



GreenLab
skive

Christopher Sorensen

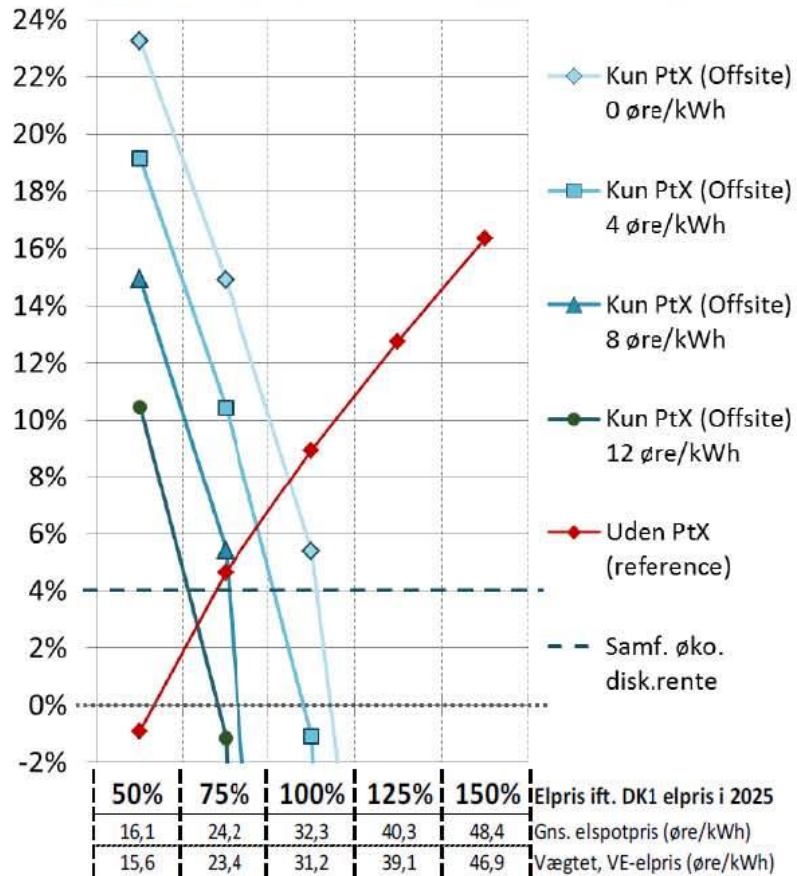
CEO, GreenLab A/S

CDSO@GreenLab.DK

P2X as a Wind Market Hedge

Rentabilitet for PtX-only og VE-only ift. elpris

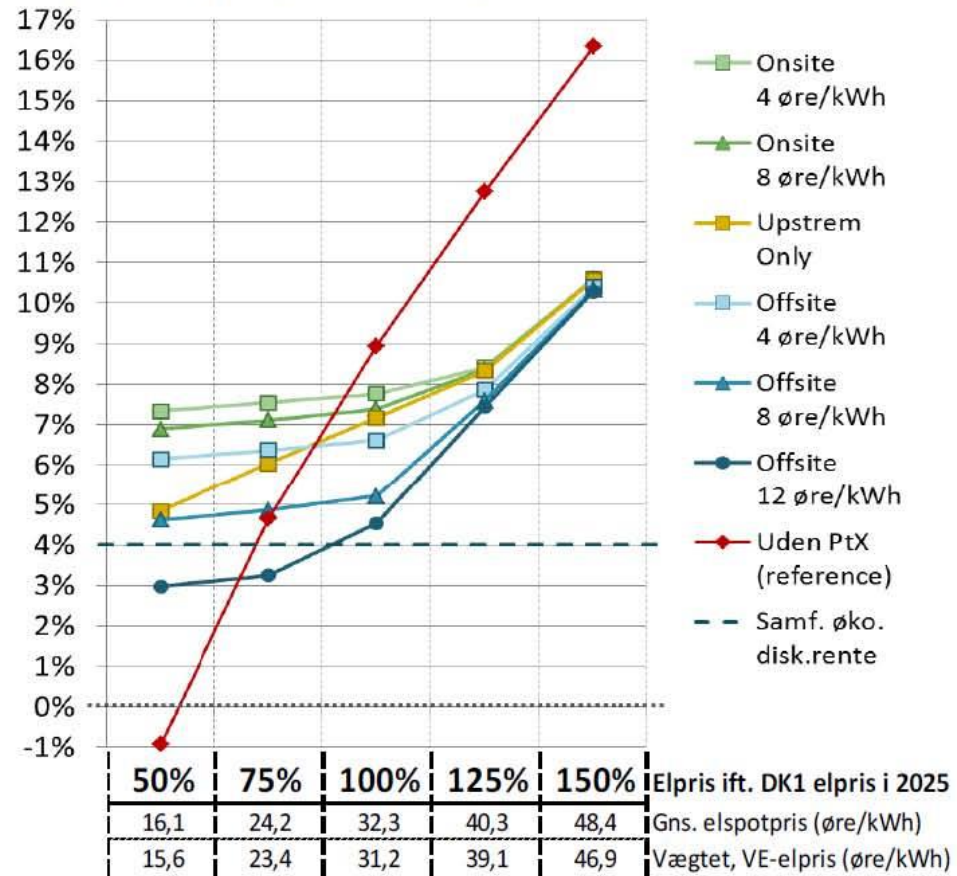
Intern rente (real) ved EBITDA i hele levetid som år 1, 2025 (AF2018)



