

PROJECT DESCRIPTION

SmallWind – Market Analysis and Prospects

Supporting Annex for project application to the EUDP 2014-I call

November 201

Contents

Resubmission key notes.....	3
1. Introduction	3
2. Background	4
3. Concept and objectives.....	5
4. Activities and work plan.....	7
4.1. Work plan and partnership overview	7
4.2. Work Package descriptions.....	7
5. Market and Competition analysis.....	13
5.1. Market Overview: forecasts, potential and drivers	13
5.2. Analysis of competition.....	17
5.3. SmallWind Value Proposition	21
6. Results and exploitation.....	22
6.1. IPR	22
6.2. Route to market.....	22
7. Project implementation and partnership	24
7.1. Project structure	24
8. SmallWind partners	25
8.1. Partners description.....	26
8.2. CV's of key staff involved in the project	33
Michael Brinch-Pedersen	43
9. Letters	44
10. Other participants (sub-contractors).....	49

Resubmission key notes

The present application SmallWind for EUDP 2014-I is a modified version of the SmallWind application EUDP 2013-II (J.nr. 64013-0518) where we have taken out all technical development and solely focused on market part of the original proposal.

As a result of the delay in EU approval of law # 900 of July 4, 2013 the Danish Smallwind market came to a halt in spring 2014, due to insecurity of the feed-in tariff. Export has not yet taken off for the small wind manufacturers to an extent it can replace the loss of the Danish market. Subsequently the smallwind business in Denmark lost more than 60% of its employment during the summer of 2014.

The Danish manufacturers are looking at various options for export, but it is still in the initial phase. Hence this Market Analysis and Prospects is highly needed for the industry.

1. Introduction

The exploitation of wind energy has been a key driver of Danish and European environmental and energy policies. Technical breakthroughs have allowed for an expansion of installed capacity during the years to a total installed capacity of 282 GW globally in 2012, with the size of turbines constantly increasing both onshore and offshore: yet, small size wind turbines (SWTs) for urban and periurban areas, still lack innovative solutions for addressing technical challenges and realize a considerable market potential.

The Act for Promotion of Renewable Energy, 2008 promoting the propagation of electricity production plants with a minor electricity production capacity, sets up appealing production incentives to boost the SWT market segment, which in Denmark holds around 15 manufacturers with certified turbines with a swept area below 200 m².

At European level, the WIND ENERGY ROADMAP for 2010-2020 also sets ambitious targets for wind energy penetration in the supply mix and for job generation in the sector. To meet these targets, one of the focus topics defined is to accelerate the reduction of turbine cost and improve techniques for assessing, minimizing and mitigating social and environmental impacts and risks¹ - mirroring the objectives of this project for SWTs.

Within the scope of Smart Cities and Communities, the project indirectly contributes to the European objectives of a specific SET-Plan industrial initiative - Smart Cities & Communities Initiative - for integrating energy, transport and ICT solutions to increase energy efficiency in urban environments, supporting cities and regions to achieve reductions of greenhouse gas emissions.²

Though several countries have adopted policies that favour SWT, the export possibilities have only been sparsely explored by the Danish SWT manufacturers with a few sporadic sales. Support avenues on export efforts are often at a cost level beyond the appetite of the SWT manufacturers and never directly aimed at their market segment.

¹ Technology Roadmap, Wind energy, International Energy Agency. 2009.

² http://ec.europa.eu/energy/technology/initiatives/smart_cities_en.htm

This project will establish an analysis of the market possibilities for SWT and illustrate the support measures available from the diplomatic network of the Danish government and Business Development Centres established in the regions. The avenues for support and market research will be conveyed in a workshop and stated in the final report. Moreover, a campaign for establishing export will be tried out in reality in cooperation with the Danish Consulate in Toronto, Canada.

Also the aim of the project is to establish a detail market analysis of the possibilities and prospects of the home market. The partners are aiming for this work to be executed by a recognized company.

2. Background

The development of the wind turbine industry in Denmark started with 15-30 kW wind turbines for installation by private persons in combination with a household. Manufacturing was by pioneers that were slowly exchanged by small companies whose entrance on the scene was facilitated by the existence of commercial blades on the market. After a rather short concept competition and selection phase, most effort has subsequently been on upscaling of turbines associated with an optimization that has been facilitated by the development of gradually more sophisticated design tools. The demand for larger turbines from the main stream market was the driving force, with the vision of supplying the world with competitive clean electricity on a large scale fed into the public power system. Large MW turbines are a necessity for this vision to come through.

For the consumer, there are many advantages to owning a turbine, and it is vital that individuals are given the opportunity to play their part in the energy sector rather than relying solely on large-scale corporations.

Even though smaller turbines were the origin of the development, the established industry lost focus on these sizes and the associated market. Much later, a revival of the interest for smaller turbines happened, however, not by involvement of the established wind turbine industry, and the situation today is that the emerging small wind industry has only minor interaction with the large scale industry. It is the assumption and the overall objective of the SmallWind project that such an interconnection and exchange of knowledge and tools could boost the small wind industry, and that this in the long run could have a beneficial influence and create dynamics in the established large scale industry.

On the global scale, several different SWT's are available on the market. However, most of them are not up to the demands of longevity stated in the industrial standard IEC 61400-2, but the Danish are. This gives the Danish brand the upper hand on technology, but a challenge in competing on Cost of Energy ("CoE"). The typical solution to such dilemma is marketing and strong references.

Benchmarking of SWT is often done with MW scale wind turbines, and here the SWT loose on CoE. However, MW size installations often require expensive modifications and reinforcements in the electrical network, whereas SWT typically have a size that allow direct connection without any need of reinforcements or modifications. Moreover most of the energy produced is consumed on location.

Off grid applications are literally none existing in Denmark. In other countries they are common, and often owned by utilities holding concession for distributing electricity in a defined area. Price restrictions often mean that these off grid installations are operated with significant losses for the distributor. In Neuquen province Argentina, the utility EPEN acquired 3 Danish SWT of 25 kW to operate in such installation in a remote village. These 3 turbines offset 60,000l diesel per year, and thus provide a payback of 3-4 years for the utility. Tens of thousands similar possibilities exist throughout the world. The benefit of such scenarios is that the customer has understanding for quality of the SWT, and here Danish SWT stand with a strong brand. However, it needs to be told to the world.

The market for SWT is growing at a rate of 20-30 %⁽³⁾ per year for grid connected versions, whereas the diesel offsetting installations are just at their beginning.

3. Concept and objectives

The main objectives of the project are:

- Improve the insight of the market potential for SWT on the national as well as the international arena.
- Identify industrial business plans for manufacturing and marketing.
- Provide insight and raise the knowledge of doing export among the Danish SWT manufacturers by means of practical training and issuance of a handbook that serve as a roadmap to exporting SWT.
- Demonstration and realization of an export campaign in an attractive market.

When starting up a new market, it is important to know where the “low hanging fruits” are. This requires a market research which primarily identifies markets with an established policy in favour of SWT installations. Secondly it is vital to know any technological obstacle in the market which can be related to Type Approval, Electrical Codes, Planning requirements, Climate etc. Thirdly it is necessary to have knowledge about Legal Issues (liability, warranty etc.), Competition and market appetite.

There are several challenges, which the consortium needs to overcome in order to achieve the project objectives. The following table summarises the key challenges/barriers, along with this project’s strategies to overcome them and advance knowledge in the field.

Table 1: Barriers and challenges for SmallWind.

Area	Barrier(s)/Challenge(s)	SmallWind	Work Packages involved
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Market selection	Knowledge to the market, Language, Legal issues, Distance, Technical Approvals, Grid Codes.	Comprehensive knowledge to what markets are hot, and what the obstacles are.	WP1 WP2 WP5
Documentation	Manuals and Technical Information material lacks international level.	Roadmap to required information level needed in product documentation.	WP4
Readiness	Insufficient experience and skills.	Workshop, that highlights the actual process of exporting a long life product.	WP3
Capacity	Lack of understanding customers' expectations on delivery time and quantity, payment terms etc.	Roadmap to how distribution is made in the best way in consideration of market and own resources.	WP3 WP6

The achievement of these goals will facilitate the expansion of the Danish industry for SWTs by making them better equipped to meet the challenges on the export markets.

4. Activities and work plan

4.1. Work plan and partnership overview

The work plan consists of 6 work packages:

WP1	Export & Marketing Initiative
WP2	Danish Market Forecast & Barriers
WP3	Danish Manufacturers Business Model
WP4	Workshop
WP5	International Market Description
WP6	Project Management and Task Force

The project comprises of partnership of DTU and six SMEs:

DTU	DTU Wind Energy
BM	Brinch Management
EM	Ecology Management
RMW	Ringkøbing Maskinværksted/Solid Wind Power
HSW	HSWind
TWP	Thy Windpower
OW	Olsen Wings

Additional the project is enriched with subcontractors to DTU and via Ecology Management supported by Væksthus Midtjylland:

DA Toronto	The Royal Danish Consulate General in Canada / The Royal Danish Trade Council
BTM	BTM Consult – final confirmation still in preparation
VM	Væksthus Midtjylland

4.2. Work Package descriptions

WP Number	1	Start Month	3	End Month	11		
WP Title	Export and Marketing Initiative						
WP objectives							

Working in practical strategy for inclusion of export in individual business models			
Description of work and role of participants			
<p>Task 1.1 – Export model/strategy (DTU, RMV, HSW, OW, TWP, EM, BM) The present model/strategy is individually described through interview performed by DTU and BM. Questionnaire is developed by DTU, EM and BM</p> <p>Task 1.2 - Options for Export Promotion (DTU, BM, EM) Various relevant options for model/strategy are presented by experienced exporters of similar technology complexity. Export channel by Agent, Sales Office, Internet Shop, Subsidiary is discussed from cost- practicality- legal perspective</p> <p>Task 1.3 - Export handbook via Vaeksthus (EM; VM) Vaeksthus Midtjylland has a department for assisting corporations in setting up export at a practical level. Access to template forms for agreements and templates for other legal paperwork and explanation to their use and limitations.</p>			
Work Package Deliverables			Delivery Month
D1.1	A toolbox of template documents suitable for exporting SWT		6
D1.2	Guidelines for implementing export in business plan		8
Work Package Milestones			Delivery Month
M1.1	Report on outcome from workshop		8

WP Number:	2	Start Month	3	End Month	7		
WP Title	Danish Market Forecast & Barriers						
WP objectives							
A comprehensive and up to date report and forecast for the Danish SWT market							
Description of work and role of participants							
<p>Task 2.1 – Report on Forecast and Barriers (EM) The work is foreseen to be made by BTM Consult as a subcontractor to DTU. BTM Consult has long experience in describing markets and making forecast. Also the company did a market analysis for smallwind 15 years ago for Denmark. Terms of Reference will be worked out by EM on behalf of DTU.</p>							
Work Package Deliverables							Delivery

				Month
D2.1	A comprehensive report and forecast of the Danish SWT market			7

WP Number:	3	Start Month	1	End Month	9		
WP Title	Danish Manufacturers Business Model						
WP objectives							
Inclusion of export in individual business models of the industry.							
Description of work and role of participants							
<p>Task 3.1 – Prepare interview framework (BM, EM, DTU) For the purpose of getting an impression of the status of resources, competence, efforts taken and export performed a questionnaire is developed.</p> <p>Task 3.2 - SWOT Analysis (BM, DTU) Based on outcome from questionnaire and individual interview individual and general SWOT analysis is made in cooperation with the SWT manufactures.</p> <p>Task 3.3 - Model for Market Penetration (BM, EM, DTU)</p>							

A general model for market penetration is made and will be part of the final report. Individual models for market penetrations will also be made in close cooperation with the individual manufacturer.

