

Offshore Wind Development to Construction



Offshore Wind Capacity Building Event
Hanoi, 30 November 2022

A WORLD ELECTRIFIED
BY RENEWABLE ENERGY



Leading Offshore Wind Track Record

20 Year+ History



Developed 20% of UK Offshore Capacity

Offshore Highlights

Hornsea Zone

- World's largest offshore windfarm now in operation
- Developed by MRP / Siemens and sold to Ørsted

Neart na Gaoithe

- Now in construction
- Developed by MRP & sold to EDF

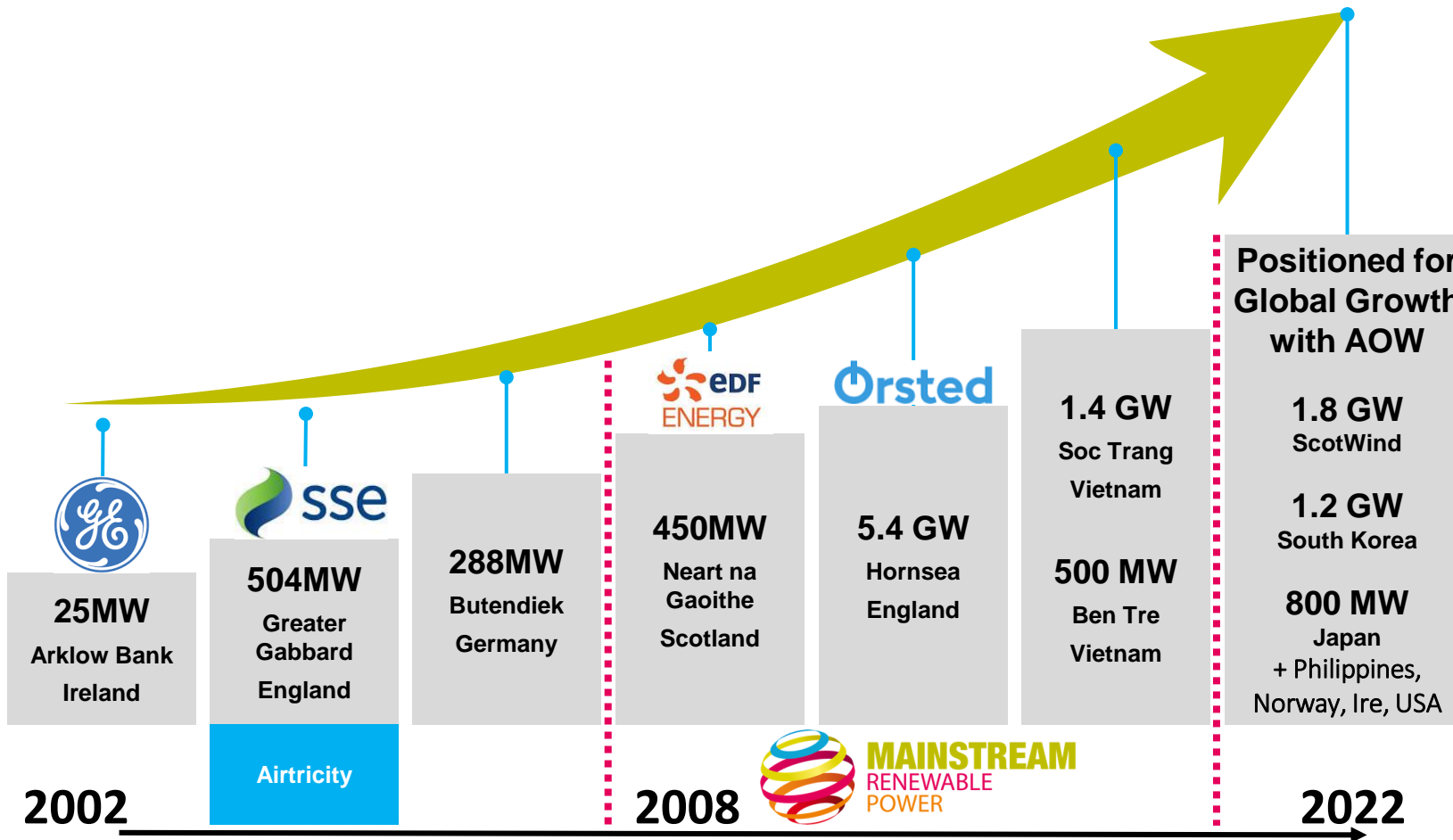
Combination Aker Offshore Wind

- Floating offshore specialist
- Now integrated in MRP
- Adds several markets, c 80 staff



