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भारत सरकार/Government of India

**नवीन एवं नवीकरणीय ऊर्जा मंत्रालय/Ministry of New & Renewable Energy
(Wind Energy Division)**

**CGO Complex, Block No.14,
Lodhi Road, New Delhi - 110003**

Dated: 5th November, 2018

Circular

Subject: Draft Indian Wind Turbine Certification Scheme - regd.

Ministry, in consultation with National Institute of Wind Energy Chennai, has prepared a draft certification scheme incorporating various guidelines issued by MNRE and titled under "**Indian Wind Turbine Certification Scheme (IWTCS)**".

2. The IWTCS is a consolidation of relevant National and International Standards (IS/IEC/IEEE), Technical Regulations and requirements issued by Central Electricity Authority (CEA), guidelines issued by MNRE and other international guidelines. It has also strived to incorporate various best practices from other countries to ensure the quality of the wind energy projects. The Scheme enlists the guidelines for the benefit of all the stakeholders from concept to lifetime of wind turbine, including Indian Type Approved Model (ITAM), Indian Type Certification Scheme (ITCS), Wind Farm Project Certification Scheme (WFPCS) and Wind Turbine Safety & Performance Certification Scheme (WTSPCS).

3. The IWTCS is envisaged to assist and facilitate the following stakeholders;

- i. Original Equipment Manufacturers (OEMs)
- ii. End Users -Utilities, SNAs, Developers, IPPs, Owners, Authorities, Investors and Insurers
- iii. Certification Bodies
- iv. Testing Laboratories

4. Comments are invited from all stakeholders/ public on the above draft scheme within 1 month of the date of issue of this OM i.e. **latest by 5th December, 2018.**



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To,

All Concerned.

Copy to (through email):

1. Secretary, Ministry of Power, Shram Shakti Bhawan, New Delhi.
2. Chairperson, CEA, Sewa Bhawan, R.K Puram, New Delhi.
3. Chairperson, CERC, New Delhi.
4. DG, Bureau of Indian Standards (BIS), New Delhi.
5. CMD, PGCIL, Gurgaon
6. All member of Committee for Certification Scheme
7. All SNAs of Wind Potential States
8. Secretary General, IWTMA, New Delhi
9. President, WIPPA, New Delhi
10. Chairman, InWEA, New Delhi
11. Chairman, IWPA, Chennai

Copy also forwarded to Director, NIC, MNRE with request to upload it on website of MNRE.

Copy for internal circulation:

1. PPS to Secretary, MNRE
2. PPS to Additional Secretary, MNRE
3. PS to JS (BPY), MNRE
4. Director (GU)/ Director (BKP), MNRE
5. Director General, NIWE, Chennai

INDIAN WIND TURBINE CERTIFICATION SCHEME (DRAFT)



IWTCS



सत्यमेव जयते

**Ministry of New and Renewable Energy,
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INDIAN WIND TURBINE CERTIFICATION SCHEME -IWTCS

Preamble

Wind energy has matured over the decades to be the mainstream source of renewable power generation in India. The steady growth of the sector has seen different types of wind turbines with diverse performance and safety criteria. The Ministry of New and Renewable Energy (MNRE), Government of India through various policies and schemes has facilitated the healthy and orderly growth of the wind energy sector. The guideline for the recognition of the certification schemes in India by MNRE was paramount for the success of quality wind turbines installed in India. The successful evaluation under the recognised schemes resulted in the wind turbines being listed in the Revised List of Models and Manufacturers (RLMM). This listing has resulted in stakeholders having confidence on the quality of the wind turbines offered by various manufacturers in India.

Wind sector in India is growing at a rapid pace with increased utilization of wind energy for the power development. The modern wind turbines have higher hub heights, larger rotor diameter, higher capacity and improved CUF along with technological improvements. Under these developments, there is a need for comprehensive document which provides the complete technical requirements which shall have to be complied by the wind turbines for the safe and reliable operation by all the stakeholders viz, OEM's, Independent Power Producers (IPPs), wind farm developers, Financial Institutions, Utilities and others. Also, there is a need for technical regulations which shall facilitate common ground for OEM's, Developers, Investors and Financial Institution for systematic development.

In this regard, and also as a part of the continuing efforts for fostering the exponential growth of the wind energy sector in the country, a comprehensive certification scheme incorporating various guidelines issued by MNRE has been formulated and titled under "**Indian Wind Turbine Certification Scheme (IWTCS)**". The IWTCS is being notified by MNRE under the provisions of section 12(1) and 16(1) of BIS Act 2016.

