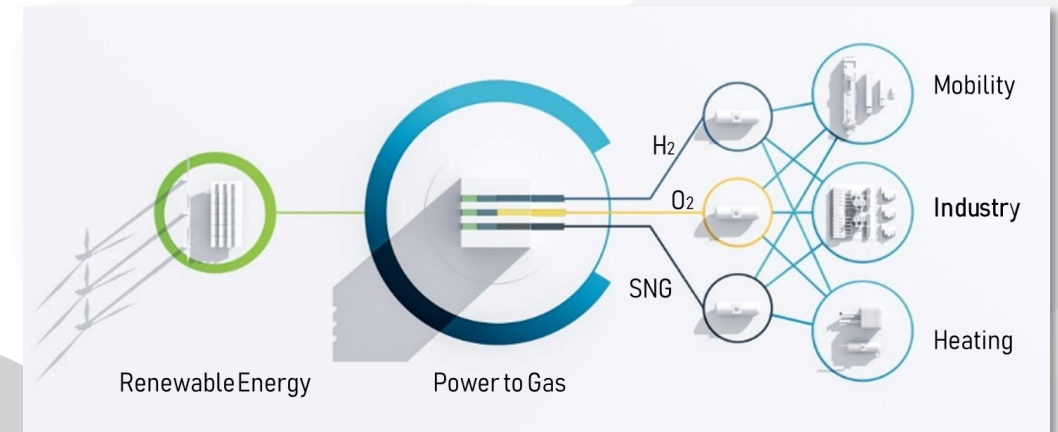




Hydrogen Europe

HySynGas



HySynGas – General project idea

Creating a green hydrogen hub in Brunsbüttel (Northern Germany) of industrial scale to supply use cases especially for heavy duty transportation on road, maritime and industry

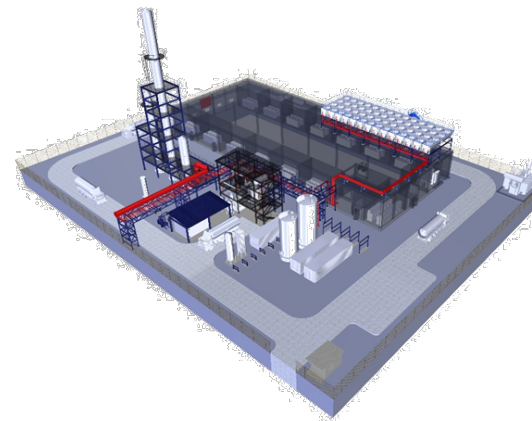
Where green hydrogen can serve fuel cell based transportation:

- An electrolysis capacity of 50 MW+ with a daily production rate of >22 t green hydrogen is planned for several use cases. TRL 8-9

Where pure green hydrogen is not applicable e.g. for industry or heat applications, heavy duty vehicles, container/cruise ships; an additional methanation unit will produce Synthetic Natural gas (SNG)

- SNG: Methanization with regional supply of CO₂ from flue gases (CCU) with >44 t SNG/day. TRL 5

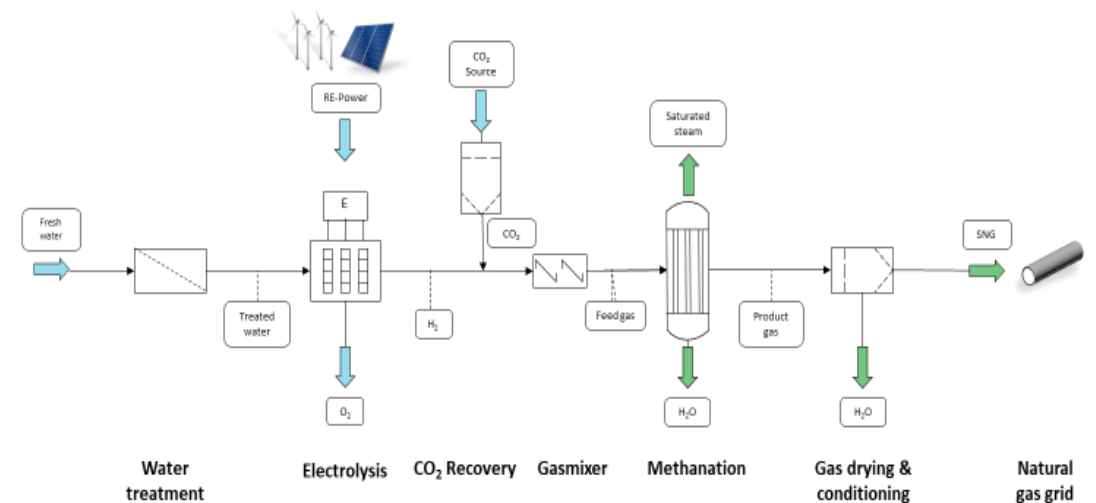
This would be the world's first large scale industrial Power-to-X project, the dimension of electrolysis as well as methanation with renewable electricity (Wind) would be first of its kind.



