



# IECRE OPERATIONAL DOCUMENT

**IEC System for Certification to Standards relating to Equipment for use in  
Renewable Energy applications (IECRE System)**

---

**Project Certification Scheme**



## **THIS PUBLICATION IS COPYRIGHT PROTECTED**

**Copyright © 2018 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### **About the IEC**

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### **About IEC publications**

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### **Useful links:**

IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).



# **IECRE OPERATIONAL DOCUMENT**

**IEC System for Certification to Standards relating to Equipment for use in  
Renewable Energy applications (IECRE System)**

---

**Project Certification Scheme**

## CONTENTS

1	Scope .....	5
2	Normative references .....	5
3	Terms and definitions (needs to clarify this list with OD-501 and RoP).....	6
4	Symbols and abbreviations .....	6
4.1	Symbols.....	6
4.2	Abbreviations .....	6
5	Management of the project certification scheme .....	6
5.1	General.....	6
5.2	Certification Agreement .....	7
5.3	Issue of certificates and conformity statements .....	7
5.4	Security of relevant documentation .....	7
5.5	Validity and maintenance of certificates .....	7
5.5.1	Validity of certificates .....	7
5.5.2	Maintenance of project certificate (optional).....	7
5.5.3	Update of project certificate (optional) .....	8
5.5.4	Supplementary conformity statement .....	8
5.5.5	Dealing with outstanding issues.....	8
5.6	Corrective actions .....	8
6	The extent of certification .....	8
6.1	General.....	8
6.2	Project design certification .....	9
6.3	Site suitability evaluation .....	11
6.4	Project certification .....	13
7	Project certification and project design certification .....	15
7.1	Site conditions evaluation .....	15
7.1.1	General .....	15
7.1.2	Site conditions evaluation requirements.....	15
7.1.3	Site conditions evaluation conformity statement.....	16
7.2	Project design basis evaluation.....	16
7.2.1	General .....	16
7.2.2	Project design basis requirements .....	16
7.2.3	Project design basis conformity statement .....	17
7.3	Integrated load analysis evaluation .....	17
7.3.1	General .....	17
7.3.2	Integrated load analysis evaluation requirements .....	17
7.3.3	Integrated load analysis evaluation conformity statement .....	18
7.4	Site-specific wind turbine RNA design evaluation.....	18
7.4.1	General .....	18
7.4.2	Site-specific wind turbine RNA design requirements .....	18
7.4.3	Site-specific wind turbine RNA design evaluation conformity statement .....	19
7.5	Site-specific support structure design evaluation.....	19
7.5.1	General .....	19
7.5.2	Tower .....	19
7.5.3	Tower design evaluation conformity statement.....	20
7.5.4	Substructure .....	20
7.5.5	Substructure design evaluation conformity statement .....	20

7.5.6	Foundations.....	20
7.5.7	Foundations design evaluation conformity statement .....	20
7.6	Other installations design evaluation.....	20
7.6.1	General .....	20
7.6.2	Other installations design evaluation requirements .....	21
7.6.3	Other installations design evaluation conformity statement .....	21
7.7	Wind turbine/RNA manufacturing surveillance.....	21
7.7.1	General .....	21
7.7.2	Surveillance requirements .....	21
7.7.3	Wind turbine/RNA manufacturing surveillance conformity statement .....	22
7.8	Support structure manufacturing surveillance.....	22
7.8.1	General .....	22
7.8.2	Surveillance requirements .....	22
7.8.3	Support structure manufacturing surveillance conformity statement .....	23
7.9	Other installations manufacturing surveillance .....	23
7.9.1	General .....	23
7.9.2	Surveillance requirements .....	23
7.9.3	Other installations manufacturing surveillance conformity statement.....	23
7.10	Project characteristics measurements (optional) .....	23
7.10.1	General .....	23
7.10.2	Grid connection compatibility according to grid codes .....	24
7.10.3	Verification of power performance .....	24
7.10.4	Verification of acoustic noise emission .....	24
7.10.5	Test reports .....	24
7.10.6	Project characteristics measurement conformity statement .....	25
7.11	Transportation and installation surveillance .....	25
7.11.1	General .....	25
7.11.2	Transportation and installation requirements .....	25
7.11.3	Transportation and installation conformity statement .....	26
7.12	Commissioning surveillance .....	26
7.12.1	General .....	26
7.12.2	Commissioning surveillance requirements .....	26
7.12.3	Commissioning surveillance conformity statement .....	26
7.13	Final evaluation .....	26
7.14	Project certificate .....	27
7.15	Project design certificate.....	27
7.16	Site suitability evaluation conformity statement .....	27
7.17	Operation and maintenance surveillance.....	28
7.17.1	General .....	28
7.17.2	Operation and maintenance surveillance requirements .....	28
7.17.3	Operation and maintenance conformity statement.....	28

## **Operational Document: OD-502, Project Certification Scheme**

This operational document replaces the project certification part of International Standard IEC61400-22 and has been prepared by WG501 under the IECRE scheme.

Further IECRE ODs are planned and are covering the same topics as OD-502 but in more detail. When such ODs are approved and published they will take precedence.

A list of all parts of the IEC61400 series, under the general title: *Wind turbines*, can be found on the IEC website (IECRE.ORG).

This document will be maintained according to the directive set out in the Basic Rules consisting of IEC CA 01 and IECRE 01-S (IECRE supplement to IEC CA 01) and IECRE 05 (WE-OMC Rules of Procedure) (IECRE 05).

## OD-502, Project Certification Scheme

### 1 Scope

The project certification scheme constitutes a third-party conformity assessment of a complete wind farm or individual installations associated with the wind farm. The project certification scheme applies for wind farms intended for both onshore and offshore installation.

This Operational Document specifies procedures for the project certification scheme, with respect to specific standards and other technical requirements, relating to safety, reliability, performance, construction, and interaction with electrical power networks. It provides:

- definitions of the modules in the wind farm project certification scheme;
- procedures for conformity assessment in the wind farm project certification scheme;
- guidance for documentation that is to be supplied by an applicant for the conformity assessment; and

The project certification scheme is not limited to wind turbines of any particular size or type. Some modules of the project certification scheme are mandatory, whilst provision is specifically made for others to be optional.

This OD describes procedures for conformity assessment relating to design, manufacturing, transportation, installation, and operation.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies unless specified elsewhere.

IEC 61400 series standards as listed in the website IECRE.org

ISO/IEC 17000, *Conformity assessment – Vocabulary and general principles*

ISO/IEC 17020, *Conformity assessment – Requirements for the operation of various types of bodies performing inspection*

ISO/IEC 17021, *Conformity assessment – Requirements for bodies providing audit and certification of management systems*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO/IEC 17065, *Conformity assessment – Requirements for bodies certifying products, processes and services*

ISO 9001, *Quality management systems – Requirements*

Earlier or withdrawn editions of the referenced normative document may only be applied according to transition rules decided by IECRE WE-OMC e.g. through clarification sheets.

### 3 Terms and definitions (needs to clarify this list with OD-501 and RoP)

For the purposes of this document, the following terms and definitions apply, together with the relevant definitions contained in document “IECRE Definitions” (IECRE Acronyms, Terms and Definitions) for general terms and definitions at IECRE.org and the IEC 61400 series.

#### **applicant**

entity applying for certification

#### **certificate holder**

entity holding a certificate after the certificate is issued

Note This entity may not be the original applicant but nevertheless is responsible for maintenance of the certificate.

