

**Abstract EWEA Conference 2015,
Paris, 17-20 November 2015**

**Abstract:
Science and Research**

**Topic:
O&M & Logistics**

**Title:
Frontload of O&M experience for utilization
in construction and installation of offshore wind farms.**

Authors:

Tove Brink*

University of Southern Denmark, Niels Bohrs Vej 9, 6700 Esbjerg, Denmark .
E-mail: tbr@sam.sdu.dk

Salla Lutz

University of Southern Denmark, Niels Bohrs Vej 9, 6700 Esbjerg, Denmark.
E-mail: salla@sam.sdu.dk

Svend Ole Madsen

University of Southern Denmark, Niels Bohrs Vej 9, 6700 Esbjerg, Denmark.
E-mail: som@sam.sdu.dk

Corresponding author marked with *

Introduction

The need for renewable offshore wind energy to become competitive with other energy sources has been proclaimed for several years. Latest on the European Wind Energy Association (EWEA) Offshore Conference 2015 in Copenhagen the requirement was highlighted for collaboration on the aim for reduction of levelized cost of energy (LCOE). This is shown in the below headlines of the declaration (EWEA Offshore 2015):

‘The offshore wind power industry has tremendous potential, but to achieve that potential, the industry must collaborate. MHI Vestas Offshore Wind, DONG Energy and Siemens Wind Power—three of the industry’s biggest players and our event partners for EWEA OFFSHORE 2015—have initiated a joint declaration outlining the concept of a “United Industry.” The goal of the declaration is to inspire the industry to come together around the promise of reducing its cost of energy.’

Offshore wind energy is typically 2-3 times more costly than e.g. onshore wind energy (OpenEI, 2015). In the period from 2010 to 2014 LCOE has decreased with 11% primarily due to ‘industries early adoption of larger turbines’ (Offshore renewable Energy Catapult, 2015; p. 4). However, the other energy sources e.g. oil has declined in price over the last year of around 50% (Nasdaq 2015), so this is a moving target. Moreover the energy market is very volatile and also influenced by the security of supply of energy (Shiryaevskaya, 2015).

The definition of LCOE varies and is subject to continuous debate. Briefly, the LCOE definitions highlight the following: The sum of the discounted lifetime generation costs (€) divided by the sum of discounted lifetime electricity output (MWh). When operation and maintenance (O&M) activities start the return on invested capital begin to materialize. Therefore it is interesting to focus on the research question: *How can O&M experiences contribute to reduction of LCOE?* It can be anticipated that experiences in O&M can summarize end results of return on investments, which can pick up important issues for learning on reduction of LCOE. The research is financed by Region South Denmark and EU.

Approach

The research is based on qualitative semi-structured interviews from June 2014 to May 2015 with actors operating on O&M activities in offshore windmill parks.

In the beginning of the qualitative research a focus group interview was conducted with participants invited due to their different roles in O&M activities within offshore windmill parks. Eleven different enterprises working on offshore O&M projects participated in the focus group interview, which was transcribed for analyses of challenges for reduction of LCOE (Eisenhardt, 1989; Charmaz, 2006; Yin, 2009).

Next semi-structured open-ended interviews were conducted with actors from twenty enterprises participating in O&M activities in offshore windmill parks. Through this interview approach more in-depth interviews could take place on challenges and lessons learned for reduction of LCOE on different offshore windmill park sites. The researchers aimed for rich information from the interviewees and therefore confidentiality was agreed upon with the interviewees. All interviews were recorded and transcribed for thorough analyses. An anonymous overview is provided on the interviewees in Table 1.

Table 1 Anonymous Overview on interviewees.

Role	Level/ function in the organisation	Number
Wind farm owner	Manager –Wind farm responsible	2
	Manager - O&M/ service responsible of wind farms	5
Wind turbine producer	Manager - Wind turbine responsible	1
	Manager - O&M/ service responsible of wind farms	2
Service providers, manpower, equipment / component suppliers	Manager – Service/ supply responsible	3
Service providers logistics	Manager – Service/ logistic responsible	3
Capital partners	Manager – Investment responsible	2
Industry associations	Manager	2
Total		20

Table 1 shows the different roles of the interviewees and the level and function they operate on in the organisation. The information from the interviews is based on six very different roles in the business network, which can provide rich information from different views formed by different interests. Hereby strategically important issues can be anticipated filed from the research.

Deductive analyses were conducted after the researchers finalized interviews in March 2015. The most interesting findings according to the literature review conducted were revealed (Charmaz 2006; Atherton & Elsmore, 2007). Hereby contributions are made to the research question for the benefit of the wind farm industry, governmental bodies and the creation of new knowledge for academia.

The preliminary research finding were presented in a conference in May 2015 and enterprises in the offshore wind farm industry were invited. Moreover, a number of industry actors elaborated on their own perception of needed activities through own presentations. Around 70 people participated in the conference. The presentations and discussions were recorded for transcription. Hereby verification through triangulation of preliminary findings could be carried out.

Main body of abstract

Both literature streams on project management and on organizational knowledge creation can be anticipated to add to understanding of important issues for O&M activities to reduce LCOE. Literature on project management is relevant, because many of the activities within O&M are carried out in relation to projects as ‘unique solutions according to the specific wind farm’. Moreover, literature on organizational knowledge creation is relevant, because learning is an essential part of the innovation required for reducing LCOE.