Source: MAN Energy Solutions

High innovative character

- Creating a hydrogen hub serving transport, industry and heating sector – scalable to GW size
- Integrated into an existing renewable virtual real-time powerplant, offering grid services in the region of North Germany with high curtailment of wind



HySynGas – Participants and location



ARGE Netz is among the leading German renewable utility companies pooling 4.000 MW installed capacity from wind, PV, biomass and solutions for storage and conversion of renewables.

ARGE Netz runs the “Erneuerbare Kraftwerk” (renewable power plant), a digital operations and sales platform for a real time energy economy.



MAN ES is the globally leading supplier of large scale diesel, gas and turbocharger engines.

The product portfolio includes two and four stroke engines for maritime and stationary applications, turbochargers and propellers as well as gas and steam turbines, compressors and chemical reactors.

Vattenfall group is a utility company with 20.000 employees. Vattenfall produces heat and electricity from six energy sources and aims to shift its energy production to completely carbon-neutral by 2050.

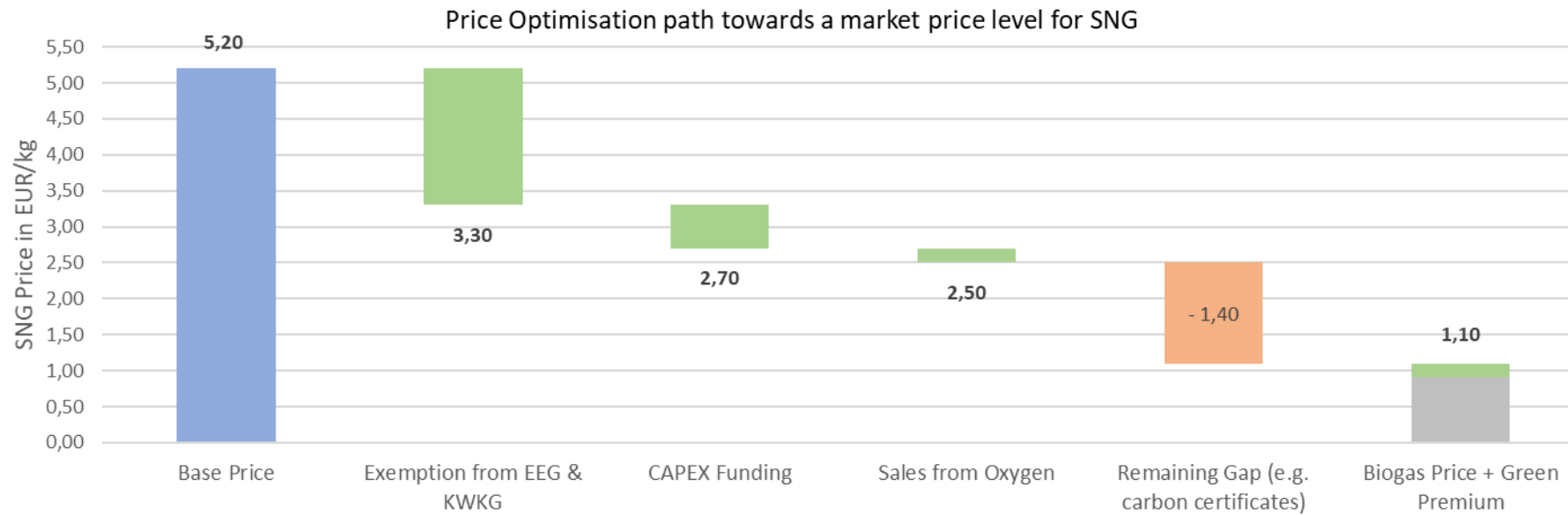
Vattenfall has been working on projects concerning hydrogen infrastructure for years in all of it's European core markets