Task 3.4 – Product Portfolio Alignment. (DTU, EM, BM)

The different markets have different certification rules; grid-codes, voltage and frequency, single or 3 phase systems. Building codes may be different as well. This calls for modifications on electrical and in particular tower height(s) and maybe also design.

Work Package Deliverables				Delivery Month
D3.1	A general SWOT analysis for the SWT business			8
D3.2	Guidelines for technical modifications to Danish version			8
Work Package Milestones				Delivery Month
M1.1	Report on outcome from workshop			8

WP Number:	4	Start Month	6	End Month	6		
WP Title	Workshop						
WP objectives							
To focus the project and exchange of experience and discussion of ways for market penetration							
Description of work and role of participants							
<p>Task 4.1 – Programme/Workgroup Areas (BM, DTU, RMV, HSW, OW, TWP, EM,) Determine areas for workgroups. Setting up programme for workshop. Decide on venue.</p> <p>Task 4.2 - Logistics (BM, EM) Clarify venue and AV equipment needed. Engage speakers and other practicalities.</p> <p>Task 4.3 - Conclusions Recommendations from Workshop (BM, EM, RMV, OW, HSW, TWP) Prepare report that concludes the findings of general nature with regards to export readiness, methodology and strategy.</p>							
Work Package Deliverables							Delivery Month
D4.1	Workshop Report						8
Work Package Milestones							Delivery Month
M1.1	Workshop						8

WP Number:	5	Start Month	2	End Month	17		
WP Title	International Market Description						
WP objectives							
Comprehensive description of the International market potential for SWT							
Description of work and role of participants							
Task 5.1 – Canada (DTU, DA Toronto)							

The report section on market potential for SWT in the Canadian market is handled solely by the Danish Consulate Trade Commission in Toronto Canada as supplier to DTU.

Task 5.2 - China (DTU, BM, DA Toronto)

The report section on market potential for SWT in the Chinese market is handled in cooperation with the Danish Consulate Trade Commission in Toronto Canada in close cooperation with their colleagues in Beijing China, as supplier to DTU. The network within IEC and IEA small wind industry will be involved in this task.

Scope of the work will also discuss possible impact from the reverse export/import between Denmark and China.

Task 5.3 - Europe (EM, HSW, RMV, TWP, OW)

After the same template as used in task 5.1 and 5.2. the market potential in selected European countries are described.

Task 5.4 – Emerging markets (EM, HSW, RMV, TWP, OW)

Market segment such as UN and National aid programmes for SWT as grid connected, stand alone and wind diesel will be described.

Work Package Deliverables			Delivery Month
D5.1	Market Approach 1 week delegation		
D5.2	A comprehensive Market report for SWT for selected markets		12

WP Number:	6	Start Month	1	End Month	14		
WP Title	Project Management						
WP objectives							
Management of the Project, Task Force and dissemination of results.							
Description of work and role of participants							
<p>Task 6.1 – Project economics and book keeping (DTU) Maintain proper book keeping and release payments and prepare for audit.</p> <p>Task 6.2 - Task force (DTU, BM, EM, RMV, TWP, HSW, OW) All members of the consortium meet in task force gatherings for the purpose of evaluating progress and align work.</p> <p>Task 6.3 - Consortium Agreements (DTU) As one of the first tasks Consortium Agreements will be signed by all participants.</p> <p>Task 6.4 – Records of Meetings (EM, BM) All meetings will be recorded in minutes of meetings.</p>							

Task 6.5 – Liason with EUDP Project Officer (DTU, EM, BM)

In support of periodic status reports the project manager will be available.

Task 6.6 – Management periodic status report (DTU, EM, BM)

On a quarterly basis the management will release a status report for the previous period.

Task 6.7 – Market Approach 1 week delegation (DTU, BM, EM, RMV, TWP, HSW, OW)

Orchestrated by DA Toronto, the consortium members will try out a Market Approach in reality.

Task 6.8 – Paper Presentation (DTU, BM, EM)

Pursuant to press releases the final report will be presented at an event.

Work Package Deliverables				Delivery Month
D6.1	Final Paper for the project.			14
Work Package Milestones				Delivery Month
M1.1	Final Paper			14

5. Market and Competition analysis

5.1. Market Overview: forecasts, potential and drivers

As previously described, the main objective of SmallWind is to enable the production of advanced, cost-effective small wind turbines (SWTs) through a close, continuous corporation between the wind turbine research community and the SWTs manufacturers, transferring new knowledge into the design process based on adequate adaptation of existing advanced design tools for MW turbines and resulting in e.g. new airfoils for SWTs and optimized structural and aerodynamic turbines. Therefore, the market potential for SmallWind results is directly associated with the **market potential and drivers for SWTs**. Within the wind industry, the definition of SWTs remains contested, and is not subjected to common standards. In the following, for the purpose of dimensioning the SWTs market, figures from the World Wind Energy Association (WWEA) are presented, wherein 100 kW is chosen as the reference upper capacity limit³.

Europe has ambitious targets for renewable energy deployment. By 2020, 20% of energy consumption should be met by renewable sources⁴. It is expected that wind power delivers the largest contribution to meet these targets. Estimates indicate that the total wind capacity installed by 2020 will produce 582 TWh of electricity, enough to

³ Small wind World Report 2012 Summary, WWEA, 2012.

⁴ http://ec.europa.eu/clima/policies/package/index_en.htm

meet 14.3% of the EU's total electricity demand. The EC 2050 Roadmap⁵ further fosters this development with the target to cost-efficiently reduce European Greenhouse Gas emissions by 80-95%, by 2050. This goal can only be achieved with significant deployment of renewable energy generation, with wind energy as a key generation source.

Until today, major developments in wind energy have focused on large wind turbines' projects (both onshore and offshore). Specifically for onshore, the design and deployment of large wind turbines in attractive areas of high wind speed have led to significant shares of wind energy fed into the electricity grid in several European countries. However, these projects are currently facing some problems related to space and financing restraints and to some public resistance^{6,7}:

- The availability of onshore sites for the installation of large wind farms is reaching saturation, especially in Western Europe countries due to dense urbanization. Moreover, the scaling up of onshore turbines is facing strong challenges due to the logistics of transporting very large components to remote onshore locations.
- Large wind parks require very large investments and the EU wind power market has grown slower than expected during the recent years due to the financial crisis and reduced demand for wind energy. Difficulties in seeking financing for large wind power projects and overcapacity in the market further added to slow-down in the market.
- The remoteness of large wind parks from consumers also results in large investments in distribution networks.
- Finally, the public resistance against large turbines is considerable due to visual impact on surrounding environment.

In this background, and given the abovementioned problems, **smaller turbines are gaining momentum and relevance all over the world as a reliable alternative for the production of clean and affordable energy** (not directly competing with large wind energy projects). SWTs are usually applied for:

- **Distributed generation**, i.e., small projects with a single or few turbines installed rather close to existing distribution network and the consumers.
- **Local supply to local network**, i.e., islands and remote places not served by the main electrical power supply system; typically powered by diesel generators.

In specific, applications for distributed SWTs can be divided into⁸:

- **Small-scale remote or off-grid power**: Supplying energy to rural, off-grid applications in the developed and developing world. This segment encompasses either individual homes or small community applications and is usually integrated with other components, such as storage and power converters and PV systems.
- **Residential or on-grid power**: SWTs used in residential settings that are installed on the house side of the home electrical meter using net metering to supply energy directly to the home. Excess energy is sold back to the supplying utility.
- **Farms, small business, and small industrial wind applications**: Supplying farmers, small businesses, and small industrial applications with low-cost energy. The loads represented by this sector

⁵ Energy Roadmap 2050, COM(2011), European Commission.

⁶ European Wind Energy Markets, Frost and Sullivan, 2011.

⁷ Technology Developments in Offshore Wind Industry—Technology Market Penetration and Roadmapping, Frost and Sullivan, 2011.

⁸ T. Forsyth and I. Baring-Gould (2007) Distributed Wind Market Applications, National Renewable Energy Laboratory (NREL)

are larger than most residential applications, and payback must be equivalent to similar expenditures (4 to 7 years).

- **Wind/diesel power systems:** Providing power to rural communities currently supplied through diesel technology. The rising cost of diesel fuel and increased environmental concerns regarding diesel fuel, transportation, and storage have made these projects' economics more sensible.

Although the market for small wind power systems has been in existence for 30 years, there are many signs that the industry is reaching a critical juncture. Nevertheless, the overall opportunity for small wind power remains strong across a variety of applications in both developed and developing countries.

The global market for small wind has been experiencing a steep growth – recent trends of the SWTs industry show an annual 35% increase in the new installed capacity for the past years. By the end of 2011, a cumulative total of at least 730.000 SWTs were installed all over the world (excluding India and Italy), 74.000 of which were newly erected that year. China continues to be the dominant player, overshadowing other major markets, with a cumulative number of more than 500.000 units installed by 2011, which represents 40% of total installed capacity.

The Chinese market is followed by USA (with 35% of global installed capacity) and the UK⁹. However, and according to RenewableUK, the UK market for SWTs surpassed the US market in 2012, with around 22 MW installed that year compared to 18.4 MW in the US^{10,11}. Only in 2011, the total number of SWT units sold in the UK accounted for almost €75 million (sales revenue rose dramatically compared with the previous year). The majority of these turbines were installed on farms and domestic rural properties, which shows the role of small wind in revitalising the rural economy. The reasons for UK leading position are related to internal policies and incentives, investor appetite, rising electricity prices and increased public awareness concerning the technology and its benefits. In addition, it was also verified a large increase in exports of UK built turbines, showing that the UK is a leading player in the sector and is building up a world-leading skills base¹².

In the US, the 18.4 MW of new installed capacity represented nearly 3.700 turbines and \$101 million in investment. SWTs sold in 2012 resulted in cumulative U.S. sales surpassing 216 MW, representing more than 155.000 total units sold since 1980. Particularly, in 2012, SWTs comprised 35% of all U.S. wind installations (both in distributed and non-distributed applications)¹³.

In terms of new installed SWT units, and according to the WWEA 2013 report, Canada ranks fourth worldwide. Canada has pledged to reduce greenhouse emissions by 17% before 2020. The sustainable movement is expressed by Canada's exceptionally strong growth in 2013 with a record of close to 1600 MW of new wind installed capacity, ranking 9th in the world within total installed capacity – with more than 7800 MW of wind energy in operation.

Particularly, for small wind, the annual sales of SWTs are in the range of 600 to 800 units, with a total rated output between 800 W and 1,000W. This represents roughly \$4.2 million in annual sales, including \$2.3 million for mini wind turbines, \$1.2 million for small wind turbines and \$0.7 million for medium wind turbines.

⁹ Small Wind Report Update 2013, WWEA, 2013.

¹⁰ Small and Medium Wind – UK market report, RenewableUK, October 2013

¹¹ 2012 Market Report on Wind Technologies in Distributed Applications, US Department of Energy, August 2013.

¹² Small and Medium Wind energy crucial for the rural economy. Renewable UK Press release. October 2013.

¹³ 2012 Market Report on Wind Technologies in Distributed Applications, US Department of Energy, August 2013.

Incentives for installing a small wind turbine are an important contribution for the success of the small wind market as they can help lower the cost of the systems. Canada has currently the highest feed-in-tariff for small wind¹⁴.