Mitsui

- Becomes shareholder in Mainstream 2022



Positioned for Global Growth with AOW

1.8 GW ScotWind

1.2 GW South Korea

800 MW Japan + Philippines, Norway, Ire, USA

Typical Schedule for Offshore Wind (500MW)



DEVELOPMENT SURVEYS, PERMITTING & DESIGN

3 to 6 years

CONSTRUCTION

*3 years
(Seasonal installation)*

OPERATION

(Design Life 25 years)

SURVEY

Wind Measurement



Fixed LiDAR

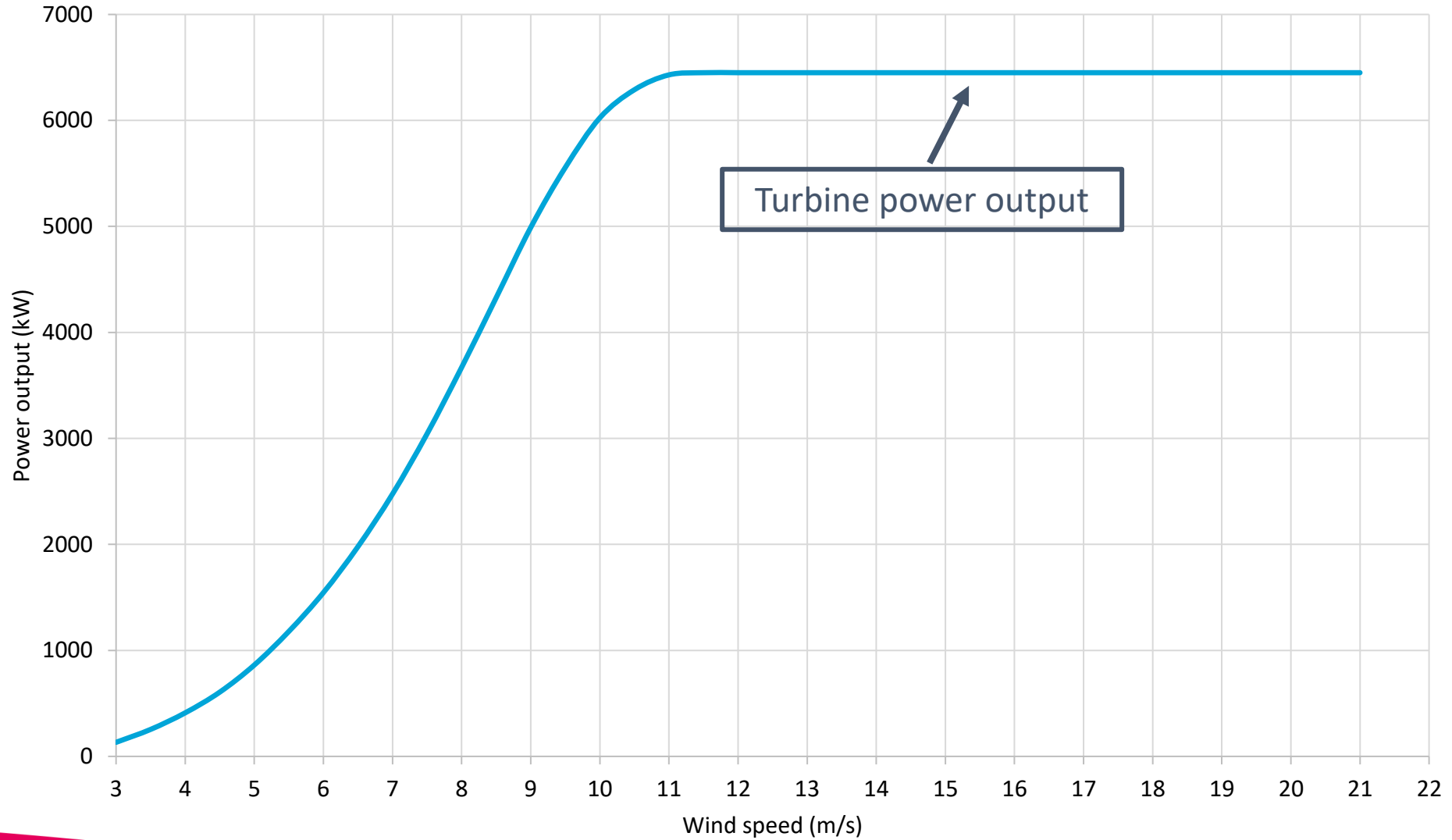


Offshore Met Mast

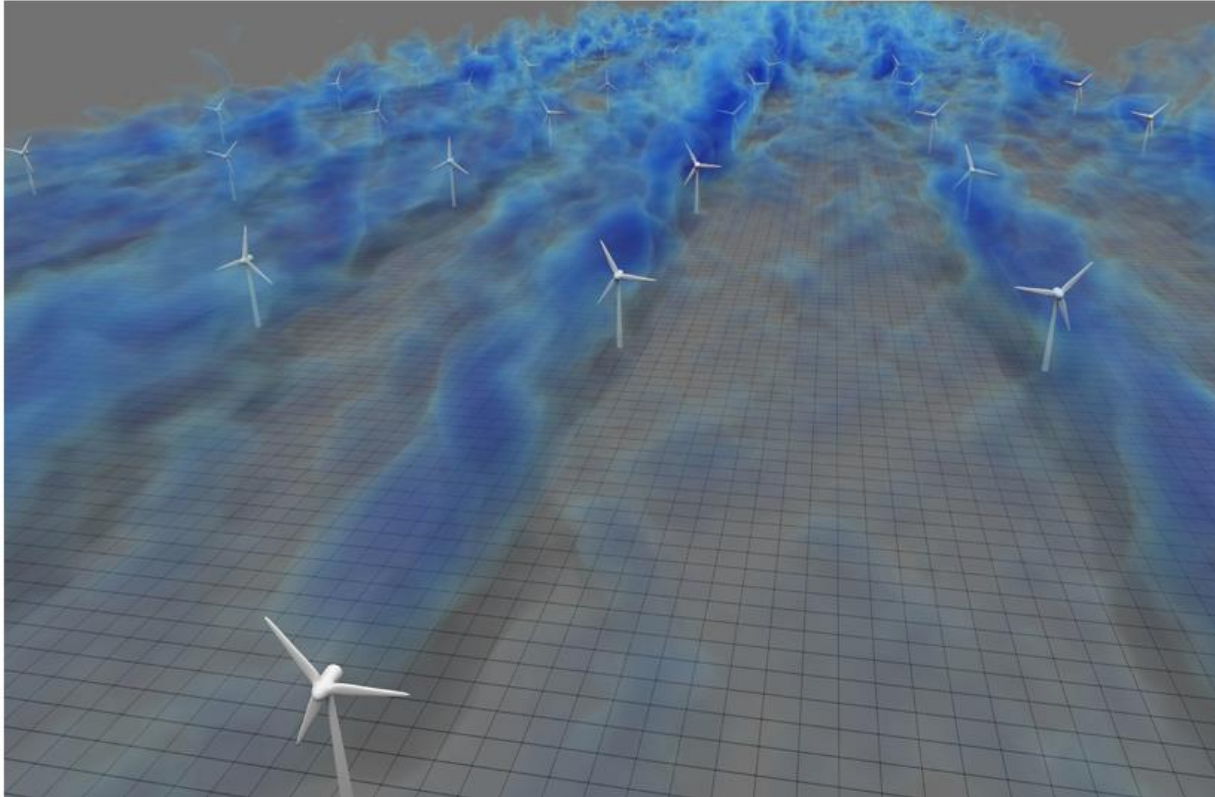


Floating LiDAR

Estimate Power Output



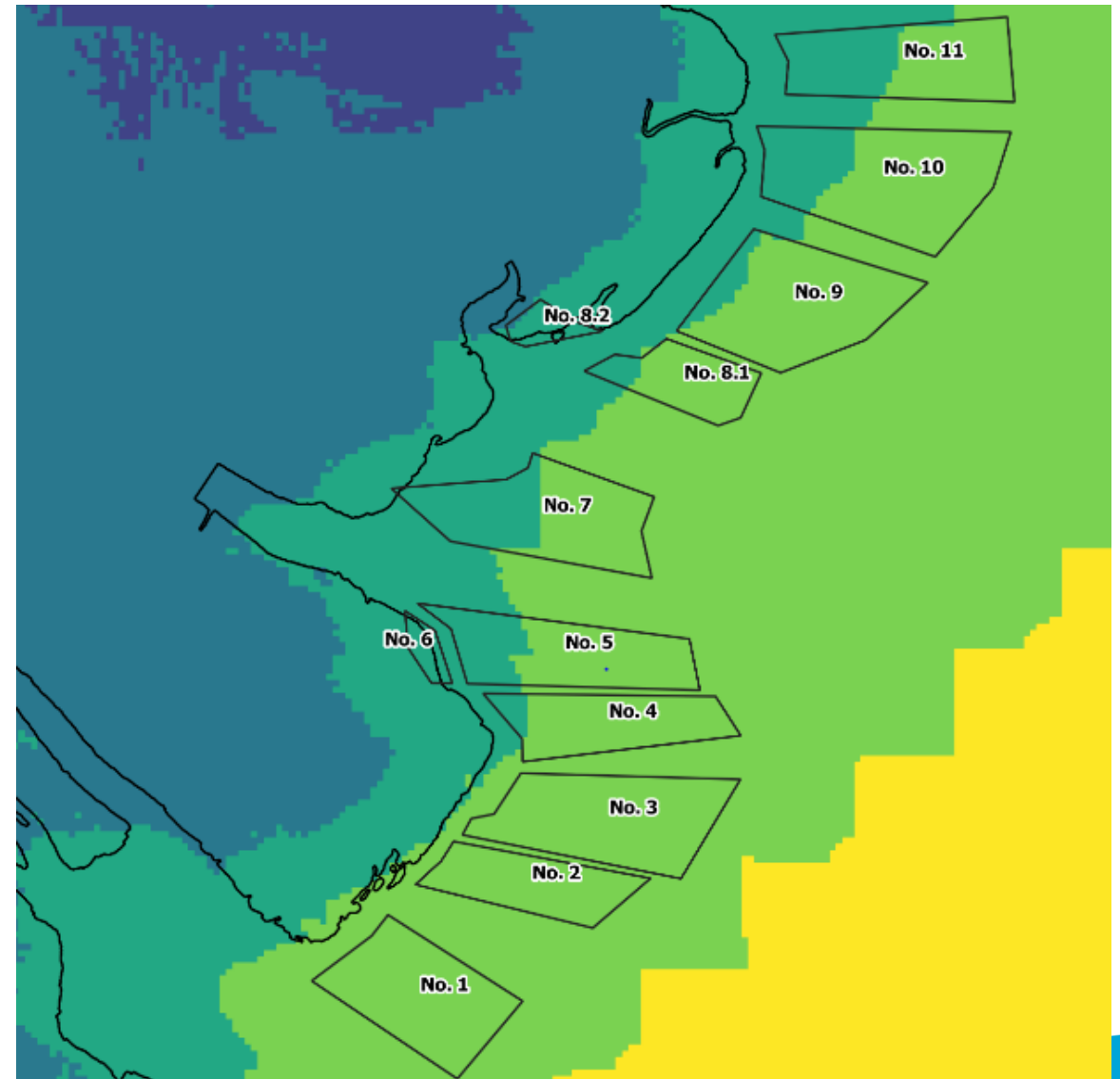
Wake modelling



Lessons learnt from Nearshore Planning



