INTERNATIONAL ENERGY AGENCY

Implementing Agreement for Co-operation in the Research, Development and Deployment of Wind Turbine Systems
Task 11

Topical Expert Meeting #93 on

Wind Turbine Lifetime Extension

IEA Wind Task 11- Topical expert meeting

December 13th, 2018

Technical University of Denmark (DTU), Risø campus, Roskilde, Denmark

Host and Technical lead:
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Ignacio Marti, DTU

Operating agent:
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Executive Summary of TEM 93

Introduction

Several MW of wind turbine installations from across Europe and other parts of the world are nearing their design lifetime (usually 20 years). The respective wind farm, turbine owners therefore require to make informed decisions on these wind turbines nearing their end of design life whether to extend their life, re-power them with new rotors or to decommission them. Such a decision must be taken based on recorded observations from the turbines over several years, from maintenance records, multi-year inspection records and other information collected in a systematic way. This problem is valid for both onshore and offshore wind turbines. However, there are no published international standards on life extension of wind turbines due to which standardized processes to quantify the risk of failure of turbine components upon life extension are not there. It is required therefore to demonstrate a recommended practice and the requirements to enable life extension of turbines, which can be deployed globally.

Extending the lifetime of a wind turbine requires that it is feasible to do so safely, quantify the cost of damage to the wind turbine components upon life extension and to put in place a relevant maintenance plan. Further there must be sufficient energy production upon life extension under the prevailing electricity rates to maintain profitability. Procedures for life extension must answer the above needs and further be introduced into new IEC standards, so as to put in place common guidelines for the wind industry that determines lifetime extension approval and planning of site specific design life.

It is timely, therefore, to take a strategic review of the procedures and methods for wind turbine lifetime extension.

The objective of the International Energy Agency (IEA) topical expert meeting (TEM) 93 was to provide an overview of the current trends in wind turbine lifetime prediction. Extension, re-powering and the challenges and opportunities that may emerge with this. Participants explored the potential needs of collaboration and international guidelines and discussed the priorities for the formation of a new IEA task.

Meeting Overview

The host of TEM 93, DTU Wind Energy, organized the meeting on Dec 13, 2018 at their Risø campus in Roskilde, Denmark. More than 35 participants attended the meeting, invited speeches were given and an intense exchange developed.

The prime topics of discussion included:

- The need for extending the life of wind turbines
- Requirements for life extension from practice
- Relevant standards for life extension today and the need for new standards
- Methods for quantifying remaining lifetime of structural components
- Methods for quantifying remaining lifetime of non - structural components
- Maintenance, repair upon life extension

In breakout sessions, three groups worked on
- Modeling for remaining life prediction
- Inspection methods and Component Damage
- Guidelines for standardization on lifetime extension

In general, presentations ranged from the data available or needed to determine remaining life, regulatory matters to specific implementations and practices already deployed. The overall assessment from the group was that, while elements of lifetime assessment already exist in the sector, significant benefit can be derived by developing a framework around which to focus and collaborate. Consequently, a core team volunteered to collaboratively prepare a work proposal for an IEA Wind TCP research task.

Main Results

The IEA TEM 93 covered many of the important topics for wind energy industry including Methods for predicting remaining life of wind turbines, the value of different types of data, the distinction between repowering and life extension, specific problems encountered in blades, drivetrains, offshore foundation etc.

The key topics there were identified as most important for lifetime extension were:

- Assessment of the safety of the primary structure and what is the reliability level that needs to be considered. Bridge the gaps in the methods for reliability analysis, such as data based versus conventional structural reliability methods for assessment of different limit states.
- Development of standards for lifetime extension.
- Inspection methods to detect damage and discuss how to categorize damages based on established knowledge, such as using FMEA.
- Management of data for life extension. What are the types of data that can be available for such a task: which sites and turbines? This data will be used for benchmarking of life extension methods. Data that shows changing environmental conditions over time and its effects on lifetime extension may also be useful.
- Other topics that may also be important are:
- Policy and state of the art on regulatory approaches and public perception.
- Business cases for life extension for banks, funding bodies, insurance companies.

These topics and more will ripple through the current wind energy design, development and operations processes to create a new, more efficient, more productive, more customer centric, wind energy industry. The key themes and outcomes of the meeting are described below.