Three players – one goal: Support the decarbonization across sectors

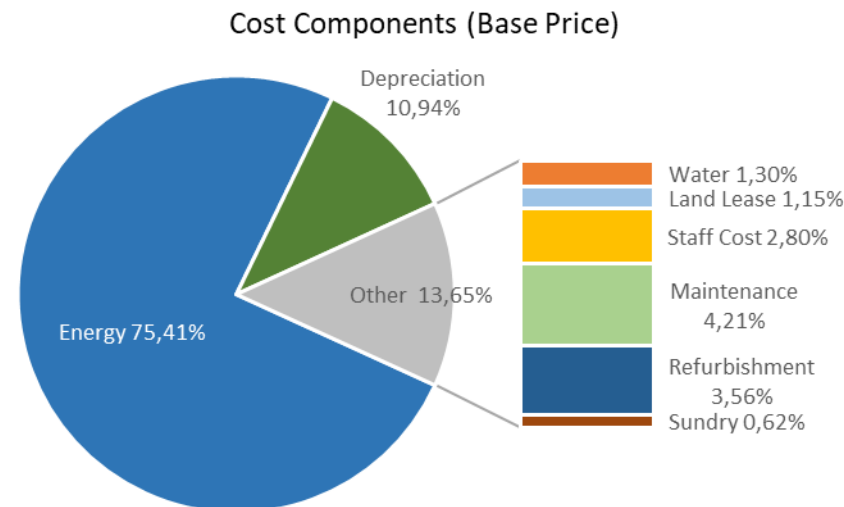
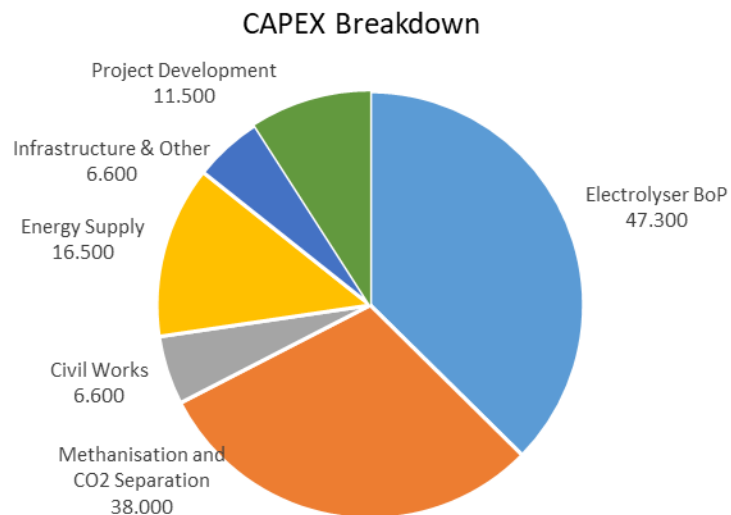
The hydrogen hub centralizes hydrogen generation around different off-takers. Location secured

HySynGas – Budget and maturity



Total CAPEX: 126,5 Mio. EUR
SNG Production p.a.: 14.500t

A prerequisite is the exemption from German “EEG and KWK” levies. This measure alone would be able to close around 50% of the price difference to the market



- Calculations are on a cost-based basic engineering.
- Estimated 2,5 years development timeline until start-of-operation
- Final Investment decision depends on detailed engineering, commitment with offtakers, confirmation of exemption of EEG and KWK and availability of funding

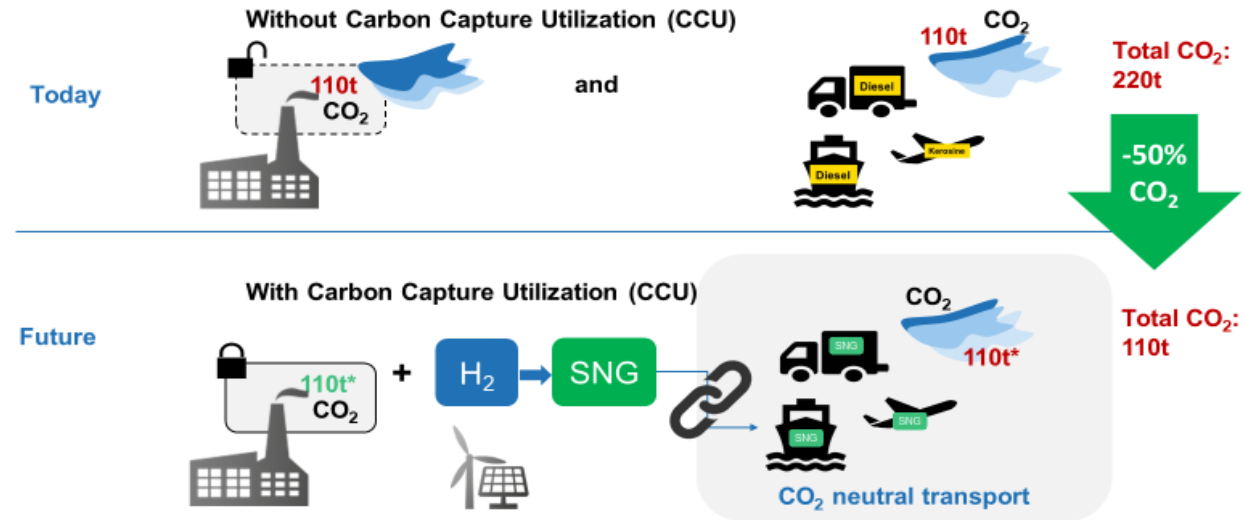
HySynGas – Impact

The project is scalable and replicable on a international level and allows to decarbonize various transport modes, heat and industries which are not adressable by electrification

- The region of Schleswig-Holstein has **one of the highest wind electricity feed-in in Europe** and is therefore optimally suited as location of a power-to-gas facility
- **High Industry density** in Brunsbüttel and Hamburg – existing LOIs for offtake of green hydrogen, SNG and oxygen and already secured existing CO₂ source
- **Public transportation demand** in Hamburg and other cities in the region as well as **heavy duty and shipping** applications in the port of Hamburg



The HySynGas Project collected already 5 Letters of Intent with different industrial off-takers



*From a regulatory point of the power plant remains accountable for the amount of CO₂ emissions.

Green Marine Fuel

CO₂ neutral shipping

