

Status Report for DDMF – January 15, 2016

Period: July 1 – December 31, 2015

**Project: Global Wind Energy Shipping and Logistics PhD research project
– Project no. 2012-97**

Partners: Aalborg University

This status report will elaborate on the following:

- Project summary
- Project organization
- Project status compared to milestone plan
- Actual costs compared to project budget and deviations explained
- Project risk analysis
- Signatures and dates

Project summary

Referring to the application (dated August 17, 2012 + January 24, 2013), the project has the following goal, scope, and deliverables:

- *Type of research project: A 4-year PhD research project jointly funded by Den Danske Maritime Fond (DDMF) and Aalborg University commencing on February 1, 2013 and to be completed January 31, 2017*
- *Research objective: To understand the global wind energy shipping and logistics market up to 2050 with an aim towards mapping out the revenue potential for different shipping and logistics entrants as well as determine capabilities required to gain leadership in this market*
- *Research angle: How the Danish maritime sector and supporting industries used to have the undisputed leading edge and how they can prevent losing this vantage position completely to other emerging global players*
- *Geography: Global project scope including Denmark, Europe, China, Asia, USA, the Americas, and the rest of the world. With Denmark being “the cradle” of the global wind industry and China being the largest market in the world at this time from all perspectives, a special focus will be put on these two countries.*
- *Output: 3 conference/journal articles, 1 PhD thesis, and 4 industry reports*

The project is planned with the following content / main tasks to be completed:

- A. *Wind energy market sizing and outlook: Market development in phases up to 2020, 2030, and 2050 including technological development*

- B. *Wind energy supply chains: Configurations, set-up, and structure*
- C. *End-to-end wind energy supply chain costs: Break-down and quantification of costs and revenue potential for shipping / logistics services*
- D. *Analysis of constituencies who participate in wind energy shipping and logistics tasks including review of what it takes to compete in this market*
- E. *Winning strategies and business models with a focus on market consolidation/M&A for shipping and logistics companies who wish to serve the global wind energy market*

Project organization

The research project is per end of December, 2015 organized as per table below:

Project sponsors	Den Danske Maritime Fond Aalborg University, Department of Mechanical and Manufacturing Engineering
Industry Reference Group	Reference Group members: DONG Energy, Siemens Wind Power, Danish Shipowners' Association, Port of Esbjerg, DHL Global Forwarding, J Poulsen Shipping, BTM part of Navigant, Per Aarsleff, Offshoreenergy.dk, and A.P. Møller-Mærsk
Project leader and PhD advisors	Lars Bo Henriksen, Professor, PhD, AAU (lead-advisor) Poul H. Kyvsgaard Hansen, Associate Professor, PhD (co-advisor)
Project administrator	AAU, Department of Mechanical and Manufacturing Engineering administration, Poul H. Kyvsgaard Hansen, Associate Professor, PhD
Project team	Thomas Poulsen, PhD Fellow, MBA, AAU

During the half year period, the following organizational issues have been settled:

- Continued TP salary negotiations took place during the second half of 2015; the negotiations were not finalized (to become in line with original budget approved by DDMF).
- Several people changes within the Reference Group companies have taken place.

Project status compared to project milestone plan

The project plan consists of 5 areas or phases to be dealt with over the 4 year period (see activity and time plans included in this document). The table below presents an overview of recent progress and predicted next steps for not only the five areas but also in terms of project and stakeholder management activities as well as a status on progress towards completion of the promised DDMF final deliverables.

Project phase / area	Completed tasks	Next steps
Project and Stakeholder Management	5 th Advisory Board / Reference Group meeting took place at Siemens Wind Power on 2 nd September, 2015 including a	6 th Advisory Board / Reference Group meeting to take place at Port of Esbjerg in Esbjerg, 9 th March, 2016 including a subsequent "go-home"