A key issue for the industry is to reap the benefits of project management for innovation and reduction of LCOE and avoid the pitfalls of underestimating uncertainty and complexity. Brady & Hobday (2012) note the concept of “ambidextrous organization” developed by Tushman, Smith, Wood, Westerman & O’Reilly (2010). The concept is based on the seminal paper written by March (1991) on exploration –“ exploring what may come to be known” and exploitation- “exploiting and refining what is known” (March, 2008, p. 8). The notion of “ambidextrous organization” highlights the need for balancing exploration and exploitation for sustained innovation. Project program

management must therefore perceive the whole complex picture of projects within the lifetime of wind farms. Project program management within complex production systems (CoPS) as wind farms thus calls for up front attention on both creativity for new development and control to exploit resources to enable innovation and reduce LCOE. CoPS are essentially conducted in one-offs or relative small batches not following a lifecycle approach within innovation (Abernathy & Utterback, 1988). Research within CoPS industries shows that “competitive advantage stems from systems innovation capabilities and experience and strong customer relationships rather than economies of scale or scope” (Brady & Hobday, 2012, p. 284). This means that CoPS projects call for up front attention to activities, which can create system integration and relations with customers/ partners to enable innovation and reduce LCOE.

Literature streams on knowledge creation have emerged during the past decades from different scholarly fields. Von Krogh, Nonaka and Rechsteiner (2012) highlight the importance of a continuum of leadership ranging from centralized to distributed leadership situated in three layers for knowledge creation: core local activity layer, conditional layer of resources/ context and structural layer forming the frame and direction for knowledge creation.

This means according to the model developed by von Krogh, Nonaka and Rechsteiner (2012, p. 268) the use of distributed leadership defined as ‘spontaneous, intuitive, participative, fluid, integrative diffusion of skills in formalizing local practices’ (von Krogh, Nonaka and Rechsteiner, 2012, p. 254).). Centralised leadership represents the hierarchical approach with the manager taking/ influencing all decisions and setting the communication message external and internal to the organisation. Both are needed respectively on providing direction and application of specific knowledge. It calls for frontload of O& M experience to utilize the lifespan experience of activities in relation to the offshore wind farms.

From the literature review the following proposition can be derived:

Proposition 1: Frontload of O&M experiences can contribute to reduction of LCOE.

3. Conclusion

The research in this paper reveals how O&M experiences can contribute to reduction of LCOE. It is shown that both direct approaches on enhancing production of MWh and cost reduction of activities can contribute. However, also hitherto overlooked impacts of O&M activities on construction and installations of offshore wind farms can enable considerable reduction of LCOE. It means that frontload of O&M experiences are an essential issue in establishing offshore wind farms.

4. Learning objectives

The learning from the need of frontload from O&M experiences highlight the need for close collaboration on employing O&M experiences from the beginning of the establishment of an offshore wind farm through integration of both management of O&M activities and specific important local knowledge issues regarding O&M. Hereby a contribution is made both to the understanding by industry, governmental bodies and academia for reduction of LCOE and enhancement of renewable energy.

Words now: 1335 – excl. references

Word limit: 1500

References:

Abernathy, W.J & Utterback J.M 1988, 'Patterns in industrial innovation'. In Moore, M.L.T.W (ed.). *Readings in the management of innovation*, Harper Business, New York.

Adner, R and Kapoor, R 2010. 'Value Creation in Innovation Ecosystems: How the structure of Technological Interdependence Affects Firm Performance in New Technology Generations', *Strategic Management Journal*, vol. 31, p. 306- 339.

Atherton, A & Elsmore, P 2007, 'Structuring qualitative enquiry in management and organisation research – A dialogue on the merits of using software for qualitative data analysis', *Qualitative Research in Organizations and Management: An International Journal*, vol. 2, no. 1, pp. 62-77.

Brady, T. & Hobday M 2012. 'Projects and Innovation'. In Morris, P.W.G, Pinto, J.K & Söderlund, J (ed.). *The oxford handbook of Project Management*, Oxford University Press, Oxford.

Charmaz, K 2006, *Constructing Grounded Theory. A Practical Guide through Qualitative Analysis*, Sage.

Eisenhardt, K. M. 1989a, 'Building Theories from Case study Research', *The Academy Management Review*, vol. 14, no.4, pp. 532-550.

European Commission, Fact Sheet, 25/02/2015) – accessed 23. April 2015.
http://ec.europa.eu/priorities/energy-union/index_en.htm

EWEA Conference in Copenhagen 2015, viewed 18. March 2015,
<http://www.ewea.org/offshore2015/news/video-message-from-event-ambassadors>

March J. G.1991. 'Exploration and Exploitation in Organisational Learning'. *Organization Science*, vol. 2, no 1, pp. 71-87.

March. J.G 2008. *Explorations in Organizations*. Stanford University Press.

Nasdaq, Crude Oil Brent 2015, viewed 29. March 2015,
<http://www.nasdaq.com/markets/crude-oil-brent.aspx?timeframe=3y>

Offshore Renewable Energy Catapult 2015. *Cost reduction Monitoring Framework*. Summary report to the Offshore Wind Programme Board. Viewed 29 March 2015,

<https://ore.catapult.org.uk/documents/10619/110659/ORE%20Catapult%20report%20to%20the%20OWPB/a8c73f4e-ba84-493c-8562-acc87b0c2d76>

Shiryayevskaya, A, 2015. 'Russian Gas'. Bloomberg Quick Take, april 22. 2015.

Tushman, M, Smith, W.K, Wood R.C, Westerman, G and O'Reilly, C 2010. 'Organizational Designs and Innovation Streams', *Industrial and Corporate Change*, Vol. 19 No. 5, pp. 1331-1366.

Von Krogh, G, Nonaka, I and Rechsteiner, L 2012. 'Leadership in Organizational Knowledge Creation: A Review and Framework'. *Journal of Management Studies* vol. 49, no.1, pp. 240-277.

Yin, R.K 2009, *Case Study Research. Design and Methods*. Sage. Applied Social Research Methods and series, vol. 5.