#### **construction**

includes manufacturing, transport, installation and commissioning of wind farm and any other installations associated with the wind farm

#### **modification**

a new installation or changes to an existing installation, which changes the original design/specification

#### **rotor-nacelle assembly**

##### **RNA**

part of a wind turbine carried by the support structure

#### **support structure**

part of a wind turbine consisting of the tower, sub-structure and foundation, see IEC61400-3

#### **wind farm**

energy producing facility, comprising all its main installations to produce power and transfer it into the power grid. The term wind farm is associated with the main installations wind turbines and substation(s) including their support structures and power cables.

### 4 Symbols and abbreviations

#### 4.1 Symbols

The relevant symbols contained in IEC61400-1 and IEC 61400-3 are applicable.

#### 4.2 Abbreviations

See document “IECRE Definitions” (IECRE Acronyms, Terms and Definitions) for general abbreviations at IECRE.org.

RNA	rotor-nacelle assembly
•	WT wind turbine(s)
•	WF wind farm(s)
•	RECTF renewable energy customer test facility

### 5 Management of the project certification scheme

#### 5.1 General

The project certification scheme shall be managed and operated in accordance with the Basic Rules consisting of IEC CA 01 and IECRE 01-S (IECRE supplement to IEC CA 01) and IECRE 05 (WE-OMC Rules of Procedure).

## **5.2 Certification Agreement**

A CB approved by REMC for operating as an RECB according to this OD shall upon request take on work for certification of wind farm and any other installations associated with the wind farm according to this project certification scheme. The services of the RECB shall be available to all applicants without undue financial or other conditions.

Prior to starting certification work an agreement between applicant and RECB shall be made. In addition to financial and other usual contract conditions, the agreement shall include the scope of the certification including a clear reference to the IECRE system and the OD-502 identifying the applicable certification modules.

## **5.3 Issue of certificates and conformity statements**

The project certification scheme covers the issuance of certificates and conformity statements and is described in the Basic Rules consisting of IEC CA 01 and IECRE 01-S (IECRE supplement to IEC CA 01) and IECRE 05 (WE-OMC Rules of Procedure).

In the case of outstanding issues of no importance to the primary safety of the certified object, a provisional certificate or provisional conformity statement may be issued for a limited period of validity, maximum 1 year, which permits evaluation and verification of the outstanding issues.

## **5.4 Security of relevant documentation**

The RECB shall keep a file of all received material that is relevant to the certificate or conformity statement. This file shall be kept in a place with restricted access for at least 5 years plus the design lifetime of the object, starting from the issuing date. The material and any copies shall subsequently be returned to the applicant or destroyed with written notice thereof.

## **5.5 Validity and maintenance of certificates**

### **5.5.1 Validity of certificates**

A project certificate documents conformity to OD-502 and the site-specific installation at the time of issue.

The applicant may optionally maintain a project certificate over the lifetime of the wind farm (see 5.5.2). If maintenance of the project certificate has not been carried out the applicant optionally can apply for an update of the project certificate e.g. for major modifications (see 5.5.3).

In the case of a provisional certificate or conformity statement the period during which all outstanding issues shall be documented by the applicant and evaluated by the RECB shall not exceed 1 year.

### **5.5.2 Maintenance of project certificate (optional)**

To maintain or re-issue a project certificate the following requirements shall be met by the applicant and the RECB:

- the applicant shall prepare an annual report for the certified project to be sent to the RECB for review. The report shall include information on installed wind turbine(s) and additional installation(s) as installed at the site, deviant operating experience known to the certificate holder and minor modifications;
- the applicant shall report major modifications to the certified project to the RECB without delay. In case the certificate holder intends to update the certificate, the update of all documents affected by the modification shall be provided; and
- an RECB shall perform operation and maintenance surveillance, see 7.17, with the purpose of checking that a specific wind turbine installation or wind turbine project at a

specific site is operated and maintained in conformity with the relevant manuals included in the design documentation and meets the required surveillance according to ISO/IEC 17065.

### **5.5.3 Update of project certificate (optional)**

To update a project certificate the following requirements shall be met by the applicant and the RECB:

- Update e.g. due to major modifications requires a new assessment with focus on the applicable technology developments including new standards and knowledge acquired since the previous issue
- The update of a project certificate may require assessment of all the relevant modules.
- Relevant historical information shall also be considered.

### **5.5.4 Supplementary conformity statement**

This is a new chapter that needs to be dealt with later.

### **5.5.5 Dealing with outstanding issues**

A provisional certificate or associated conformity statement may be issued in case of no safety implication for the wind farm and its installations.

The outstanding issues should be limited to issues with no safety implication within the period of validity (maximum 1 year).

The certificate holder of a wind farm with a provisional certificate shall ensure that the outstanding issues are solved and assessed by the RECB.

## **5.6 Corrective actions**

The RECB shall be informed by the certificate holder in the event that wind farm or its installations are not functioning according to the design specifications and/or other criteria relevant to the certificate.

Incidents known to the certificate holder where the safety of a wind farm, the surroundings or personnel is involved shall be reported to the RECB without delay.

The RECB shall carry out an evaluation of the certificate holder's incident reporting including root cause analysis and corrective actions.

If the incident is found to be related to a serial defect and the certificate holder is not able to take appropriate action to prevent further incidents then the certificate shall be immediately suspended. The suspension period shall not exceed 1 year.

Should it be concluded that further incidents cannot be avoided or the suspension period has expired, then the certificate shall be withdrawn.

## **6 The extent of certification**

### **6.1 General**

The certification procedures specified in this operational document describe a third-party conformity evaluation of a wind farm or other installations at a specific location. An evaluation results in one of the following:

- a project design certificate; or
- a project certificate; or
- a site suitability evaluation conformity statement

The approach given in this operational document has a modular structure to account for requests for individual conformity statements, see following chapter 6.4.

The RECB shall require an applicant to provide documentation that covers all the aspects detailed in this clause. The documentation shall be evaluated for compliance with the technical requirements of the IEC61400-series and additional codes or standards chosen by the designer and agreed with the RECB e.g. local standards relevant for the site.

## **6.2 Project design certification**

Project design certification shall confirm for a specific site that wind turbines and if needed particular foundation designs meet requirements governed by site-specific external conditions and are in conformity with applicable local codes and other requirements relevant to the site. Project design certification may also confirm conformity for other installations in relation to the turbine installations. The certification shall confirm that the wind conditions, other environmental and electrical network conditions, and soil properties at the site conform with those defined in the design documentation for the wind turbine type(s) and if needed foundation(s).

A “Project Design Certificate” shall be issued when the selected wind turbines are type-certified according to the criteria detailed in OD-501. It will address the needs of late stage projects and ready-to-build projects.

A “Provisional Project Design Certificate” can be issued when the selected wind turbines are not type certified but covered by a design evaluation conformity statement or a provisional type certificate according to OD-501. It will address the needs of early stage projects.

