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Operations and Maintenance in the Offshore Wind Sector

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Current Landscape and Future Directions for Operations and Maintenance Services in the Offshore Wind Sector

Introduction to Offshore Wind Services

Offshore wind is growing fast in Europe and especially around the North Sea. The development of the industry is driven by the push for more renewable energy generation capacity. However, Offshore Wind is not without challenges and one of the key focus areas in the industry is lowering the life-time cost of wind farms. There is a wide industry consensus that the offshore wind industry needs to work towards lower Levelized Cost of Energy, and by extension lower life-cycle cost, to remain attractive and competitive option in the energy mix. Here Offshore Wind Services (OWS) play a key role. OWS are the services that are needed to install, operate and maintain and decommission or repower an offshore wind farm through its life cycle. In other words OWS comprises is the Balance of Plant services as well as Operations and Maintenance of the offshore wind turbines and other equipment of the farm.

The European Clusters for Offshore Wind Servicing (ECOWindS, 2012-2015) was a project funded by the European 7th Framework Programme for Research and Innovation. The project focused on the OWS, with the aim to analyse the present state of the industry around the North Sea and offer directions for the future. One of the key outcomes is a Joint Action Plan (OWS) which offers an industry wide agenda for OWS-related innovation especially on optimizing costs.

The OWS industry is still in its infancy or the phase of emergence in most countries. However, due to the ever increasing offshore wind capacity, OWS is growing in significance and volume. The following table presents an estimate of OWS spending and market size between 2015-2020, based on an analysis of current published estimates of capacity growth and OWS spending for a generic profile current generation offshore wind farm (Cronin 2015). If the installed capacity continues to grow at projected rate following the European SET-Plan and national strategies, OWS will be a major industry branch by 2020 requiring investment of €3,200M in installation and O&M. According to the estimate direct spending on OWS is 0.120 MEUR per year per MW of nameplate capacity. During installation phase, the cost is 0.74 MEUR/MW of installed nameplate capacity. This amounts, as discussed in the introduction to an approximately 1.3 Bn. EUR/year industry in 2020.

New capacity to be installed 2015-2010 (EWEA/Navigant)	19	GW
Total capital spend on offshore projects 2015-2020	69 000	M€
Total capital spend on installation phases 2015-2020	14 000	M€
Total annual spend on O&M in 2020	1995	M€/yr
Potential spending on service providers, installation 2015-2020	1900	M€/yr
Potential spend on service providers, O&M in 2020	1300	M€/yr

Table 1: Market size estimate for Offshore Wind Services 2015-2020

Cost drivers and Challenges for Offshore Wind Service Industry

We can break down the challenges for OWS to technical and organizational/business, which have some overlap. The OWS can be further divided to two main phases, installation and operation. The major technical challenges tend to revolve around lack of technical standards relating to key interfaces of components both in the installation phase and during operation. These interfaces include non-standard technical interfaces between the major componentry, but also non-standard tower access solutions, boat landings and helipads to name concrete examples. The flipside of the technical coin is technical and other standards that relate to humans interacting with the componentry. Presently, for example, O&M workers have to be trained and certified for each technical platform separately. Often also multiple overlapping if not interchangeable Occupational Health and Safety (OH&S, often related to Health, Safety, Environmental and Quality – HSEQ – policies) training and certifications are required for crews working on same equipment in different jurisdictions.

Two intertwined underlying challenges that exacerbate these issues are complexity of projects in terms engineering and delivery in complex value network and a lack of communication both horizontally and vertically in the value network between suppliers, original equipment manufacturers (OEMs), service providers, contractors, developers and operators. Complexity and poor communication in turn have their own effect to resource congestions and bottle necks in delivery, both in terms of availability of adequately specified equipment, ports and vessels as well as skilled and qualified labor.

<table>
<tr><th>Level/Phase</th><th>Installation</th><th>Operation</th></tr>
<tr><td rowspan="2">Technical</td><td colspan="2">Depth and distance raise OWS cost and make installation more sensitive to weather windows.
(Depth affects cost of foundation and installation in particular, distance affects both installation and operation)</td></tr>
<tr><td>Non-standard electro-mechanical interfaces</td><td>Non-standard interfaces such as boat landings and helipads
Reliability of some key components (depending on original equipment manufacturer)</td></tr>
<tr><td>Non-technical</td><td>Planning, zoning and permitting delays; grid connections and associated project management cost overruns
Dock and port availability
Availability of vessels; competition with oil&gas industry over the resources</td><td>Need for overlapping separate technical and safety training and certifications</td></tr>
</table>

Table 2 Challenges for OWS to technical and organizational/business

Future Directions – Joint Action Plan

The Joint Action Plan (JAP) is an international roadmap for research, development, and innovation (RDI) for the OWS industry. The vision associated with the JAP is that by 2020 OWS is a recognized industry with strong networks around the Globe and especially the North Sea. By that time the installed offshore wind capacity has multiplied, and as a consequence of the industrialisation and purposeful RDI and standardization efforts, the key components have been standardised to an extent that enables smooth installation, interoperability between components, and efficient O&M services.