Key themes of TEM 93:

- Lifetime extension will yield significant advancement opportunity for the wind energy sector since a very large base of wind turbine installations are nearing the end of their certified lifetime.
- Wind turbine lifetime extensions is hindered by the lack of adoption of standards and best practices
- Validated methods and decision tools are needed for organizations to enable lifetime extension in terms of both safety and profitability.
- Collaborative work on wind turbine lifetime extension would be highly valuable for both individual business and the industry as a whole

Key outcomes of TEM 93:

- Meeting presentations are available here on the IEA Wind platform.
- Formation of a new collaborative IEA task proposal with a focus on the following areas:
    - Reliability and Safety Assessment
        1. Target reliability levels for life extension
        2. Data based Methods
    - Inspection procedures and maintenance
        1. Preventive maintenance and repair
        2. Methods for inspection and where to inspect
    - Standardization and Regulatory frameworks
        1. Inputs to Standards development relevant to lifetime extension
        2. Policies, Investment Decisions and insurance

Summary of Presentations

The slides of the presentations can be found here on the IEA Wind platform

First session : Wind Farm perspective

8:45 Wind farm owner perspective: Business case life extension (Jan-Hendrik Wunsch, European energy)
Presentation of case study with repowering and life extension on same site
Old turbine operation cost of 2,93 ct€/ kWh
Potential for optimization for each turbine
Motivation to change structure of land fee, with variable fee
Discussion to change the full service agreement
Goal to have as variable operation cost as possible
Potential to decrease fixed cost of about 50%
On GE 1.5, gearbox have already been changed

9:00 Overview and potential for life time extension of wind farms in Europe (Ivan Komusanac, Wind Europe)
Definition : if you change the foundation : repowering
Presentation of statistics about age of turbine and age of decommission
Old turbine will have to comply with the new grid codes
30% of turbine are eligible to repowering, EIA are much more restricted, also distance to buildings
Support mechanism of repowering make the lifetime shorter, otherwise running turbine as long as possible
Steering committee : End of life strategies 2019 5-6 September 2019

9:15 Site specific evaluation of design life (Thomas Krogh, Orsted)
Presentation of operating assets, purely offshore windfarm with last numbers of sites and turbines
Difference between design and operation : less fatigue than the usual design
Evaluation of potential lifetime of 35 years as possible
Gathering data, and tunes aeroelastic model with operational data,
Aeroelastic model is becoming a part of the turbine supply
Next step is including more data and have an estimation of life consumption
Objective of certification for lifetime extension
Approach possible also for onshore, certificate for life on turbine, approach made to justify longer time

9:30 Bellacorick Wind Farm (Shane Holden, Bord na Mona)
Replaced by 9:30 Actions for small wind turbine life improvement (José Franco, CEMIE Eolico, Mexico)
Microtaps to reduce loads to improve lifetime especially on small wind turbines
Show 20% reduction in the load of blades
R&D work on artificial intelligence on smart diagnosis
Control system to modify the profile of wind turbines blades, reduction of fatigue damage
Morphing section to identify allow the change
100 turbines in Mexico, going into 50% of their life, consideration with remaining life

9:45 YR21 Investment Decision Support for Next Generation Wind Farming (Rupp Carriveau, University of Windsor)
Concept Investment Valuation model
Remaining Useful Life Estimation, 80% accuracy, only with Scada data, supervised learning

approach
Can identify very clearly when the maintenance of the blade was made
Question every single day, to help operator making the decision
Model to identify critical components and fatigue
Power Price Estimation
Making scenario of strategies and LCOE related to PPA prices
Learnings : wind farms generate remarkable quantities of data : limitless opportunities to leverage them
Develop a social acceptance index on operation, access wind resistance in the area

10:00 2030: End-of-life wind power capacity and wind energy target in Italy (Laura Serri, RSE S.p.A.)
Statistic of End of Life for each year, and on the other hand ambitious target for development
From 100 to 300 MW each year the next 5 years, low hub height, small size, best site, repowering ?
2025-2023, better for lifetime extension, already higher hub height
Lot of different constraint to evaluate
Dedicated discussion about decommissioning in TEM 96 in November 2019

10:15 The status of simulation method and modeling in China (Xu Honglei, Goldwind)
First wind plat already decommissioned
End of subsidy in 2020, demand for more power production
Proposal of active load control to have better turbine production based on real data
MD4X to have structure health monitoring based on operation data and sensor
Evaluation of RUL with time, with generic model but not mature, based on assessment related to the class,