The project design certification consists of the following modules as shown in figure 1:

- site conditions evaluation;
- project design basis evaluation;
- integrated load analysis evaluation;
- site-specific wind turbine RNA design evaluation;
- tower design evaluation;
- substructure design evaluation;
- (generic) foundation design evaluation; (optional)
- grid code compliance evaluation; (optional)
- other installations design evaluation; (optional)

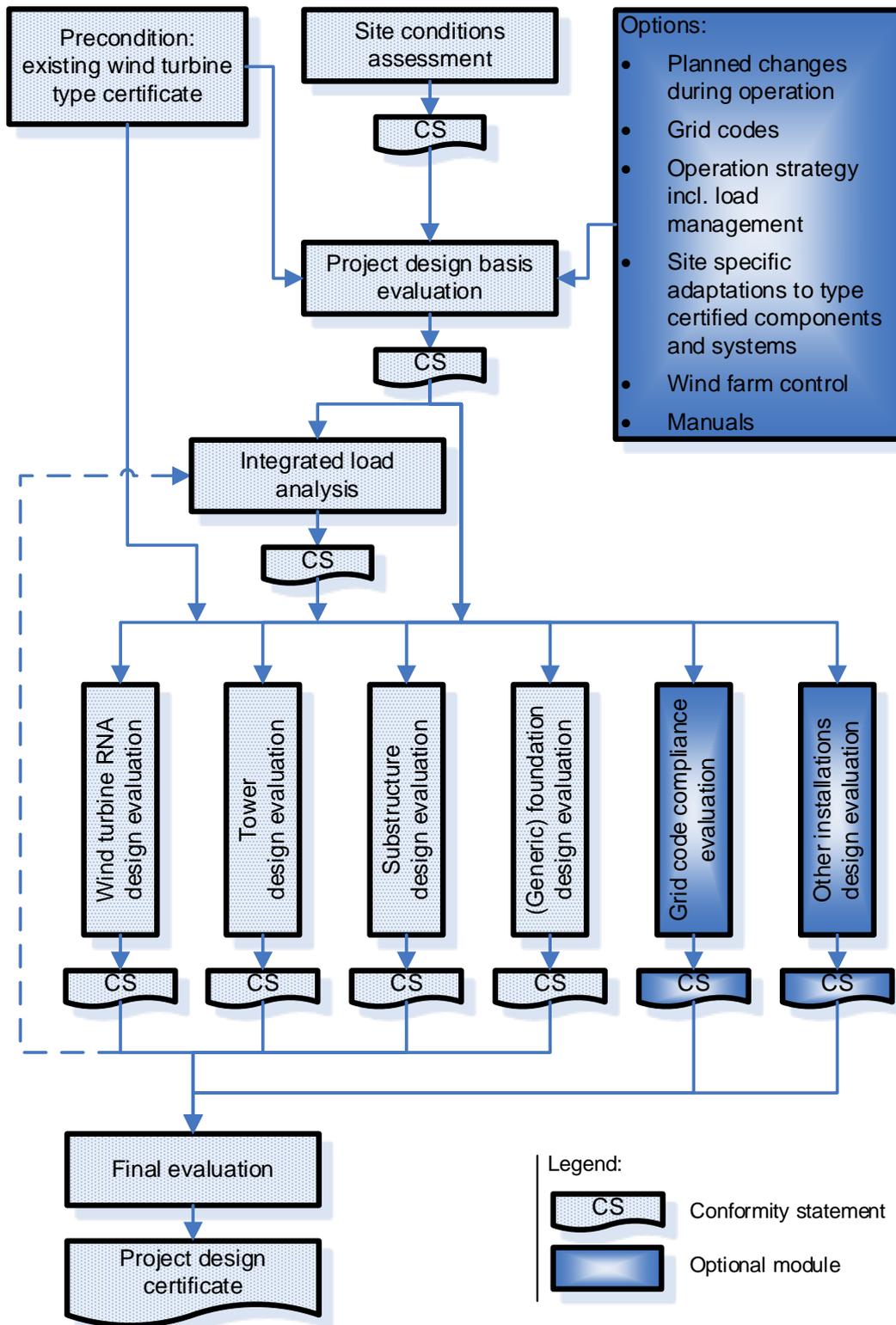


Figure 1 – Modules in project design certification

### 6.3 Site suitability evaluation

As a simplified alternative to a complete Project Design Certification as per section 6.2, a Site Suitability Evaluation<sup>1</sup> may be carried out instead.

As compared to a complete Project Design Certification, the Site Suitability Evaluation:

- only includes an evaluation of the site conditions, of the project design basis, and of the integrated load analysis, as well as of the RNA and tower design, thus omitting some of the modules otherwise included in a Project Design Certification;
- does not include any Conformity Statements other than the final Site Suitability Evaluation Conformity Statement; and
- is a stand-alone evaluation, without further proceeding towards a complete Project Design Certification, or towards a Project Certification; this means that the Site Suitability Conformity Statement cannot be used as part of Project Design Certification or Project Certification.

Refer to Figure 2 for further details.

A “Site Suitability Evaluation Conformity Statement” shall be issued when the selected wind turbines are type-certified according to the criteria detailed in OD-501. A “Provisional Site Suitability Evaluation Conformity Statement” can be issued when the selected wind turbines are not type certified but covered by a design evaluation conformity statement or a provisional design evaluation conformity statement or a provisional type certificate according to OD-501.

---

<sup>1</sup> Site Suitability Evaluation as a simplified alternative is generally intended for use in the context of wind parks for which a complete Project Design Certification or Project Certification is not needed, such as relatively small on-shore wind parks or in very early stage period. In many cases, the RECB will carry out such evaluation in direct cooperation with the WTG designer, especially in those cases where the evaluation includes an estimation of the site-specific technical life time (specific OD will be developed).

