

Status Report for DDMF – July 15, 2015

Period: January 1 – June 30, 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 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 June, 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: Danish Shipowners' Association, DONG Energy, Siemens Wind Power, Port of Esbjerg, DHL Global Forwarding, Combi-Lift/J Poulsen Shipping, BTM part of Navigant, Per Aarsleff, offshoreenergy.dk, and A.P. Møller-Mærsk
Project leader and Ph.d. advisor	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 (full time) Gang Chen has departed the PhD project

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

- In March, Poul H Kyvsgaard Hansen was added as co-advisor for the PhD project.
- In May, Poul H Kyvsgaard Hansen replaced Martin Heiden Jørgensen as Project Lead/Project Administrator.
- By the end of June, Gang Chen departed the project as his tenure as Assistant Professor with AAU came to its' completion.
- Continued TP salary negotiations took place during the first half of 2015; the negotiations were not finalized (to become in line with original budget approved by DDMF).
- A. P. Møller-Mærsk joined the Reference Group (Chris Jephson).
- 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
<p>Project and Stakeholder Management</p>	<p>4th Advisory Board / Reference Group meeting took place at Per Aarsleff on 17th March, 2015 including a subsequent “go-home” meeting. Key conclusion of the meeting was that industry consolidation is highly relevant in the form of M&A, the step-change in technology will continue to drive innovation in logistics, and the business area of EPC has seen a shift in Denmark lead to Holland/Belgium firms now in pole position.</p> <p>Collaboration was progressed with researchers (PhD students) from other institutions in DK working on similar projects, particularly the ReCoE project of SDU, ECOWindS, DTU, Boston University, and Rasmus Lema, AAU.</p> <p>Participation in launch and follow-up meetings of the offshoreenergy.dk Cost Reduction Forum focus area of O&M logistics.</p> <p>Continuation of collaboration with Michigan State University, Boston University, SDU, and DTU Risø Wind</p> <p>Continuation of collaboration with DONG Energy Wind Power and offshoreenergy.dk on AAU M.Sc student projects</p> <p>Meetings with PhD network partners such as A. P. Møller-Mærsk, Vattenfall, Port of Grenaa, and Port of Rønne</p>	<p>5th Advisory Board / Reference Group meeting to take place at Siemens Wind Power in Brande, 2nd September, 2015 including a subsequent “go-home” meeting</p> <p>Project steering to be continued</p> <p>Academic progress to be driven by academic journal papers</p> <p>Progress collaboration with DTU, Boston University, and 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>One GSD4 student Master Thesis project accepted by DONG Energy related to wind energy shipping and logistics</p>
<p>Travels</p>	<p>In-depth case study trip to China/South Korea cancelled/postponed due to continued internal AAU budget disputes about PhD project (unresolved)</p> <p>Dissemination of PhD project findings at speaker’s corner EWEA Offshore 2015 Copenhagen (March, 2015) and Short Sea Shipping Conference (June, 2015)</p>	<p>Asian case study openings about to “dry out” as momentum built up over last 2 ½ years is not pursued due to budget constraints</p> <p>European case study openings (DanTysk, Anholt, Dogger Bank) about to “dry out” as not pursued due to budget constraints</p> <p>Rasmus Lema UK study visit (July 15-16, 2015)</p> <p>MSSM conference in Nyborg (August, 2015)</p>

	<p>Dissemination of PhD project findings at NEDSI academic conference in Boston (March, 2015)</p> <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 student projects (DONG Energy Wind Power and offshoreenergy.dk)</p> <p>Meeting in Brussels with the EU Commission for lobbying purposes (March, 2015)</p>	<p>Follow-up meeting with EU Commission about lobby work (September, 2015)</p> <p>ECOWindS finalization workshop in the UK (September, 2015)</p> <p>M&A case data collection travels (interviews)</p> <p>Continuation of discussion about “speed boats” with Siemens Wind Power, offshoreenergy.dk, DONG Energy Wind Power, Vattenfall, LIFTRA, A2sea, DHL, and Vestas</p>
Wind Energy Market Sizing and Outlook	Continued dialogue with particularly DONG Energy, Vattenfall, Siemens Wind Power, Vestas, and Envision.	Potential DONG Energy project about 2030 market developments.
Wind Energy Supply Chain Configurations	Detailed case study on logistics R&D continued with DONG Energy Wind Power in collaboration with Master students. Combination of interviews and survey finalized and strategy crafting under way	Case study student projects contemplated with LIFTRA, Siemens Wind Power, DONG Energy Wind Power, and offshoreenergy.dk.
Wind Energy Supply Chain Costs	Industry-led cost reduction case study started together with Master student and offshoreenergy.dk (CRF)	Continued support of ECOWindS project and 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	Participation in MEGAVIND test facilities meetings (June, 2015)	Apply for EU funding to become available in 2017 or 2018
Case studies	<p>Anholt (Europe), DanTysk (Europe), Dogger Bank (Europe), M&A (Europe), and China/South Korea (Asia) case study efforts halted due to internal budget disputes at AAU about the PhD project</p> <p>Student case studies with DONG Energy Wind Power (logistics R&D) and offshoreenergy.dk (O&M logistics) progressed with a total of 5 M.Sc students from AAU</p>	<p>Go to South Korea with Professor Lee from Boston University to open up the case study</p> <p>Exploit opening of China case study with COSCO by attending case study trip during autumn, 2015</p> <p>Ensure that the trail of European case studies are kept “hot” (Anholt, DanTysk) before the opportunity is lost</p> <p>Pursue Statoil/Statkraft Dogger Bank case study opportunity</p> <p>Initiate data collection for M&A case study</p>