	<p>subsequent “go-home” meeting. Key conclusion of the meeting was that the logistics challenges will continue to increase as larger wind turbines come into production. The SWP 7.0 MW platform was contrasted to NREL and DTU Risø Wind studies about 10 MW, 15 MW, and 20 MW machines.</p> <p>Collaboration was progressed with researchers (PhD students) from other institutions in DK working on similar projects, DTU Risø Wind, and Rasmus Lema, AAU.</p> <p>Participation in the Offshoreenergy.dk Cost Reduction Forum was continued both in general and specifically within focus area number 4, O&M logistics.</p> <p>Continuation of collaboration DTU Risø Wind where a PhD exchange program was initiated for Thomas Poulsen as of August 10, 2015. Key contacts at DTU are Charlotte Bay Hasager and Thomas Buhl.</p> <p>Finalization of collaboration with DONG Energy Wind Power with support from AAU M.Sc student projects.</p> <p>Meetings with PhD network partners such as Vestas, Copenhagen Infrastructure Partners, and Port of Rønne</p>	<p>meeting. Reference Group member structure will be expanded to increase supply chain extent covered.</p> <p>Project steering to be continued.</p> <p>Academic progress to be driven by academic journal papers.</p> <p>Progress collaboration with DTU Risø Wind, Boston University, AAU researchers and others. Initiate further joint article writing to progress academic coverage of our topic and joint research efforts where relevant, such as case study work.</p> <p>Follow-up on EU H2020 funding in terms of LCE13 and LCE14 grants.</p> <p>Expected birth of TP’s first child with Stine (due date May 15, 2016).</p>
<p>Travels</p>	<p>In-depth case study trip to China about offshore wind conducted during July and October including participation in China Wind Power exhibition in Beijing. Dissemination of PhD project research findings in the form of a presentation at the annual Sino-Danish wind seminar in Beijing on October 16, 2015.</p> <p>Dissemination of PhD project findings at MSSM conference in Nyborg August 26-28 and HubNorth/City of Aalborg conference in Aalborg on November 12, 2015.</p> <p>Dissemination of half-way PhD project findings at AAU/DDMF mid-term conference at AAU Copenhagen on October 9, 2015 as part of Danish Maritime Days 2015.</p>	<p>Complete data collection efforts about Offshoreenergy.dk CRF group 4 O&M Logistics for subsequent paper writing.</p> <p>Complete data collection in China with COSCO case study.</p> <p>Continue participation in DONG Energy Wind Power RM5 Logistics Reference Group.</p> <p>Continue participation in Offshoreenergy.dk CRF group 4 O&M Logistics and group 3 INNOLOG. Continue participation in overall CRF.</p> <p>Dissemination of project findings at various events including possibly Baltic Sea Region conference in Rønne, Bornholm on January 27-28, 2016.</p>

	Denmark travels for meetings with particularly Reference Group stake-holders (DONG Energy, DHL, Offshoreenergy.dk, others) and key “speed boats” in the form of key academic case studies for journal paper writing (DONG Energy Wind Power and Offshoreenergy.dk)	
Wind Energy Market Sizing and Outlook	Continued dialogue with particularly DONG Energy, Siemens Wind Power, Vestas, Envision, LM Wind Power, Niebuhr, Longyuan, China Guangdong Nuclear, ZPMC, and Profundo.	Continued involvement with DONG Energy Wind Power technology development. Continued involvement with Siemens Wind Power technology development.
Wind Energy Supply Chain Configurations	Detailed case study on logistics R&D completed with DONG Energy Wind Power in collaboration with Master students. Combination of interviews and survey finalized and strategy crafting completed.	Case study student projects contemplated with LIFTRA, Siemens Wind Power, and Offshoreenergy.dk.
Wind Energy Supply Chain Costs	Industry-led cost reduction case study continued with Offshoreenergy.dk (as part of CRF) with focus on O&M Logistics.	Continued support of Offshoreenergy.dk industry driven CRF project.
Required Wind Energy Logistics and Shipping Capabilities	Continued use of semi-structured interviews used to get familiar with areas of incomplete knowledge within the supply chain.	Further dealings with industry through Reference Group, case studies, and other interaction to continue to update this part of the knowledge in the research project.
Future role and capabilities of the Blue DK	EU lobbying activities about long-term logistics involvement in H2020 funded EU wind energy calls successfully secured (new verbiage in LCE13 and LCE14)	Understand different consortia assembling to apply for the EU funding and consider to support the application process.
Case studies	Student supported case studies with DONG Energy Wind Power (logistics R&D) and Offshoreenergy.dk (O&M logistics) completed with a total of 5 M.Sc students from AAU	Exploit opening of China case study with COSCO by attending case study trip during spring, 2016 Complete the Offshoreenergy.dk CRF Group 4 data collection and complete the case study.

