

Webinar on 29th September 2020

# Reallabor Westküste 100

Complete sector coupling: Renewable hydrogen and decarbonisation on an industrial scale

Presentation for IEA Experts' Group on R&D Priority-setting and Evaluation (EGRD)





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**Let's create a world  
that runs entirely  
on green energy**

# Ørsted develops energy systems that are green, independent and economically viable

■ Under construction ■ Installed

## Segments

### Offshore Hydrogen is part of Offshore



- Global leader in offshore wind
- Develop, construct, own and operate offshore wind farms
- Ambition of 15 GW installed capacity by 2025

### Onshore



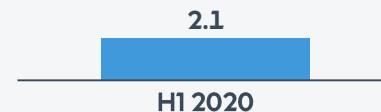
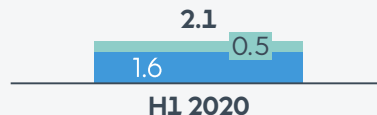
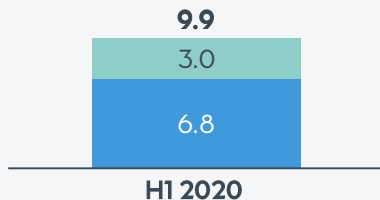
- US onshore wind portfolio
- Develop, construct, own and operate onshore wind farms
- Energy storage solutions and solar

### Markets & Bioenergy



- Route-to-market for own and customers' generation portfolio
- Market trading operations
- Convert CHPs to sustainable biomass and phase out coal by 2023
- Recent divestment of Radius, B2C and City Light

## Capacity GW

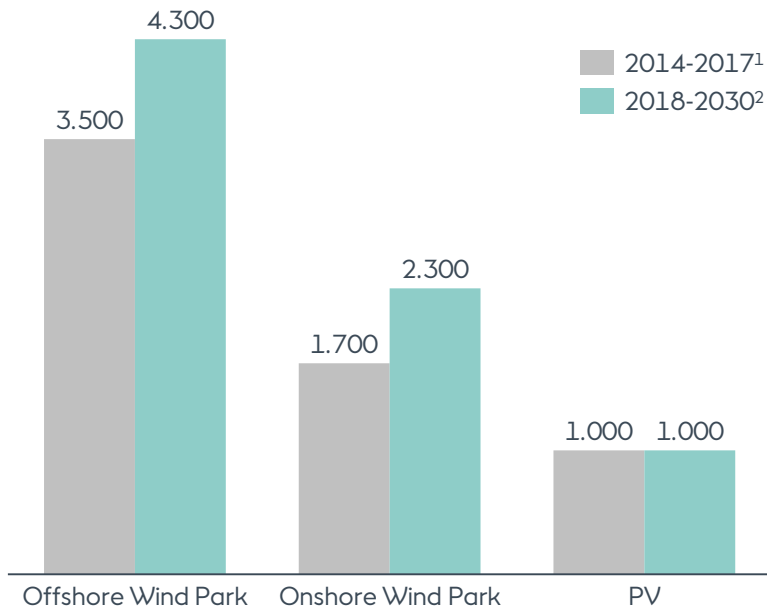


**Ørsted sees renewable hydrogen as a potential way to decarbonise areas that are currently not addressed and difficult to electrify directly.**

*Henrik Poulsen, CEO Ørsted*

# Offshore wind power favours stable renewable hydrogen production and enables industrial scale up

Average annual full load hours (FLH) in Germany [MWh / MW = h]



## High Full Load Hours<sup>3</sup>

- German offshore wind parks provide significantly higher full load hours than onshore wind or PV.

## Scalability

- Large offshore wind power areas available
- Less height (-> size) limitation of wind turbines offshore
  - ✓ Hornsea 1: 1.2 GW since 2019
  - ✓ Hornsea 2: 1.4 GW in 2022
  - ✓ Borkum Riffgrund 3: 0.9 GW in 2024/25

1. BDEW (2018): [https://www.bdew.de/media/documents/Jahresvollaststunden-2010\\_2017\\_o\\_online\\_jaehrlich\\_Ba\\_26042018.pdf](https://www.bdew.de/media/documents/Jahresvollaststunden-2010_2017_o_online_jaehrlich_Ba_26042018.pdf)

2. Bundesnetzagentur (2018): Genehmigung des Szenariorahmens 2019-2030, page 150.

3. FLH [h] = wind park average annual power production [MWh] divided by its rated power [MW]

## 450 GW Offshore Wind Power potential in Europe <sup>1</sup>



<sup>1</sup> The study '[Our energy, our future](#)' ([Wind Europe, 2019](#)) presents, how 450GW installed Offshore Wind Capacity can be reached. 450 GW Offshore Wind Capacity is part of a scenario of the EU Commission to reach carbon neutrality by 2050.

