



The next generation of offshore wind farms integrated with green hydrogen

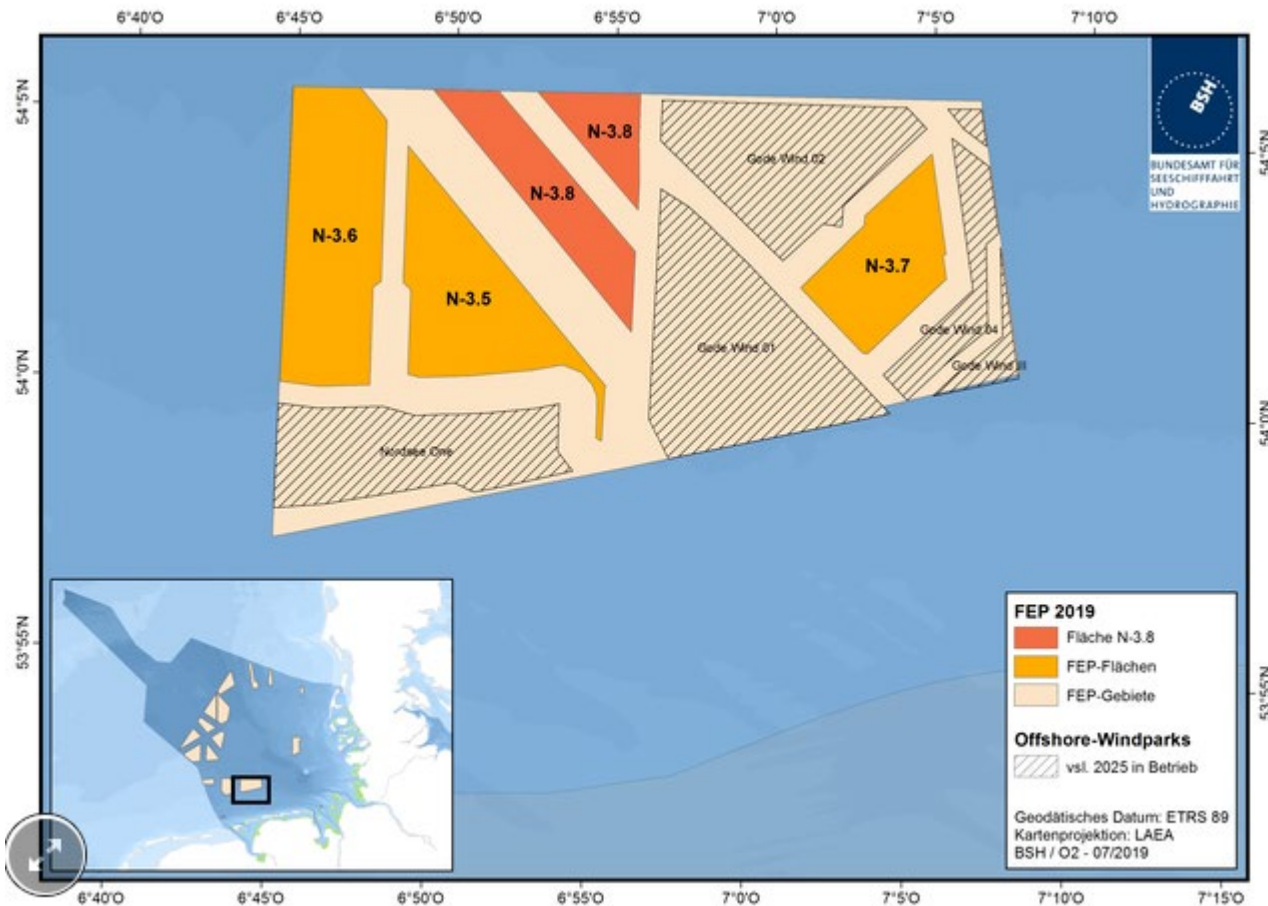
Financing Innovative Clean Tech conference

