

DeepWind Cluster O&M Subgroup webinar

20th of September



O&M image source— Scottish Power

Welcome to the webinar

O&M Subgroup Co-chairs

Paul Cairns



Graham MacArthur



HALLIBURTON

The logo for Halliburton, consisting of a solid red rectangular box with the word "HALLIBURTON" in white, uppercase, sans-serif font centered within it.

Programme

- 10.00 – Welcome and housekeeping – **Jeya Calder, HIE**
- 10.05 – Introduction from Subgroup Co-chair **Paul Cairns of MISTRAS**
- 10.10 – O&M Strategy for Moray West – **Jamie Dempster, Ocean Winds**
- 10.25 – O&M on Hywind Scotland – **Matthew Bramwell, Equinor**
- 10.40 – Q&A session
- 11.00 - End of Webinar

OW
OCEAN WINDS



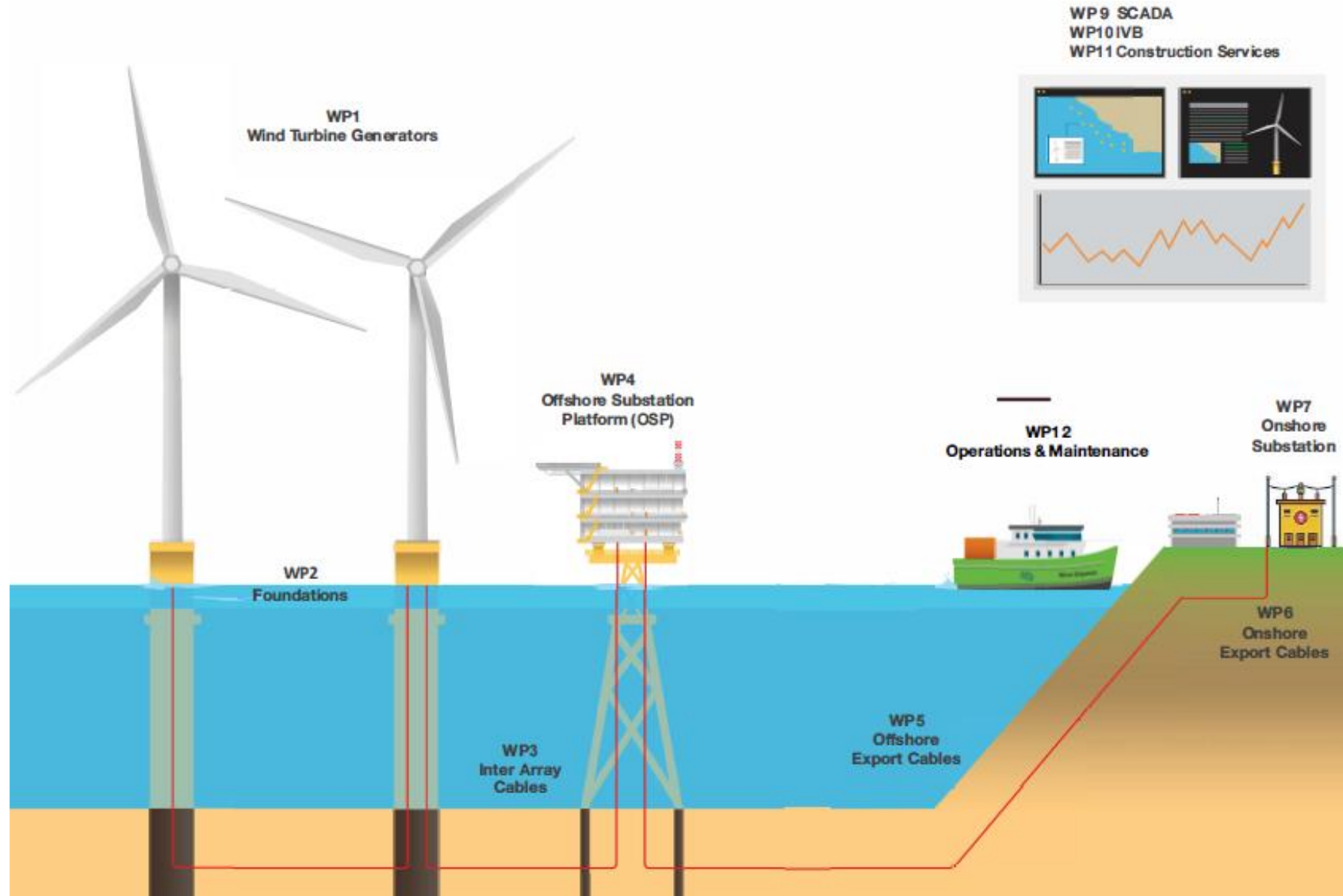
Jamie Dempster
Moray West



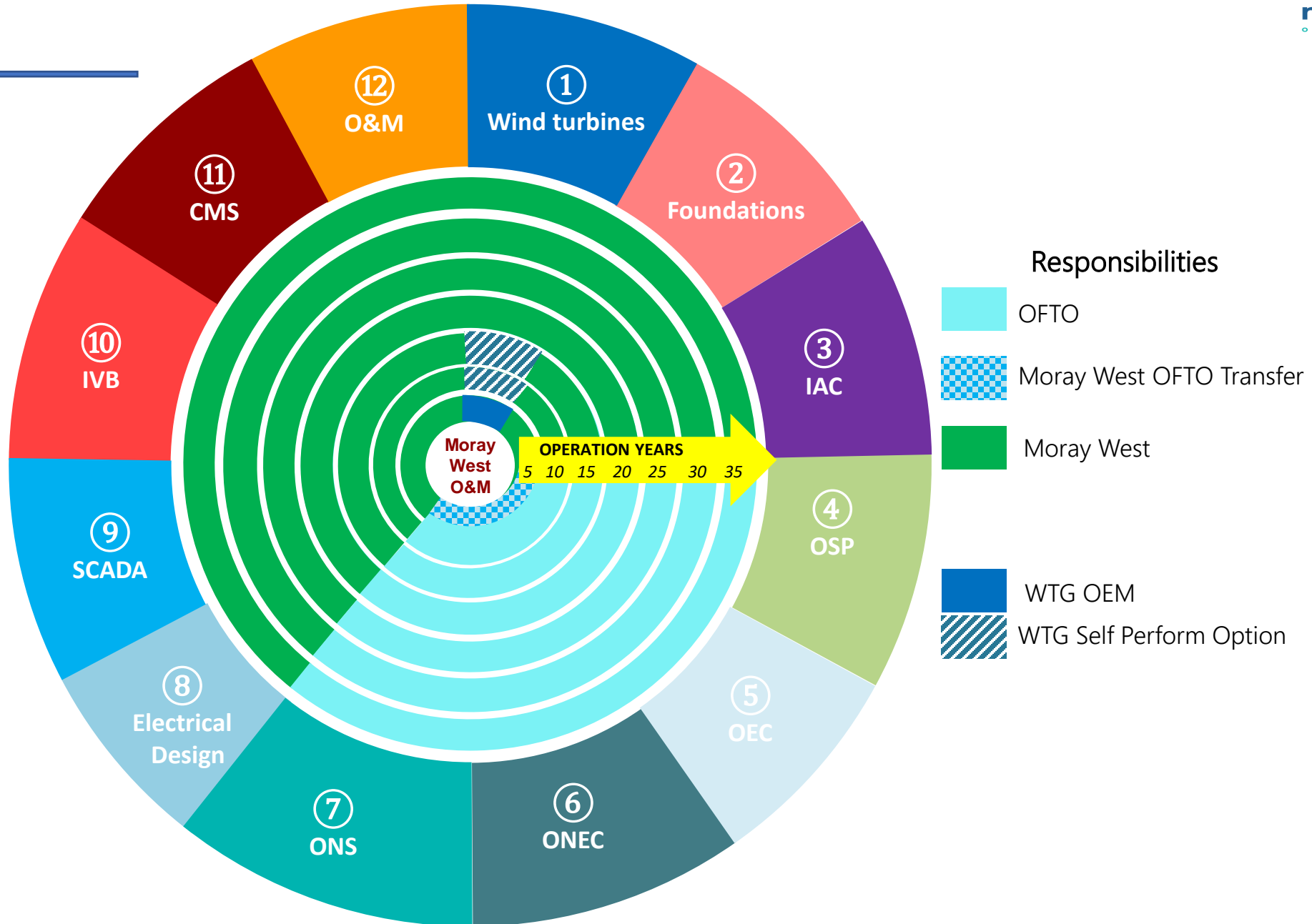
Deepwind O&M - Jamie Dempster

20-09-2021

Moray West Work Packages



Moray West Work Packages



O&M Contracts – Part I



Contract	Timing	Duration	Description
Lease for Onshore Base	Pre-FID	30 Years	The lease agreement is subject to approval of project funding
Construction of Onshore Base	Post FID, in time for start of Operation		Multiple contracts covering design and construction
CTV Charter	Post FID	5-10-15 Years (TBD)	Charter to be negotiated and duration determined on experience and envisaged vessel development