Note: 20 MW_{el} PtX (elektrolyse/metanol-anlæg)
VE-anlæg på 50 MW landvind og 25 MW sol, pv (mark)

Hedging ved kombination af PtX og vind/sol

Intern rente (real) ved EBITDA i hele levetid som år 1, 2025 (AF2018)



Note: 20 MW_{el} PtX (elektrolyse/metanol-anlæg)
VE-anlæg på 50 MW landvind og 25 MW sol, pv (mark)

EU RE Directives define **targets for the transition**

EU energy transition main goals

Share of RE in final consumption

- 20% by 2020
- >32% by 2030
- 14% of RE in transport consumption by 2030

Increase in energy efficiency

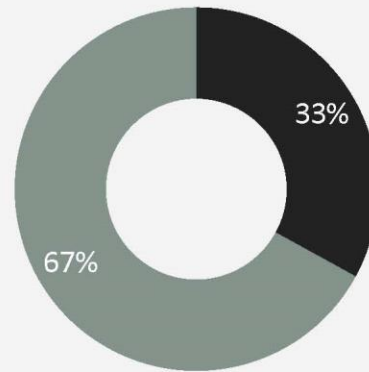
- 20% by 2020
- >32.5% by 2030

Green House Gas reduction

- 20% by 2020
- 40% by 2030

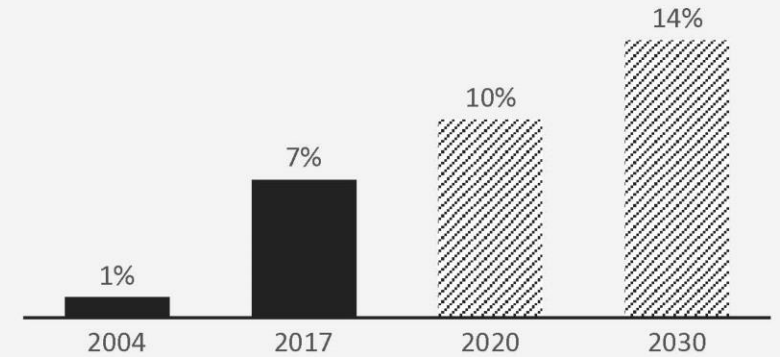
Current state of transport energy consumption in the EU

Final energy consumption EU-28 (2015)



■ Transport ■ Other energy

Share of RE in transport



From 2020 to 2030 the use of RE in transport is expected to jump from 10% to 14%. (CAGR of 3,4%)

RED II stipulates that the 14% target could be reviewed and increased in 2023

Nowadays, conventional biofuels have the highest contribution to the RE content. But share will be capped at 7% to avoid overexploitation of farming lands

GreenLab enables the application of green types of fuel and energy to fill the gap

GreenLab combines green energy and intelligent technology in the world's first truly green symbiosis



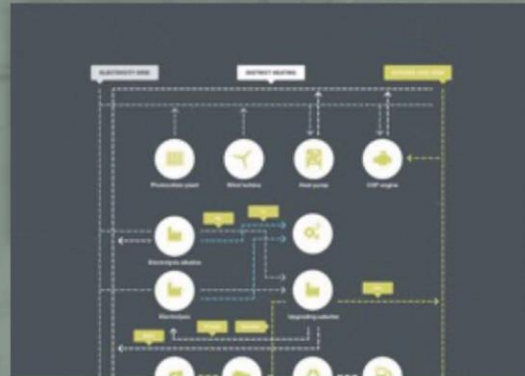
The Site – GreenLab Industrial Energy Park



Located at the **nexus of the national gas and electricity infrastructure** gives an ideal environment to apply **P2X Technology**. The symbiotic grid connects companies that consume and supply **green energy, fuels, resources and products**