The table below presents an overview of recent progress and predicted next steps for particularly the academic/dissemination related activities and a status on progress towards completion of these.

Project phase / area	Completed tasks	Next steps
Academic Conferences	Conference paper submitted for SMS conference in Denver, however, participation halted due to budget issues for the project at AAU (not resolved).	Only local Copenhagen academic conference attendance possible due to unresolved internal budget deliberations.
Academic and project Publications	IJESM special issue journal paper draft “Reducing cost of energy in the offshore wind industry: The promise and potential of supply chain management” revised by Jan	Third year industry report to be developed. Academic paper manuscripts to be crafted and submitted to academic journals.

	Stentoft of SDU and Ram Narasimhan of Michigan State University. Paper was accepted into the journal according to Professor Narasimhan.	PhD thesis writing to commence.
Academic exchange program	Academic exchange program with DTU Risø Wind in Roskilde approved by Lars Bo Henriksen, Poul H Kyvsgård Hansen, and DTU Risø Wind. PhD exchange started on August 10, 2015	Continue academic exchange program to complete joint paper writing with researchers from DTU Risø Wind.
Press in various media	- Article in Danish newspaper "Børsen" on September 29, 2015 - Various press in Denmark and internationally in connection with DMD mid-term conference on October 9, 2015	Additional press pursued on a continuous basis
PhD courses	All participation in PhD education courses ceased until further clarification obtained in terms of project finance status within AAU (unresolved)	Planning for remaining 8 ECTS points to be done with Lars Bo Henriksen. Very limited remaining PhD project funding exists (internal AAU budget issues are unresolved) and practical execution is questionable unless at AAU, DTU Risø Wind, or the Copenhagen area at little or no cost.
Lecturing / Supervision	Teaching and supervision obligation towards AAU has been fulfilled.	Teaching and supervision obligation towards AAU has been fulfilled.

Referring to the original project plan included milestones displayed below, it is our estimate that the project scope remains intact by now and is well on track compared to planned progress.

Activity	Year/Quarter																			
	2013				2014				2015				2016				2017			
	M3	M6	M9	M12	M15	M18	M21	M24	M27	M30	M33	M36	M39	M42	M45	M48	M51	M54	M57	M60
Project management, administration and reporting to DMF	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Research assistant, +30 more ECTS points completed and Ph.d. scholarship preparation	x	x	x	x																
Formal Ph.d training/education, dissemination/lecturing at university					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Preparation, get in place, launch of project, and setup of Reference Group	x	x																		
Phase 1 - market sizing and outlook																				
Work with available market data to quantify wind market size 2020, 2030, 2050		x	x																	
Work with OEM's, utilities, and available market data and technology/R+D			x	x																
Phase 2 - wind energy supply chains																				
Current supply chain designs, strategies and business models						x	x													
Future supply chains							x	x												
Phase 3 - end-to-end wind energy supply chain costs																				
Generic supply chain cost estimates based on averages						x	x													
Detailed supply chain cost component analysis for sub-processes							x	x												
Phase 4 - requirements for market participation																				
Types of players involved in the shipping and logistics tasks							x	x												
Definitions of supply chain tasks, roles, and responsibilities now and future								x	x											
Case studies throughout phases 1 through 4																				
Case A - full supply chain analysis research questions 1, 2, 3, and 4 (DK)		x	x	x	x	x	x	x	x											
Case B - full supply chain analysis research questions 1, 2, 3, and 4 (PRC)					x	x	x	x	x	x										
Cross case analysis/conclusions and mit-term seminar										x	x									
Phase 5 - how The Blue Denmark can maintain or regain leadership																				
Blue Denmark survey									x	x	x	x	x							
Wrap-up of Blue Denmark study work and matching to cross case analysis														x	x	x				
Final seminar																				x
Attendance of conferences, industry fora, and events	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Industry interviews and site visits as relevant	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Workshops, seminars, and speeches at conferences					x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Publication of 4 articles for academic conferences / journals		x	x	x					x	x			x	x			x	x		
4 industry reports for Den Danske Maritime Fond		x	x						x	x			x	x			x	x		
Stay abroad at foreign academic institution																				
Ph.d thesis finalization																				x

Activities related to phase 1 have been launched according to plan, and regarding the planned case studies during the whole project period, internal AAU discussions pertaining to the PhD project budget continue to cause delays and alterations to the original plans. As such, the scope of the Asian case study efforts has been decreased and the continued Anholt case study efforts in Europe delayed along with the initiation of the DanTysk case. New case study efforts (Dogger Bank, M&A) have not been initiated. Student project supported case studies have been continued with Offshoreenergy.dk (CRF) and completed with DONG Energy Wind Power (logistics R&D).

