on green hydrogen and therefore to produce e-fuels and chemicals using biogenic CO2
- Market price more visible and clear synergies with transport biofuels activities, where FI is strong
- Karimi & Komendantova (2015) refers to 2011 Eurobarometer whereas 41 % of Finnish respondents considered CCS an effective tool for combating climate change, 42 % did not see it as effective and 17 % had no opinion. Only 28 % of respondents in Finland showed interest in being directly involved in the decision-making process regarding implementation of the technology.
- Last decade has more or less missed public CCUS debate. Browsing the main Finnish news media one could not find but few remarks on CCS 2011-2019.



Companies starting to show an interest

- Forest companies
 - UPM released white paper on CDR/CCUS week ago
 - Metsä Group has announced cooperation with Fortum to develop bioCCU
 - StoraEnso investigating the field, no clear signals yet
- Energy industry (district heat companies)
 - Helen (Helsinki), new 260 MW HOB, has shown some CCUS-interest
 - Tampere Energy, new 210 MW CHP study on BECCS
 - Several CCUS projects ongoing: Tampere, Vantaan Energia, Keravan Energia, Kotkan Energia, ESE (Mikkeli), Savon Voima (Joensuu) etc.
- Renewable Fuels company Neste
 - EU Innovation funded SHARC-project in their Porvoo refinery, 6 x 20 MW electrolyser agreement announced, CCU and maybe CCS pathways looked intov



Metsä Group and Fortum into cooperation in using carbon dioxide generated as a production side stream in the forest industry

Metsä Group Press release 27 March 2023

UPM.COM Responsibility > People and society > Views and positions

UPMBIOFORE BEYOND FOSSILS

UPM White Paper on Carbon Dioxide Removals



NEWS / 10.12.2021

Helen and Horisont Energi enter cooperation for carbon capture, utilisation and storage (CCUS)

The Finnish energy company Helen and the Norwegian clean energy company Horisont Energi have signed a memorandum of understanding for cooperation in the areas of hydrogen economy and carbon storage. The companies are jointly exploring the capture of carbon dioxide from power plant flue gases and the utilisation, logistics and storage of the recovered carbon dioxide.



CCUS projects to foreseen in Finland

- Ongoing research for P2X hubs, biogenic CO2 value chains, CO2 storage in minerals in the soil or in products, such as concrete.
- Today there are at least 12 announced CCU-projects in Finland where the majority plans to use biogenic CO2 source as feedstock. Most of these plants target to enter the market by end of 2020's. Most of the projects aim to produce synthetic methane for heavy transportation. Summed up figure for all the announced projects indicates the use of roughly 0,6 Mtn/a CO2.
- According to the industry, it is still possible technically and planning wise to have significant BioCCS-projects ongoing before 2030.



Sample of announced biofuels & synthetic fuels projects

- Pori: 63 000 m3 bioethanol, 22 000 t biomethane, 70 000 t lignin CCU
- Pori: Power-to-Gas plant 20 MW, 20 000 t CCU CCU
- <u>Haapavesi</u>: 65 000 t bioethanol ja 11 000 t biomethane CCU
- <u>Hamina:</u> 130 000 t renewable pine diesel (in operation since 2022)
- Kerava: synthetic methane, CCU
- Lahti: 35 000 t synthetic methane (start 2024?) CCU
- Tampere: 12 000-35 000 t synthetic methane (start 2023?) CCU
- <u>Mikkeli</u>: 12 000 t synthetic methane (start of the project 2024) CCU
- <u>Vaasa</u>: 15 000 t synthetic methane (start of the project 2024) CCU
- Kotka: 35 000 t synthetic methane (start of the project 2024) CCU
- <u>Äänekoski</u>: 12 000 t biomethane, ethanol, fertilizers (in operation 2024)
- <u>Joensuu</u>: 30–50 MW production of hydrogen together with bio-CHP CCU
- Vantaa: 80 000 MWh synthetic methane CCU
- <u>St1, Lappeenranta</u>: 25 000 synthetic methanol (study) CCU (not bio)
- <u>Metsä Group Fortum</u>: Bio-CCU pre-feasibility study



Clarity needed to proceed with CCS in FI

- Clear CCUS-strategy, including targets and how to address public acceptance: national
- Financing model for negative emissions needed: EU & national
 - EU legislation does not reward capture and storage of biogenic CO2, instead of capture of fossil CO2. ETS review in 2025!
 - Technology neutral Carbon removal framework (CRCF) sooner than later
 - Double claiming situation unclear, should not be an obstacle
 - VCM the main finance flow until early 2030's
 - Clarity on Paris Agreement NDC allocation between member states
- CCS chain onto storage requires decisions on planning and investments + permitting on Finnish ground: national

In Summary

Finland has an abundance of biogenic CO2 point sources. Companies most interested on CCU, because more clear business case

Political support for BioCCUS in FI has grown. Still sufficient incentives for large-scale projects seem unlikely. \rightarrow Decisive role for the voluntary market.

Infrastructure needed for both pathways: clear need to assess the optimal system for the Finnish industry in synergy with hydrogen network and electricity network/production

To enable the private sector's credible financing pre-2030 is the key for bringing up carbon removal projects in time.



Thank you!

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