- Many coastal provinces focussing on closely spaced nearshore blocks
- Concerns with wake effects – will neighbouring blocks be built or not? For bankability must assume will be built – feasibility then in question



SURVEY

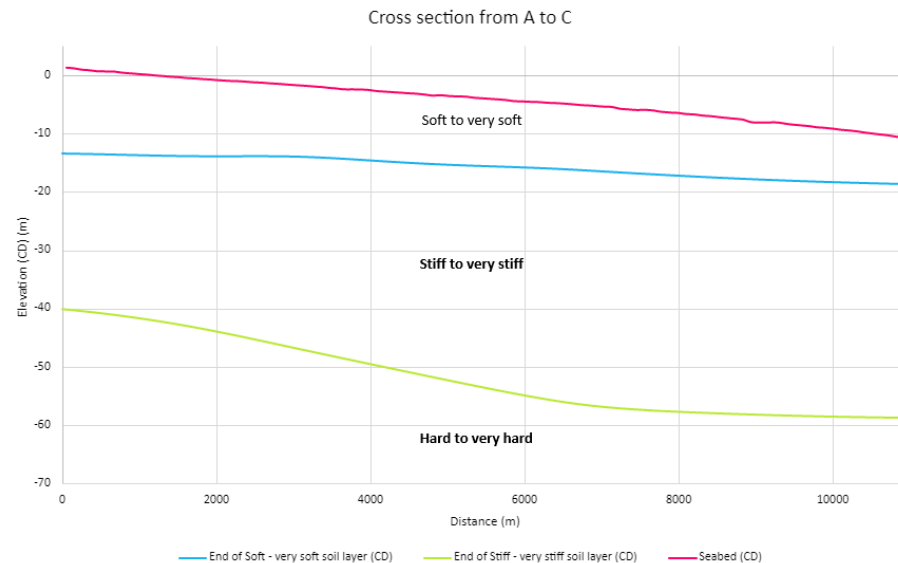
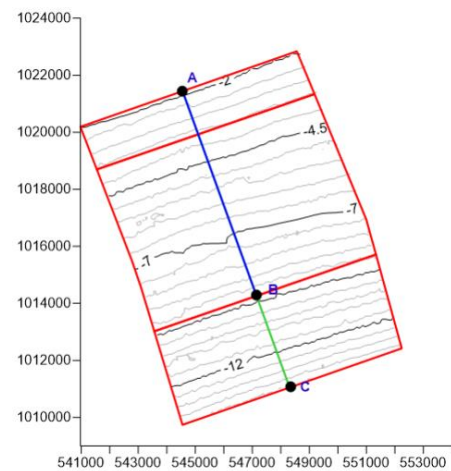
Geotechnical