In Europe, other countries that may see a faster development of the SWTs market, due to high public awareness and incentive policies, include The Netherlands and Germany¹⁵. Demark is also expected to find a world leading position in the small wind energy market. Since November 2012 the feed-in tariff scheme has been under reconstruction. In May 2013 the proposal is 2,50 DKK/kWh for small wind under 10 kW and 1,50 DKK/kWh for small wind between 11 and 25 kW. At present, the notification of the law is pending in the EU-system, thus awaiting the final conclusion by spring 2014. Currently, the feed-in tariff of 0,60 Dkk/kWh is utilized.

The remarkable growth of the past years is anticipated to continue until 2015, reaching an annual installation of 400 MW of SWTs. After this period, it is expected a steady compound growth rate of 20% until 2020, with a cumulative installed capacity of 5 GW anticipated to be reached by this time (see Figure 4)¹⁶. WWEA expects that by 2020, with the estimated annual growth rates, the world market for SWTs can reach a size of 1 billion €¹⁷.

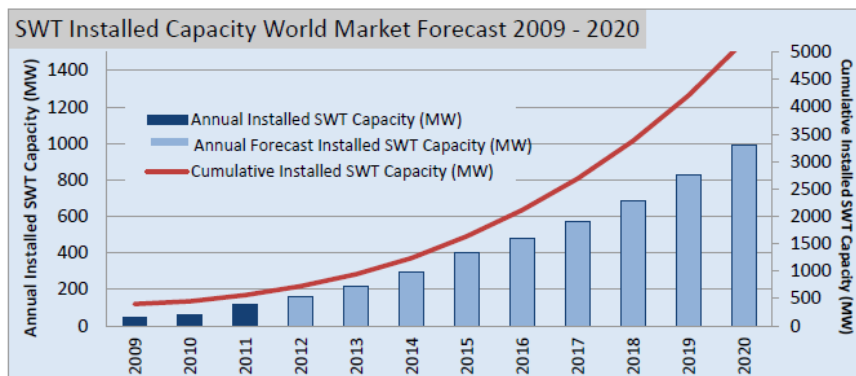


Figure 4: Small wind turbine installed capacity global market forecast (2009-2020).

Increasing fossil fuel prices, global warming and the ever-growing electricity demand will continue to be the three long-term drivers of the SWTs industry. Political support is expected, as well, to increase the installed capacity of SWTs in the upcoming years – Governments and international organisations (e.g. IRENA) have started to understand the potential of small wind and, therefore, are now more and more including small wind in their renewable energy programmes. However, in the long term, this industry may even slowly evolve from a policy-driven model to one that is based on the **productivity and affordability of the turbine itself**. The future of the SWT industry will, thus, depend on the cost of the technology, along with certification and quality assurance¹⁸.

Small Wind Turbines can undergo type certification according to IEC 61400-22, as the case for Denmark. However, in reality, SWTs are not certified under this scheme. Alternatively, several other certification schemes have been developed, such as the Microgeneration Certification Scheme (MCS) in the UK, the Small Wind Certification Council (SWCC) in the US, the CE compliance in Europe, etc. IEC 61400-2 serves, at the end of the day, as a substantial base for the majority of those schemes (as the relevant national standards for SWTs are

¹⁴ Small Wind Report Update 2013, WWEA, 2013.

¹⁵ Small Wind Turbines Market in Europe, Frost and Sullivan, 2010.

¹⁶ Small Wind Report Update 2013, WWEA, 2013.

¹⁷ http://www.wwindea.org/home/index.php?option=com_content&task=view&id=369&Itemid=40

¹⁸ Small wind World Report 2012 Summary, WWEA, 2012.

based on IEC 61400-2), however, no uniform certification process exists and in most cases, certification under one scheme is not recognized by the others (a partial exception is the provisional recognition by SWCC of turbines certified under the MCS). Furthermore, those schemes have only limited application – for example, SWCC scheme has been adopted only by some of US states, and in many cases the certification is not at all required.

Despite the large demand for SWTs observed, the market remains fragile¹⁷. The SWTs market has not developed to the same extent as the large wind turbines due to a number of reasons, including, but not limited to: lack of government support policies (only a relatively reduced number of countries have yet implemented specific feed-in tariffs schemes), lengthy authorisation and permitting processes, and, importantly, technical and performance issues which have been affecting the image of small wind technology¹⁹.

Currently, the market is dominated by proven old designs, with key figures on performance dwarfed by modern MW size turbines, basically due to the lack of innovative engineering. Therefore, technology advancements for onshore smaller wind energy technologies are increasingly being sought.

5.2. Analysis of competition

Among the results of this project is a benchmarking of the main suppliers in the market with respect to:

- Technology related to CoE
- Technology related to maintenance costs
- Market visibility and segments
- Distribution channels
- Financial strength

SWT manufacturers

The development of SWTs remains clustered around countries in North America and Europe, with five countries accounting for over 50% of the SWT manufacturers (Canada, China, Germany, the UK and the USA). By the end of 2011, there were over 330 SWT manufacturers in the world offering complete one-piece commercialised generation systems²⁰. However only a minor number of the SWT manufactures does hold a certified turbine on commercial terms. Key success factors for a SWT manufacturer are closely associated with unique patented design and continuous R&D – the competitive edge is achieved by minimizing/optimizing use of material and man-hours spent in design and manufacturing, while raising power performance.

In the following pages (Table 3), we provide a list of the main SWT manufacturers together with some product specifications. Currently, the most relevant competitor is Gaia Wind (certified in Denmark and in UK to the MCS-scheme) that 3 years ago moved from Denmark to Scotland. This company produces a turbine at a reasonable technology level, however, is lacking knowledge and tools for further development. In addition, a number of Chinese manufacturers are also considered competitors (e.g. Osiris Energy), however, with products at a low technology level. As mentioned in section 2 of this Annex, so far, the quality of the majority SWTs imported from




¹⁹ Small Wind Turbines Market in Europe, Frost and Sullivan, 2010.






²⁰ Small wind World Report Summary, WWEA, 2012.

China does not comply with IEC/EN/DS-standards. In Canada and the US there are also some relevant competitors:

- In Canada there is a handful (5-8) of listed suppliers of small wind turbines. However not all of them are active in the market, and several are known not to perform as promised. Furthermore, there is no evidence of suppliers in the ranges of certified wind turbines of 25 kW. Therefore, it is considered a strength to the consortium that the market approach is small wind turbines designed with the tools of today and matching the level of international standards and certification.
- In the US the competition is considered tenses, as an increasing number of small wind manufacturers are having their product tested and certified to the Small Wind Certification Council (SWCC) requirements. However most of these turbines are of European origin.

Table 3: Main small wind turbine concepts and manufacturers.

SWT Model	Company / Country	Rated Power (kW)	Design life-time (years)	Design standard	Certification	Annual energy production (kWh)	Rotor Braking system	Blade		website	
								Number of blades	Blade type		Blade material
 EO-25/12 Wind Turbine	Eocycle Technologies Canada	25	20 (min.)	IEC 614002, wind class IIA / AWEA Standard 9.1 – 2009	AWEA / MCS (Testing in progress)	115 400* (8 m/s)	Normal shutdown: Generator with yaw assistance Emergency shutdown: Diskbrake with yaw assistance Emergency rotor brake type: Failsafe spring activated disk brake	3	Aerodynamically efficient airfoils: proprietary design using a combination of high efficiency airfoils, maximum $C_p > 0,46$ for $TSR \approx 8$	Carbon Fiber/Glass Fiber/Epoxy composite with integrated mesh for lightning protection	http://eocycle.com/products-services/direct-drive-wind-turbine/
 KW15	Kingspan Wind UK	15.7 kWp (peak power)	-	IEC61400-2	MCS (Testing in progress)	60 000 (8 m/s)	Electro-mechanical fail-safe braking Fail-safe electro-mechanical braking mechanism (monitored and controlled by the inverter).	-	-	Thermoset with Carbon Spar	http://www.kingspanwind.com/pdf/KW15.pdf
 CF20	C&F Green Energy Ireland	20 (max)	-	IEC 61400-2	MCS	93 578 (8 m/s)	Hydraulic rotor brake system - The braking system is designed to gently bring the turbine to a halt. Critically, the braking system is based on a failsafe operation principle, such that if grid power is lost, the brake automatically engages.	3	-	Polyurethane foam core, wrapped in glass fibre, and infused with vinyl ester.	http://www.cfgreenenergy.com/sites/default/files/CF_Green_Energy_Brochure.pdf

 Osiris10	Osiris Energy China	10	-	IEC 61400-2	IEC 61400-2 AWEA 9.1 JSWTA	~47 000 (8m/s)	Electrical brake	3		Carbon fibre composite	http://www.osirisenergy.com/download/Osiris_10_Specification_Sheet.pdf
 Gaia Wind 133-11 kW	Gaia Wind A/S UK	11	20	IEC 61400 Class III	MCS HB	46 527 (7 m/s)	Three levels of safety features including: - Passive stall control - Mechanical brake activation - Deployment of centrifugally activated tip brakes	2	-	-	http://www.gaia-wind.com/133-11kw-turbine/certification/
 Polaris	Polaris America USA	25	20	IEC SWT Class II standard IEC 61400-2	-	130 800 (8 m/s)		3	-	-	http://www.polarisamerica.com/wp-content/uploads/2012/11/Model-P12-25kW-Spec-Sheets-REV0.pdf http://www.polarisamerica.com/turbines/wind-turbines-for-farming/
 Huaya Turbine	Shandong Huaya Industry Co., Ltd China	25	-	EN61400-2	-	25000 – 75000 (min-max)	Electromagnetic brake + manual brake	3	Aerofoil blades with protection film	Polyester resin reinforced with fiber glass	http://www.huaya-turbine.com/te_product_a/0/0.chtml
 SUREOC 38-25	SUREnergy USA	25	20	IEC 61400-2, wind class II	-	-	Dynamic dissipative generator stall (braking time @ max RPM < 6 seconds), yaw-assisted for emergency / fault-alarm conditions; emergency disk brake. .	2	-	Epoxy/glass fiber composite	http://www.surenergy.us/sureoc38-25.html

5.3. SmallWind Value Proposition

According to a recent WWEA small wind report²¹, today, cost is one of the main factors and challenges in the dissemination of small wind. RenewableUK²² commissioned Element Energy to assess the cost of small and medium wind projects. The elaborated study showed that project costs have risen around 20% since 2009. A number of reasons for this increase were identified, including the following:

- Previous costs were driven down by cheap products that have since failed to gain certification;
- Development work has focused on improvements in performance (energy production) rather than reducing capital costs, as this is currently a more effective way to reduce the cost per kWh;
- Increases in material prices;
- Certification costs.

The SWTs industry is still under development and before the establishment of economies of scale it will be difficult to significantly reduce manufacturing costs. Still, and despite modest, cost reduction in the short term is feasible, namely through improvements in the design, material optimization, and improvements in manufacturing efficiency.

With an estimated global growth rate of 20% until 2020 it is expected that the Danish manufacturers of SWTs can maintain their market share if their products are unchanged and develop in small incremental steps. However, there is also the risk that other manufacturers abroad develop even better SWTs and the Danish manufacturers loose market shares.

SWOT analysis

Strengths:

- Know-how in the market place
- Several man-years of experience in small turbine technology and certification
- Numerous market tools that can be arched and dedicated SWTs
- Knowledge base to assist in market segment selection

Weaknesses

- An industry and a community on SWTs is hardly existing and only emerging

Opportunities

- Growth of SWTs market and untapped opportunity
- Development of cost-effective SWTs and a new industry on more firm basis
- National funding/FIT

Threats

- Limited financial capability of small companies
- Competitors' new innovations and commercial strengths

²¹ Small Wind Report Update 2013, WWEA, 2013.

²² Small and Medium Wind – UK market report, RenewableUK, April 2011.