10:45 Results from the LifeWind Project: Data driven analysis (Anand Natarajan, DTU)
Different strategies related to the level of data available
Interview of wind farm owners to understand what they want : they want but with the same level of inspections
Maybe some standard sets of rules for small wind turbines, but computation needed for larger wind turbines
Inspection in DTU of 8 wind turbines of more than 15 years
Main structural components did not show significant damages
In numerous cases, damage due to corrosion
Need decision about leading edge erosion, is it a real problem ?
Bolts, bearing need to be tested, where is the right level
Potential useful norm ISO 13811 about lifetime assessment of existing structure

11:00 Wind turbine rotor re-blading for lifetime extension, (Alessando Croce, Politecnico di Milano)
Different approach :
Residual life assessment
Minor or major lifetime extension : focus on major lifetime extension in presentation
Repowering
Re blading is using more efficient blades, but several topeix to maintain some loads and estimate lifetime of other components
Cp Max design : Italian tool used for several industrial blade design, with own codes structured in different levels
Cooperation with Gurrit for designing new blades for reblading.
New to identify the initial parameter, sometimes the initial WT manufacturer is not in the project
Optimization between aerodynamic and costs

Load testing model to have certification of the blades (as a single element), including models and testing

11:15 Life-time extension by retro-fitting a load-reducing real-time controller (Axel Schild, IAV GmbH)

Load reducing turbine control is a 742'000 search in Google
Results in more complex operating strategies, AEP vs fatigue
Enabled by sensor technologies lidar and fiber optic blade load sensors, need smart data processing
Model-predictive control as most promising technology to fill the void
Should be an add-on
Achievement : significant load reduction +2% more AEP, -10% fatigue loads in critical structural components
Optimization in the transition phase between wind regimes, use better the energy stored in the rotor
Can also work without Lidar : creating of a real time supervisory control framework base on dynamic plan model and safe operating regime to have real time optimal pitech and optimal torque
Mature but a lot of issue to overcome : get access, set up an interface, re-certification, need economy of scale, need of low cost sensor technology, for example virtual sensors

11:30 Wind turbine Lifetime Extension: The importance of full scale validation (Dominic Bolduc, Nergica, Canada)

Research center, owning testing facilities, with cold climate analysis
Repowering will be an issue in Canada from 2025 (later than in Europe) after 25 years, but people are starting asking questions
Different environment : different approach for remaining life, especially in complex terrain
On coast, erosion by dust and sand, question of the right level of maintenance
What is the influence of cold climate, does it have an impact on structural parts life, and what regarding icing ?
With rotor imbalance, potential critical events
New instruments on the turbine, to monitoring complex load and icing, several industrial collaboration
Also very complex requirement for the grid to follow

11:45 Turbine life prediction and reliability, Design and Operation Paul Veers, NREL)

Introduction : no one can predict the life of anything
Decision about lifetime extension may come before the "economic" life time
Standards require designing to an acceptable failure within a specified lifetime
Weibull curve for a component probability of failure, life extension is accepting a high probability of failure
Data to correct the probability of failure and make better choice
Main challenge : failure are often not the one accounted during design
Mainly bearing with axial cracks, that was not foreseen, how to foresee that ?
Dedicated research made
More sliding than rolling with high energy amount, high speed bearing analysis to try to understand
Cold operations at low power generate more frictional energy
Several different other explanation are discussed, but thinks that this sliding is the main one
Verification of model and prediction made
A lot of questions also about the electrical potential failure are still open

12:00 Summary of existing standards relevant for life extension (Jannie Nielsen, AUU)

Related also to LifeWind project : assessing remaining lifetime

What should be the standard ? Focus on economic, on safety, on sustainability, on loss on reputation, on pollution?
What are the risks? Different methods, risk informed, probabilistic and semi probabilistic
New updated characteristic values and safety factors in Eurocodes CEN TC250 WG2
Inspection can be planned to update the reliability models