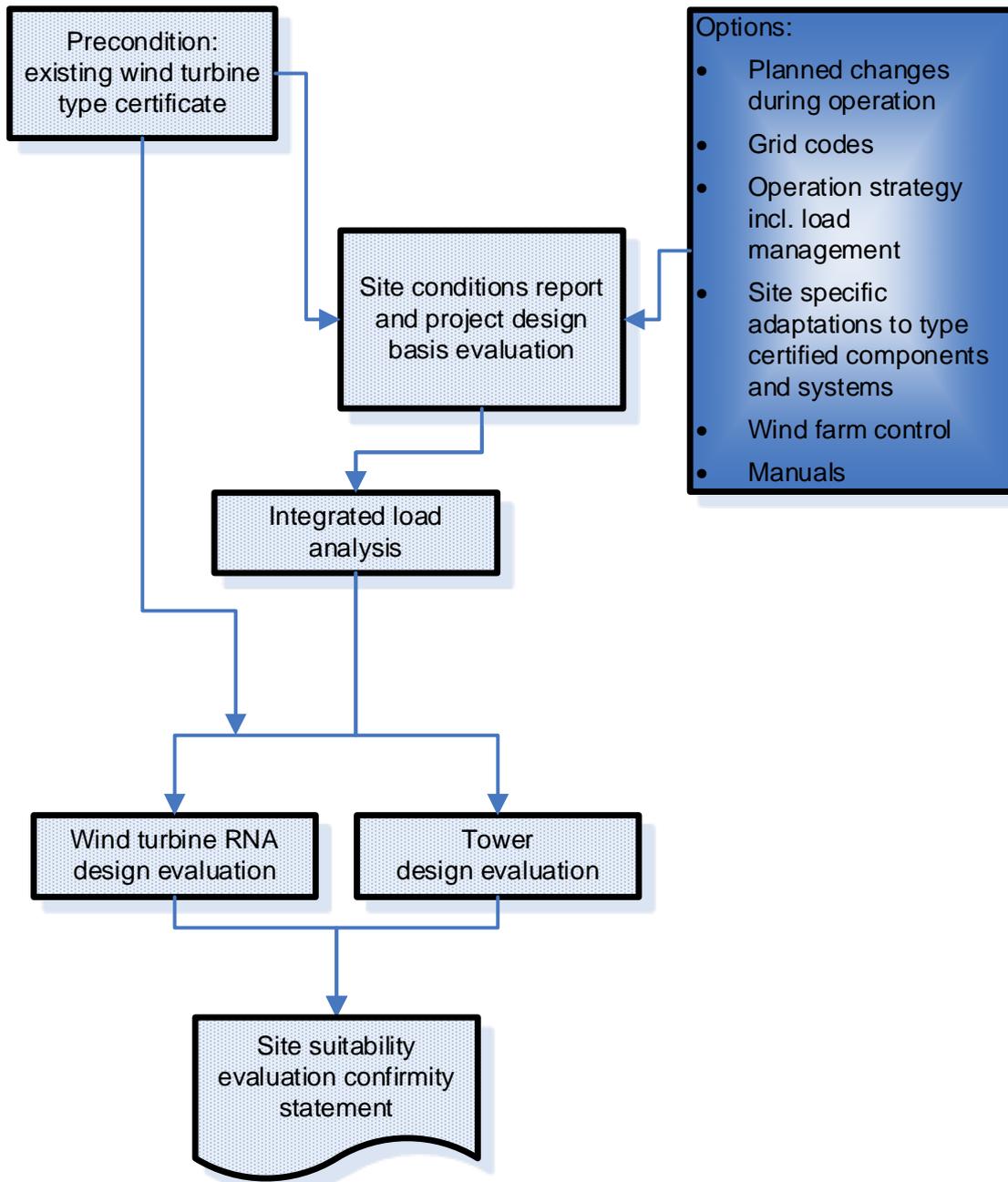


Figure 2 – Modules in site suitability evaluation

#### 6.4 Project certification

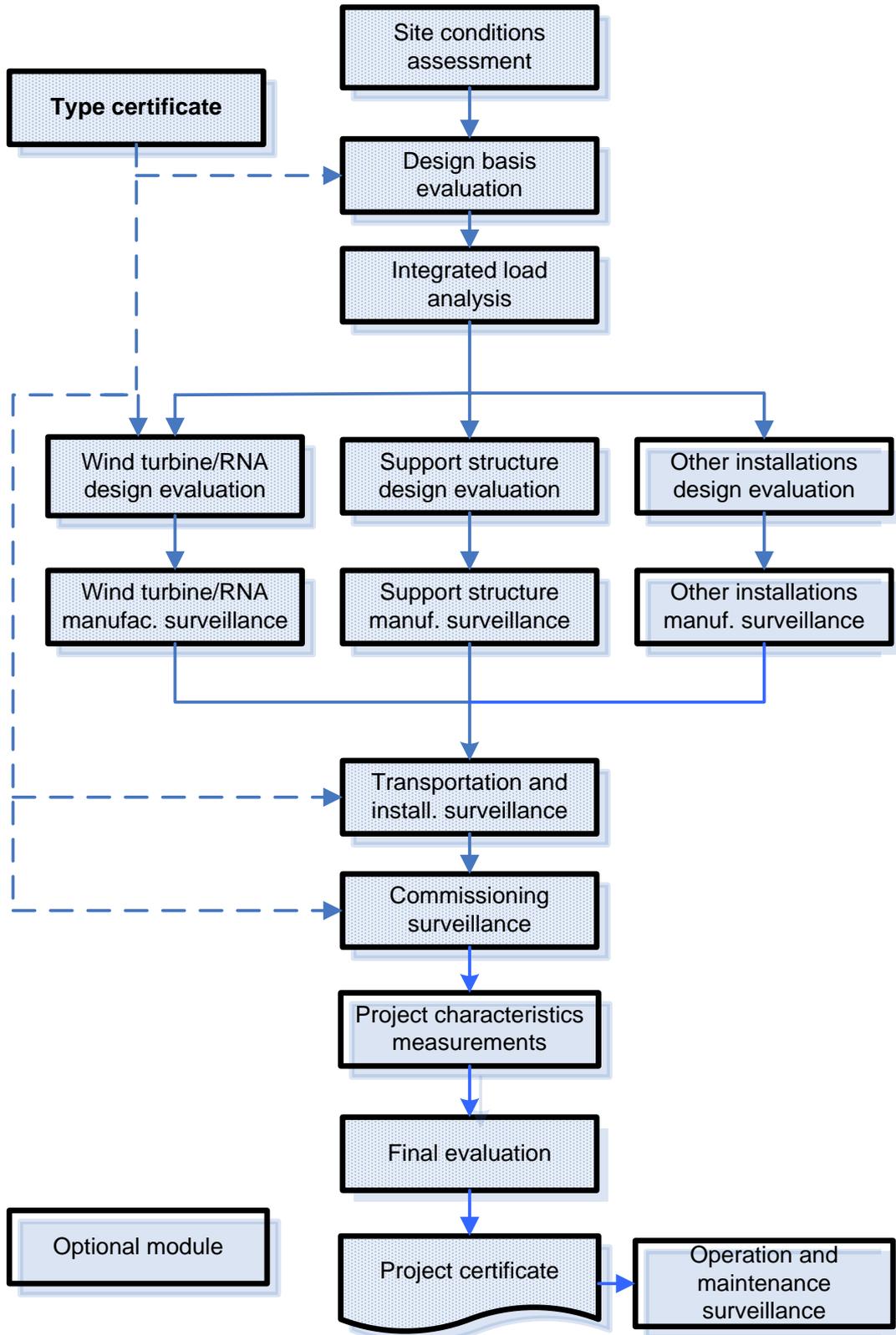
The purpose of project certification is to evaluate that the wind farm (wind turbine, support structures, etc.) is in conformity with applicable standards for a specific site.

A prerequisite for a project certificate is the availability of a type certificate for the wind turbine according to OD-501. If there is no type certificate issued for the wind turbine, the mandatory modules for type certificate shall be fulfilled within project certification, see Figure 3. Henceforth the mandatory modules of type certification covered by the project certification shall be evaluated by an RECB with respect to the specific project and site-specific conditions.

Project certification of type-certified wind turbines/RNA consists of the following modules which shall be completed by a conformity statement each:

- site conditions evaluation;
- project design basis evaluation;
- integrated load analysis evaluation;
- site-specific wind turbine RNA design evaluation;
- support structure design evaluation;
- other installations design evaluation; (optional)
- wind turbine/RNA manufacturing surveillance;
- support structure manufacturing surveillance;
- other installations manufacturing surveillance; (optional)
- project characteristics measurements; (optional)
- transportation and installation surveillance;
- commissioning surveillance;
- final evaluation; and
- operation and maintenance surveillance. (optional)

The modules are illustrated in Figure 3. Satisfactory evaluation of each module is concluded with an evaluation report and a conformity statement.



**Figure 3– Modules in project certification**

A project certificate documents conformity for all the mandatory modules and may additionally document conformity for optional modules. The project certificate is issued based on the completeness and correctness of the evaluation reports and conformity statements.

The modules are described in chapter 7.

## **7 Project certification and project design certification**

### **7.1 Site conditions evaluation**

#### **7.1.1 General**

The purpose of site conditions evaluation is to examine the environmental, electrical and ground conditions at a site.

#### **7.1.2 Site conditions evaluation requirements**

The site conditions are classified in the following categories:

- wind conditions;
- other environmental conditions;
- earthquake conditions;
- electrical power network conditions; and
- geotechnical conditions.