A green, full-scale symbiotic network



SymbiosNet© is the world's most advanced and **first truly green commercial symbiosis**. A fully **integrated infrastructure for electricity, gas, fuel, thermal and data distribution** enables the symbiotic energy network



Innovation, research & development



Research partnerships with the Danish universities, including two of the **Top 10 engineering universities in Europe**: Aalborg University and DTU to expand the application of **renewable energy (RE)**, production of **clean fuels** and to develop the **intelligent algorithm** at the center of our symbiosis





Global partnerships & regulatory advantages







GreenLab provides solutions to some of the most pressing global challenges and we create both **political and commercial partnerships** with leading international organisations to support the journey towards a **greener future**

The world's first truly green commercial symbiosis

 The Site

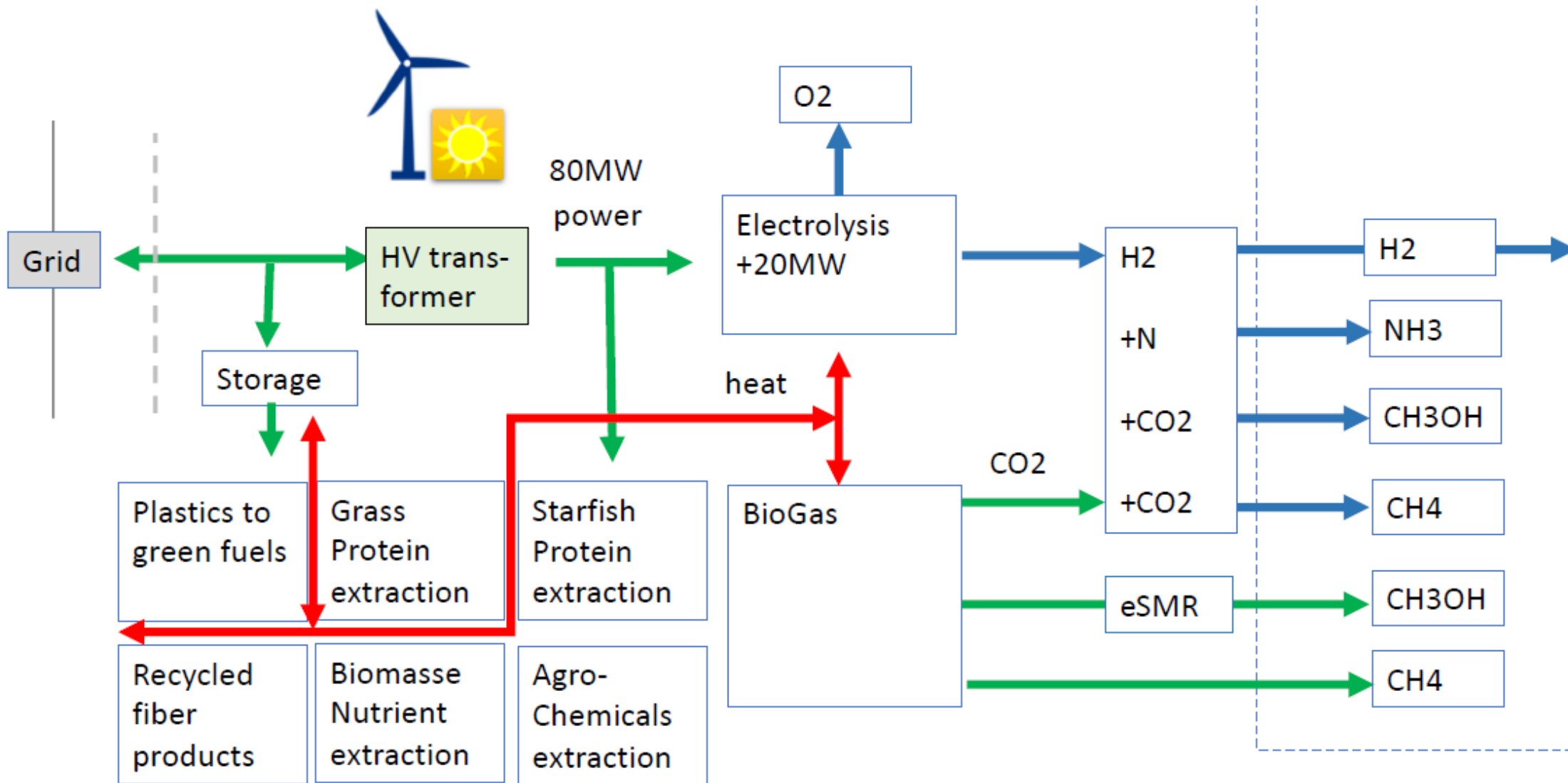
 SymbiosNet©

 Innovation, research & development

	1 Infrastructure	2 Clean energy	3 Energy Conversion	4 Energy Storage	5 Smart Grid	6 Analysis, AI & IOT	Output	
Why	<p>Creating flexibility Contribute to a decarbonization through a positioning and technology that increase flexibility in energy source and timing</p>	<p>Sustainability Push the boundaries by intelligent integration of RE to decarbonize production</p>	<p>Energy flexibility Transforms energy to allow flexibility in the application and to enable the production of a variety of green products</p>	<p>Enabling optimization Overcome the inflexible and the unpredictable nature of RE</p>	<p>Intelligent balancing Maximize the utility of energy</p>	<p>Automation Optimize processes by automation of data collection and processing</p>		<p> Resource optimisation result in environmental and economic sustainability</p>
How	<p>Conversion & optimization The grid integrate electricity, gas, heat, fuels & data exchange, and connect to national grids for supply & consumption</p>	<p>Plug and play platform Engage with a range of actors who plug in to the integrated grid that support sustainable production at scale</p>	<p>Conversion Converts energy to distribute to the optimal off taker</p>	<p>Multiple storage opportunities Energy is stored and applied within the system or sold for use outside the business park</p>	<p>Demand-response Direct the energy to where it has the most use to balance demand throughout the system</p>	<p>Technology & analytics Analysis of energy flows and interaction in system to continue to optimize system load</p>		<p> Manage demand & supply by balancing production, distribution & storage of energy</p>