# WESTKÜSTE100

Förderkennzeichen 03EWR009

Supported by:



Federal Ministry  
for Economic Affairs  
and Energy

on the basis of a decision  
by the German Bundestag

# Hydrogen Region West Coast

Our starting point and our motivation

Unique periphery in Heide and Schleswig-Holstein:

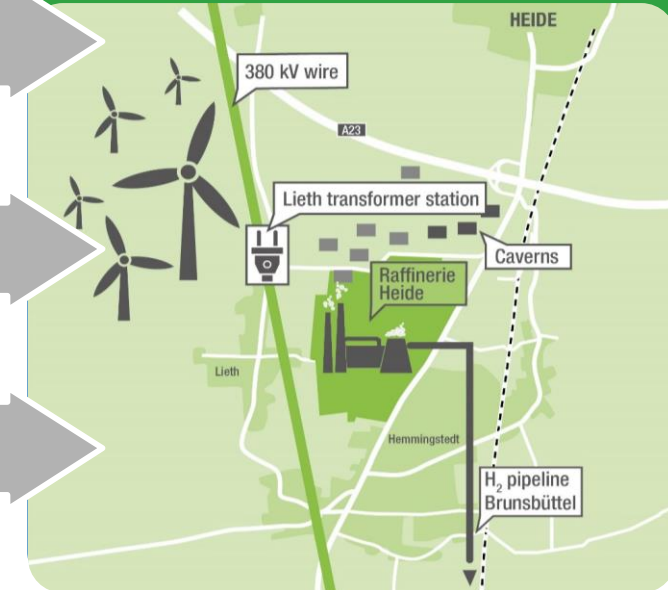
- GW-scale offshore wind & multi MW-scale onshore wind power
- O<sub>2</sub>-offtake & carbon capture at cement production Lägerdorf
- Refining expertise in Heide & salt caverns for possible on-site storage of H<sub>2</sub>
- Demand for sustainable aviation fuel at airport Hamburg in close proximity