For offshore sites, these conditions are supplemented by

- marine conditions

The RECBs shall evaluate whether assessment of the site conditions, as detailed in IEC 61400-1 for onshore or IEC 61400-3 for offshore projects, have been adequately undertaken and documented.

The RECB may carry out independent calculations for selected parameters based on the environmental and geotechnical data provided.

Measurements of the external conditions of the site:

- a) shall either be carried out by an RETL,
- b) or the RECB (or any ISO/IEC 17025 accredited test laboratory accepted by the RECB) shall accompany the measurement campaign to verify the satisfactory quality and reliability of the measurements; such verification shall include evaluation of:
  - test and calibration methods;
  - equipment;
  - measurement traceability;
  - assurance of the quality of test and calibration results; and
  - reporting of the results;

and the RECB shall verify that data acquisition, analysis, and reporting of the external conditions at the site is carried out by qualified personnel (e.g. meteorologists, engineers, or geologists).

- c) or, if (a) and (b) are not available because the project specific measurement campaign has been executed prior to the involvement of an RECB the RECB (or any ISO/IEC 17025 accredited test laboratory accepted by the RECB) shall verify that:
  - data acquisition has been carried out using adequate test methods, and using appropriate equipment that has been calibrated;
  - all measured data is sufficiently traceable;
  - data acquisition, analysis, and reporting of the external conditions at the site has been carried out by qualified personnel (meteorologists, engineers, or geologists); and
  - adequate quality assurance has been applied to data acquisition, analysis and reporting.

For offshore sites normally no or only limited project specific ocean (wave, current and water level) measurements are available and data from adjacent locations are to be capitalised on instead, proper transformation of such other data shall be performed to account for possible differences due to different water depths and different seabed topographies. Such transformation shall, for example, take wave shoaling and refraction into account. Hindcast of ocean data may be used to extend measured time series, or to interpolate to places where measured data have not been collected. If hindcast is used, the hindcast model shall be calibrated against measured data to ensure that the hindcast results comply with available measured data.

In all cases, the RECB shall evaluate whether relevant reports properly document the external conditions, the data acquisition, as well as the setup and calibration of the hindcast and transformation. Furthermore, RECB shall evaluate the applied statistical methods and the design parameters for the external conditions.

### **7.1.3 Site conditions evaluation conformity statement**

A satisfactory site conditions evaluation is concluded with a site conditions evaluation conformity statement. The conformity statement shall include identification of the evaluated reports.

## **7.2 Project design basis evaluation**

### **7.2.1 General**

The purpose of the project design basis evaluation is to examine that the project design basis is properly documented and sufficient for a safe design and execution of the project.

### **7.2.2 Project design basis requirements**

The project design basis shall identify and include:

- design parameters for the external conditions;
- design methodologies and principles;
- codes and standards which form the basis for the project;
- other relevant statutory requirements (e.g. embarkation, rescue and decommissioning);
- wind turbine type; main specifications or type certificate with identifications of deviations;
- support structure concept;
- corrosion protection concept;
- any other installations to be covered by the project design certificate or project certificate
- requirements for manufacturing, transportation, installation, commissioning; and
- requirements of operation and maintenance.

Options can be added, such as:

- planned changes during operation
- grid codes
- operation and maintenance strategy, for example, load management
- site specific adaptations to type certified components and systems
- wind farm control
- manuals
- requirements for grid connection; and
- other project requirements, e.g. from the owner.

The project design basis shall include all relevant overall design aspects and parameters to be applied in the calculations regarding the site external conditions, loads, design load cases, partial safety factors applied on loads and materials, geometric tolerances, corrosion allowance, marine growth, etc.

The project design basis shall describe the design principles and methodology, including how the following have been established:

- codes and standards;
- external design parameters;
- wake effects;
- design load cases;
- load factors and load reduction factors;
- duration of simulation as well as number of simulations; and
- extreme and fatigue design loads/response analyses.

The project design basis shall include relevant manufacturing, transportation, installation and commissioning requirements such as:

- codes and standards;
- environmental conditions relevant for installation; and
- requirements from the manufacturing, transportation, installation and commissioning manuals.

The project design basis shall include relevant operation and maintenance requirements such as:

- codes and standards;
- inspection scope and frequency;
- target lifetime of components, systems and structures;
- requirements for operation and maintenance manuals;
- requirements for conditioning monitoring systems; and
- requirements with respect to personnel safety.

### **7.2.3 Project design basis conformity statement**

A satisfactory project design basis evaluation is concluded with a project design basis evaluation conformity statement. The conformity statement shall include identification of the evaluated reports.

## **7.3 Integrated load analysis evaluation**

### **7.3.1 General**

The purpose of the integrated load analysis is to examine whether the site-specific loads and load effects on the integrated wind turbine structure, including the rotor-nacelle assembly plus the support structure and supporting soils, are derived in conformity with the project design basis.

### **7.3.2 Integrated load analysis evaluation requirements**

If the conditions and requirements in the project design basis regarding loads and load effects are more benign than assumed for the type certification for the wind turbine and the support structure and the wind turbine characteristics are identical, no further load analysis needs to be made.

If further load analyses are to be carried out, the applicant shall perform these calculations taking due account of complete structural dynamics. The applicant shall provide full

documentation to the RECB of the load calculations and a comparison with the loads assumed for the type certificate.

The RECB shall evaluate:

- the combinations of external conditions and design situations (e.g. normal, fault, transport, installation);
- the respective partial load safety factors;
- the calculation methods, e.g. simulation procedure, number of simulations and combinations of wind and wave loads, if applicable;
- the design driving load cases defined with reference to the site conditions and the operation and safety system of the wind turbine; and
- any difference between the site-specific loads and the loads assumed for the type certificate.

### **7.3.3 Integrated load analysis evaluation conformity statement**

A satisfactory evaluation of the integrated load analysis is concluded with a conformity statement.

## **7.4 Site-specific wind turbine RNA design evaluation**

### **7.4.1 General**

The design of the site-specific wind turbine RNA shall be evaluated for compliance with the project design basis. In the case of a site-specific support structure design, the evaluation shall only comprise the RNA.

In addition to wind and marine conditions, other external conditions can affect the integrity and safety of the site-specific wind turbine RNA, e.g. by thermal, photochemical, corrosive, mechanical, electrical or other physical action.

### **7.4.2 Site-specific wind turbine RNA design requirements**

The wind turbine RNA type certification conditions and limitations shall be compared to the actual site conditions as given in the project design basis and acc. to IEC 61400-1 or IEC 61400-3. This comparison shall be part of the design documentation. The comparison shall in addition to loading conditions include other relevant conditions such as:

- temperature;
- humidity;
- solar radiation;
- rain, hail, snow and ice;
- chemically active substances;
- mechanically active particles;
- salinity;
- electrical conditions; and
- lightning etc.

The action taken with respect to the relevant conditions shall be stated in the design documentation.

Structural, mechanical and electrical components shall be evaluated acc. to the appropriate site conditions and IEC 61400-1 and -3. The corrosion protection systems shall be evaluated for the site-specific environment. Special attention shall be given to the effects of the site-specific conditions on electrical components such as generator, converter, transformer, switch gear and enclosures.

The site-specific loads resulting from the integrated load analysis have to be evaluated with respect to the design loads used in the type certification acc. to IEC 61400-1 or IEC 61400-3. Any increases in load level as well as any changes in vibration modes/natural frequencies shall be reported and carefully evaluated. This evaluation shall consider the relevance and validity of load measurements, functional testing and component tests. Furthermore, the evaluation shall also identify components that will require reinforcement or modifications.