- Soil Samples secured from: **Fixed platform** or **Floating platform**
- UXO Survey



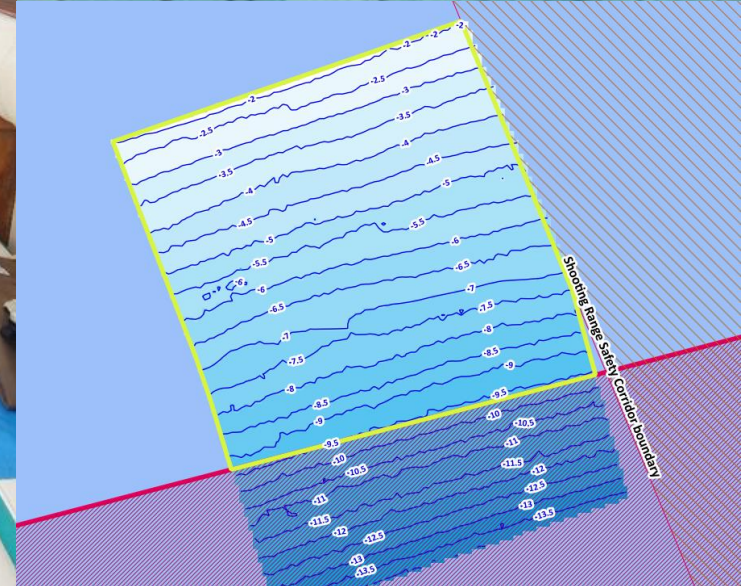
- Standby due to bad weather can be significant
- Soil Profile:



- Combination of instruments on the sea bed and divers
- 2 years of surveys needed
- Risk of equipment loss in fishing nets

Table iv: Tidal water level descriptors relative to MSL [m].

Datum	Description	Elevation [m]
HAT	Highest Astronomical Tide	2.12
MHWS	Mean High Water Springs	1.40
MHW	Mean High Water	1.25
MHWN	Mean High Water Neaps	1.10
MSL	Mean Sea Level	0.00
MLWN	Mean Low Water Neaps	-0.61
MLW	Mean Low Water	-1.21
MLWS	Mean Low Water Springs	-1.82
LAT	Lowest Astronomical Tide	-3.18





Name	Channel Depth (at Zero Tide)	Vessel size capacity (DWT)	Warehouse/ Yard area (ha)	Note
Long An Port	Current: 9.5m Future: 10.5m	70000	Warehouse: 9.2ha Yard: 12ha	
PTSC Port (Vung Tau)	9.5m	80000	Warehouse: 1.8ha Open yard: 10.7ha	
Vietso Petro (Vung Tau)	N/A	10000	Total 9.5 ha	
Tran De	N/A	N/A	N/A	Expect up to 2030 Tran De will build 6 harbors with the length around 1600m to 2200m that can accept vessel capacities up to 160000 DWT
Ba Son Port (Phu My)	8m-12m	30000	30ha	
Tan Cang Cai Mep International	16.8m	160000	Total port area: 55ha	
Tan Cang Cai Mep	16.8m	1400000	Total port area: 20ha	
Tan Cang Cai Mep - Thi Vai	16m	160000	Total port area: 48ha Warehouse 1: 1ha Warehouse 2: 0.64ha	

Environment Impact Assessment and Community Engagement

EIA/ESIA



Picture 5: Khmer people fishing in the coastal areas – Source: Scoping visit



Picture 6: Khmer people fishing in the offshore/nearshore areas – Source: Scoping visit



