

# NEGATIVE EMISSIONS

## WHITEPAPER ON WHAT IT IS AND WHERE TO START.

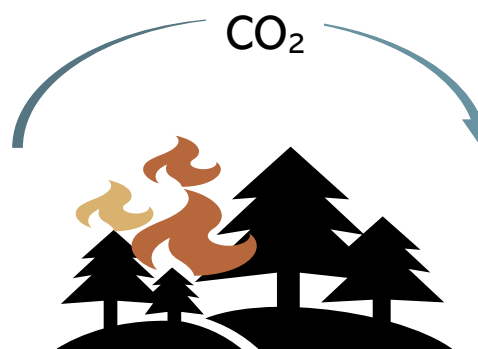
Cutting greenhouse gas emissions will not be enough in order to limit the global warming to 1.5 °C, according to the International panel of climate change (IPCC). Consequently, commercializing negative emission technologies is critical to achieve that target. The maturity level of CCS enables us today to assess the effects of process integration with any given plant with CO<sub>2</sub> emissions and thus identify viable carbon sinks.

### Why now?

Sweden was one of the first nations to legislate a nationwide carbon neutrality by 2045<sup>1</sup> after the Paris Agreement was adopted. Since then more countries have concretized long term targets<sup>2</sup> and carbon neutrality is endorsed by almost all EU countries<sup>3</sup>. Negative emissions technologies (NETs) are now gaining attention, as it is urgent to identify viable carbon sinks and start upscaling and commercializing these technologies to achieve the carbon neutrality targets.

### The CO<sub>2</sub> origin

Focusing on power and heat generation plants (CHP), refineries and pulp and paper facilities, one promising NET is applying carbon capture and storage on CO<sub>2</sub> from biomass (BECCS).



Emitters with an emission mixture of both fossil and biogenic CO<sub>2</sub> have the possibility to achieve carbon neutrality by carbon sequestration. This applies to for example waste-to-energy (WTE) plants with predominant biogenic content (~60 %).

<sup>1</sup> Sweden's Climate Act and Climate Policy Framework, Swedish EPA <http://www.swedishepa.se/Environmental-objectives-and-cooperation/Swedish-environmental-work/Work-areas/Climate/Climate-Act-and-Climate-policy-framework/>

<sup>2</sup> Energy & Climate Intelligence unit, <https://eciu.net/netzerotracker>

<sup>3</sup> EU National long-term strategies [https://ec.europa.eu/info/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-long-term-strategies\\_en](https://ec.europa.eu/info/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-long-term-strategies_en)

The discussion regarding negative emissions does not apply to emitters with primarily fossil CO<sub>2</sub> emissions. However, attempts to switch towards biofuels will of course change that actuality.

### BECCS incentives

Removal of carbon dioxide is included in all IPCC strategies to limit global warming to 1.5 °C and decarbonization of the energy sector is one of the most cost-effective strategies in greenhouse gas mitigation<sup>4</sup>. But while cutting fossil emissions are targeted by taxes and trading emission allowances, incentives for net negative emissions are not applied yet.

Suggested strategies to accelerate BECCS initiatives and technology development includes grants as well as policy and negative emissions trade instruments<sup>5</sup>. The biogenic carbon commodity market is also expanding as the demand of non-fossil feedstock for production of, for example, jet fuel is increasing<sup>6</sup>.

This offers an opportunity for existing industries with biogenic emissions such as the paper and pulp industry and CHP plants to include climate benefits with BECCS into their business model.

### Where to start?

In order to make the transition towards net negative emissions as cost and time effective as possible one need to identify which plants are most viable to start with. The methodology behind capturing carbon dioxide have been known for decades and key configuration parameters are established for several technologies for post-combustion carbon capturing. With the given information it is possible to estimate the impact of a retrofitted carbon capture unit at any given plant.

Additional information relate to liquefaction, transportation and storage infrastructure are also available. Hence, it is possible to establish the capital and operational expenses for the entire BECCS process chain.

### Conclusion: Get ahead!

Technical specifications for process integration are already accessible. There is an opportunity to evaluate potential carbon capture technologies as well as transport and storage solutions. Get ahead of the BECCS incentives development and join of the fast-growing CCS community.

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<sup>4</sup>IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change [https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc\\_wg3\\_ar5\\_summary-for-policymakers.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_summary-for-policymakers.pdf)

<sup>5</sup> "Vägen till en klimatpositiv framtid" [Vägen till en klimatpositiv framtid - Regeringen.se](http://www.regeringen.se)

<sup>6</sup> [Goda resultat för produktion av förnybart flygbränsle i Östersund - IVL Svenska Miljöinstitutet](http://www.miljoinstitutet.se)