Design documentation shall be provided for any new, modified or reinforced components and systems that are not fully covered by the type certificate for the wind turbine.

Design documentation for new or modified electrical components and systems shall comply with the project design basis and, if relevant, also with the requirements for the type certification.

#### **7.4.3 Site-specific wind turbine RNA design evaluation conformity statement**

A satisfactory evaluation of the site-specific wind turbine RNA design is concluded with a conformity statement.

### **7.5 Site-specific support structure design evaluation**

#### **7.5.1 General**

The site-specific support structure (tower, sub-structure and foundation) design shall be evaluated for compliance with the approved project design basis as well as the standards listed therein. In cases where the scope of the project design basis does not cover the support structure, reference to a recognized standard or design method can be made by the applicant, provided this is accepted by the RECB. In any event, the resulting safety level shall at least comply with the intended level in the relevant IEC61400 series standard i.e. IEC61400-1, IEC61400-2 or IEC61400-3.

The interfaces between the:

- Wind turbine RNA and tower;
- Tower and substructure; and
- Substructure and foundation;

shall be defined in the project design basis and accordingly considered in the design sections of this OD.

#### **7.5.2 Tower**

The design evaluation of the tower shall at least include:

- evaluation of the design of the tower with respect to the results of the integrated load analysis;
- calculated tower stiffness and damping as compared to the assumptions made in the load calculations;
- evaluation of manufacturing plan, transportation plan, installation plan and maintenance plan (these plans/manuals can also be generic), however only as far as required for the structural integrity of the final installed (permanent) tower; and
- evaluation of corrosion protection system(s) based on the project design basis.
- evaluation of design assumptions (for example for materials) with respect to the external conditions which are defined in the project design basis
- evaluation of possible impact of tower internals on the primary structure.

The design documentation for the tower shall at least include design drawings, general manufacturing specifications and design calculations, which may be combined with measurement/test reports.

### **7.5.3 Tower design evaluation conformity statement**

A satisfactory evaluation of the tower design is concluded with a conformity statement.

### **7.5.4 Substructure**

The design evaluation of the substructure shall at least include:

- evaluation of the design of the substructure with respect to the results of the integrated load analysis;
- calculated substructure stiffness and damping as compared to the assumptions made in the load calculations;
- evaluation of manufacturing plan, transportation plan, installation plan and maintenance plan (these plans/manuals can also be generic), however only as far as required for the structural integrity of the final installed (permanent) substructure; and
- evaluation of corrosion protection system(s) based on the project design basis
- evaluation of design assumptions (for example for materials) with respect to the external conditions which are defined in the project design basis
- evaluation of possible impact of secondary structures (for example boat landings) on the primary structure.

The design documentation for the substructure including documentation of the geotechnical aspects shall at least include design drawings, general manufacturing specifications and design calculations, which may be combined with measurement/test reports.

### **7.5.5 Substructure design evaluation conformity statement**

A satisfactory evaluation of the substructure design is concluded with a conformity statement.

### **7.5.6 Foundations**

The design evaluation of the foundations shall at least include:

- evaluation of the design of the foundations with respect to the results of the integrated load analysis;
- calculated foundations stiffness and damping as compared to the assumptions made in the load calculations;
- evaluation of the geotechnical design documentation based on the project design basis
- evaluation of manufacturing plan, transportation plan, installation plan and maintenance plan (these plans/manuals can also be generic), however only as far as required for the structural integrity of the final installed (permanent) foundations; and
- evaluation of corrosion protection system(s) based on the project design basis
- evaluation of design assumptions (for example for materials) with respect to the external conditions which are defined in the project design basis.

The design documentation for the foundations including documentation of the geotechnical aspects shall at least include design drawings, general manufacturing specifications and design calculations, which may be combined with measurement/test reports.

### **7.5.7 Foundations design evaluation conformity statement**

A satisfactory evaluation of the foundations design is concluded with a conformity statement.

## **7.6 Other installations design evaluation**

### **7.6.1 General**

A project may comprise other installations such as substations, cables etc., the design of which shall be evaluated as required by the client. Such other installations design shall be evaluated for compliance with the standards and other specifications in the approved project design basis as well as with site-specific loads and conditions. In any event, the resulting

safety level shall at least comply with the intended level in the relevant IEC61400 series standard i.e. IEC61400-1 or IEC61400-3.

### **7.6.2 Other installations design evaluation requirements**

The design evaluation of the other installations shall at least include:

- evaluation of the design documentation;
- evaluation of the design of the installation with respect to the results of the integrated load analysis, if relevant;
- evaluation of the geotechnical design documentation if relevant based on the project design basis;
- evaluation of manufacturing plan, transportation plan, installation plan and maintenance plan (these plans/manuals can also be generic), however only as far as required for the structural integrity of the final installed (permanent) structure; and
- evaluation of corrosion protection system(s) based on the project design basis.

The design documentation for the other installations shall at least include design drawings, documentation of the geotechnical aspects where relevant, general manufacturing specifications and design calculations that may be combined with measurement/test reports.

### **7.6.3 Other installations design evaluation conformity statement**

A satisfactory evaluation of the other installations design is concluded with a conformity statement.

## **7.7 Wind turbine/RNA manufacturing surveillance**

### **7.7.1 General**

The manufacturing evaluation during type certification according to OD-501 is based on a limited number of specimens. The project certification will in addition to this include inspection/audit activities (surveillance), in order to verify that the manufacturing of wind turbines for the specific project is carried out according to the approved design according to chapter 7.4 (Site-specific RNA design evaluation).

### **7.7.2 Surveillance requirements**

The extent of manufacturing surveillance consists of document review and onsite activities such as inspections and/or audits. Surveillance activities to be carried out for project certification will be evaluated for each single project and wind turbine type.

The RECB will tailor a scope of work for surveillance activities. The exact scope should be defined during the project design basis but before the start of the manufacturing surveillance. This scope will include use of international standards together with input from the design evaluation such as:

- critical items/processes identified during the design evaluation;
- test programs/procedures for production; and
- approved design documentation such as drawings and specifications.

The following items will typically influence the detailed scope for the surveillance:

- the manufacturer's experience with respect to delivery of the specific item to wind turbines;
- the RECB's experience with the manufacturer;
- time schedule and number of items for the specific delivery;
- number of production plants;
- type of manufacturing process, e.g. hand lay-up or vacuum injection of laminates, manual or automatic welding, etc.;

- type of quality control e.g. NDT or visual inspection, statistical methods or testing each item, etc.;
- appropriateness of the manufacturer's quality system in relation to the specific manufacturing process and control activities;
- extent of inspection by purchaser, e.g. manufacturer's inspection on case of sub-suppliers;
- availability of certified documents specifying the quality requirements;
- manufacturing codes and standards applied, e.g. national or international;
- availability of relevant quality control documents such as requirements for final manufacturing documentation, test programmes, acceptance test procedures, NDT procedures, weld procedures, corrosion protection, handling, curing, heat treatment, mechanical testing requirements, etc.;
- access to the manufacturing facility's sub-suppliers and manufacturing documents; and
- procedures for handling of deviations to requirements, e.g. waiver procedures.

### **7.7.3 Wind turbine/RNA manufacturing surveillance conformity statement**

A satisfactory evaluation of the wind turbine/RNA manufacturing surveillance is concluded with a conformity statement.

