University of Stuttgart
IER Institute of Energy Economics
and Rational Energy Use

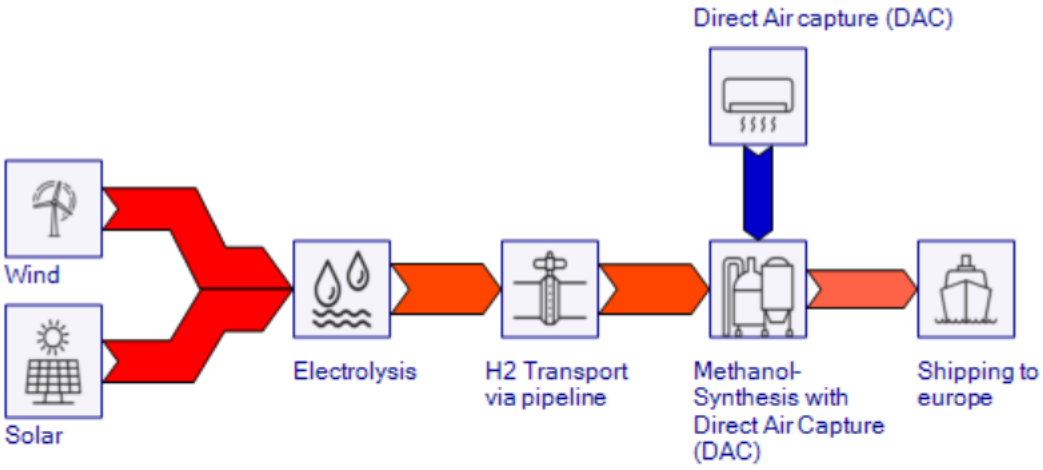
Fact sheet – IER project Hy4Daures Namibia

2.3 Techno-economic assessment of methanol synthesis with direct air capture

BACKGROUND

The hydrogen production in Namibia is just the starting point. The big question is, what comes next and there are frankly several options that might be considered. To deepen the understanding, what can come next and what is attractive from a technical and economic standpoint a so-called techno-economic assessment (TEA) will be conducted. The following factsheet gives an insight into the value chain of synthesizing methanol with CO2 from direct air capture.

METHANOL SYNTHESIS WITH DIRECT AIR CAPTURE (DAC)



The third hydrogen value chain shows the methanol pathway. The produced hydrogen will be transported via pipeline to Walvis Bay, where a methanol synthesis takes place. The required carbon will be taken from ambient air with the help of Direct Air Capture (commonly referred as "DAC"). The produced methanol will be shipped to europe, where it can be directly used as a chemical feedstock or energy carrier.

RESULTS

In the following preliminary results are presented for producing methanol and exporting it to Germany. The overall cost along this hydrogen value chain equates to roughly 20 ct/kWh of liquid methanol in Germany. The sensitivity analysis shows the impact of reducing/increasing several cost components by 50 %. The DAC has the biggest impact on the cost, while hydrogen production itself is the second biggest cost component along the hydrogen value chain. Reducing these two cost components improves the competitiveness enormously.

The diagram also shows two stripes, which represent a benchmark. The intersection of the two stripes represent the current market price of methanol. The pink stripe shows the range for increasing the price by 50 % and the ocher stripe shows a decrease by 50 %.

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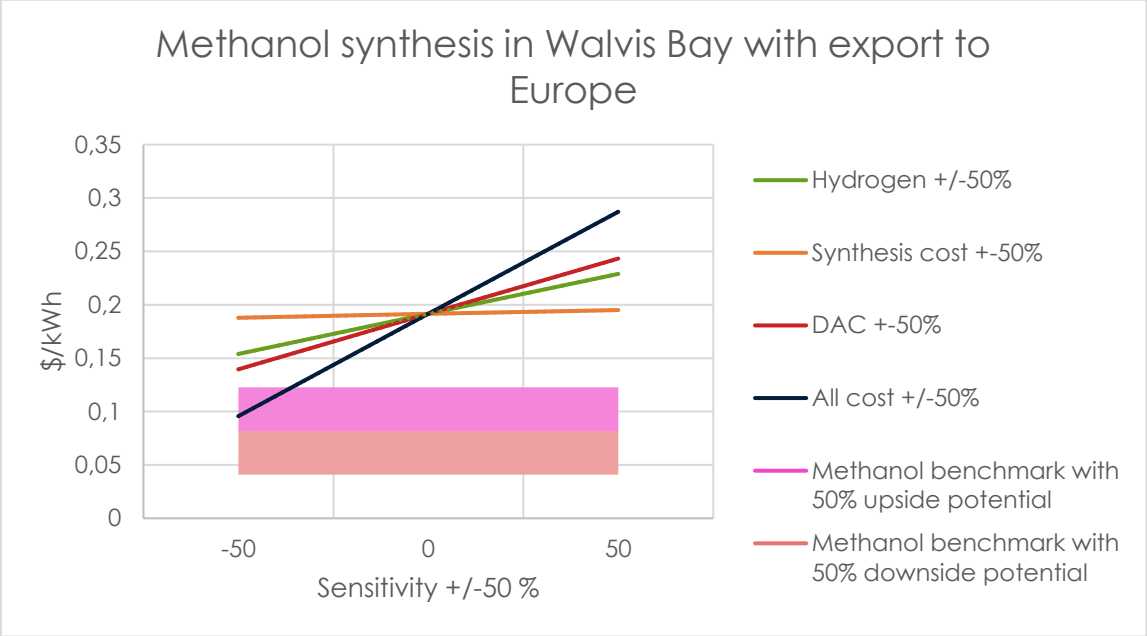

Source for benchmark: "Average methanol price on the European market between 2019-2023" from statista.

CONCLUSIONS / FURTHER WORK

The results show that methanol production in Namibia is from an economic stand point today not attractive. Though it is to highlight, that direct air capture is a expensive technology. You can see at the sensitivity analysis, that the DAC has the biggest impact on the cost (it has the highest slope). Scaling and improving that technology can reduce that cost component, which might attribute substantially to the economic attractiveness.

It is also to mention, that environmental aspects are not considered. Utilizing DAC to synthesize methanol reduces the climate effect significantly compared to conventional methanol, which uses natural gas and reforms that with the help of steam methane reformation to syngas. This effect is not measured at this study, but this is an interesting question, that will be answered within the project. How much Carbon dioxide can be saved by producing green hydrogen compared with the conventional produced grey hydrogen.

This improvement is also adding value to the green methanol, which is changing the economics and might lead to a viable business case. The economics are also improved by the fact, that offtakers are willing to pay a premium on green methanol.

FOR FURTHER INFORMATION AND FEEDBACK

Have a look at our other Fact Sheets covering topics from Project Descriptions, Use Cases, Techno-Economic analysis, Indicators, Energy System Analysis, Macro-Economic modelling, and many more:

https://github.com/IER-Hy4Daures/Fact-Sheets

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In collaboration with