6. Results and exploitation

This project will generate three main exploitable results:

- A comprehensive market analysis for SWT
- A roadmap for exporters of SWT guiding on resources needed and selection of distribution strategy
- A hands on approach in a known prospective market for SWT

Alongside these results are market analyses in an area where the small wind turbine type certificate issued in Denmark is considered valid for installation in the targeted market. This figures equally as an output of the project.

6.1. IPR

It is not expected that any IP will be relevant. Any information provided by the SWT manufacturers will be treated with absolute confidentiality and strong and weak issues will be described as general issues.

6.2. Route to market

After securing protection of generated foreground, the project manager will establish, in dialogue with the consortium, more specifically the industrial partners, how best to disseminate project results. Beyond the activities targeting the scientific community, attending conferences and publishing papers on the advancements obtained, specific strategies will be defined for groups or target audiences – among these national and international SWT manufacturers, end-users of all segments previously described, regulators, standard committees and policy-makers.

Route to market is illustrated in the figure above, where the different target groups and the benefits derived from the project are identified, together with the steps towards commercialization. The industrial partners participating in the project will further benefit from being first users of the integrated approach in SmallWind, as they will have their products optimized at the end of the project.

Audiences for dissemination efforts and networking activities will primarily consist of end-users (farms, small businesses and community projects) and of turbine manufacturers. The benefits for end-users are detailed above in section 5.3. Other stakeholders targeted include national decision-making bodies and international certification institutions. In addition, national and international organizations and networks – e.g. The 'Energy Agency's Secretariat for the Danish Wind Turbine Certification Scheme', the Danish Wind Industry Association, the European Wind Energy Association, the European Energy Research Alliance (EERA) Joint Programme on Wind Energy (DTU coordinating) – will provide platforms for a broad dissemination of the project results.

A strategy to ensure wide dissemination and communication across stakeholders and key sectors will be presented in a Dissemination Plan, which will be established by the Project Manager in consultation with all

project participants. The dissemination strategy will be implemented taking into consideration that all relevant IPR must be protected before dissemination.

The SmallWind consortium is favourably positioned for an effective European launch. The potential first sales of SWTs developed using the SmallWind technology are expected to be conducted through contracts with established customers – HSW and RMV have already a key position and established distribution networks in Denmark (HSW has the leading position in Denmark on the 25kW turbines market, with 1MW installed only in 2013; RMV has installed 4 different prototypes SWTs in the same year and approx. 25 units under contract for 2014, however under constrain to the Danish Feed-in Tariff under consideration). Sales contracts are also expected to be realized as a result of networking activities planned with key stakeholders.

Initially, the new SWTs will be introduced in Denmark, directly by the industrial partners, following which other markets will be explored. The UK and Germany, in specific, will not be initially targeted as their national certifications for SWTs are very costly and time consuming for small companies as HSW and RMV. Therefore, other countries will be prioritized as for the rest of the world the Danish certificate is valid under the same wind conditions.

Particularly, the consortium aims to introduce the results in the US and Canada in the first commercialization phase due to forecasted small wind growth potential (China will not be targeted mainly because of language and legal barriers). To enter the Canadian and the US market, the Royal Danish Consulate General in Toronto (TC Canada) – sub-contracted in this project – will have a crucial role.

The mandate of TC Canada is to promote Danish business interest in Canada. TC Canada has a dedicated team of 7 trade advisors assisting in everything from market studies, to develop business visits, to do actually sales calls and sale meetings for Danish companies and organisations. Wind and energy has been a focus area for TC Canada in a number of years and the Consulate has a very well developed network, especially in the energy sector. In specific, TC Canada will be active in an in-depth market study to fully understand the commercial potential for SWTs in Canada, and in the development of a delegation visit to capitalize on those opportunities. Several network meetings will be also organized to present the SmallWind Danish manufacturers to the relevant partners, using the network already established by the General Consulate.

To assess the export potential of SmallWind turbines to European countries the industrial partners will be participating in the Husum Fair (already in March 2015). The knowledge and network gained will be crucial for the decisions regarding the following-up approach. It is foreseen that a report of the possibilities in the European Market will be presented and partly implemented.

Some SmallWind budget will be made available for industrial partners, to be used for consultancy activities to help the manufacturers with market analyses and other market related activities.

For all the aforementioned, the consortium believes that the project has a very strong chance of successful achievement of commercial objectives.

7. Project implementation and partnership

7.1. Project structure

The project management structure has been designed to ensure a smooth implementation and execution of the development and demonstration activities, and has taken in consideration not only the dimension of the project, but also the healthy collaboration between partners. In cooperation, the partners have designed the following structure to adequately address the scope of the technical challenges and the need to ensure a swift exploitation and commercialization post-project.

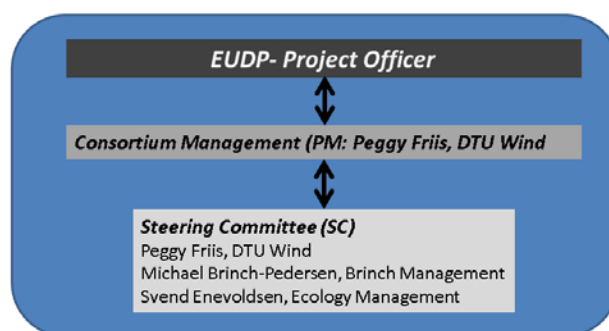


Figure 6: Project Management structure.

As holders of the original project idea, key knowledge and positioning in the wind energy market, and as a major investor of own resources, DTU Wind Energy will take central stage with regard to exploitation and Project Management. All issues related to financial execution, consortium management and IPR, and commercialization of results will be the responsibility of DTU.

Steering Committee (SC) – The SC is the highest decision-making body of the consortium, controlling the project and its progress and taking the responsibility of ensuring that the project meets objectives. The SC will be authorized to deliberate, negotiate and decide on all matters related to the project. The SC is comprised of representatives from companies with significant marketing and export experience, and is chaired by the **Project Manager** – Peggy Friis, from DTU Wind Energy. Decisions on actions ahead and possible conflicts will be taken by the SC, by simple majority. To ensure a clear distribution of rights and roles of each partner from the beginning, a Consortium Agreement (CA) will be signed before the project start date. The SC will meet according to need, but at least every two months, with the first meeting at project kick-off. At the meetings, overall progress and progression of each work package will be reviewed, based on information from the Project Manager, and following actions will be agreed upon.

Peggy Friis is the appointed **Project Manager (PM)**, being also directly responsible for exploitation and dissemination of the project results, in collaboration with the other partners. The PM will act as the primary interface between the project consortium and EUDP, representing the SC, and overseeing day-to-day management of the project. On a regular basis, the PM will liaise with the EUDP Project Officer to whom she is accountable on behalf of the project partners. Peggy has longstanding project management experience with extensive involvement in Wind Energy related research and commercial projects. Please refer to the following section for a detailed description of Peggy's CV, including the managerial expertise that she brings to the project.

8. SmallWind partners

The core partnership involved in SmallWind gathers one research institute and 6 companies, with extensive experience within the wind energy field. As a whole, this partnership includes all the core and complementary competences required for a successful implementation of the development and demonstration activities proposed within the project. All partners already maintain close collaboration and have experience from working with collaborative projects. Brief descriptions of partner's profiles are outlined below.

8.1. Partners description

DTU Wind Energy



Organization and Business:

The Wind Energy Department at DTU (Technical University of Denmark), which is a merger of the former Risø DTU wind energy division, material sciences sections with several sections from DTU Lyngby campus, represents a truly cross-disciplinary research environment. DTU Wind Energy contributes to research, development and international exploitation of sustainable energy technologies and strengthens economic development in Denmark. DTU Wind Energy employs more than 230 people, with 150 scientists and 60 PhD students.

DTU Wind Energy is one of Europe's leading research centres in sustainable energy. DTU Wind Energy creates pioneering research results and contributes actively to their exploitation, both in close dialogue with the wider society. The majority of their scientific projects are conducted in collaboration with both Danish and international industry. DTU Wind Energy has large test facilities and interdisciplinary research environments that enable them to solve problems across traditional professional boundaries and competences.

Relevant experience:

The Wind Energy Department has a long record for research in meteorology, wind turbines and experimental testing as well as design and certification. DTU Wind Energy has key competences in:

- Aero-elastic modelling. The aeroelastic program carries out research, development and application of aero-servo-elastic programs, computational fluid dynamics code and software design tools for airfoils, blades, and wind turbines.
- Experimental testing. Test and measurement programme represents departmental expertise in organizing and conducting field meteorological measurements, and in providing instruments as well as data systems and data management for the Wind Energy Department and outside clients.
- Designs airfoil and blades, used for many years on MW turbines.

Tasks in the project and benefits from participating:

DTU will coordinate the project activities and will participate in all the WPs in the project. In this way DTU has a key role in the project in order to transfer knowledge and modelling experience from the MW turbine industry into the SWT community. This is done in close cooperation with the industrial partners in the project which also have a key role in the industrial implementation of the new SWT design basis.

Key staff involved in the project:

Peggy Friis.

HSWind



Organization and Business:

HSWind is developing, manufacturing and dealing wind turbines in the size of 25kW. Since four years ago HSWind has worked on the Viking25kW turbine which is now being sold primarily in Denmark but the sales outside Denmark have slowly begun as well.

HSWind is a company with only 4 fulltime employees and 3 external associated, which core competence is to develop, manufacture and sell small wind turbines with quality components for easy handling.

Relevant experience:

HSWind is in the small wind turbine business and knows the markets, what drives the customer demand, and has know-how about site conditions for small wind turbines due to the regulations.

HSWind is one of the first companies to go through the development of a small wind turbine according to the IEC 61400-2 which gives HSWind expertise in the development procedure and demands for small wind.

Tasks in the project and benefits from participating:

HSW is one of the two turbine manufacturers in the project. They participate in all the WPs and will make a turbine available for one of the measurement campaigns.

HSWind will be able to evaluate technical solutions from a practical side of view. Practical in terms of manufacturing, installation and handling in the work shop and on site.

Key staff involved in the project:

Ulrich Høgenhaven, CEO

RMV - Ringkøbing Maskinværksted/Solid Wind Power



Organization and Business:

RMV - is a total supplier of custom-made machines, production equipment, transportation equipment, material handling, lifting equipment, tool making, machining, assembly, and repair tasks.

Today RMV employs approx. 50 people. RMV was established in 2003 by Carsten Lauridsen; at the time the company had 3 employees.

RMV has a broad experience in custom-made equipment and supplied costumers in Denmark, Germany, Norway, Poland, UK, Spain, USA, Brazil and China.

For the manufacturing and production of the Small Wind Turbine (SWP25-14Txx) RMV has established a subsidiary Solid Wind Power.

RMV Management system is certified to DS / EN ISO 9001:2008. CE in conformity with the Machine directive 2006/42/EF. Welding in conformity to ISO 3834 and AWS D14.1 and Environmental management in conformity to ISO 14001.

Relevant experience:

RMV is a newcomer in the design and manufacturing of SWTs, but took up the challenge of design and manufacturing their own 25 kW wind turbine in 2013. The design is based on a 35 year old proven concept the Bosted-turbine. The first prototype was designed and erected in 2013; followed by 4 additional prototypes with different concepts to be tested. As today the first design for market introduction is concluded, and the type certificate to be issued is expected in March 2014.

Our experience in design of turbine and blade has reached a level of quality and know-how to be able to meet the demand for good input-data for the aeroelastic model. We are flexible in the manufacturing process and set-up and able to take new findings into our design and work line.