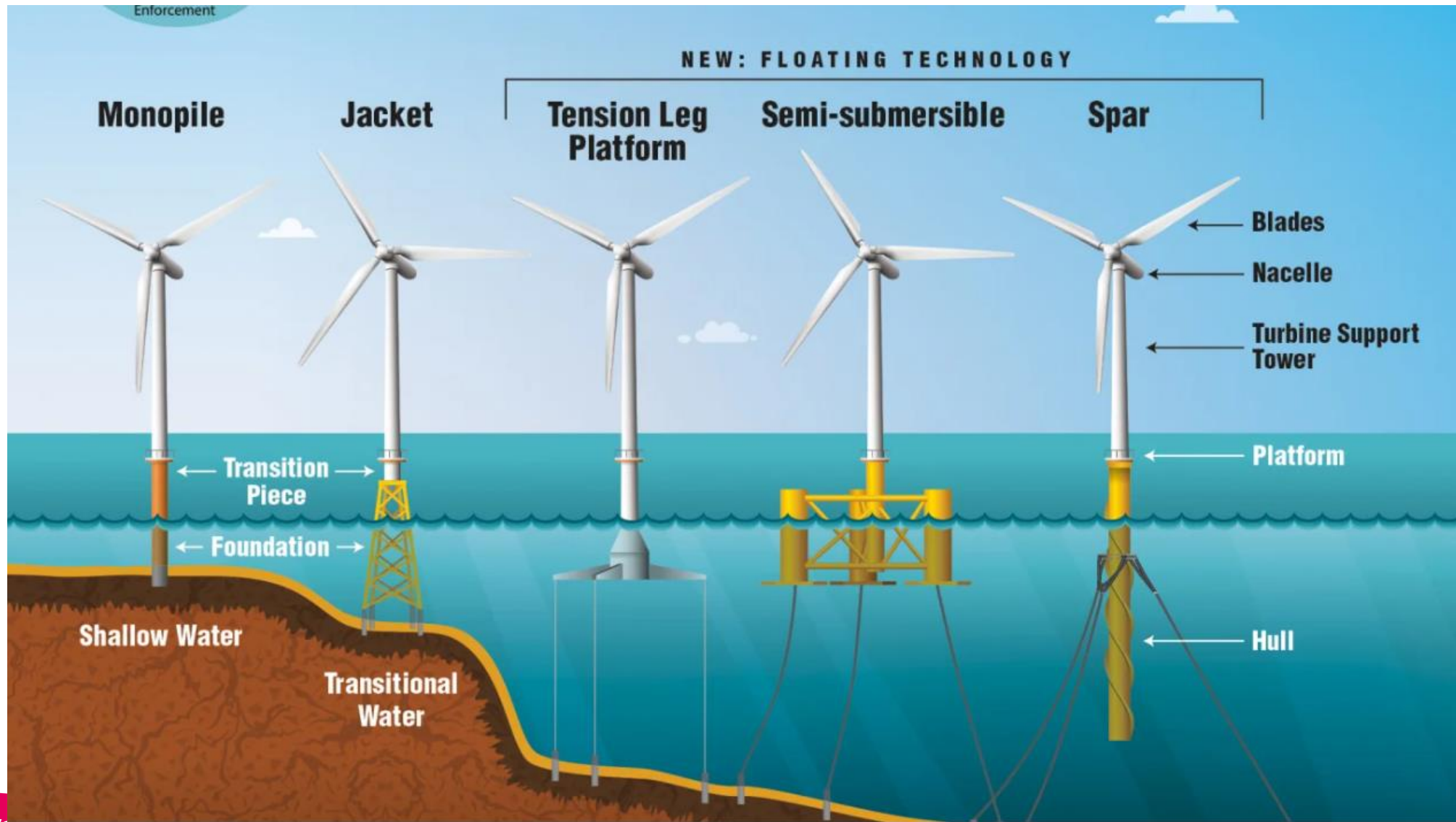
Picture 2: A Household in the shrimp farms areas – Source: Scoping visit