The IWTCS is a consolidation of relevant National and International Standards (IS/IEC/IEEE), Technical Regulations and requirements issued by Central Electricity Authority (CEA), guidelines issued by MNRE and other international guidelines. It has also strived to incorporate various best practices from other countries to ensure the quality of the wind energy projects. The Scheme enlists the guidelines for the benefit of all the stakeholders from concept to lifetime of wind turbine, including Indian Type Approved Model (ITAM), Indian Type Certification Scheme (ITCS), Wind Farm Project Certification Scheme (WFPCS) and Wind Turbine Safety & Performance Certification Scheme (WTSPCS).

Type Certification of wind turbines plays an active role to ensure that wind turbines in India meet the requirements of requisite IS/IEC/IECRE standards, in vogue. Internationally, IEC /IECRE Certification schemes for wind turbines are well recognized

and widely used and the IWTCs in its formulation has incorporated the rules and procedures of IS/IEC/IECRE.

The IWTCs defines certification system guidelines for wind turbines that comprised of Prototype Certification and Type Certification; Project Certification, Failure reporting of installed wind turbines, Safety and Performance assessment and De-commissioning & Safe Disposal of the wind turbine / wind turbine projects installed onshore and offshore. It specifies guidelines for carrying out conformity evaluation of wind turbines and wind farms, with respect to specific standards and other technical requirements, relating to safety, reliability, performance, testing and interaction with electrical power networks.

The guidelines has been categorized into four (4) volumes as enumerated below:

- Volume-I - Management of IWTCs, Indian Type Approved Model (ITAM) and Recommendation for Grid Synchronization of Prototype Wind Turbine
- Volume-II - Indian Type Certification Scheme
- Volume-III - Wind Farm Project Certification Scheme
- Volume-IV - Wind Turbine Safety and Performance Certification Scheme.

The volumes I to IV briefly describe certification requirements from concept to lifetime operational safety and performance of the wind turbines as per the requirements of IEC/IECRE and are enumerated below:

Indian Type Approved Model (ITAM)

ITAM is a procedure for enlisting wind turbine models in India and it has evolved from the earlier procedure of Revised List of Models and Manufacturers (RLMM). The process is further streamlined with online mechanism with improved safeguards keeping in view the experiences gained in implementing the RLMM for over 2 decades. .

Prototype Certification Scheme

Prototype certificate ensures turbine safety during testing of a new or improved turbine design. A prototype certification scheme covers a wind turbine installed at a specific location, which are not ready for serial production. The prototype certification scheme enables testing of a new wind turbine type in order to obtain type certification or for research and developmental works of type certified wind turbine (including provisional).

Indian Type Certification Scheme (ITCS)

ITCS covers certification of wind turbine type, including the tower and the proposed type of connection between tower and foundation. A Type Certificate is one of the mandatory requirements for serial production of wind turbines by a wind turbine manufacturer in the country. ITCS is based on the IS/IEC 61400-22.

The type certificates issued as per the IECRE scheme is also recognized (as per [Clause 2.4](#) of Volume-I) and are permitted for serial production in the country.

Wind Farm Project Certification Scheme (WFPCS)

WFPCS is a process for streamlined development of wind farm, which may consist of one or more wind turbines, including the foundation(s) evaluated for specific external conditions at an installation site. A Project Certificate streamlines the process of installation, commissioning and safe commercial operation of the wind turbine / wind farm in the country.

Wind Turbine Safety and Performance Certification Scheme (WTSPCS)

WTSPCS is a process for ensuring safety and performance of the turbine during its operational lifetime. This covers failure reporting & analysis, wind turbine safety and performance when the wind turbine nears its design life and decommissioning & safe disposal of turbines, which are declared unfit for operation.

Under the Failure reporting and Analysis, the catastrophic failure of all the existing and upcoming wind turbines connected to the grid is evaluated and key lessons drawn. As per the requirement, all the catastrophic failures of wind turbines shall have to be reported by Owner of the Project to the accredited Certification body and NIWE, which would facilitate evaluation of the failure and ensure safe operations of similar turbine installations in the country.

Under the Safety and Performance assessment of installed wind turbines, an assessment of all the existing wind turbines connected to the grid that are in operation for more than 80% of the design life shall have to be carried out by the accredited Certification body / NIWE to ensure safety and performance. This process has to be ensured by the PPA holder, Utility / State Nodal Agency.