RMV has the following engineering capacity in general: Solid modelling/3D CAD in SolidWorks; Simulation (FEM); Structural design and analysis; Risk Assessment; Instruction Manual; CE marking; Tensile testing and Non-destructive testing.

Tasks in the project and benefits from participating:

RMV/Solid Wind Power will contribute to the project with design and operational data of their SWP25-14Txx wind turbine, and as a manufacturer and designer of turbine and blade contribute with test turbine and blades. RMV/Solid Wind Power beneficial exportations to the project is a turbine calculated and designed to the state-of-the-art of aeroelastic models, thus facilitating optimization of the turbine to international by means of the support of the DTU wind energy knowledge in the field of design and standardisation.

Also RMV considers the support the project can offer in terms of an in-depth market study to understand commercial potential for SWTs and development of a delegation visit to capitalize on those opportunities as very important for the development of the company and the product.

Key staff involved in the project:

Carsten Lauridsen; Founder and Owner

Lars Bo Johansen

Olsen Wings A/S



Organization and Business:

Olsen Wings A/S has existed in its current form since 2008, but the founder Søren Olsen has worked with wings for wind turbines since 1985. Olsen Wings A/S develops, manufactures and sells wings worldwide.

Turnover: 2012 6 mio DKK, 2013 9,5 mio DKK, Budget 2014 16,5 mio.

No. employees: 2012, 7 employees, 2013, 14 employees, 2014 18 employees.

Relevant experience:

Olsen Wings A/S has been focusing on developing wings for several of the European small wind turbine manufacturers. During the process the wings have been optimized regarding shape, performance, stability, low noise, etc.

The knowledge and experience level in the small wind turbine industry is generally low. Olsen Wings A/S is one of the most experienced in the field, but still Olsen Wings A/S expects to both obtain and deliver further knowledge through the project.

Olsen Wings A/S is able to bring the development directly into the production process.

Furthermore, Olsen Wings A/S has both robots and CNC equipment in order to make plugs and forms efficiently and quickly.

Tasks in the project and benefits from participating:

Olsen Wings A/S' role in the project, together with DTU, is mainly to develop and subsequently manufacture the new wings for test and measurement for a 2 year period.

Olsen Wings A/S' substantial experience in the use of materials and in the characteristics of materials in their behaviour during the production process will be used in the development phase.

Olsen Wings A/S will benefit from participating in the project by getting new profiles for a future generation of wings for smaller turbines.

Key staff involved in the project:

Søren Olsen, CEO, founder and owner in Olsen Wings A/S.

Troels Ette, COO and owner in Olsen Wings A/S

Ecology Management ApS



Organization and Business:

Since 1995 Ecology Management ("EM") has been serving the wind industry in areas of: Wind Assessment, Engineering, Training, Project Management, Asset Management.

Relevant experience:

As holder of WasP certificate #19 EM has conducted numerous commercial wind studies throughout the world. Furthermore EM was lead engineer in the development of the Viking 25kW wind turbine. Moreover EM was project manager in the supply of a wind diesel project in Patagonia, Argentina.

Tasks in the project and benefits from participating:

The project will benefit from the hands on experience from more than 6 years of working with small wind in the areas of Marketing, Engineering, Component Compliance and Manufacturing Method. Moreover the experience gained from wind studies worldwide and former job as director of Sales and Marketing raising annual turnover from 40 to 720 million by worldwide export.

Key staff involved in the project:

Svend W. Enevoldsen will be involved in the project.

Thy Windpower ApS



Organization and Business:

Thy Windpower has been producing small wind turbines for the Danish market since 1983, where they started with a 7.5kW and later in 1985 made an 11 kW model. In 2011 they made a new version of the 11kW downrated to 6 kW for the Danish market and in 2013 a new upgraded 10 kW model was introduced. From 2011 till 2014 more than 230 units has been installed in Denmark.

Relevant experience:

The owners of Thy Windpower are experienced in developing and producing small wind turbines and have more than 30 years' experience in the wind turbine industry and developing projects in Denmark.

Tasks in the project and benefits from participating:

Thy Windpower is looking for new markets for export and expect to find local partners, agents or service companies for cooperation.

Key staff involved in the project:

Mr. Leif Pinholt, CEO

Partner: Brinch Management



Organization and Business:

Brinch Management ApS ("BM" hereafter) is a SME, based in Denmark, constituting partners and subcontractors.

BM helps clients in the development and optimization of Business Models and value chain processes, from research to strategic marketing and market penetration. Clients are constituted by SME's, International companies and organizations

BM is the founder and owner of AviTec Wind Turbine Solutions; an international start-up enterprise.

BM is experienced with and recognised for managing, participating and successfully completing project with multiple partners on business models and knowledge sharing in an international and market-oriented setting.

Relevant experience:

BM represents more than 25 years' experience within the energy and climate sector in general, and from the wind energy sector in particular. In recent years the work with business models in the green-tech industry has increased.

From its international work with Business Models, BM is experienced in working with the management of SME's and MNE's, and to understand their needs and opportunities in relation to different product specifications and market contexts.

Also, the organization participates in various networks devoted to development of sustainable and efficient energy and climate technologies.

Tasks in the project and benefits from participating:

BM will be responsible for mapping Danish Manufacturers Business Models and related activities in the project that aims to strengthen the partner's connectivity to new market opportunities.

The benefit will be to get insight to and hands on experience with SWT business models and market opportunities, and to actively engage in and benefit from knowledge sharing.

Key staff involved in the project:

Michael Brinch-Pedersen

8.2. CV's of key staff involved in the project

Peggy Friis (DTU)

CURRICULUM VITAE

Peggy Friis, DTU Wind Energy

Education: B.Sc., Mechanical Engineer/ Energy Engineer.
Profession: Senior Advisor
Date of Birth: 29. July 1954
Nationality: Danish

Key Qualifications

30+ years of experience in the wind energy industry, including research and development, project innovation, project development, planning and execution.

Present Working Areas @ DTU Wind Energy

Danish Energy Agency's Certification Scheme for wind turbines and the technical certification scheme for the design, manufacture, installation, maintenance and service of wind turbines.

Grid Code: Maintenance group Energinet.dk.

Wind turbine maintenance and service pursuant to the type and project certification.

Wind turbine major damage or damage affecting safety evaluation and statistics.

Wind Turbines Insurance Committee: Danish Wind Turbine Owners' Association.

Test Centre for Wind Turbine Components project development.

DS-588 Active member and coordinator of workgroups A05 (61400-22) and A12 (EN/DS50308)

IEC61400-2 maintenance group: Safety standard for small wind turbines.

IEC 61400-22 Conformity testing and certification of wind turbines: Conformity Assessment Board (CAB)

Positions/Employments

2009: Senior Adviser, Technical University of Denmark. Institute for Wind Energy, Risø Campus

2009-2010: Aktiv Wind ApS. Technical Advisor

2006-2009: EuroTrust A/S, Kolding. Technical Manager.

2006-2006: Vattenfall AB, Manager in the Project Development Department.

2000-2006: ELSAM A/S, Manager in the Department of Wind Power Project Development.

1980-2000: ELSAM Engineering (Elsamprojekt).

Selected assignments

Technical Advisor and formal acting president of the wind farms in Poland and Spain

Acquisition of the wind farm project and construction management

Design of avifauna monitoring program according to environmental permit

Operation and maintenance follow up

Financing follow up and wind farm management as Technical Director

Planning of wind power projects under development and initial project development

Due diligence for selected projects in Europe, America and Asia

Sale of company assets/ Financing of company projects

Preparation of Project Information Memorandum (PIM)

Bankable project specifications and reports

Preparation of project documents in Data Room and Due Diligences

The 2 MW/60 m Tjæreborg Wind Turbine. Design, installation, O&M, R&D

Nibe Wind Turbines. Commissioning, O&M, R&D

Ulrich Høgenhaven (HSWind)

Curriculum Vitae

Ulrich Høgenhaven, Abildkrogen 10, 8920 Randers NV
 Mobil phone: +45 25 79 33 80
 Email: ulrich@hoegenhaven.dk



Marital Status:	43 years old, married to Anisette, who works as a head nurse at Randers Central Hospital. Together we have three children aged 16, 14 and 10 years.
Occupation:	
Oct. 13 -	CEO at HSWind ApS
July 12 – July 13	Independent Consultant at Suzlon Wind Energy SA Manager Logistic, Installation & Commissioning Contract negotiation and management of sub-contractors Sales calculation, Technical backup and knowledge transfer
Jan. 12 – July 12	Senior WTG Concept Specialist at Repower Logistic, Installation & Commissioning Sales calculation, Technical backup and process optimization
Marts 10 -	Co-owner of Dansk Industribelysning ApS. Energy optimization of lighting installations for industrial and retail shops.
April 08 – Marts 10	Internal project manager and head of department at Siemens Wind Power A/S Cost optimization of transport and installation of wind turbines. Process optimization using LEAN principles
Aug. 07 – April 08	Independent Consultant at Siemens Wind Power A/S Process optimization for the installation of Siemens 2.3MW wind turbine.
May 07 – Aug. 07	Independent Consultant Energy optimization of among other 22 auto repair shops.
Aug. 06 – Aug. 07	Restraint by competition clause for 1 year from applying job in the wind industry. Taken courses for Entrepreneurs, L-AUS and Energy Optimization of lighting systems.
Nov. 05 – Aug. 06	Project Manager in the development department at Vestas Wind Systems A/S. Subproject for the optimization of transport, installation and service of 3MW turbine.
May 04 – Nov. 05	Maintenance Manager, 4MW platform in the development department at Vestas Wind Systems A/S. Responsible for the operation of - and following up on errors and improvements on a prototype and project management for the development of transport, installation and maintenance of the wind turbine.
May 03 – May 04	Technical coordinator between the Service and Development at NEG-Micon A/S. Representing Installation & Service in the development of new turbine types and service products.
Aug. 02 – May 03	SAP Super User / trainer in the IT department at NEG-Micon A/S. Specific task of building and subsequently training in a quality system for Installation & Service in SAP.

Aug. 99 – Aug. 02	Coordinator / Technician in Installation & Service dept. at NEG-Micon A/S. Weekly planner for installers, coordinated cranes and transport of installations and authorized service reports. Participation in development groups, installing proto types as well as improvements of exception reporting system, instructions and checklists for installation. Training of newly hired engineers in the use of I&S manuals and quality instructions.
Jan 95 – Aug. 99	Installation and service technician at NEG-Micon A/S. Installed and serviced wind turbines
Nov. 93 – Sep. 94	Marine Engineer at Rohde Nielsen.
Jul 92 – Okt. 93	Assistant Marine Engineer at A.P. Møller.
Apr. 90 – Nov. 90	Boilermaker at Nordfab Weiss A/S.

Education:

Dec. 90 – Jun. 92	Marine Engineer up to 3000 kW at Frederikshavn School of Engineering.
Nov. 86 – Apr. 90	Apprenticeship as Boilermaker at Nordfab Weiss.

Continuing education / training:

February 2009	Internal LEAN course, Siemens AG
January 2007	12 lessons First aid course, SWP A/S
September 2007	Safety and Rescue at work in wind turbines and Maritime rescue, SWP A/S
May 2007	Energy optimization of lighting, Randers TS
Marts 2007	L-AUS course, Randers TS
Winter 2006/07	Entrepreneurship Course, Randers Erhvervs- & Udviklingsråd
Marts 2005	Internal project management course, Vestas Wind Systems A/S.
October 2003	Internal Project training course, NEG-Micon A/S.
August 2002	SAP course at SAP Belgium, NEG-Micon A/S.
Spring 2001	Internal course for managers in I & S, NEG-Micon A/S.
May 2001	Internal course on Customer / supplier relationship in the company, NEG-Micon A/S.
Spring 2000	Internal course in quality management, NEG-Micon A/S.