SURVEY

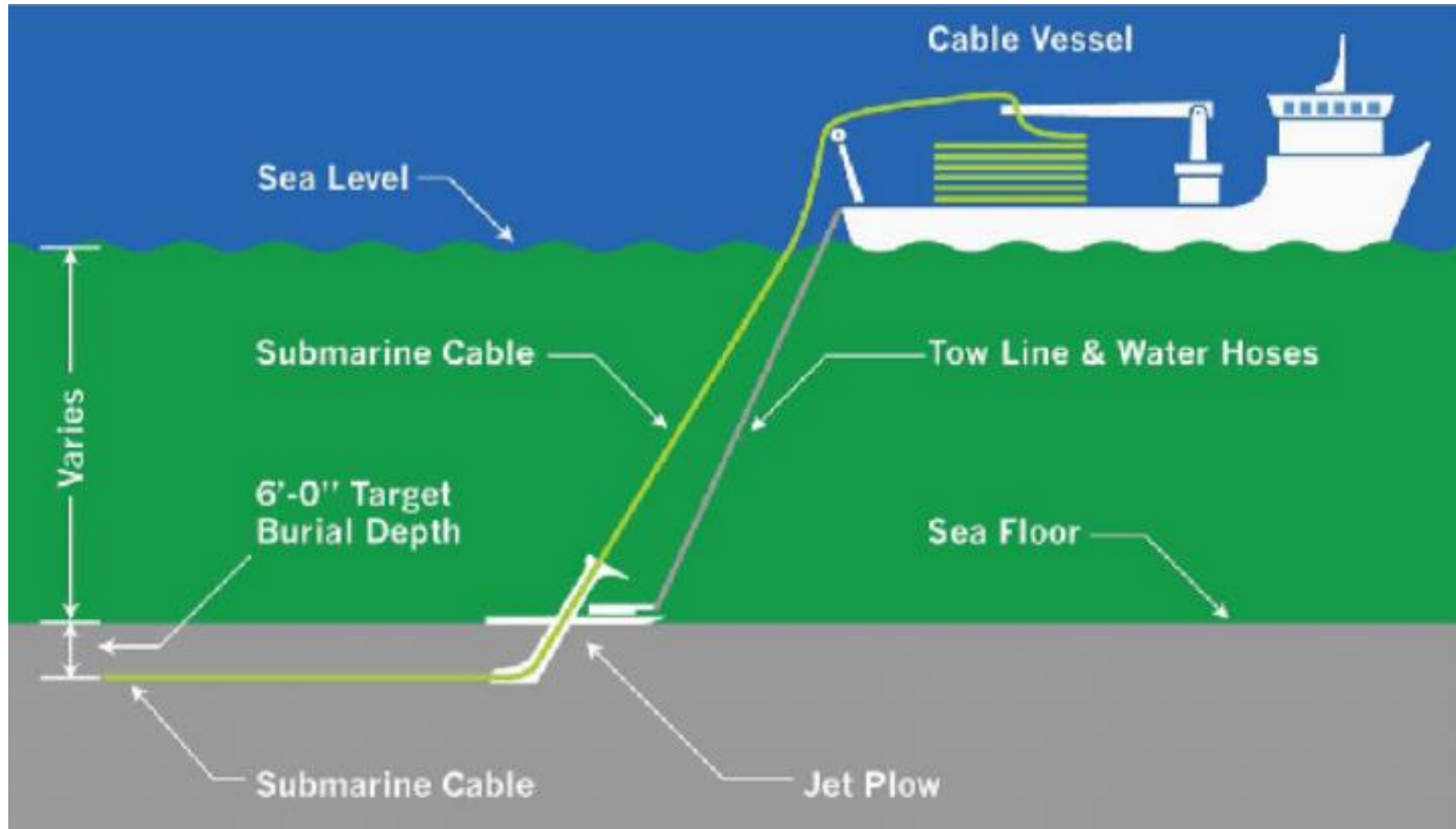
Onshore transmission Line route selection



Foundation Selection



Submarine Cable Installation

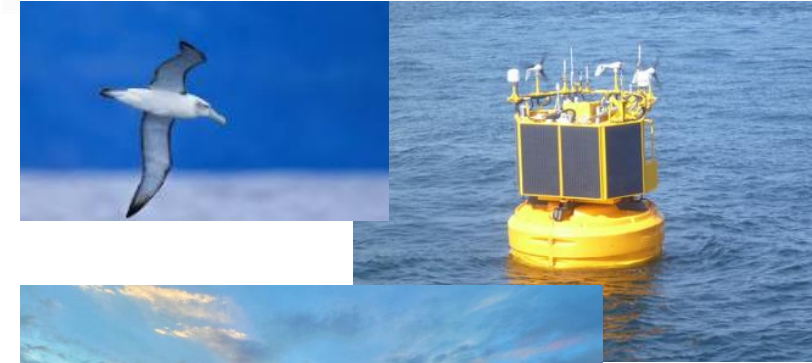


450MW Neart na Gaoithe (NnG)

Scotland



Developed by:	Mainstream Renewable Power
Location:	15.5km from Fife Ness
Number of Turbines:	54
Total Zone Capacity:	450 MW
Area Size:	Approximately 105 km ²
Water Depth:	Between 45m and 55m
Current Project Owners:	EDF Group and ESB
Number of Homes Powered:	Around 391,000 homes