2023-01-19

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Introduction Nordsee Two Offshore Windfarm

Part of the Nordseecluster



Joint development of four offshore wind areas by RWE & Northland Power

- N-3.8 ~ 433 MW (Nordsee Two)
- N-3.7 ~ 225 MW
- N-3.5 ~ 420 MW
- N-3.6 ~ 480 MW

Development as a cluster in two stages

Stage one: Nordseecluster Phase A

- COD: December 2026
- Areas: N-3.8 + N-3.7
- Grid Connection
Capacity: 658 MW

Stage two: Nordseecluster Phase B

- COD: December 2028
- Areas: N-3.6 + N-3.5
- Grid Connection
Capacity: 900 MW

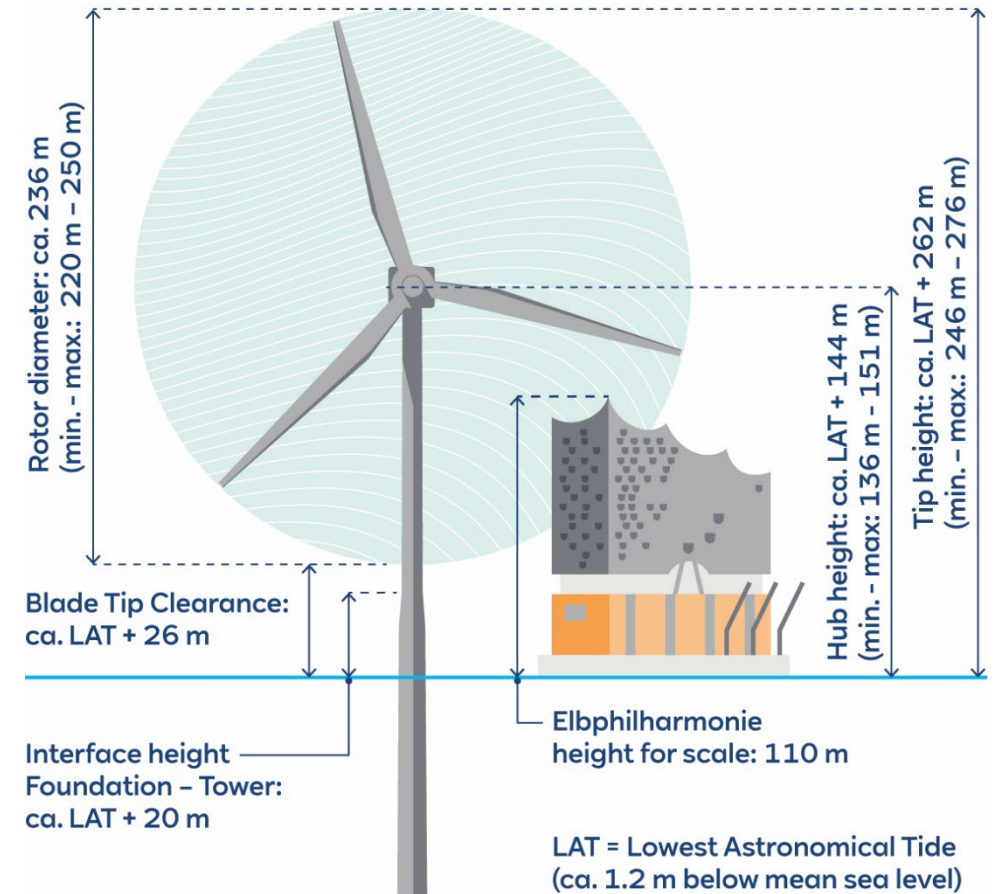
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Overall Nordseecluster



Key Metrics	Unit	Value ¹
Total Annual Power Production	MWh/year	6,400,000
Supply of Households (4 persons)	No.	1,600,000
Estimated Annual Emission Savings	tCO ₂ e	2,700,000 ²
Total Investment Volume	EUR	4,000,000,000
EEG Subsidy	EUR	0.00