Hobbies:

Family and kids' sports.
Active in the local riding club and football club

Troels Ette (COO and owner in OLW)

CV Summary

Troels Ette
Sondrupvej 48
8350 Hundslund
Denmark
Born: 22.05 1964
E-mail: info@olsenwings.dk
Mobile +45 21 67 58 30

Highlights

Since 2005: Has been a leading person in Olsen Boats (later Olsen Wings A/S) working with development and production of boats and wings in composite materials.

High level of expertise in operating robots and CNC equipment for manufacturing plugs, forms etc.

Since 2008: Owner and COO in Olsen Wings A/S and is a key person in the management of the results so far and the future development of Olsen Wings A/S.

Søren Olsen (CEO and founder and owner in OLW)

CV Summary

Søren Olsen
Vads Møllevej 2
Sondrup
8350 Hundslund
Denmark
E-mail: info@olsenwings.dk
T-Phone: 86 55 05 76

Highlights

1975-1985: Different development projects on wings for small wind turbines.

1985: Founder of Olsen Boats, which build smaller sailboats and kayaks and wings.

2008: Olsen Wings A/S is established as a limited co. (A/S) together with Troels Ette as a key person. Olsen Wings A/S is now focusing on development and manufacturing of wings for smaller Wind Turbines and is now one of the leading companies in the field.

Søren Olsen is the leading person in all new inventions in Olsen Wings A/S and is also advisor for other wind blade manufactures.

Svend W. Enevoldsen (EM)



Svend W. Enevoldsen

Credentials.

Training in Wind Power:

Trained more than 1,500 engineers from lecturing in USA, China, Egypt, Finland, Germany, Brazil, UK, Fiji and Denmark.

Membership:

Danish Wind Industry Association.
National Advisory Board on Wind Turbine Certification.

Education.

Marine Engineer
BDE (BSc)
Holder of Diploma in Business Adm.

Positions.

1976-83 Vølund Varmeteknik
1983-86 Vestas
1986-87 Wincon/Micon USA
1987-89 DifConsult USA
1989-90 Viking Capital A/S
1990-95 Micon A/S
1995- Ecology Management
Except for Vølund Varmeteknik until 1980 all positions were at management/executive level.
Via Ecology Management several executive positions in related companies.

	Wind Assessment	Feasibility Study	Market Assessment	Project Management	Engineering	Training	Bank's Engineer
ABB Equity Ventures BV	X	X					
Baltic Enviro Partner ApS	X						
CMA Insurance Adjusters					X		
Danish Ministry of Energy						X	
DeeFond	X	X					
Det Norske Veritas						X	
Devers Hill Wind Farm	X	X			X		
DONG VE A/S	X	X				X	
ECN						X	
Envision Energy, China	X	X					
Everpower Renewables	X						
First Interstate Bank					X		
Handelsbanken, Denmark	X	X					
HSH Nordbank		X					
HSWind A/S	X			X	X	X	
Land4Wind A/S	X	X					
LM Wind Power						X	
Micon Wind Turbines, Inc					X		
NEG Micon A/S	X	X					
Nordic Power A/S					X		
NRG Patagonia					X		
Ny-Revision		X					
Offshore Center Denmark						X	
Renovatio Power SRL	X	X					
RWE INNOGY						X	
SeaWest Industries	X	X			X		
Siemens Wind Power						X	
Sparekassen Sydjylland	X						X
South Pacific Renewable Energy Project	X					X	
Suzlon Wind Power	X					X	
The Industrialization Fund for Developing Countries	X	X					
Vestas Danish Wind Technology	X	X					
Viking Windfarms (NS 1, NS 2, 1, Inc; 2, Inc; NS Ltd)	X	X	X	X	X	X	
Windforce Ltd	X						
WinWind						X	

Lars Bo Johansen (RMV)

Engineer, Design and Development at Ringkøbing Maskinværksted A/S
lbj.idoine@gmail.com

Experience

Engineer, Design and Development at Ringkøbing Maskinværksted A/S

February 2013 - Present (1 year 2 months)

As a designer I have been tasked to upgrade and redesign an old Small Wind Turbine (25kW class). The work incorporates the complete turbine. The redesigned turbine will be erected locally and tested to verify it's performance and to complete the certification.

The full documentation package is part of my work.

From the very beginning of this project the turbine was designed to run with a 14m diam. rotor (The SWP 25-14).

However, to start with the turbine was fitted with a traditional blade design from the 80'ties limiting it to 11,6m diam. rotor (The SWP 25-12). This blade was chosen to gain experience with the turbine, before running it with the larger end design rotor featuring the RMV 7000 Blade, which I have designed explicit for the SWP 25-14 turbine.

The SWP 25-12 has now (October 2013) run for 4 months without any problems.

Now (October 2013) we installed the RMV 7000 blade changing the SWP 25-12 into the SWP 25-14. The RMV 7000 blade is VERY quiet and so far it matches the calculated power curve!

Here at RMV A/S we are very excited about our turbine and we are looking forward to seeing how it performs at all windspeeds with the new blade!

Now (December 2013) we have verified the full power curve. With a gear ratio of 1:20 we get the highest AEP with a pitch angle of +5deg.

Playing around with gear ratio and pitch settings, show us that an even higher AEP can be achieved this however, increases the noise from the blades slightly and makes the turbine look stressed (spinning faster).

The turbine is currently in the process of being certified and this will be with the 1:20 gear.

Feel free to visit:

<http://solidwindpower.com/>

tools, tested and verified that the specifications were met with a special focus on the safety for the workers and efficiency of the tools. The project included doing the Factory Layout, the Production Start up as well as the first months of Serial Production.

2 recommendations available upon request

Engineer, Design, Wind Turbine Industry at Vestas Blades A/S

June 2006 - November 2007 (1 year 6 months)

Engineer, Design, Vestas Blades A/S

As a designer of Measuring and Inspection Tools for the manufacturing of all Vestas blade types in the Production Engineering Department I did mainly Design Improvements on existing tools, but I also did a couple of new ones.

1 recommendation available upon request

Engineer, Quality, Wind Turbine Industry at Vestas Blades A/S

July 2000 - May 2006 (5 years 11 months)

Engineer, Quality, Vestas Blades A/S

As quality assurance engineer in the Blade Factory I conducted quality assurance and production technical tasks ranging from assessing the design basis, doing production maturation, running-in and of course the daily follow-up on continuous improvement, non conformances and feedback from our customers. The last two years our team worked on a total organisational change project under change management.

Engineer, Design, Aeronautical Industry at Terma Industries

January 1999 - June 2000 (1 year 6 months)

I was design responsible for one to two projects at the time. I designed subassemblies mainly in aluminium and composites for the aeronautical industry, air forces and navy's.

Engineer, Quality, Aeronautical Industry at Terma Industries

February 1997 - January 1999 (2 years)

I worked in Terma's Quality Department. Along with our daily quality assurance work in our department, I was also involved in one or more specific projects. One of these was the company's prestige project (development, design and production of a reconnaissance pod). The company has a full composite department and through my involvement in projects in this department, I learned a lot in this field.

Engineer, aircraft maintenance at Business Flight Services

October 1995 - February 1997 (1 year 5 months)

In cooperation with the technical manager I conduct the maintenance of 15 Turbo prop Beech craft aircrafts as well as a number of other small aircrafts. Also I coordinated spare parts between the storage and the destinations on which we operated our aircrafts.

Projects

SWP 25kW

February 2012 to Present

Members: Lars Bo Johansen, Carsten Lauridsen, Lars Ottow, Bruno Østergaard, Peter Fly

SWP 25kW is an elegant reliable Small Wind Turbine.

Education

Danmarks Ingeniør Akademi

Bachelor of Science, Mechanical Engineering, 1985 - 1990

CV

Adresse Oddesundvej 183, 7755 Bedsted
Telefon +45 53574088
E-mail dvf@karby.dk

Leif Pinholt



Profile

- CEO - THY Windpower Aps
- Owner - Dansk Vindmølleformidling Aps (Danish Used Windturbines Ltd)
- Born 1956

Experience

- More than 30 years experience in the wind industry.
- Project Management

Career

2011 -	CEO - THY Windpower
1994-	Owner - Danish Used Windturbines
1996 - 2003	Salesman - BONUS Energy
1988-1994	Salesman - Micon A/S

Michael Brinch-Pedersen
Managing director, HD(O)

Arnevangen 24, Søllerød
2840 Holte, Denmark
Born 5. februar 1960
Married, 3 children

Employment

2005 - Managing director, partner, Brinch Management ApS
Founder and owner, AviTec Wind Turbine Solutions
2002 - 2005 Managing Director, Nordic Partnership for sustainable Business Models
2001 - 2002 Vice-General secretary, WWF Denmark
1999 - 2001 Chairman of Board, WWF International EMEA
1996 - 2001 Programme director, WWF Denmark
1993 - 1996 Programme manager, WWF Denmark
1990 - 1993 Project manager, Ribe County Council
1987 - 1990 Project manager, Danish Environmental Research Institute
1984 - 1987 Project manager, Billund Municipality

Education

2013 Harvard University, USA: Human Health and Global Environmental Change, edx course
2002 University of Cambridge, UK: Prince of Wales European Senior Executive Seminar
1998 WBCSD, Switzerland: Sustainable Business Challenge
1998 CBS Copenhagen Business School, Copenhagen: HD(O) in Strategy and Business

Affiliations

2014 - Vice-chair, EC REA, FET OPEN, Horizon 2020
2012 - International Expert and Rapporteur, EC REA, 7. Research Framework Programme
2007 - 2008 Member, Amnesty International, DK CSR expert group
2000 - 2001 Member, Danish Governments Nørby-Johansen Comm., expert group on Corporate Governance
1999 - 2001 Member, Danish Governments Eco-label Council
1999 - 2001 Member, Danish Governments Wilhelm Comm.ittee
1998 - 2001 Member, WWF Global Steering Committee, Schweiz
1997 - 2000 Member of Board, WWF Macro Economics Programme Office Washington, USA
1997 - 1999 Member of Board, WWF European Policy Office Bruxelles, Belgium
1995 - 1997 Member of Board WWF Russia Programme Office Moscow, Russia
1994 - 1996 Deputy Secretary, MLW working Group, Helsinki Commission, Finland

Other

2007 - External examiner, Danish Defense Academy, Military Masterstudies
2006 - External opponent IIIIEE, Lund University, Sweden
1998 - External examiner, Master studies at 6 Danish Universities (MBA, MPG)

9. Letters

ROYAL DANISH CONSULATE GENERAL Toronto

Royal Danish Consulate General
2 Bloor Street West, Suite 2109
Toronto, Ontario
M4W 3L2
Canada

Tel +1 416 962 5669
Fax +1 416 962 3668



Toronto, February 28th, 2014

Letter of Intent

MINISTRY OF FOREIGN AFFAIRS – THE ROYAL DANISH CONSULATE IN CANADA & THE TRADE COUNCIL is a committed participant in the SmallWind project proposal dedicated to prepare analysis of the market in North America and presenting the Manufactures of small wind turbines to potential partners and interested parties in Canada. The proposal is being submitted to the EUDP call 2014-1 on March 2014.

Finally, THE ROYAL DANISH CONSULATE IN CANADA & THE TRADE COUNCIL will, once a successful demonstration has been achieved, seek to further commercialize the project results and ensure dissemination.