12:15 Control methods to enhance life time extension of wind turbines (Vassilis Pettas, Universität von Stuttgart)
Evaluation of retrofit control strategies
Put together fatigue reserve, load reduction new methods with update OM cost to make the evaluation
Baseline of fatigue based on IEC class inputs
Miner's rule calculation to estimate potential damage
Assume constant fatigue consumption rate over years
Potential methods : Individual pitch control, down regulation, lidar assisted feedforward control
Methods complement each other
Relevant projects OWP control (5MW offshore) and Winsent (750 kW onshore complex terrain)
Estimation of RUL What is missing ?
Measurement data, fatigues reserve estimations, level of detail, wakes : how much is enough?
Clear legislation and standardization : high uncertainties in other owner issue

Summary of Brainstorming Sessions

Break-out sessions in the areas of methods and modeling for remaining life prediction, inspection and maintenance planning and procedures, guidelines for standardization were held.

The break-out sessions were well attended and key presentations were made during the break-out sessions to aid the discussions on the respective topics. The points of view from different countries was heard on lifetime extension. Overall there was a large consensus on the need for validated models to predicting remaining life and to enable lifetime extension. The needs for specific inspection procedures, what to inspect and when to inspect to prevent failures and to extend life was also stated. The procedures for IEC standards in lifetime extension was deliberated. A special presentation from the IEC 61400-28 working group that is setting up a technical specification on lifetime extension was made whereby the status in that standards working group was understood. The ideas and suggestions from the break out sessions would be included in the proposal for a new IEA task on lifetime extension.

The output from each breakout group was presented and discussed in the wider meeting and, post-meeting, further consolidation identified sub-categories and a plan for further work in the scope of a new IEA task on lifetime extension.

The findings from the session will inform follow-up actions, including the scoping of a possible IEA task on Lifetime extension.

Conclusions & Next Steps

General agreement on creating a new task on lifetime extension, which may run for 2 years. A proposal document needs to be tabled by April 2019 at the next IEA ExCo The framework and rules under which IEA Tasks operate was mentioned by Ignacio Marti.

A discussion was led on the key topics on which the new task should focus on. Topics that were suggested include:

- Assessment of the safety of the primary structure and what is the reliability level that needs to be considered.
- Bridge the gaps in the methods for reliability analysis, such as data based versus conventional structural reliability methods for assessment of different limit states.
- Inspection methods to detect damage and discuss how to categorize damages based on established knowledge, such as using FMEA.
- Management of data for life extension: What are the types of data that can be available for such a task: which sites and turbines? This data will be used for benchmarking of life extension methods.
- Data that shows changing environmental conditions over time and its effects on lifetime extension may also be useful.

The results of the task should be utilizable in the development of standards for lifetime extension or also useable by national bodies putting in place regulations on lifetime extension.

Other topics that may also be included are:

- Policy and state of the art on regulatory approaches and public perception may be included.
- Develop business cases for life extension for banks, funding bodies, insurance companies.

DTU volunteered to lead the IEA Task and the proposal writing. There were volunteers from the U.S.A. (NREL) and Canada (Univ. of Windsor) in contributing to the proposal. All participants who wish to take part in the proposal writing should send a confirmation email to Anand Natarajan anat@dtu.dk by Dec 20th.

APPENDIX ONE - TEM 93 Introductory Note

Anand Natarajan – DTU Wind Energy
Ignacio Marti – DTU Wind Energy

BACKGROUND

Several wind turbines and wind farms on land and offshore are approaching the end of their intended operational lifetime. Wind turbine and wind farm owners often see a value in continuing the operation of these wind turbines beyond their original design lifetime. Such life extension calls for a thorough review of the risk faced upon continued operation and a tabling of appropriate procedures with regards to approving lifetime extension. Extending the lifetime of a wind turbine requires that it is feasible to do so safely, quantify the cost of damage to the wind turbine components upon life extension and to put in place a relevant maintenance plan. It is required to show that the risk of failure upon continued operation beyond the certified design life is sufficiently low. Further there must be sufficient energy production upon life extension under the prevailing electricity rates to maintain profitability. Procedures for life extension must answer the above needs and further be introduced into new IEC standards, so as to put in place common guidelines for the wind industry that determines lifetime extension approval and planning of site specific design life.