## **7.8 Support structure manufacturing surveillance**

### **7.8.1 General**

The project certification shall include surveillance activities in order to verify that the manufacture of support structure(s) for the specific project is carried out according to the approved design according to chapter 7.5 (Site-specific support structure design evaluation).

It is a precondition for the manufacturing surveillance of the support structure that the manufacturer of the support structure or the main parts of the support structure operates a certified ISO 9001 system. The inspection/audit activities shall focus on the quality system implemented during manufacture and evaluate that the quality system is appropriate.

### **7.8.2 Surveillance requirements**

The extent of manufacturing surveillance consists of document review and onsite activities such as inspections and/or audits. Surveillance activities to be carried out for project certification will be evaluated for each single project.

The RECB will tailor a scope of work for surveillance activities. The exact scope should be defined during the project design basis but before the start of the manufacturing surveillance. Any processes may be subject to evaluation, depending on the type of structure such as:

- manufacture of steel plates;
- manufacture of primary load-carrying steel structures and
- build of concrete structures.

For each of these processes, the RECB shall tailor a scope of work for surveillance activities. This scope shall include utilisation of international standards together with input from the design evaluation such as:

- critical items/processes identified during the verification of final design documentation;
- test programs/procedures for production; and
- approved design documentation such as drawings and specifications.

The detailed scope for the surveillance will also typically be influenced by the items mentioned in 7.7.2.

### **7.8.3 Support structure manufacturing surveillance conformity statement**

A satisfactory evaluation of the support structure manufacturing surveillance is concluded with a conformity statement.

## **7.9 Other installations manufacturing surveillance**

### **7.9.1 General**

The project certification shall include surveillance activities in order to verify that the manufacture of other installations for the specific project is carried out according to the approved design according to chapter 7.6 (other installations design evaluation).

It is a precondition for the manufacturing surveillance of the other installations that the manufacturer of the installation or the main parts of the installation operates a certified ISO 9001 system. The inspection/audit activities shall focus on the quality system implemented during manufacture and evaluate that the quality system is appropriate.

### **7.9.2 Surveillance requirements**

The extent of manufacturing surveillance consists of document review and on site activities such as inspections and/or audits. Surveillance activities to be carried out for project certification will be evaluated for each single project.

The RECB will tailor a scope of work for surveillance activities that has to be agreed with the client. The exact scope should be defined during the project design basis but before the start of the manufacturing surveillance. This scope will include use of international standards, together with input from the design evaluation such as:

- critical items/processes identified during the design evaluation;
- test programs/procedures for production; and
- approved design documentation such as drawings and specifications.

The detailed scope for the surveillance will also typically be influenced by the items mentioned in 7.7.2.

### **7.9.3 Other installations manufacturing surveillance conformity statement**

A satisfactory evaluation of the other installations manufacturing surveillance is concluded with a conformity statement.

## **7.10 Project characteristics measurements (optional)**

### **7.10.1 General**

The purpose of project characteristics measurements within project certification is to establish performance-related characteristics of a specific wind turbine or wind turbine project at a specific site, in addition to the measurements done for a single turbine within the type certification. These optional measurements may be selected by the applicant and shall conform to the relevant IEC61400 series standards. The measurements comprise one or more of the elements:

- grid connection compatibility according to grid codes;
- verification of power performance; and
- verification of acoustic noise emission.

In cases where IEC standards are not applicable, the measurement procedure shall be agreed between the applicant and the RECB.

In case of a well-established competence area in IECRE, the project characteristic measurements shall be carried out by an RETL or an RECTF for the subjected test scope, see also IECRE 05 (Wind-OMC rules of procedure).

In case of no well-established competence area in IECRE (no RETL and RECTF), the project characteristic measurements can be witnessed by an approved certification body by REMC for the subjected test scope, see also IECRE 05 (Wind-OMC rules of procedure).

Measurements and test results shall be documented in a test report evaluated by the RECB. The RECB shall evaluate that the measurements have been carried out in accordance with an approved detailed program and that the report properly documents the characteristics required for certification.

A satisfactory evaluation is concluded with a conformity statement issued by the RECB, attesting that the measurements have been carried out in accordance with the appropriate test procedures and relevant IEC61400 series standards.

#### **7.10.2 Grid connection compatibility according to grid codes**

Grid connection compatibility measurements shall be evaluated by the RECB to verify specified reactions (e.g. during grid fault conditions) defined in the grid codes applicable to the site. For project certification, the RECB shall evaluate grid connection compatibility by comparing the measurements with the electrical network and conditions given in the grid codes. The RECB shall verify that the measurement procedures conform with IEC61400 series standards and grid codes, and that the measurement conditions, instrumentation and equipment, calibrations and analyses are described in a test report.

The purpose of these measurements is to document the grid connection compatibility of a specific wind turbine or wind turbine project at a specific site.

#### **7.10.3 Verification of power performance**

Power performance tests and measurements shall be evaluated by the RECB in order to verify the power production of one or more wind turbines included at the project site. For project certification, the RECB shall evaluate the performance of the wind turbine(s) by comparing the results of the tests and measurements with the reference individual performance of the wind turbines supplied by the customer.

The RECB shall also verify that the measurement procedures conform to the relevant IEC61400-12 series of standards and/or customer defined requirements or procedures. The standards or procedures applied and the results of the evaluation shall be clearly referenced and stated in the conformity statement issued by the RECB.

The purpose of these measurements is to document the power performance of a specific wind turbine or of all or some of the wind turbines installed at a specific project.

#### **7.10.4 Verification of acoustic noise emission**

Acoustic noise measurements shall be evaluated by the RECB to verify compliance with specific acoustic noise emission criteria established either by the client or by local codes.

The RECB shall verify that the measurement procedures conform, to the extent it is possible, with IEC61400-11 and with the reference standards and compliance criteria. The reference standards and compliance criteria shall be clearly identified in the conformity statement issued by the RECB.

The purpose of these measurements is to document compliance with respect to acoustic noise emission of a specific wind turbine or the project as a whole installed at a specific site.

#### **7.10.5 Test reports**

The RECB shall require that the project characteristics measurement reports conform with the requirements of ISO/IEC 17025 and relevant standards used to define the test requirements (e.g. grid codes). In addition, descriptions of:

- the specific wind turbine or wind turbine project at a specific site, including the test turbine(s), serial number(s) and control system software revision number(s); and
  - any significant unexpected behaviour
- shall be required.

Attestation by the RETL shall be clearly marked on the final project characteristics measurement report(s).

#### **7.10.6 Project characteristics measurement conformity statement**

The RECB shall issue a conformity statement based on satisfactory evaluation of the test reports. The conformity statement shall specify:

- the measurements carried out;
- the measurement standards applied; and
- identification of the test report(s).

### **7.11 Transportation and installation surveillance**

#### **7.11.1 General**

The purpose of transportation and installation surveillance is to verify conformity with the requirements of the design basis and to verify that the loads on components and subsystems of the wind farm and its installations are not exceeding the design envelope during transportation and installation and that possible transportation and/or handling damages are being detected.

It is a precondition for the transport and installation surveillance of the windfarm and its installations that the contractor for transport and installation operates a certified ISO 9001 system. The inspection/audit activities of the RECB shall focus on the implementation of the quality system during transportation and installation and evaluate that the applied quality system is appropriate to cover the above mentioned purpose.