Morten Siem Lyng

Head of Mission, Consul & Trade Commissioner
Royal Danish Consulate General





Visby 2014-11-12

Letter of Intent

THY Windpower Aps is a committed participant in the SmallWind - Market Analysis and Prospects.

THY Windpower Aps guarantees its co-financing share of the project resources, as detailed in the budget information uploaded with the proposal.

Finally, THY Windpower Aps will, once a successful demonstration has been achieved, seek to further disseminate the project results to ensure knowledge sharing in the academic and industrial communities and a rapid expansion and commercialization of the new tool.

Leif Pinholt

CEO

A handwritten signature in blue ink, appearing to read "Leif Pinholt".

THY WindPower Aps

Oddesundvej 183 Visby
7755 Bedsted
+45 53574088



Randers, November 13, 2014

Letter of Intent

Ecology Management ApS is a committed participant in the SmallWind - Market Analysis and Prospects.

Ecology Management ApS guarantees its co-financing share of the project resources, as detailed in the budget information uploaded with the proposal.

Finally, Ecology Management ApS will, once a successful demonstration has been achieved, seek to further disseminate the project results to ensure knowledge sharing in the academic and industrial communities and a rapid expansion and commercialization of the new tool.

Ecology Management ApS



Svend W. Enevoldsen, CEO



Holte, 12th November 2014

Letter of Intent

Brinch Management ApS is a committed participant in the SmallWind - Market Analysis and Prospects.

Brinch Management ApS guarantees its co-financing share of the project resources, as detailed in the budget information uploaded with the proposal.

Finally, Brinch Management ApS will, once a successful demonstration has been achieved, seek to further disseminate the project results to ensure knowledge sharing in the academic and industrial communities and a rapid expansion and commercialization of the new tool.

 A handwritten signature in blue ink that reads "Michael Brinch-Pedersen". The signature is fluid and cursive, with a long horizontal stroke at the end.

Michael Brinch-Pedersen

Managing director,

Ringkøbing Maskinværksted A/S

Ringkøbing 01.03.2014

Letter of Intent

Ringkøbing Maskinværksted is a committed participant in the SmallWind project proposal dedicated to the development, testing and validation of a new design basis for small wind turbines. The proposal is being submitted to the EUDP call 2014-I on March 2014.

Ringkøbing Maskinværksted guarantees its co-financing share of the project resources, as detailed in the budget information uploaded with the proposal.

Finally, Ringkøbing Maskinværksted will, once a successful demonstration has been achieved, seek to further commercialize the project results and ensure dissemination.

Carsten Lauridsen

Direktør



10. Other participants (sub-contractors)

The Royal Danish Consulate General in Toronto (TC Canada) will not be a partner in SmallWind but will participate in some project activities as a sub-contractor: Below, a description of TC Canada is provided, together with a description of the activities proposed in SmallWind, a Letter of Intent, and CVs of key staff to be involved.

The Royal Danish Consulate General in Canada / The Royal Danish Trade Council

Organization and Business:

The Royal Danish Trade Council in Canada (TC Canada) is part of the Danish Ministry of Foreign Affairs. The mandate of TC Canada is to promote Danish business interest in Canada and facilitate business corporation between Denmark and Canada. We have a dedicated team of 7 trade advisors assisting in everything from market studies, to developing business visits and to do sales calls and sale meetings for Danish companies and organisations.

Relevant experience:

Every year TC Canada works with approximately 50 Danish companies on a bilateral level, but TC Canada also develops a large number of delegations ranging from small business delegation of 6 people to larger delegation of up to 90 people as the largest.

Energy and Environment, Mining, oil and gas; ICT, defence and design are the main areas of focus for TC Canada. TC Canada has worked on a variety of assignments within the area of "Energy and Environment": biogas, wind, energy efficiency and water optimization are examples of sub-sectors that have been in focus. Clients have been everything from large well-known companies like Grundfos, Danfoss and Vestas to small SMV companies.

Tasks in the project:

TC Canada will use its existing network to gain insight in the Canadian market, and conduct an in-depth market study. If need, TC Canada will coordinate and develop potential market studies for North America the USA and/or South America to be carried out by TC-offices.

TC Canada will plan and implement a business delegation visit to capitalize on commercial opportunities after the market study is done. The delegation will consist of networking opportunities and concrete b-to-b meetings where the delegation will get to meet potential partners, customers and other key stakeholders in the Canadian market.

Key staff involved in the project:

TC Canada will put together a team of advisors with complementing strengths and relevant experiences for the project to draw on. The project will be led by an experienced project leader: Krista Friis, who is based in the Toronto office and also act as the Deputy Head of Trade in Canada.

Also involved in the project will be Amanda Lapadat. She has a background as journalist and work with Global Business Reports and different magazine in developing hands on, in-depth market studies on subject as mining in Brazil and Oil & Gas in Russia. During these assignments Amanda was posted to these countries for 3 months to conduct numerous interviews, etc.

Irina Vasiliu, Trade Advisor, will also assist on the project. Irina has been with TC Canada since February 2013 where she had lead the offices efforts within construction and defence. Prior to working with TC Canada she worked one year at the US Trade Office in Canada with focus on sustainable energy.

Resumes on each of the advisors can be found below.



Proposal – Canada February 2014

Support to Project:

SmallWind – Optimization of small wind turbines

Prepared by The Royal Danish Consulate General in Toronto

Background and about TC Canada

The Royal Danish Consulate General in Toronto (TC Canada) is pleased to be able to support the consortium of DTU Wind Energy, HSWind, RMV, Olsen Wings A/S and Ecology Management Aps in Smallwind. One of the key outcomes of SmallWind being an improved turbine design, more efficient and cost effective solution, the next important step is to bring this technology to the market to capitalize on the improved commercial opportunities present.

The mandate of TC Canada is to promote Danish business interest in Canada. We have a dedicated team of 7 trade advisors assisting in everything from market studies, to develop business visits, to do sales calls and sale meetings for Danish companies and organisations.

TC Canada will assist the consortium in actively promoting the results of SmallWind in Canada, and more broadly in North America (or South America depending on indication from initial market research to be developed). The Canadian market has seen strong growth for SWTs. For a successful route to market for the SmallWind consortium members, TC Canada will develop in depth market studies for deep understanding of firstly the Canadian market, and following an overview to determine next steps on either the US or the South American market. TC Canada will further apply this market knowledge in establishing direct connections with key stakeholders in the market including; 1) potential customers such as farmers, remote communities, local businesses, small scale utilities 2) key influencers such as national and international organizations, renewable energy associations, environmental agencies, grassroots, certification bodies, etc.) Potential partners for market access, such as resellers, distribution partners, consultants, etc.

Wind and energy has been a focus area for TC Canada in a number of years and the Consulate has a very well developed network in the renewables and especially the wind sector.

Please find below a short potential project description on how The Royal Danish Consulate General can assist Project Small Wind in Canada.

Canadian Wind Market

Canada has pledged to reduce greenhouse emissions by 17 % before 2020 and the sustainable movement is expressed by Canada's exceptionally strong growth in 2013 with a record of close to 1600 MW of new wind, ranking 5th worldwide, and placing 9th in the world within total installed capacity - with more than 7800 MW of wind energy in operation. There are only a handful of local suppliers of both large wind turbines and small wind system's.

Small Wind overview

The most current numbers unfortunately are a close to 5 years old, and much movement has happened since then. At that point there was between 2,200 and 2,500 SWTs installed in Canada.

The annual sales of SWTs are in the range of 600 to 800 units per year, with a total rated output of between 800 W and 1,000 W. This represents roughly \$4.2 million in annual sales, including \$2.3 million for mini wind turbines, \$1.2 million for small wind turbines and \$0.7 million for medium wind turbines.

The most active current markets for SWTs are in four areas: battery charging, on-grid residential, farms & commercial, and northern communities. Each is distinct in terms of SWT preference, decision-making factors and geographic activity.

Project description

The Canadian part of the project is proposed to be split in two major parts. Step 1 is an in-depth market study to fully understand current commercial potential for SWT. Step 2 is development of a delegation visit to capitalize on those opportunities.

It is important to stress that TC Canada find it important that a close dialog between the project and TC Canada is established to secure direction and adjust the project as it evolves and new angles needs to be explored or elaborated. Such a new angel could be the inclusion of market data from e.g. the US or relevant South American countries. TC Canada will in this case be coordinating data sourcing from our offices in the US and in other relevant countries.

Step 1: Market study

Step 1 is expected to be carried in 2014 and perhaps the first quarter of 2015. The purpose of this step is to create an in-depth understanding of the Canadian market and the real market potential. TC Canada will develop a market report which will contain following focus points:

- Stakeholder mapping
 - Who are the relevant regulators and what are their roles and importance
 - Who are the opinion makers (associations, advocacies etc.) and what are their roles and importance
 - Who are the entities that can fund/support SWT development
 - Who are the key market players
 - Etc.
- Regulatory framework mapping
 - What does the current regulation says about setting up SWTs
 - What are the barriers for setting up SWTs
 - What are the rules for local content
 - Etc.
- Understand the competitive landscape
 - Who are the competitors
 - How do they market themselves – what is there value proposition
 - What are their sales channels – do they work?
 - How is their pricing structured
 - Etc.
- Understand the current market technologies
 - Which technologies are the competitors using
 - What are their strengths and weaknesses
- What is the overall market potential

- How big is the market today – how has it developed
 - Challenges and opportunities for growth
 - How big could it be
 - How receptive is the market to the existing technologies
- What should be the go-to-market strategy for a Danish SWT project?
 - Based on above input develop a strategy with focus on e.g. 1) what is the DK value proposition, 2) how should DK technology be marketed, 3) who are key clients to target, 4) which distribution channels should be used etc.

Step 2: Market approach

Based on the developed market strategy a first country visit should be developed for the project. The delegation should focus on verification of the study results, build network and explore the market opportunities to take the final step into the market.

A ~one week delegation would be prepared with focus on meetings with:

- Potential partners
- Potential distributors/agents
- Potential customers
- Relevant organisations and associations
- Political meetings
- Develop a networking event with invited target people

Associations and people to meet could be on local, provincial as well as federal level.

CVs of key staff involved:

Amanda J. Lapadat

AMANDA J. LAPADAT

TRADE ADVISOR
 MINISTRY OF FOREIGN AFFAIRS OF DENMARK
 The Trade Council, Toronto
 DIRECT: +1 416 640 1662
 MOBILE: +1 416 716 5212
 EMAIL: amalap@um.dk



PROFILE:

Experienced trade and business development professional in the fields of Energy, Mining, Oil & Gas, and Information and Communication Technology (ICT). Managed research based projects throughout Canada, South America and Europe with the ability to coordinate across borders and adapt to changing circumstances. Strong economic, business development and communication skills with particular focus on the energy industry.