OBJECTIVES

DTU Wind energy invites participants to this IEA Wind Topical Expert Meeting to present their findings on life extension of wind turbines and procedures that quantify the risk upon life extension. DTU Wind is coordinating the Danish EUDP funded LifeWind project which works with the Danish industry to develop guidelines for life extension based on measurements and inspections on aging wind turbines. The current results from this project will also be presented at this meeting. The specific topics to be discussed can include

- The need for extending the life of wind turbines
- Requirements for life extension from practice
- Relevant standards for life extension today and the need for new standards
- Methods for quantifying remaining lifetime of structural components
- Methods for quantifying remaining lifetime of non - structural components
- Maintenance, repair upon life extension
- Regulatory frameworks in different countries.

TENTATIVE PROGRAM

The TEM will be hosted at the Technical University of Denmark, Risø campus on Dec 13th, 2018. The program will include:

- Introduction by the host (DTU)
- Recognition of participants
- Presentations from participants covering the topics listed above
- Break-out sessions in the areas of methods and modeling for remaining life prediction, inspection and maintenance planning and procedures, guidelines for standardization.
- Presentation of the results of the breakout sessions

INTENDED PARTICIPATION

Participation is expected from academia, research institutes, wind turbine manufacturers, wind farm owners/operators, certification authorities, service providers etc. All participants will be expected to make a presentation on the work that they have been involved in the above topic areas.

EXPECTED OUTCOMES

The outcome of this meeting will be a document summarizing

- Presentations from the participants
- Recommendations for methods for site specific design life evaluation
- Recommendations for procedures, activities needed to approve life extension
- Needed research activities to support standards development.

APPENDIX TWO - Meeting Agenda

H.H. Koch Meeting Room, Bld. 112, Risø Campus, Technical University of Denmark (DTU), Frederiksborgvej 399, Roskilde 4000, Denmark

Dec 13, 2018, 8:30-16:30

8:15 Morning Coffee

8:30 Welcome and Opening of TEM 93 (Anand Natarajan, DTU/Lionel Perret, IEA Wind/Planair)

8:45 Presentations – I : Wind Farm Perspective

8:45 Wind farm owner perspective: Business case life extension (Jan-Hendrik Wunsch, European energy)

9:00 Overview and potential for life time extension of wind farms in Europe (Ivan Komusanac, Wind Europe)

9:15 Site specific evaluation of design life (Thomas Krogh, Orsted)

9:30 Bellacorick Wind Farm (Shane Holden, Bord na Mona) – cancelled and replaced by

9.30 Actions for small wind turbine life improvement (José Franco, CEMIE Eolico)

9:45 YR21 Investment Decision Support for Next Generation Wind Farming (Rupp Carriveau, University of Windsor)

10:00 2030: End-of-life wind power capacity and wind energy target in Italy (Laura Serri, RSE S.p.A.)

10:15 The status of simulation method and modeling in China (Xu Honglei, Goldwind)

10:30 Coffee Break

10:45 Presentations – 2 : Wind farms to wind turbines

10:45 Results from the LifeWind Project: Data driven analysis (Anand Natarajan, DTU)

11:00 Wind turbine rotor re-blading for lifetime extension, (Alessando Croce, Politecnico di Milano)

11:15 Life-time extension by retro-fitting a load-reducing real-time controller (Axel Schild, IAV GmbH)

11:30 Wind turbine Lifetime Extension: The importance of full scale validation (Dominic Bolduc, Nergica)

11:45 White Etching Area cracks in bearings and other failure modes (Paul Veers, NREL)

12:00 Summary of existing standards relevant for life extension (Jannie Nielsen, AUU)

12:15 Control methods to enhance life time extension of wind turbines (Vassilis Pettas, Universität von Stuttgart)

12:30 Lunch

13:15 Break-out Session 1 (Modeling for remaining life prediction, H.H. Koch room)

Group Leader: Nikolay Dimitrov

13:15 Brief Outline of Objectives (Nikolay Dimitrov, DTU)

13:20 Presentation 1: Remaining lifetime prediction modelling. A case-study. (Takis Chaviarapoulos, NTUA)

13:30 Presentation 2: Remaining useful lifetime from standard turbine signals (Michael Muskulus, NTNU)
13:40 Presentation3: Estimation of remaining lifetime, models versus observations (Nikolay Dimitrov, DTU)
13:50 Group Discussion on methods for predicting remaining life
14:45 Prepare Presentation for Forum

