leanwind

Logistic Efficiencies And Naval architecture for Wind Installations with Novel Developments

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Document Information

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			Prepared by	**Reviewed by**	**Approved by**
V1	05/02/2015	**University of Hull**	Riccardo Mogre	Dylan Jones Lars Magne Nonås Katie Lynch	Dylan Jones Lars Magne Nonås Katie Lynch
V2	23/02/2015	**University of Hull**	Riccardo Mogre	Jan Arthur Norbeck	Jan Arthur Norbeck
V3	25/02/2015	**University of Hull**	Riccardo Mogre	Fiona Devoy McAuliffe	Fiona Devoy McAuliffe
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Author(s) information (alphabetical):	
Name	**Organisation**
Riccardo Mogre	University of Hull

Support by:

Acknowledgements/Contributions:	
Name	**Organisation**
Negar Akbari	University of Hull
Steve Clarke	University of Hull and DevCo
Federico D'Amico	EDF Energy
Adam Lindgreen	University of Cardiff
Martin Hingley	University of Lincoln
Sri (Srinivas) Talluri	Michigan State University

Definitions

TCE	Transaction cost economics
SCRM	Supply chain risk management
AHP	Analytic hierarchy process
TOPSIS	Technique for order of preference by similarity to ideal solution
ANP	Analytic network process
DSS	Decision support system
EPC	Engineering, procurement and construction

Executive Summary

The energy generated by offshore wind is expected to increase consistently in the next years, because of the construction of many new farms and their improved capacity. These capacity improvements result from employing larger turbines and installing more turbines per farm, with the aim of gaining efficiency in energy generation and also achieving economies of scale. However, larger offshore-wind farms make their construction project extremely complex to coordinate, particularly as they inevitably move into deeper waters and further from shore. Offshore-wind supply chain plays a pivotal role for such task.

Therefore, *the first aim of our research is to understand how the offshore-wind supply chain can adapt to cope with more complex construction projects.* We answer this question using evidence from real-world, offshore-wind farm projects, and the London Array farm in particular. As larger-scale projects emerge, the supply chain necessarily must include more firms. Sourcing from well-established suppliers in continental Europe remains the norm for UK offshore-wind projects. Employing local sourcing strategies not only could simplify the logistical challenges but also increase the GDP of the local economy. However, involving new suppliers in the supply chain requires ad-hoc supply development programmes to increase their capabilities. As the size and the complexity of projects grow, the owner likely cannot bear all the construction of operational risks. These include: disruptions in synchronising logistical flows, failures of the many turbine components and bad weather influencing the farm construction. Responsibilities and risks should be identified before the project starts, in order for them to be shared across the various supply chain partners. The increased size and complexity of offshore-wind projects also result in cost surge. Enhancing supplier capabilities and control on the supply chain could reduce project costs. Better coordination of supply chain activities with supplier incentives to control costs could also contribute to cost reduction.

As detailed above, the increased complexity of offshore-wind projects lead offshore-wind supply chains to face increasing exposure to risks. Therefore, to increase the control over such risks *the second aim of our research is to design a decision support system to mitigate the supply chain risks in the offshore-wind industry.* Previous academic studies in the area overlooked the measure-selection process of supply chain risk management. We aim to fill this gap in the literature by proposing a two-stage decision support systems that will help managers to select not only mitigation strategies for supply chain risks but also contingency plans when the risks happen. In order to do so, we formulate a decision-tree problem using a matrix formulation to facilitate experts' judgement collection. We applied our decision support system to the offshore-wind supply chain. We validated this case application and collected expert judgements trough a focus group. The results showed how to select mitigation strategies and contingency plans for supply chain risks within the offshore-wind industry.

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