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**Abstract:  
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**Title:  
Small and Medium-sized Enterprises (SMEs) and their contribution to O&M  
activities in offshore wind parks in the North Sea.**

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## 1. Introduction

Motivation for this study arises from the Energy at Sea<sup>1</sup> project and the later Offshore Wind Denmark –project<sup>2</sup> that focuses on, how development in business practices in offshore wind farms can contribute to the reduction of levelized cost of energy (LCOE). Remarkable cost reductions are needed in order to make electricity produced through this renewable source competitive. In the offshore wind farm context it is especially important to focus on Small and Medium-sized Enterprises (SMEs), as their portion of the work in offshore wind farms is estimated to represent 60%-70% of the total cost of a offshore wind farm (Danish Wind Industry, 2012).

However, SMEs often lack time and resources, which limit their activities and hamper their abilities for contribution (Brink and Madsen 2015; Edwards et al., 2005; Murphy, 1996). This can cause delays and more importantly hamper the opportunities of entrepreneurial SMEs to contribute with creative and innovative new solutions for reduction of LCOE. Therefore, the aim of this study is to shed light on the contribution role of SMEs by posing the following research question: *how can SMEs contribute to competitiveness of offshore wind energy?*

## 2. Approach

The research is based on longitudinal qualitative analyses in the period from June 2011 to May 2015 in two different research approaches for gathering the data. Through heuristic analyses, the research focus is set on SMEs and their roles in the North Sea wind farm context (Eisenhardt, 1989; Yin, 2009).

The first research approach provides qualitative data from a project-based network and learning course with 15 SMEs participating and with larger enterprises making presentations for discussions with the SMEs from June 2011 to March 2012. Follow-up interviews with 10 of these SMEs from September 2013 to December 2013 were conducted.

The second research approach began with a focus group interview with 11 enterprises participating (both SMEs and larger enterprises) conducting O&M tasks in offshore wind farms in June 2014. Then more thorough interviews with 20 of the essential larger key actors (utilities, Original Equipment Manufacturers (OEMs), Larger Independent Service providers (ISPs)) and SMEs were conducted from October 2014 to March 2015 and finally a seminar with SMEs and larger enterprises were held for presentation of the preliminary findings with 60 participants in May 2015. Through this research approach triangulation analyses of the data can be conducted.

Thorough analyses were conducted after the researchers ended the interviews in March 2015, which

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<sup>1</sup> Energy at Sea is a project run by the Danish Wind Industry Association and funded by Growth Forum of Southern

<sup>2</sup> Offshore Wind Denmark is a joint initiative between the Danish Wind Industry Association and Offshoreenergy.dk funded by Growth Forum of Southern Denmark. It is a four-year project that started in 2012 and it runs until the end of 2016.

revealed a lot of dimensions for reduction of LCOE. During the analyses, a deductive approach was used to reveal the most interesting findings based on the literature review. Here one of the important findings was the different role and routes SMEs can choose for contribution to competitiveness of offshore wind energy.

### **3. Main body of abstract**

Collaboration on innovation is stated as interesting and essential in the wind farm context by essential actors, e.g. at the European Wind Energy Association (EWEA) Conference 2015 in Copenhagen. Offshore wind farms require highly complex activities that are very dependent on different actors over a long-term period. In project management theory, this is aligned with the notion of Complex Product Systems (CoPS). CoPS is defined as '*high-value, capital goods systems, networks and infrastructural components, designed and produced by firms as one-offs or in small tailored batches to meet the requirements of large businesses or government customers*' (Brady & Hobday, 2012, p. 282). In the offshore wind farm sector, there are relatively small batches of wind turbines placed in a farm in different complex surroundings with different water depths, sea-beds, water flows, cabling and wind conditions. Thus, standards regarding wind farms are difficult to obtain and this calls for complex project program management in a CoPS context. The lifetime issue of reduction of cost of energy in the CoPS context makes project program management necessary within offshore wind farms and different from traditional project management practices. CoPS does not follow a lifecycle approach to innovation (Abernathy & Utterback, 1988) but instead remains in the early fluid phase, as CoPS essentially continue with new development in relatively small batches as a consequence of the typically different contexts of offshore wind farms.

Here SMEs with their creativity and knowledge from application in other industries can make a contribution to competitiveness of offshore wind farm energy. However barriers for utilizing the SME collaboration opportunities are also found. The findings show that SMEs basically have four routes for collaboration with larger enterprises:

1. *Arms-length cooperation*
2. *Demand driven cooperation.*
3. *Supplier-driven cooperation.*
4. *Partner-driven collaboration*

It is therefore important to distinguish the SME-approach to larger organisations in accordance with own SME strengths and act accordingly. It is also important for larger enterprises to acknowledge the entrepreneurial approach of SMEs and act accordingly. Finally, it is important for governmental bodies to create the spaces for innovation collaboration between SMEs and larger enterprises in the offshore wind farm sector.

## 4. Conclusion

The routes revealed for SMEs on contributing to O&M activities for competitiveness of offshore wind farms in the North Sea are perceived as 'bumpy'. There are four different routes revealed, however also several hindrances stemming from partly own SME behaviour and partly from the behaviour of larger organisations are revealed.

However, important opportunities are left behind, which easily could be picked up if more clear routes for innovation collaboration is present in O&M activities regarding offshore wind farms. The current 'arms length' principle has to be enhanced with other cooperation and collaboration routes between SMEs and larger enterprises on some of the offshore projects and activities.

## 5. Learning objectives

The research reveals the necessity of focusing the role of SME practices as one of the means to reduce LCOE in offshore wind farms. It is necessary for both SMEs and larger enterprises to acquire a more enhanced insight and understanding on the routes for SMEs to contribute to competitiveness of offshore wind farm energy.

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