13:15 Break-out Session 2 (Inspection methods and component damage, Christian Riisager room)
Group Leader: Ignacio Marti
13:15 Brief Outline of Objectives (Ignacio Marti, DTU)
13:20 Presentation 1: Effects of defects and damage on wind blade laminates (Joshua Paquette, SNL)
13:30 Presentation 2: Standardization of inspection and maintenance procedures for rotor blades (Kyle Wetzel, Wetzel Wind Energy Services) - *canceled*
13:40 Presentation 3: Probabilistic calculation of remaining sub structural lifetime based on strain measurements (Clemens Hubler, Universität von Hannover)
13:50 Group Discussion on methods for predicting remaining life
14:45 Prepare Presentation for Forum

13:15   Break-out Session 3 (guidelines for standardization on lifetime extension, Ole Rømer Room)
Group Leader: Anand Natarajan
13:15 Brief Outline of Objectives (Anand Natarajan, DTU)
13:20 Presentation 1: Reliability- and risk based life extension approaches (John Dalsgaard Sørensen, AUU)
13:30 Presentation 2 : Best practices for life management and assessment for extended operation of wind farms (Mark Spring, Lloyds Register)
13:40 Presentation3 :The technical specifications for wind turbine lifetime extension of CGC (Fu Pengcheng, China General Certification Center)
13:50 Group Discussion on methods and guidelines for standardization
14:45 Prepare Presentation for Forum

14:45 Coffee Break

15:10 Plenum Continues
15:10 Presentation on Methods and modeling for remaining life prediction (Group 1)
15:20 Presentation on Inspection methods and Component Damage (Group 2)
15:30 Presentation on guidelines for standardization on lifetime extension (Group 3)
15:40 Discussion on enabling lifetime extension in the context of IEA (All)

16:30 End of Meeting

APPENDIX THREE - Meeting Participants

The meeting was attended by 37 participants from 12 countries. Following is the list of participants and their affiliations.

Name	Country	Company/Organization
Alessandro Croce	Italy	Politecnico di Milano
Anand Natarajan	Denmark	DTU Wind
Andrea Cervetto	Italy	WINDFOR
Axel Schild	Germany	IAV GmbH Ingenieurgesellschaft Auto und Verkehr
Bernd Woelfel	Germany	Woelfel Engineering GmbH + Co. KG
Clemens Huebler	Germany	Universität von Hannover
Dominic Bolduc	Canada	Nergica
Flemming Langhans	Denmark	COWI
Gonzalo Stabile	United States	EDF Renewables
Gregory Simmons	Sweden	Vattenfall
Han Wei	China	Beijing Goldwind Science & Creation Windpower Equipment Co., Ltd.
Henrik Pedersen	Denmark	DTU Wind
Ignacio Marti	Denmark	DTU Wind
Ivan Komusanac		WindEurope

Jan-Hendrik Wunsch	Denmark	European Energy
Jannie Sonderar Nielsen	Denmark	AAU
John Dalsgaard Sorensen	Denmark	Aalborg Universitet
Jose Franco Nava	Mexico	Centro Mexicano de Innovacion
Joshua Paquette	United States	Sandia National Laboratories
Kenny Krogh Nielsen	U.K.	Lloyd's Register
Kyle Wetzel	United States	Wetzel Wind Energy Services
Laura Serri	Italy	Ricerca sul Sistema Energetico - RSE S.p.A.
Lindsay Miller	Canada	University of Windsor
Lionel Perret	Switzerland	Planair
Mark Spring	U.K.	Lloyds Register
Michael Muskulus	Norway	NTNU
Nikolay Dimitrov	Denmark	DTU Wind
Pengcheng Fu	China	China General Certification Center
Rebeca Rivera Lamata	Denmark	Orsted
Rupp Carriveau	Canada	University of Windsor
Shane Holden	Ireland	Bord na Mona
Takis Chaviaropoulos	Greece	NTUA
Thomas Krogh	Denmark	Orsted
Tim Mueller	Germany	Enercon
Vasilis Pettas	Germany	Universität von Stuttgart
Veers Paul	United States	NREL
Xavier Munduate	Spain	CENER
Xu Honglei	China	Beijing Goldwind Science & Creation Windpower Equipment Co., Ltd.