What	<p>Multiple Grids GreenLab is an electricity, thermal & gas grid able to distribute energy within the system & directly to the national grid</p>	<p>Connection of multiple RE producers Wind, Solar, Thermal, Waste to energy etc.</p>	<p>P2X technology Enable the conversion of power into a variety of forms such as Hydrogen, Ammonia, Methanisation, Thermal</p>	<p>A truly sustainable business park Full storage possibilities for all relevant energy types</p>	<p>Unique software solution A software solution that is able to direct energy within the system</p>	<p>Real-time data & intelligent algorithms Technology provide real-time data on demand, prediction and trading algorithms</p>		<p> Integrated green energy, intelligent grid and sustainable production</p>

Prognosis to product optimizer = RE + conversion + trade




Electrofuels



GreenLab achieves **full operation in 2020** followed by global expansion




Operations commence and development continue

Major milestones

-  Four sites become operational
-  Implementation of state-of-the-art electric heat pump (heat symbiosis)
-  Partnerships with major off-takers of RE fuels




Moving into the future

Major milestones

-  Renewable energy park with a capacity of 80MW wind and solar
-  Electrolysis installed on site enabling large scale H2 and NH3 production
-  Symbiotic energy park is fully operational

Expanding the symbiosis and pushing new boundaries

Major milestones

-  Symbiosis is expanded with new partners
-  Existing partners scale up production, especially within RE fuels
-  State-of-the-art research facility with short go-to-market time

Global expansion

Expansion of the GreenLab concept on a global scale through partnership-model



2019

2020

2021 and beyond

GreenLab provides the **energy symbiosis** of tomorrow



A unique organisation combining a commercial outlook while bridging the gap between political, academic and commercial actors

Strong knowledge synergies and enable effective decision-making



Direct connection to RE plant and a biogenic CO2 source on site, which enable production of clean fuels

Clean fuel production is essential for decarbonisation, has major commercial potential and no regulatory risk within new EU directives



The symbiotic network enables resource optimisation within the business park

The SymbiosNet© minimise cost and climate impact through maximising resource efficiency and circular resource application



The combination of actors, experimental environment and scale provide a park unique for commercial and academic R&D

Application of new processes and technologies provides a platform for producing cleaner and more competitive products e.g. RE fuels



GreenLab is relevant on a global scale to drive the change towards a hydrogen economy and broaden the application of circular value chains

Partnership with IYEM – The Yucatan institute of entrepreneurs and recent visit from Gabon indicates a truly global potential GreenLab holds

Contributing to the green transformation **on a global scale**



SIEMENS Gamesa

e-on HALDOR TOPSOE

PRAXAIR

QUANTAFUEL

Danish Marine Protein

DEIF

PlanEnergi

ALL NRG

DTU Technical University of Denmark

AALBORG UNIVERSITY DENMARK

Skive College

eniig

SKIVEKOMMUNE SKIVE VAND

GreenLab.DK

Christopher Sorensen, CEO
CDSO@GreenLab.dk