Note: In case the employer of the contractor for transport and installation operates a supplier qualification process that has already evaluated the contractor's ISO 9001 system, this can be used by the RECBs' to reduce or substitute the activities regarding the quality management related inspections on-site.

The RECBs' surveillance shall be performed for a representative number of wind farm components and its installations. The exact scope of the transport and installation surveillance should be defined during the design basis, at latest before start of the surveillance.

#### **7.11.2 Transportation and installation requirements**

The RECB shall evaluate from documentation whether the transportation and installation processes of the wind farm and its installations are in conformance with the project design basis.

The RECB shall ensure that components are inspected for damage that may have occurred during transport and installation. This is including, but not limited to, damage to corrosion protection or actual corrosion. After completion of the installation, a final visual inspection of all relevant components shall be made.

For offshore projects, surveillance shall include:

- monitoring of sea-transportation and installation;
- compliance with the wind farm and its installation with respect to the transport procedures
- compliance with the wind farm and its installation with respect to the installation procedures.

Verification, inspection and surveillance activities shall be concluded with reports that describe the activities carried out.

### **7.11.3 Transportation and installation conformity statement**

The RECB shall issue a conformity statement based on a satisfactory evaluation of verification, inspection and surveillance reports.

## **7.12 Commissioning surveillance**

### **7.12.1 General**

The purpose of commissioning surveillance is to verify that the wind farm and its installations are commissioned in conformity with the relevant manuals included in the design documentation.

### **7.12.2 Commissioning surveillance requirements**

The RECB shall evaluate whether the commissioning of the wind farm and its installations is in conformance with the instructions supplied by the manufacturer/operator in accordance with relevant parts of the IEC61400 series. Other tests to be performed during commissioning in addition to tests in accordance with the general instructions may be agreed with the manufacture/operator.

This evaluation requires examination of commissioning records. In addition, the RECB shall witness the commissioning of at least one wind turbine and additionally at least one wind turbine per every 50 turbines in the project.

The RECB shall as a minimum verify that:

- the commissioning instructions supplied by the manufacturer are adequate;
- the instructions supplied by the manufacturer are followed during commissioning; and
- the final commissioning reports are complete.

Verification and surveillance activities shall be concluded with reports that describe the activities carried out.

### **7.12.3 Commissioning surveillance conformity statement**

The RECB shall issue a conformity statement based on a satisfactory evaluation of verification and surveillance reports.

## **7.13 Final evaluation**

The purpose of final evaluation is to provide documentation of the findings of all RECB involved in the evaluation of the modules of the project design certificate or project certificate.

Following the evaluation of the evaluation reports and conformity statements, the final evaluation report shall be prepared, consisting of:

- a reference list of all supporting product and project documentation including manuals for operation and maintenance for the project certificate; and
- report of whether the detailed documentation is complete and consistent with the requirements of the project certification modules; and
- only applicable for project design certificate; report of all conformity statements issued for the project design certification modules.

The final evaluation report shall be delivered to the applicant and a copy retained in the confidential files of the RECB.

#### **7.14 Project certificate**

The RECB shall issue a project certificate based on the final evaluation for completeness and correctness of the evaluation reports and conformity statements. The project certificate shall include the results of the mandatory modules and the agreed optional modules.

For the validity of the project certificate see section 5.5.1. The RECB and the applicant may agree to include operation and maintenance surveillance in order to confirm the validity of the project certificate at periodic intervals (see sec. 5.5.2)

The project certificate shall reference in an appropriate way the standards and normative documents used. An example of a project design certificate is given in the approved templates.

#### **7.15 Project design certificate**

The RECB shall issue a project design certificate based on the final evaluation for completeness and correctness of the evaluation reports and conformity statements. The project design certificate shall include the results of the mandatory modules and the agreed optional modules.

The project design certificate is valid for wind turbine(s) and additional installation(s) as planned at the site specified in the certificate at the date of issue.

The project design certificate shall reference in an appropriate way the standards and normative documents used. An example of a project design certificate is given in the approved templates.

The RECB and the applicant may agree to continue with the modules towards full project certification.

#### **7.16 Site suitability evaluation conformity statement**

If a Site Suitability Evaluation as per section 6.3 is carried out as a simplified alternative to a complete Project Design Certification, the certification body shall issue a Site Suitability Evaluation Conformity Statement.

The purpose of the Site Suitability Evaluation Conformity Statement is to function as a stand-alone document, and as such does not require any final evaluation, other evaluation reports, or other conformity statements as a pre-requisite. The Site Suitability Evaluation Conformity Statement shall include the results of the mandatory modules and the agreed optional modules.

The Site Suitability Evaluation Conformity Statement shall reference in an appropriate way the standards, normative documents, and technical documents used. In addition, the Site Suitability Evaluation Conformity Statement shall include detailed technical information regarding the following:

- wind farm layout and coordinates
- site conditions
- wind turbine type
- scope of evaluation work
- estimated site-specific technical life time (optional)<sup>2</sup>

---

<sup>2</sup> For this optional evaluation, the WTG designer will, in most cases, estimate the site-specific technical life time (e.g. based on their load analysis and design tools), and the RECB will confirm through the Site Suitability Evaluation Conformity Statement that this estimate is appropriate, consistent with the design assumptions, and in accordance with the relevant technical requirements.

An example of a project design certificate is given in the approved templates.

## **7.17 Operation and maintenance surveillance**

### **7.17.1 General**

The purpose of operation and maintenance surveillance is to establish that a specific wind turbine installation or wind turbine project at a specific site is operated and maintained in conformity with the relevant manuals included in the design documentation.

This surveillance requires evaluation of operation and maintenance records as well as inspection of the wind farm and its installations.

Operation and maintenance surveillance shall be carried out at regular intervals based on an agreement between applicant and RECB. The agreement shall specify the intervals and the extent of the surveillance. An operation and maintenance surveillance conformity statement shall attest compliance under the terms of this agreement.

### **7.17.2 Operation and maintenance surveillance requirements**

The RECB shall evaluate operation and maintenance records and reports. The evaluation shall as a minimum establish that:

- maintenance has been carried out by authorised and qualified personnel in accordance with and at the intervals specified in the maintenance manual;
- the control settings have been checked regarding conformance with the limiting values specified in the design documentation; and
- all repair, modification and replacement has been carried out in accordance with the original project certificate. In case of deviations these needs to be reported and evaluated according to section 5.5.2.

In combination with this, the RECB shall inspect the general condition of the wind farm and its installations are covered by the project certificate. The extent of the inspection shall be based on:

- the evaluation of operation and maintenance records and reports;
- status of outstanding findings from previous inspections;
- status of outstanding recommendations from previous inspections; and
- status of ongoing repair, modification and replacement -projects.

### **7.17.3 Operation and maintenance conformity statement**

A satisfactory operation and maintenance evaluation is concluded with inspection reports and a conformity statement.

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

3, rue de Varembé  
PO Box 131  
CH-1211 Geneva 20  
Switzerland

Tel: + 41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

IEC SYSTEM FOR CERTIFICATION TO STANDARDS  
RELATING TO EQUIPMENT FOR USE IN RENEWABLE  
ENERGY APPLICATIONS (IECRE SYSTEM)

IECRE Secretariat c/o IEC  
3, rue de Varembé  
PO Box 131  
CH-1211 Geneva 20  
Switzerland

Tel: + 41 22 919 02 11  
[secretariat@iecre.org](mailto:secretariat@iecre.org)  
[www.iecre.org](http://www.iecre.org)