APPENDIX FOUR - IEA Agreement

International Energy Agency Agreement

Implement Agreement for Co-operation in the Research, Development and Deployment of Wind Turbine Systems (IEA Wind)

The IEA international collaboration on energy technology and RD&D is organized under the legal structure of Implementing Agreements, in which Governments, or their delegated agents, participate as Contracting Parties and undertake Tasks identified in specific Annexes.

The IEA's Wind Implementing Agreement began in 1977 and is now called the Implementing Agreement for Co-operation in the Research, Development, and Deployment of Wind Energy Systems (IEA Wind). At present, 26 contracting parties from 22 countries, the European Commission, and Wind Europe, participate in IEA Wind. Austria, Belgium, Canada, Denmark, the European Commission, EWEA, France, Finland, Germany, Greece, Ireland, Italy (two contracting parties), Japan, Republic of China, Republic of Korea, Mexico, Netherlands, Norway (two contracting parties), Portugal, Spain, Sweden, Switzerland, United Kingdom and the United States are now members.

The development and maturing of wind energy technology over the past 30 years has been facilitated through vigorous national programs of research, development, demonstration, and financial incentives. In this process, IEA Wind has played a role by providing a flexible framework for cost-effective joint research projects and information exchange.

The mission of the IEA Wind Agreement continues to be to encourage and support the technological development and global deployment of wind energy technology. To do this, the contracting parties exchange information on their continuing and planned activities and participate in IEA Wind Tasks regarding cooperative research, development, and demonstration of wind systems.

Task 11 of the IEA Wind Agreement, Base Technology Information Exchange, has the objective to promote and disseminate knowledge through cooperative activities and information exchange on R&D topics of common interest to the Task members. These cooperative activities have been part of the Wind Implementing Agreement since 1978.

Task 11 is an important instrument of IEA Wind. It can react flexibly on new technical and scientific developments and information needs. It brings the latest knowledge to wind energy players in the member countries and collects information and recommendations for the work of the IEA Wind Agreement. Task 11 is also an important catalyst for starting new tasks within IEA Wind.

IEA Wind TASK 11: BASE TECHNOLOGY INFORMATION EXCHANGE

The objective of this Task is to promote disseminating knowledge through cooperative activities and information exchange on R&D topics of common interest. Four meetings on different topics are arranged every year, gathering active researchers and experts. These cooperative activities have been part of the Agreement since 1978.

Two Subtasks

The task includes two subtasks.

The objective of the first subtask is to develop recommended practices (RP). Recent developed RPs were on "Wind Farm Data Collection and Reliability Assessment for O&M Optimization (Task 33)" (RP#17) and "Floating Lidar Systems (Task 32 in coordination with the Offshore Wind Accelerator initiative)" (RP#18).

The objective of the second subtask is to conduct topical expert meetings in research areas identified by the IEA R&D Wind Executive Committee. The Executive Committee designates topics in research areas of current interest, which requires an exchange of information. So far, Topical Expert Meetings are arranged four times a year.

Documentation

Since these activities were initiated in 1978, more than 80 volumes of proceedings have been published. In the series of Recommended Practices 19 documents were published and six of these have revised editions.

All documents produced under Task 11 and published by the Operating Agent are available to citizens of member countries participating in this Task.

Operating Agent

Planair SA
Rue Galilée 6
1400 Yverdon-les-Bains

COUNTRIES PRESENTLY PARTICIPATING IN THE TASK 11 (2018)	
COUNTRY	**INSTITUTION**
Denmark	Danish Technical University (DTU) - Riso National Laboratory
Finland	Technical Research Centre of Finland - VTT Energy
Germany	Federal Ministry for Economic Affairs and Energy (BMWi)
Ireland	Sustainable Energy Ireland - SEI
Italy	Ricerca sul sistema energetico, (RSE S.p.A.)
Japan	New Energy and Industrial Technology Development Organization (NEDO)

Mexico	Instituto Nacional de Electricidad y Energías Limpias, (INEEL)
Netherlands	Rijksdient voor Ondernemend Nederland (RVO)
Norway	The Norwegian Water Resources and Energy Directorate - NVE
Republic of China	Chinese Wind Energy Association (CWEA)
Spain	Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas CIEMAT
Sweden	Energimyndigheten - Swedish Energy Agency
Switzerland	Swiss Federal Office of Energy - SFOE
United Kingdom	CATAPULT Offshore Renewable Energy
United States	The U.S Department of Energy -DOE