

Status Report for DDMF – July 15, 2016
Period: January 1 – June 30, 2016

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 (revised date of completion now expected to be May 15, 2017 due to paternity leave of PhD Fellow Thomas Poulsen in 2016)*
- *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/book chapters, 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 organized as per the table below as of the end of June, 2016:

Project sponsors	Den Danske Maritime Fond (the Danish Maritime Foundation) 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, DTU Risø Wind, Offshoreenergy.dk, J Poulsen Shipping, FTI Consulting, Give Goodwind, Per Aarsleff, AH Industries, Head Energy, DHL Global Forwarding, and A.P. Møller-Mærsk
Project leader and PhD advisors	Lars Bo Henriksen (LBH), Professor, PhD, AAU (lead-advisor) Poul H Kyvsgaard Hansen (PHKH), 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 (TP), PhD Fellow, MBA, AAU

During the half year period of this reporting, the following organizational issues have arisen:

- The salary situation remained unchanged.
- New organizational plan of combined AAU Mechanical and Manufacturing Engineering and AAU CIP departments in Copenhagen has been planned. The future plans in regards to the research area of global wind energy shipping and logistics have not yet been decided upon and discussions did not include the PhD student.
- Several people changes within the Reference Group companies have taken place and new Reference Group companies have been included.

Project status compared to project milestone plan

The project plan consists of five 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. The table contains not only the five areas but also updates on 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	Birth of first child of TP with Stine on May 11,	7 th Advisory Board / Reference Group meeting

<p>Stakeholder Management</p>	<p>2016 at 16:05 PM. Subsequent “fader” leave of absence by TP for 2 weeks immediately thereafter.</p> <p>The 6th Advisory Board / Reference Group meeting took place at the Port of Esbjerg on March 9, 2016 including a subsequent “go-home” meeting. Key conclusion of the meeting was that the logistics is a major component in the area of operations, maintenance, and repairs (“OMR”) for wind farms. Offshore wind farm OMR examples were reviewed and focus was put on both topside and subsea challenges.</p> <p>Collaboration was progressed with researchers (PhD students) from other institutions in DK working on similar projects. Collaboration was also furthered with researchers from DTU Risø Wind, Michigan State University, SDU, and AAU (Rasmus Lema).</p> <p>Participation in the Offshoreenergy.dk Cost Reduction Forum (“CRF”) 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 contact at DTU remains Charlotte Bay Hasager.</p> <p>Meetings with PhD network partners and Reference Group members such as Vestas, Offshore Center Bornholm, DTU Risø Wind, Maersk Broker, A.P. Møller-Mærsk, Head Energy, FTI Consulting, and Offshoreenergy.dk</p>	<p>to take place at Danish Shipowners’ Association in Copenhagen on August 24, 2016 including a subsequent “go-home” meeting. Reference Group member structure may 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 as case study data collection efforts to be used for the PhD thesis has been completed.</p> <p>Progress collaboration with DTU Risø Wind, Boston University, AAU researchers, and others. Initiate and continue 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 stranded EU H2020 funding grants now including logistics in terms of LCE13 and LCE14. The objective is to try to obtain participation of PhD Reference Group as a consortium.</p> <p>Paternity leave of Thomas Poulsen (expected August 29 – November 18, 2016, both days included).</p>
<p>Travels</p>	<p>Dissemination of PhD project findings took place at the Windforce Baltic Sea conference in Rønne, Bornholm on January 27-28, 2016. This included a TV interview with the local news station (TV2).</p> <p>Denmark travels for meetings with particularly Reference Group stake-holders and key “speed boats” in the form of key academic case studies for journal paper writing (Offshore Center Bornholm and</p>	<p>Possibly complete data collection in China with COSCO case study to complete the China offshore wind work.</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>Continue participation in Offshore Center</p>

	Offshoreenergy.dk)	Bornholm cluster formation strategy efforts.
Wind Energy Market Sizing and Outlook	Continued dialogue with particularly DONG Energy, Siemens Wind Power, Vestas, Envision, Danbor/Øer/NSG Wind, Head Energy, Offshoreenergy.dk, DTU Risø Wind, Maersk Broker, Torm, Atkins, and Offshore Center Bornholm.	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 offshore wind in China completed.	Case study project contemplated with Vestas about USA onshore rail market. Additional case studies considered with A.H. Industries, Siemens Wind Power, and Blue Water Shipping.
Wind Energy Supply Chain Costs	Industry-led cost reduction case study continued with Offshoreenergy.dk (as part of CRF). Case study data collection efforts with focus on O&M Logistics (CRF Group 4) were finalized/completed.	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	Successful EU lobbying activities about long-term logistics involvement in H2020 funded EU wind energy calls stranded: The calls with logistics texts successfully secured (new logistics verbiage inserted in H2020 LCE13 and LCE14 calls) were pursued differently by AAU, i.e. AAU chose to pursue these calls with different partners than those project Reference Group members who lobbied with TP for the logistics inclusion.	Understand and possibly participate in different consortia assembling to apply for the EU funding. Possibly support the application process.
Case studies	Work on further case studies (Offshore Center Bornholm cluster strategy and Offshoreenergy.dk INNolog I&C OWF life-cycle project) continued whereas major case study work for PhD output was completed. Journal manuscript writing process initiated.	Exploit finalizing of China case study with COSCO by attending case study trip during summer/autumn of 2016 Continue the Offshoreenergy.dk INNolog and Offshore Center Bornholm Baltic Sea data collection efforts and continue these case studies.