The new communication procedures were implemented and along with new office premises at AAU and PhD exchange at DTU Risø Wind, the overall working conditions for TP were stabilized although the fundamental challenges of the PhD were not resolved. These challenges include salary disputes, budget disagreements, and communication procedures.

The publication targets for the PhD are on track. The EDSI conference book chapter was published during May, 2015. The joint paper with Professors Narasimhan and Stentoft was modified and accepted for publication. The manuscript with Rasmus Lema was almost completed and will be submitted for publication in February, 2016. The DONG Energy Wind Power case study paper writing has commenced.

Actual costs compared to project budget and deviations explained

Due to complexity in the financial setup the financial statement will be reported separately.

Project Risk analysis

Below is an overview of main factors posing a risk to the project not meeting its deliverables for the rest of project period as well as current strategies for their mitigation.

Potential Main Risks	Strategy of Mitigation
Loss of key resources / persons from project team due to unforeseen circumstances, particularly TP.	Mitigation of the working conditions and working situation of TP are being sought. The AAU workers' council representative and the AAU work environment representative have been involved along with a new co-advisor of the PhD project.
Significant budget changes on the part of AAU.	The PhD project will need to be re-scoped, altered, and restructured to match the reality.
Lack of project steering	Project steering meetings between all team members are usually held at AAU on a monthly basis and DDMF is updated on progress on an on-going basis. The internal AAU team meetings did take place twice during the July 1-December 31 period and the lower frequency was due to internal budget and structural challenges of the project. DDMF has a standing invitation to join any

	and all Reference Group meetings, conferences such as the October 9, 2015 mid-term conference, and/or call bilateral meetings as needed.
Wind energy loses strategic importance as an energy source across the world	This can potentially be a risk, but more in the long term and project ambition is to assist the industry in reducing levelized cost of energy to make wind more competitive. The recently agreed COP21 agreement in Paris will further increase the need for renewable energy, including wind.
Scope too wide or unrealistic?	The first Reference Group meeting already debated and agreed a further sub-scoping of the project. The project team tries - on an ongoing basis - to manage the balance between the project's practical and academic deliverables. Since the start of the PhD position on February 1, 2014, the academic deliverables have increasingly received attention from the team as TP must satisfy these to achieve the academic PhD degree in the coming years.
Access to companies and empirical evidence not available?	TP is in close dialogue with relevant companies and market intelligence businesses to get access to data. Also use of generic modeling and averages will ease access to data and information from companies along with use of NDA's, confidentiality agreements, etc.
Individual project parts / phases are not sufficiently linked, and synergies lacking across work efforts?	Tight coordination across project parts is something the PhD project strives for at all times.
Project team members have different aims and interests and these can potentially develop in to conflicts between team members, e.g. also between advisors and TP as the PhD fellow.	This is a risk in any project where several persons form up a project team or have to collaborate on tasks. The risk is mitigated through clarifying tasks roles and responsibilities upfront and ensuring an ongoing constructive dialogue among team members about project aims and personal interests in the project. The project goals, academic goals, and goals of the PhD student are now more closely aligned between Lars Bo Henriksen, Poul H Kyvsgård Hansen, and Thomas Poulsen.
Strategy changes or major reorganizations in partner companies	The Reference Group member organizations are most critical, however, members can be exchanged. Case study member organizations will also be critical for research at tactical level going forward.
Lack of backup of relevant stakeholders	The PhD project is broken down into five major steps. The PhD project deliverables are both short and long term. Significant effort is done to develop good presentation materials (PPTs) and reach out

	to important stakeholders in the appropriate sequence as the project progresses with visible results and when found relevant.
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Signatures and dates
Aalborg and Copenhagen, January 15, 2016

Lead advisor, Lars Bo Henriksen, Professor, PhD, Aalborg University

Co-advisor, Poul H Kyvsgaard Hansen, Associate Professor, PhD, Aalborg University

Thomas Poulsen, PhD Fellow, MBA, Aalborg University