380 kV transformer station within sight

Local H<sub>2</sub> demands supplied from here

Connection to H<sub>2</sub> system in Brunsbüttel via pipeline

## Hydrogen region Heide



**WESTKÜSTE 100: Green hydrogen and decarbonization on an industrial scale**



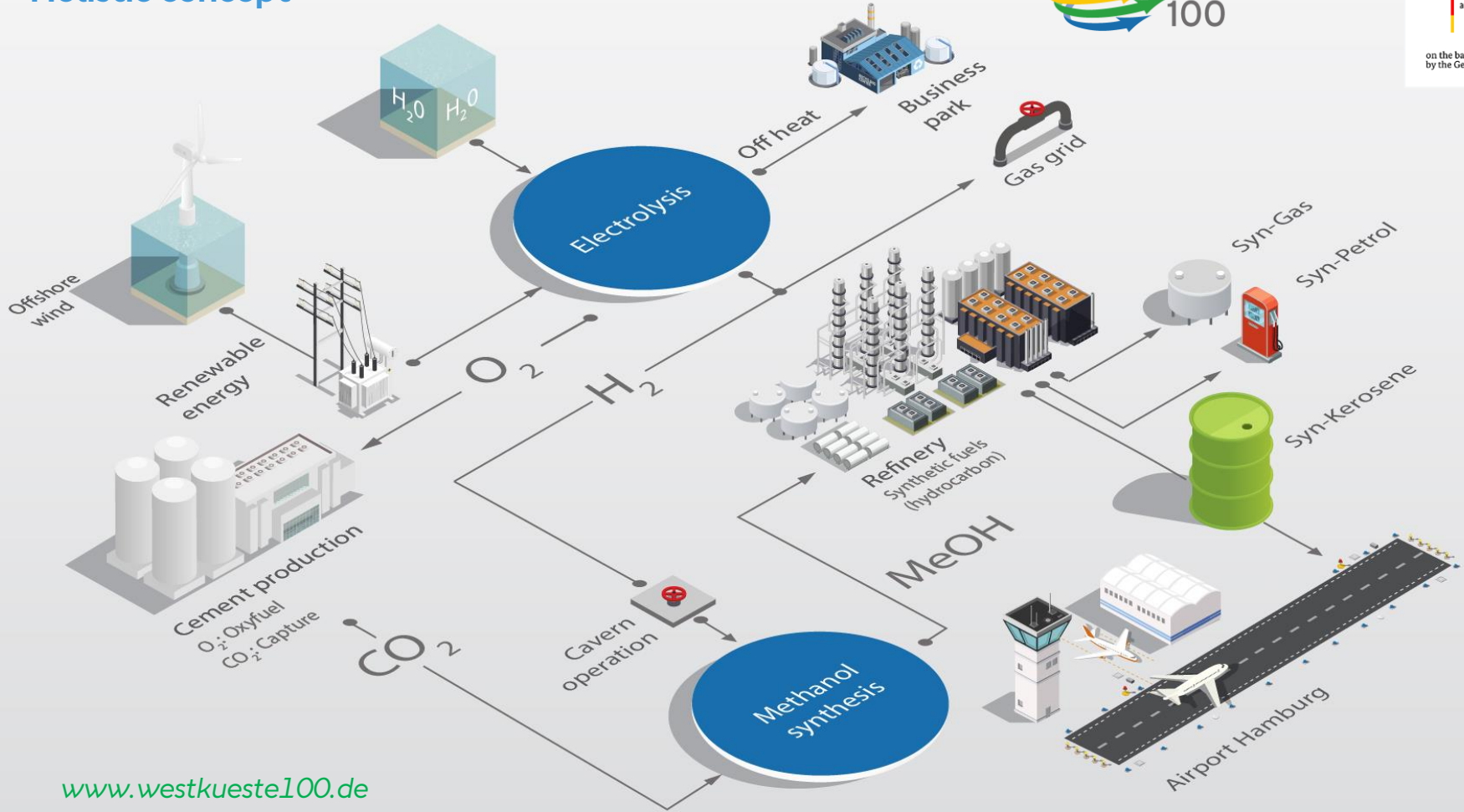
# Complete sector coupling

Green hydrogen and decarbonisation on an industrial scale

- Represents **complete value chain** through industrial partnerships - 10 companies in consortium
- Realisation of **direct sector coupling**: Renewable electricity production, fuel production & distribution and cement production
- 3 partner JV 'H2 Westküste' to finance, design, build, integrate, operate and optimize a dynamically run first fo a kind **30 MW electrolysis system**. Also: H2-cavern storage, a local H2 infrastructure and 2 FEED studies -> laying the technical, commercial and regulatory foundations for the 700 MW scenario "**Vision 2025+**"



# Holistic concept



# Development path for scaling up



## WESTKÜSTE100

- 30 MW electrolysis system
- > Main application to supply the refinery process
- > Parallel tasks on H2 storage, oxygen and waste heat
- > Total invest ~ € 89 mio, of which > 30 mio co-funded by BMWi

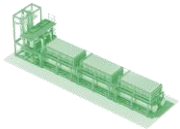
## PILOT PLANT

- > Applications: refinery, mobility, gas grid
- > Research and development on e-fuels

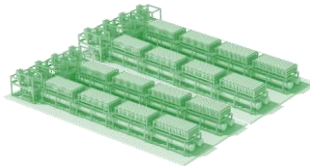
## UPSCALING

- ~ 700 MW electrolysis system
- > Holistic applications of green H2 and e-fuels in all sectors

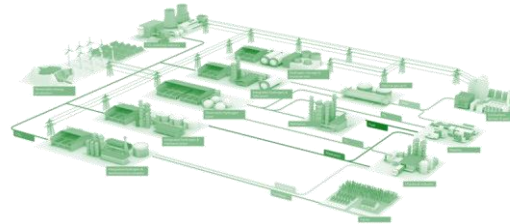
>10 MW class



>50 MW class



>100 MW class



**WESTKÜSTE100 - Fly, Build and Heat more sustainably!**

# Where we are



## Framework conditions and location factors

- Technology
  - > Various technologies for electrolysis systems are available on the market
  - > Size of ~ 30 MW as the next scaling step
  - > Complementary consortium has co-funding secured
- Location "Westküste" in Schleswig-Holstein
  - > High potential for the use of wind energy for sector coupling
  - > Commitment from all actors involved (economy & politics)



## Regulatory framework (extract)

- RED II and delegated act on electricity procurement
    - > REDII to be implemented into national legislation to give renewable hydrogen a value when used in the production of fuels.
    - > Requirements for electricity to produce renewable H2 to be developed (del. act)
    - > Germany can use the EU Council Presidency to accelerate the process
  - Fees and levies for electrical power (primarily EEG surcharge)
    - > It is likely that EEG levy will be reduced by extending a legislation for energy intensive industries to (renewable) hydrogen, but important details are still unclear
- Implementation of ideas from the German National Hydrogen Strategy



**Legal uncertainty need to be removed to incentivise investments in renewable hydrogen**

# Questions?



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