Statutory Inspection	Pre-Start Operations	3 – 5 Years	Includes all inspection required by authorities, for the purpose of Asset Integrity and HSE
Structural Health Monitoring	Pre-Start Operations	3 – 5 Years	Includes the monitoring and diagnostics of SHM data for the purpose of demonstrating asset integrity and remaining life
HV System O&M	Pre-Start Operations	3 – 5 Years	Planning and execution of yearly and other scheduled maintenance services
HV System Spare Parts	Pre-Start Operations	3 – 5 Years	Scope and duration are subject to final procurement strategy
OSP Facility Spare Parts	Pre-Start Operations	3 – 5 Years	Scope and duration are subject to final procurement strategy
OSP Consumables	Pre-Start Operations	3 – 5 Years	Scope and duration are subject to final procurement strategy
Subsea Survey and Inspection	Pre-Start Operations	3 – 5 Years	Scope and duration are subject to final procurement strategy
Cable Management and Repair	Pre-Start Operations	3 – 5 Years	Framework agreement for cable repair contractor
Long term Storage for Spare Cables and Strategic Spare Parts	Pre-Start Operations	15 Years +	Scope and duration are subject to final procurement strategy
Tools and Equipment Hire	Pre-Start Operations	3 – 5 Years	Scope and duration are subject to final procurement strategy
Call Off Contracts for SAPs	Pre-Start Operations		Call of contract for Senior Authorised Persons
Facility Management and Utilities	Post construction	3 – 5 Years	Multiple contracts for out/indoor facility management of onshore base and onshore transmission assets, utilities, internet access, radio communication/mobile phone cell etc

O&M Contracts – Part II

Contract	Timing	Duration	Description
WTG SMA	Pre-FID	TBD	SMA with the OEM, including availability warranty, scheduled and corrective maintenance and Major Component Exchange logistics.
WTG SLTA	Pre-End of SMA	TBD	Post SMA for the OEM. Scope and duration to be determined based on experience and industry development. Main target is to ensure engineering and update/upgrade services and possible Major Component Exchange services or expertise
WTG Spare Parts	Pre-End of SMA	TBD	Subject to final procurement strategy and SLA scope
Condition Monitoring	Post SMA	3 – 5 Years	Possible scope of SLTA or 3 rd party service, includes vibration monitoring and diagnostics and oil/grease analysis



Moray Offshore Windfarm (West) Ltd.

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Matthew Bramwell
Hywind Scotland

Hywind Scotland Pilot Park O&M

Matthew Bramwell

What is Hywind?