Milestones & Challenges

- 2014: Successfully deployed the North Sea's first commercial floating LiDAR (Flidar)
- 2015: Won the first offshore wind auction in UK. Planning permission challenged by RSPB
- 2018: Sold to EDF (offshore substation installed and first jacket installed in Oct 2022)

2009

Mainstream was awarded the rights to develop NnG



2013

Onshore planning permission was awarded by East Lothian Council



2014

Offshore investigations completed, Offshore consents were awarded



2018

Sold to EDF Group



5.4GW Hornsea England

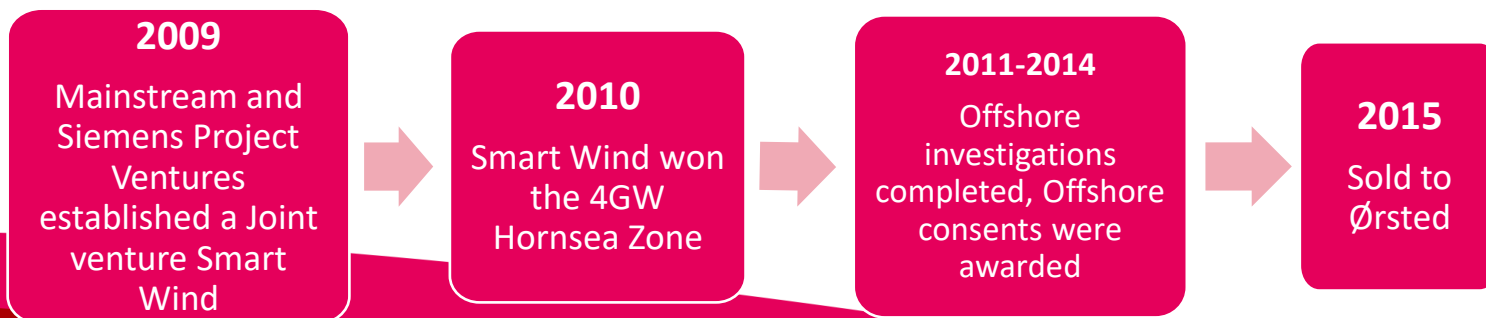
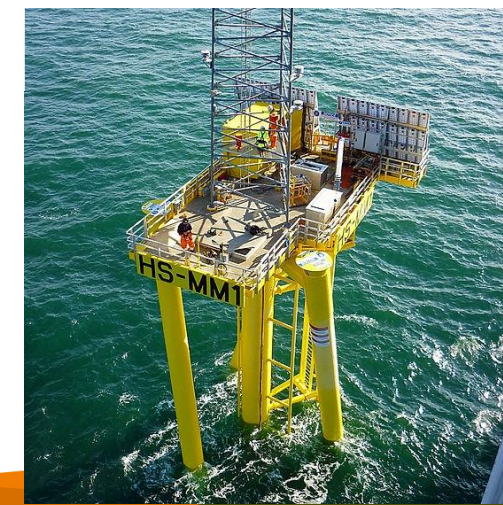


Developed by:	Smart Wind, a joint venture between Mainstream Renewable Power and Siemens Project Ventures
Location:	120km Off the Yorkshire Coast, England
Technology:	Siemens 7 MW
Estimated Zone Capacity:	5.4 GW
Area Size:	Approximately 407 square kilometres
Coastal Distance:	120 km
Current Project Owners:	Ørsted
Number of Homes Powered:	More than 1,000,000 UK homes (Hornsea One)



Milestones & Challenges

- 2009-2010: Consenting strategy and site Phasing finalised
- 2011: Twisted jacket foundation for offshore wind installed, 120km from shore.
- 2014: Consent granted by Secretary of State for Energy and Climate Change



1.4GW Soc Trang Vietnam



Developed by:	Mainstream Renewable Power and Phu Cuong Group
Location:	Soc Trang Province
Estimated Number of Turbines:	Phase 1(A): 28 to 36
Total Zone Capacity:	1,400 MW / Phase 1: 400 MW / Phase 2: 1,000 MW
Distance to Shore:	Phase 1 (A): 4km
Total tCO2e avoided each year:	1,220,000+ tonnes
Project Owners:	J/V between Mainstream and Phu Cuong Group
Total Number of Homes Powered:	995,000+ typical Vietnamese homes
Commercial Operation Date:	Phase 1(A): 2025



Milestones and Challenges:

- 2018 – 2021: Completed Site Studies
- 2021 Awarded investment Registration Certificate by Soc Trang Province
- 2022: Project Finance approved by IFC World Bank
- 2022 : Grid Connections agreements paused by EVN (single offtaker) due to policy gap for renewables