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	NEDSI conference forum in Boston (March, 2015): Conference presentation of abstract developed together with Professor Lee from Boston University.	No further academic conference attendance planned due to AAU PhD project budget <u>limitations</u> .
Academic and project Publications	EDSI conference paper book chapter entitled "Changing business models and strategies in global wind energy shipping, logistics, and supply chain management" published in May, 2015 IJESM special issue journal paper draft "Reducing cost of energy in the offshore wind industry: The promise and potential of supply chain management" submitted with Jan Stentoft of SDU and Ram Narasimhan of Michigan State University	Second year industry report to be developed Academic paper manuscripts to be crafted and submitted to academic journals Mid-term PhD project seminar to be conducted as part of Danish Maritime Days on October 9, 2015
Academic exchange program	Plan the exchange program with another university. Overseas exchange abroad no longer possible due to budgetary constraints of PhD project within AAU	Find local solution in Denmark for academic exchange
Press in various media	- Interview in <u>internal</u> AAU "Matchmaker" magazine (March, 2015) - Interview in Nordjyske Stiftstidende about the future of wind turbines (June, 2015)	Additional press pursued on a continuous basis
Ph.D courses	Philosophy of Science, AU, January, 2015 (4 ECTS) Qualitative research methods, RUC, March, 2015 (3 ECTS) EDEN cross-border M&A, EIASM, March, 2015 (4 ECTS)	Planning for remaining 9 ECTS points to be done with Lars Bo Henriksen. Very limited remaining PhD project funding exists.
Lecturing / Supervision	Supervisor 3 GSD2 students (DONG Energy Wind Power case study) Supervisor 1 GSD3 student (DONG Energy Wind Power case study) Co-supervisor 1 student Master thesis project (offshoreenergy.dk CRF O&M logistics)	Co-supervisor 1 GSD4 student Master Thesis (DONG Energy Wind Power)

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				
	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		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						
4 industry reports for Den Danske Maritime Fond					x	x			x	x			x	x			x	x						
Stay abroad at foreign academic institution																	x	x						
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 Asian case study (China/South Korea) efforts have been slowed down critically 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. Instead, student project case studies have been started with offshoreenergy.dk (CRF) and DONG Energy Wind Power (logistics R&D).

In order to secure the continuing progress of the PhD project the following procedures were chosen:

- Going forward, all internal AAU academic dialogue to go through the lead advisor, Lars Bo Henriksen.
- All internal AAU project management related dialogue to go through the co-advisor, Poul H Kyvsgaard Hansen.
- No direct internal AAU communication to take place from the Head of Department or Vice Head of Department to/from TP.

The salary challenges were not resolved and office premises for the PhD student were changed in order to improve the overall working conditions and ensure the successful continuation of the PhD project.

Regarding publications targets for end of this year, these are in progress for being achieved with the completion of the EDSI2014 conference paper conversion to a book chapter and the Ram Narasimhan/Jan Stentoft article manuscript submitted to IJESM. The Rasmus Lema journal article, the LogMS2013 conference paper re-write, and the first DONG Energy Wind Power article are being worked on.

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 not take place during the period of August through December, 2014 due to internal organizational challenges and the departure of the lead advisor from the PhD project. DDMF has a standing invitation to join any and all Reference Group meetings and/or call bilateral meetings as needed (such a meeting took place with TP on December 5, 2014)
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.
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.
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 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.

Signatures and dates
Aalborg and Copenhagen, July 15, 2015

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