A standard offshore wind turbine placed on a ballasted substructure and anchored to the seabed

- Conventional technology used in a new way
- Simple substructure construction that enables mass production
- Inshore assembly reduces time and risk of offshore operations
- Equinor's floating motion controller uses blade pitch control to dampen out motions



2001
The idea



2009
The demo

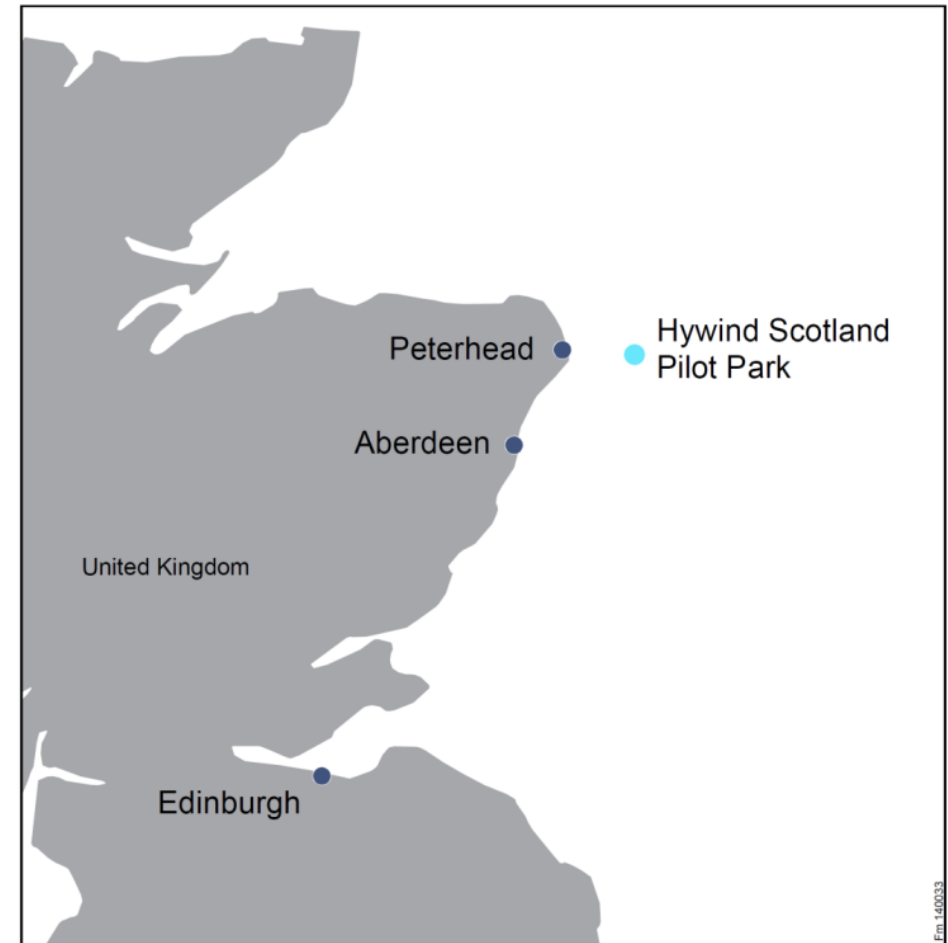


2017
The world's first
floating wind park



Hywind Scotland