RELEVANT PROFESSIONAL EXPERIENCE:

Ministry of Foreign Affairs of Denmark
Trade Advisor

Toronto, Canada
October 2013 - Present

- Providing trade advice and strategic support to Danish companies in Canada.
- Focus: Energy sector, Mining, Oil & Gas, Heavy Industry
- Work: Industry research, meeting plans, Delegation management, partner search and matching

Applift, a Hitfox Group Company
Business Development and Accounts Manager

Berlin, Germany
Mar 2013 – Sept 2013

- Manages partnerships, identifying growth opportunities and negotiating ongoing beneficial deals
- Up-to-date industry knowledge on technology sectors worldwide pertaining to mobile marketing
- Develops marketing material including presentations, newsletters, press releases, White Papers, blog

Global Business Reports
Business Journalist
Market Analyst / International Project Management
2012

Argentina / Brazil / Canada / Europe / UK
Oct 2012 – Mar 2013
Sept 2011 – Oct

- Working in field to gather economic intelligence on emerging and mature markets and perform analysis to produce in-depth reports on industry trends, regulatory framework, corporate strategy and trade
- Reports published in leading international trade magazines, online news sites and publications
- Reports focus on: Power, Oil&Gas, Mining, Chemicals, Agriculture, Petrochemicals

Kreab Gavin Anderson
Associate Consultant

London, UK
Sept 2010 – Oct 2011

- **Key Clients:** Ministry of Finance, Trade - Eurozone country, leading Energy firm, Spanish bank, tech company
- Responsible for implementing communications strategies through op-eds, market intelligence, competitive analysis, strategic advice, and creation / pitching of press releases and white papers to target audiences
- Lead on international accounts, and research projects for clients throughout Europe, Africa and Asia
- Business development lead responsible for producing industry reports on a variety of sectors including financial services, retail, energy, government, and professional services

(Relevant Profession Experience continued)

**Canada China Business Council
Business Development Coordinator**

**Beijing, China
Mar 2010 – Jul 2010**

- Developed market insight, business and logistical support, and potential project leads in Canada and China.
 - Oversaw content and editing of Quarterly Review magazine distributed in Canada, China in over 1000 copies
 - Organized corporate event for over 2000 government and business officials
-

EDUCATION:

**Master of Management – Global Management
Queen's University, Canada**

Sep 2009 – Oct 2010

Peking University, Beijing, China - International MBA Exchange

- Overall GPA: 3.28/4 (82%)
- Course Work: Strategic Management, International Law, Macroeconomic Policy Analysis, Leadership
- Master Thesis: Company research project for Canadian company ClimateCHECK Corporation, a greenhouse gas management company working with companies to help manage and reduce their GHG emissions. Thesis was to develop a framework for the 'Financial Disclosure of Climate Change as a Strategic Tool'. Framework was completed using research from China, Netherlands, UK and Canada

**Honours Bachelor of Business Administration
Wilfrid Laurier University, Canada**

Sep 2003 – Sep 2007

- Overall GPA: 9.75/12 (81%), Business GPA 9.95/12 (83%)
- Course Work: Business Strategy, Accounting, Marketing, Operations, Human Resources, Finance
- Awards: Admissions and In-Course Scholarships, Semi-Finalist in business competition



Irina Vasiliu

50 Lynn Williams Street, Unit 1512 Toronto, Ontario, M6K3R9

Cell: (647) 534-5282 Email: irivas@um.dk

Summary of Qualifications

- Entrepreneurial spirit with strong initiative, strategic vision, self-direction and drive-for-results combined with highly developed business acumen thrive
- Excellent interpersonal skills, recognized teamwork skills, and ability to work independently and to manage a team, as well as attention to detail
- Proven time management, ability to work in a fast paced environment, prioritize and multi-task, respond to changing priorities, and exceed goals under tight deadlines
- Strong written and oral communication skills in English, French, Russian, and Romanian
- Recognized decision making skills, critical thinking, creative problem solving, persuasive negotiation and presentation skills
- Proficient in database management and data modeling software including standard computer software programs (i.e. MS Office, email)

Selected Experience

Trade Advisor

Jan '13 - Present

Royal Danish Consulate General, The Trade Council, Toronto ON

- Responsible for Defence, Aerospace, Design & Construction sectors
- Provide a wide range of assistive programs to the Danish companies who want to enter the Canadian market; these include up-to-date market research, market entry strategies, partners/distributors/customer searches, arrangement of meetings/visiting programs, information on customs duties etc.
- Developing new business opportunities by cold calling, conducting and coordinating conference calls, and face-to-face meetings with prospective clients
- Provide assistance with start-up in Canada – i.e. incubators office facilities, counseling, back-office, etc.

Trade Assistant

Jul '12 - Dec '12

U.S. Consulate General, Commercial Service Toronto, Toronto ON

- Responsible for Energy including Renewable and Mining sector, as well as covering some projects in Defence and Construction
- Engaging in assistive programs to facilitate U.S. – Canada trade and to attract foreign direct investment into the U.S., providing assistance to US companies interested in exporting to Canada, providing business matchmaking services, conducting market research, preparing trade reports, implementing and designing marketing and sales strategies for business development
- Responsible for providing monthly updates on Renewable Energy activities in Canada
- Plan and execute seminars, trade shows and promotional events with participation of the US Renewable Energy delegation to Canada; responsible for event logistics and promotional material i.e. The Canadian Wind Energy Association Conference and Exhibition (CanWEA), APPRO Power Conference, POWER-GEN Conference & Exhibition

Administration/Billing Specialist

Jun '07 – May 09

General Health Management, Thornhill, ON

- Responsible for collecting, posting and managing account payments, submitting claims and following up with insurance companies, preparing database summaries and financial reports as well as training new staff and providing database orientation.
- Performed administrative duties such as enter data, created spreadsheets and databases, filed documents, identified and resolved patient billing complaints.

Selected Experience Cont'd	<p>Technical Support Specialist, Sep '08 – Dec '08 <i>Antibex Software, Concord, ON /www.antibex.com/</i></p> <ul style="list-style-type: none"> • Installed and configured computer hardware operating systems and applications, provided database support; ensured that all staff were trained on new database program • Troubleshoot system and network problems; diagnosed and solved hardware software faults; tested and evaluated new database software, managed software updates. • Monitored clients through a series of actions over the telephone, provided customer support, including procedural documentation, built customized statistical and financial reports to meet clients' requirements, managed company's website <p>Customer Service Associate promoted to Cash Office Manager/Accountant Nov '05 – May '07 <i>General Health Management, Thornhill, ON</i></p> <ul style="list-style-type: none"> • CSA: Responsible for making and processing return decisions; provided customer support and assistance, responding to customers' inquiries and concerns over the phone and at the counter. • COM: Administration of all cash and operations office; processed incoming payments; completed bank deposits, prepared and reviewed key reports; ordered and maintained correct denominations of currency and change daily from the bank.
Education	<p>Bachelor of Arts, Bilingual Honours, International Studies Major Apr '12 <i>York University Glendon Campus, Toronto ON</i></p> <ul style="list-style-type: none"> • Covering multiple courses on International Trade and Investment • Successfully completed an academic year with bilingual requirement <p>Ontario/Rhône-Alpes University Exchange Program Apr '11 <i>Institute des Etudes Politiques, Grenoble, France /www.sciencespo-grenoble.fr/</i></p> <ul style="list-style-type: none"> • Successfully completed an academic year in Institute des Etudes Politiques, entirely in French • Received Letter of Recognition of International Experience <p>ATHGO Global Forum on the Miracles of Development Jul '08 <i>World Bank HQ, Washington DC, USA</i> www.athgo.org/about_us/news/athgo_08_july_15.html</p> <ul style="list-style-type: none"> • Selective Program, 2nd place group winner of the 16 • Within team, prepared Business Proposal and Policy Memorandum to address UN Millennium Development Goals
Languages	<p>Speak, write, and read fluently in English, French, Russian and Romanian</p>
Volunteer Experience /Affiliations	<p>York University International Studies Students Association, Member 2009 -2012</p> <p>UNICEF, Volunteer/photographer 2009 - Present</p> <p>AIIESEC York University, Member 2009-2010</p> <p>Bayview Secondary School, Volunteer/English and Accounting Tutor 2006-2007</p>
Other	<p>Have the ability to travel within the province and internationally, have a valid driving licence</p>

Krista Friis

KRISTA FRIIS
Deputy Head of Trade
Ministry of Foreign Affairs – The Royal Danish Consulate in Canada
The Trade Council
Phone: +1 416 640 7485
E-mail: krisfr@um.dk

Profile

High energy, results-driven, self-motivated team player with exceptional business development, project management, critical thinking, communication, and problem solving skills.

Relevant Professional Experience

Jan. 2014 –

Deputy Head of Trade

- Providing strategic business development support to Danish companies in Canada.
- Responsible for planning, leading and implementing the short and long term strategy for the energy and environment sector focus, including green building and other energy efficiency technologies
- Assigning tasks and providing support and guidance for team of Trade Advisors and Senior Trade Advisors in their daily work on behalf of Danish Companies.
- Providing project leadership in all sectors, developing strategic plans for clients, Project planning and implementation. Industry research, marketing research, sales & marketing support, meeting plans, partner search and matching
- Secure long term relations with clients through high customer satisfaction and value creation

Jan. 2012 – Dec. 2013

Senior Trade Advisor

- Providing strategic business development support to Danish companies in Canada.
- Develop joint export activities initiative to enhance visibility and synergies in collaboration between Danish companies
- Being the key contact in Canada for Danish organisations and companies within the energy and environment sectors, including green building and other energy efficiency technologies.
- Develop and implement strategies to assist individual and groups of Danish companies in positioning themselves on the market, including but not limited to market analysis, partner search, direct sales, PR work, study missions, subsidiary set up, Public Diplomacy projects, etc.

Jan. 2009 – Dec. 2011

Trade Advisor

- Providing export strategy advice and business support to Danish companies pursuing Canada.
- Focus: Energy & Environment
- Work: Industry research, meeting plans, Delegation management, partner search and matching

March 2008 – Dec 2008

Bid Manager – nD Insight

- Managing the end-to-end proposal development and submission process, including the development of win themes
- Facilitating bid response meetings and working closely with subject matter experts to develop/write succinct, persuasive proposal content
- Communicating effectively and professionally with internal and external stakeholders
- Ensuring adherence to proposal requirements, timelines and established standards and guidelines
- Assigning tasks to supporting team members
- Ensuring professional and easy-to-understand final products
- Conducting market research

Jan. 2007 – Dec. 2007

Assistant Trade Advisor – Traineeship at the Royal Danish Consulate General, Trade Commission of Denmark in Toronto

- Working both independently and with Senior Trade Advisors
- Assisting Danish companies establish a market for their products in Canada.
- Conducting market research, establishing contacts with clients and writing business proposals.
- Handled a multitude of additional tasks including web administration, development of client's marketing material (with use of Adobe Indesign), Presentations for business and schools visiting Toronto from Denmark.

2005-2006 (Student 15-20 hours/week)

Communications Consultant – the Danish Wind Industry Association

- Handled a multitude of communicational tasks including web administration, sending out newsletters, maintaining and updating member and general contact database, assisting in developing quarterly industry news magazine.
- Developed marketing campaign targeted the general public in order to stimulate positive emotions towards wind generated power.
<http://www.windpower.org/en/core.htm>

Education

2011 – 2012 Toronto, Canada	<p>Certificate in Project Management <i>University of Toronto (Project Management Institute - PMI)</i></p> <p>Foundations of Project Management, Leading Projects in Organizations and Project Implementation and Control.</p>
2005 – 2008 Copenhagen, Denmark	<p>M.Sc. Marketing & Communications Management (MCM) <i>Copenhagen Business School</i></p> <p>Focus in Marketing/ International Business/ Sustainable Business /Social and Political Marketing</p> <p>Social Entrepreneurship – Using Blended Value Strategies to Transform the Non-Profit Sector/ Sustainable Development and Competitive Advantage</p>
2002 – 2005 Copenhagen, Denmark	<p>B.Sc in Economics, Business Languages & Administration <i>Copenhagen Business School</i></p>
2005 Paris, France	<p>International Business Exchange <i>Sciences Po</i></p> <p>Focus in International Relations/ Sustainable Business/ Business Development in China / French</p>
2003 Paris, France	<p>International Business Exchange <i>Université Paris Dauphine</i></p> <p>Focus in Corporate Communications/ Strategic Marketing and Management/ Economics/ Business Accounting/ French</p>