Central to this progress are strong networks and confidential relationships along the value chain that enable optimizing the delivery of value through the whole life cycle of the wind farm from the factory door to end of life. These networks involve the key stakeholders from operators and developers to turbine and grid component manufacturers, load handling and hauling enterprises who handle the components, to the offshore service enterprises who install and maintain the farms when installed. Within the network everyone knows their added value and receives relevant information that enables them to continue to deliver value to the farm.

This Joint Action Plan itself is a portfolio that comprises 8 proposed actions, which can be divided into four parallel work streams - 'coordination actions', 'research, development and innovation', 'harmonisation and standardisation', and 'skills and qualifications' - which are support each other (see figure below). The action themselves can be viewed as projects or programmes that make up a portfolio of OWS development. Each of the four work streams contributes to one or more sub goals set for the JAP, which together take OWS and offshore wind closer to the overall target of lowering the levelised cost of energy (LCoE) 40% by 2020.

The central storyline of the JAP is that through development of inter-regional interconnections, the OWS enterprises gain complementary capabilities and are able to deliver new and improved services for the operators. At the same time the networking that creates closer business relations enables quicker and more candid feedback within the whole offshore wind ecosystem that enables standardization of components, processes and practices, which lays foundations for the continuous improvement of the OWS service delivery. These relations are the foundation on which the mission-oriented research development program, development of skills and qualification programs and drive for OWS specific standards build on.

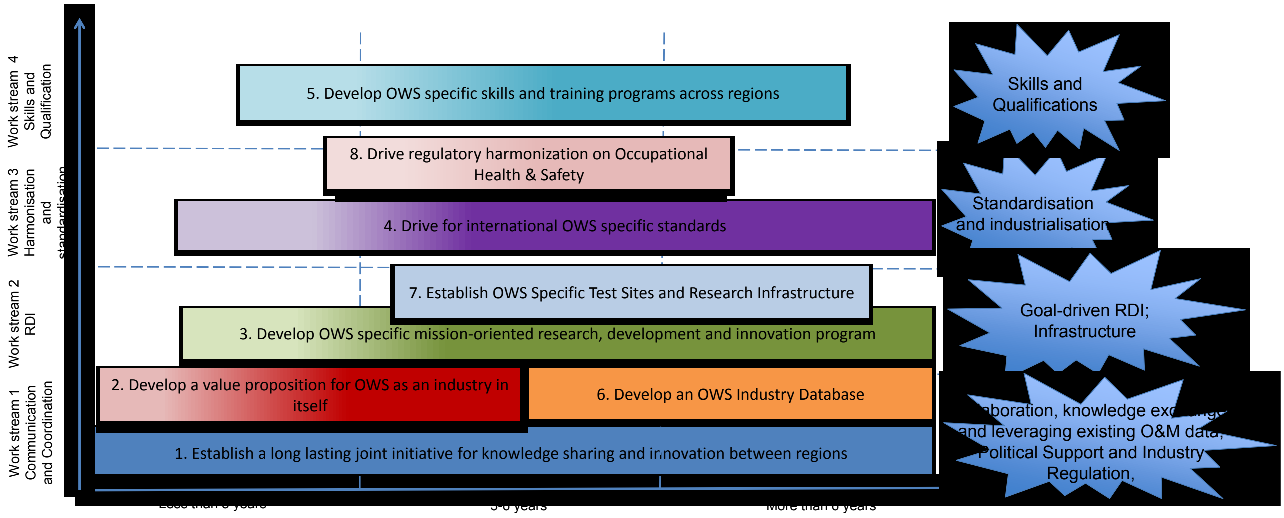

Figure 1: Overview to the updated Joint Action Plan. Work streams on the different levels are named on the left, and the associated goals are on the right.

In summary, OWS plays a key role in sustainability of Offshore Wind as a whole. OWS is also a growing industry driven by the overall growth of renewables. However, to develop Offshore Wind into its full potential, action is needed to reach an economically sound basis and competitive Levelized Cost of Energy. Here innovation related to specifically to OWS can play a key role in reaching the goals, and as illustrated there is scope for innovation related to technical aspects of OWS, business models, and related standards.

If you would like to know more about the JAP process or contents, the full documents are available from

ECOWindS website http://www.ecowinds.eu and

DTU Orbit publication repository http:orbit.dtu.dk

Further questions can be addressed to:

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