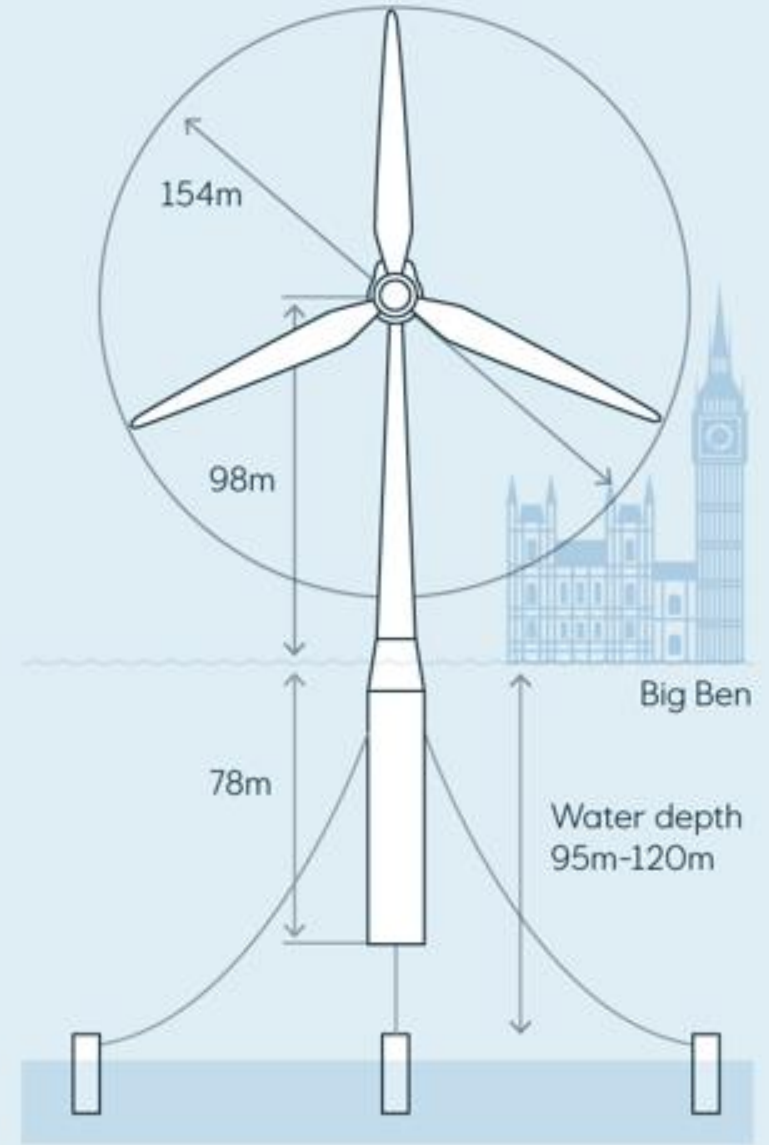
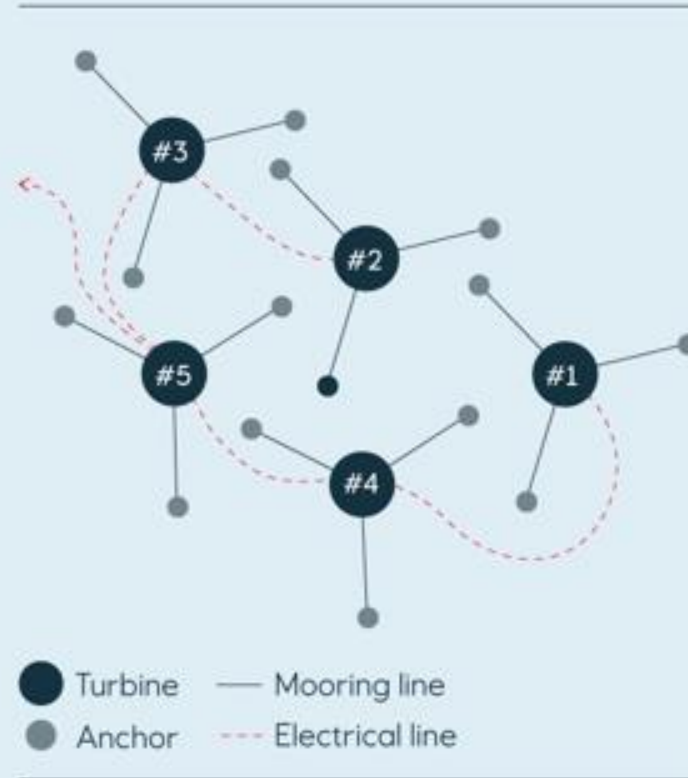
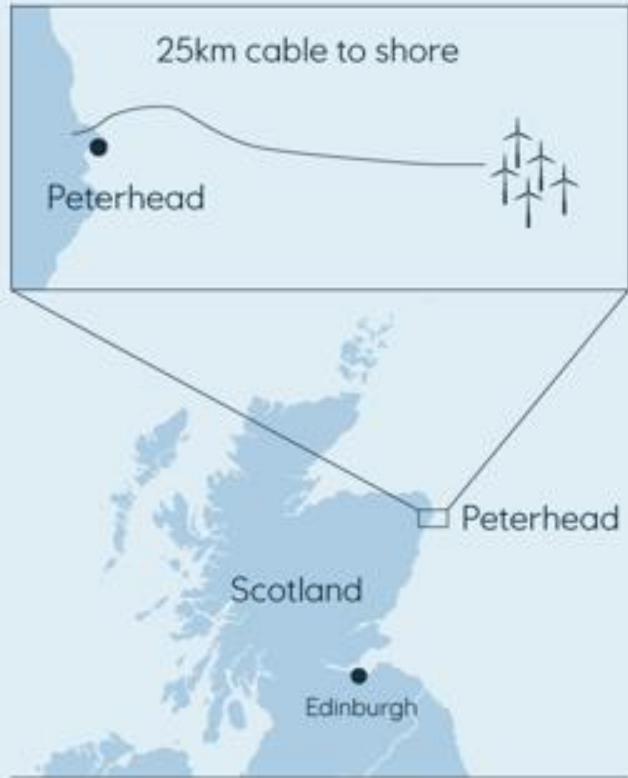
	Hywind Scotland
Installed capacity (5 WTGs)	30 MW
Area (sea level)	~4 km ²
Water depth	95-120 m
Average wind speed (@100 m)	10.1 m/s
Mean waves, Hs	1.8 m
Offshore export cable length	Ca.30 km
Onshore cable length	Ca.2-3 km
Transmission voltage	33 kV (no OFTO)
Grid connection	Peterhead, Grange
Mooring	Pre-laid chains
Anchor	Suction
Operational base	Peterhead
Lifetime/TQP	20/5 years