Overview of WTG with Foundation

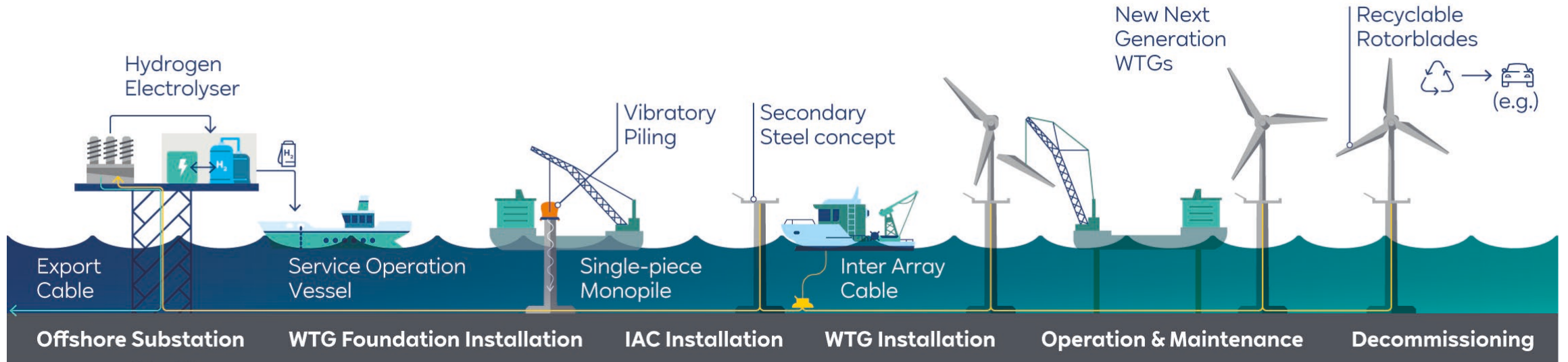


¹ Preliminary estimates; approximate values

² >1% of total emissions from German power production; baseline 2022 Emissions Germany

Innovation Project Overview

Objective: Greenhouse gas reduction



Innovations around Green Hydrogen

- 4 MW Electrolyser on OSS
- 100% replacement of diesel for emergency generator by green hydrogen
- 80% replacement of diesel for SOV by green hydrogen

Innovations around Foundations

- Single-piece monopiles
- 10% green steel
- Vibratory piling

Innovations around WTG

- Rating: 15 MW or higher
- Rotor diameters: 220-240m or higher
- Recyclable Rotorblades

Objective Greenhouse Gas Emission Reduction

Contributing to EU emission reduction goals



Electricity

	Unit	N2OWF	Scalability potential		
			Within NSC	In DE until 2030 ¹	In EU until 2030 ¹
Production of electricity	GWh/year	1,845	4,555	35,792	276,494
CO2 emission savings²	t/years	324,167	800,314	6,288,654	48,579,996

Green Hydrogen

Production of green hydrogen	Usage of green hydrogen Replacement of Diesel during Operations		CO2 emission savings	Scalability potential
	OSS emergency generator	Service Operation Vessel		
t/year	t/year	t/year	t/year	<ul style="list-style-type: none"> • Offshore Wind Sector • Offshore Hydrogen • Shipping/maritime industry
460	4	335	4,644	

¹ Scaled by MW

² EU 2030 Reference Scenario

Challenges and risks

Many of the risks identified in the application process have already materialized



Permitting process

- Permitting process for OWF had to start before Innovation Fund award
- Unclear permitting process for new technologies

Insurability

- Uncertainty about availability of insurances for new technologies
- Reduction in markets by introducing innovative technology

Financing

- Innovative technologies reduce list of available lenders and drive margins
- Carve-out of innovative technologies from financing if separation from other assets possible

Supplier availability

- Strong market demand leaves only few OSS suppliers in the market available
- Integration of new technologies is challenging for suppliers under given timeframe