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	No academic conference progress due to internal budget challenges for the project at AAU (not resolved).	Only local Copenhagen academic conference attendance possible due to continued AAU PhD project budget misalignments internally.
Academic and project	Elsevier IJESM special issue journal paper "Reducing cost of energy in the offshore	Academic paper manuscripts to be crafted and submitted to academic journals.

Publications	wind industry: The promise and potential of supply chain management” published after completed peer review. MDPI Energies journal paper “How Expensive Is Expensive Enough? Opportunities for Cost Reductions in Offshore Wind Energy Logistics” published after completed peer review. Charlotte Bay Hasager from DTU Risø Wind was the co-author.	PhD thesis writing to continue.
Academic exchange program	Academic exchange program with DTU Risø Wind in Roskilde extended so far until December 31, 2016.	Continue DTU Risø Wind academic exchange program to complete joint paper writing with researchers there. Thesis writing support will also be provided by DTU Risø Wind researchers as and when needed by TP.
Press in various media	Appearance on TV and various press in connection with Windforce Baltic Sea conference in Rønne, Bornholm on January 27-28, 2016	Additional press pursued on a continuous basis
PhD courses	TP participated in an internal AAU PhD course entitled “Synergies, Conflicts and Trade-offs in Climate Change Planning”. The PhD course took place at AAU Copenhagen on February 15-19, 2016.	Planning for remaining 3 ECTS points to be done with Lars Bo Henriksen. Very limited remaining PhD project funding exists (internal AAU budget limitations). Practical execution therefore remains critically 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. The only exception is the 2+12 week leave of absence in connection with the birth of TP’s son which will defer certain activities. At the same time, this will leave room for submitted manuscripts to become peer reviewed and possibly published before thesis submission. The 14-week paternity leave will only defer the original plan but not cause a delay to the planned milestones. As such, expected PhD thesis hand-in timing will be deferred from end of January, 2017 until 14 weeks later, i.e. the middle of May, 2017.

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				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
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							
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										
4 industry reports for Den Danske Maritime Fond		x	x						x	x														
Stay abroad at foreign academic institution																	x	x						
Ph.d thesis finalization																	x	x	x	x				

Internal AAU discussions pertaining to the PhD project budget continued 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, floating wind, and M&A) have not been initiated. Student project supported case studies have been completed with Offshoreenergy.dk (CRF). Smaller case study projects such as INNolog and OCB have been initiated.

The new communication procedures worked fairly well with some exceptions. The PhD exchange at DTU Risø Wind led to a new socialization at DTU Risø Wind and the overall working conditions for the PhD student were stabilized although the new seating arrangement at AAU was less favourable from an AAU socialization perspective.

The publication targets for the PhD are on track. Three conference papers have been submitted, peer reviewed, and presented at academic conferences in 2013 and 2014. Three manuscripts have been submitted, peer reviewed, and published during 2015 and 2016. One additional manuscript has been submitted for publication in 2016. One manuscript is in the process of being written. The PhD thesis writing process 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. In addition, union support, DTU Risø Wind mentoring, and external counseling initiatives have been invoked.
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	An internal AAU project steering meeting was planned for May 11, 2016 but was cancelled last minute due to the birth of TP's child on that same day. Regular meetings about the academic progress took place between LBH and TP via Skype and a meeting was also conducted in person. DDMF has a standing invitation to join any and all Reference Group meetings and/or call bilateral meetings as and when 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. Brexit and the current Danish government make prospects for UK and Denmark uncertain beyond 2018.
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 TP including academic publications as TP must satisfy these deliverables in order to achieve the academic PhD degree in 2017.
Access to companies and empirical evidence not available?	TP is in close dialogue with relevant companies, organizations, 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. This now becomes more clear with the project's three main case studies and academic output published and under way.
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 LBH, PHKH, DTU Risø Wind, and TP.
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 have also be critical for research at tactical level going forward. As the three key case studies are now more or less completed and paper writing/publication efforts under way, this item becomes less critical.
Lack of backup of relevant stakeholders	The PhD project is broken down into five major steps combined in three research questions. 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. Dissemination efforts, press coverage, and project output has been extensive.

Signatures and dates
Aalborg and Copenhagen, July 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