Hywind Scotland Floating Offshore Wind Farm



- The world's first floating wind farm (Sep'17)
- Installed Capacity 30MW: powering ~36,000 UK homes
- 60-70% cost reduction from Hywind Demo



Batwind

- 1MW battery (same as approx. 2 million iPhones!)
- R&D project to determine battery storage concept
- Several test modes including: Reduction of balancing costs (steady supply) and Arbitrage (capture when power price is low/sell high)
- Located at Peterhead substation



Maintenance Strategy - General

Hywind is an operational site, however large focus for Equinor on Research and Development to ensure the concept is as efficient as possible on a large scale for future projects

Back-office support in the Equinor Greater Wash office in Great Yarmouth, including Control Room function and Engineering Support

More campaign based in Hywind compared to constant presence on our fixed bottom mainly due to weather and smaller number of WTGs at HYS

All sites tend to stack maintenance in the Summer months where possible, due to access and optimising production

Maintenance Strategy - Specific

Area/Equipment	Task	Duration per year	Contractor
Wind Turbine	Annual Service of WTG and troubleshoot	5 days per WTG	Siemens Gamesa as part of service agreement
Wind Turbine and Transition Piece	Annual High Voltage Service	1 day per WTG	MES Power
Wind Turbine and Transition Piece	Statutory Inspection and crane maintenance	1 day per WTG	Certex
Offshore	Subsea survey	5 days	Reach Subsea
Onshore Substation Peterhead	General HV maintenance and troubleshoot	10 days	MES Power
Batwind	General maintenance and troubleshoot	3 days	Aggreko
Crew Transfer Vessel	Managed by CTV	-	Maritime Craft Services (MCS)
Blades	UAV inspections	2 days	-

Knowledge Sharing

- Hywind Scotland is used to support research projects alongside operations:
 - eDNA and sail buoy campaigns to evaluate biodiversity
 - Subsea inspections to identify species attached to the substructures
 - Marine Scotland fishing trials within the windfarm





EDNA Campaign

Sail Buoy



CTV MCS Swath 1

Subsea Survey Mooring Chains



Future Challenges – HYS and Floating

Major component exchanges, current design to tow entire WTG

Harsher and harsher environmental conditions around the world means higher specification vessel required

Potential for additional forces and movements causing premature wear

Ensuring continuous improvement towards reduction of CAPEX and OPEX



Hywind Scotland Pilot Park

[Shared assets \(equinor.com\)](#)

<https://www.youtube.com/watch?v=RHcy4uOEdKY>

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