Supply and Service price increase

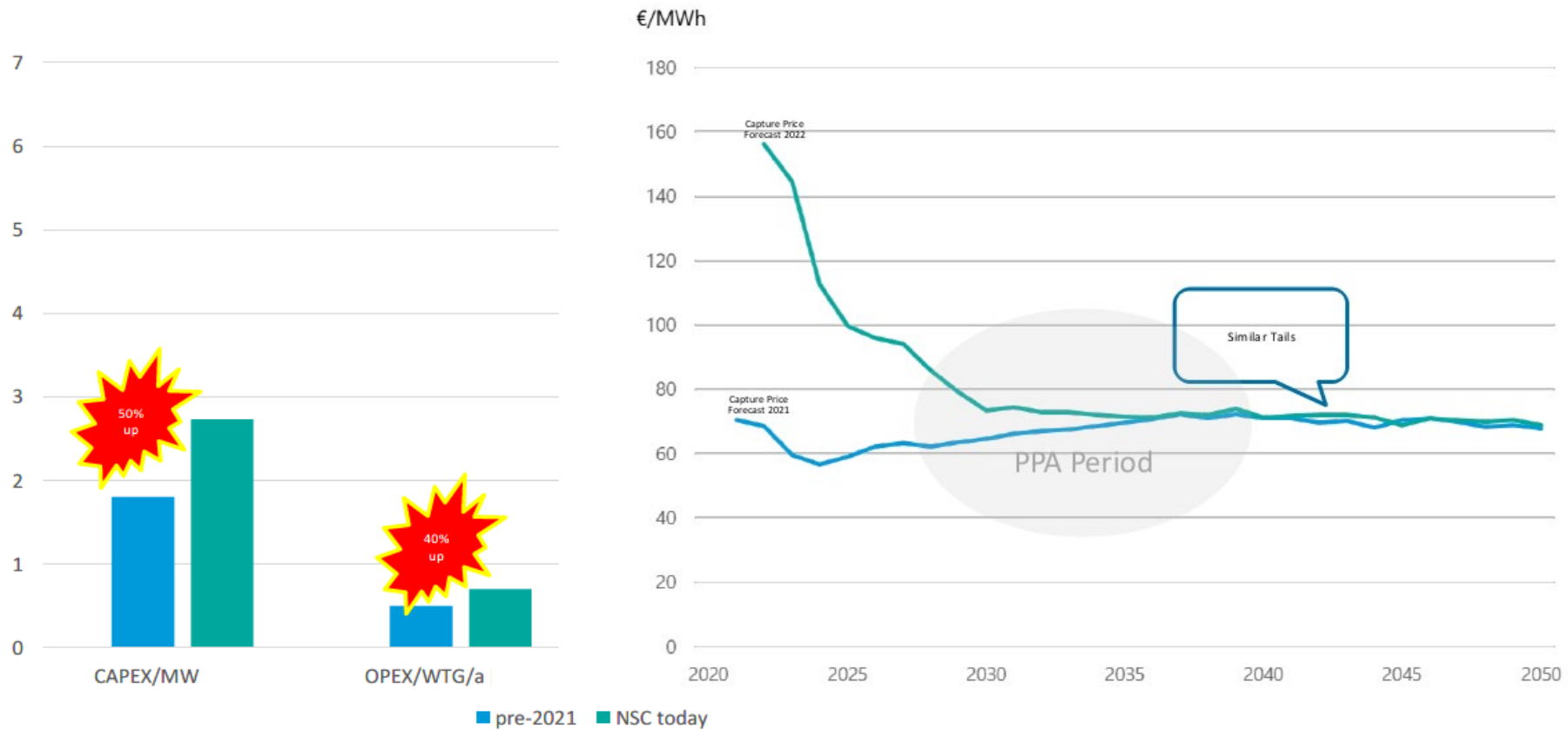
- Prices for supply of materials and services have increased significantly due to war and inflation, leading to a significant cost increase for the project

Development of Offshore Wind economics 2020 - 2022

The markets upside down



Prices skyrocket...revenue prospective unchanged





Thank you for your attention!