Under Decommissioning procedure, safe decommissioning of wind turbine and their disposal as per the standards and guidelines are detailed. The wind turbine that does not satisfy the safety and performance assessment shall be decommissioned, dismantled and safely disposed.

The IWTCS is envisaged to assist and facilitate the following stakeholders;

- i. Original Equipment Manufacturers (OEMs)
- ii. End Users -Utilities, SNAs, Developers, IPPs, Owners, Authorities, Investors and Insurers
- iii. Certification Bodies
- iv. Testing Laboratories

IWTCS will come into force from the date of notification by MNRE

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**INDIAN WIND TURBINE CERTIFICATION
SCHEME**

VOLUME - I

**MANAGEMENT OF IWTCs, INDIAN TYPE
APPROVED MODEL (ITAM) AND
RECOMMENDATION FOR GRID
SYNCHRONIZATION OF PROTOTYPE WIND
TURBINE**

INDIAN WIND TURBINE CERTIFICATION SCHEME

VOLUME - I

MANAGEMENT OF IWTCS, INDIAN TYPE APPROVED MODEL (ITAM) AND RECOMMENDATION FOR GRID SYNCHRONIZATION OF PROTOTYPE WIND TURBINE

1.0 INTRODUCTION

Indian wind energy sector has grown over decades and is considered as one of the main streams of Renewable power generation in the Country. The Ministry of New and Renewable Energy (MNRE), Government of India has been facilitating the healthy and orderly growth of the wind energy sector so as to make them as a main stay in renewable energy by framing appropriate guidelines from time to time. This document consolidates and elaborates the guidelines issued by MNRE and the standards (both National and International) for the growth of the wind energy sector.

The price discovery mechanism for the wind energy sector in the recent years has become successful in terms of achieving grid parity. This has paved the way for the wind energy sector to be one of the main stays in the power generation in the future. This calls for a comprehensive guideline to ensure the reliable and sustainable wind power development in the country, while taking care of the safety and quality of wind turbines. Hence, a comprehensive Indian Wind Turbine Type Certification Scheme (IWTCS) has been formulated.

IWTCS refers the relevant National and International Standards (IS/IEC/IEEE), Technical Standards for Connectivity to the Grid Regulations issued by Central Electricity Authority (CEA), etc. In addition, relevant guidelines relating to wind energy sector issued by MNRE and various other authorities including states have been considered and incorporated in IWTCS along with international guidelines & best practices adopted in other countries.

IWTCS shall come into force from the date of notification by MNRE.

1.1 Stakeholders

The IWTCS is applicable for all the stakeholders including:

- i. Original Equipment Manufacturers
- ii. Developers

- iii. Investors
- iv. Testing Laboratories
- v. Certification Bodies
- vi. Utilities, SNAs, IPPs, Owners, Authorities, Financial Institutions, Insurers, etc.,

1.2 Scope

The IWTCS defines the guidelines for a comprehensive certification scheme for Prototype Certification & Type Certification for wind turbines; Project Certification, Failure reporting of installed wind turbines, Safety and Performance assessment and De-commissioning & Safe Disposal of the wind turbine / wind turbine projects. IWTCS is applicable for both onshore and offshore wind power projects.

The IWTCS specifies guidelines for carrying out conformity evaluation of wind turbines and wind farms, with respect to specific standards and other technical requirements, relating to safety, reliability, performance, testing, certification and interaction with electrical power networks.

IWTCS is applicable to all the grid connected wind turbines and has four Volumes related to the following areas:

- Volume-I - Management of IWTCS, Indian Type Approved Model (ITAM) and Recommendation for Grid Synchronization of Prototype Wind Turbine
- Volume-II - Indian Type Certification Scheme
- Volume-III - Wind Farm Project Certification Scheme
- Volume-IV - Wind Turbine Safety and Performance Certification Scheme.

1.2.1 Prototype Certification Scheme

A prototype certificate scheme covers the mechanism for grid connection to the wind turbine installed at a specific location, which is not ready for serial production. The purpose of wind turbine prototype certification scheme is to enable testing of a new wind turbine type in order to obtain type certification or for research and developmental works of type certified wind turbine (including provisional).

1.2.2 Type Certification

Type Certification of wind turbines confirms that the wind turbine is designed, documented and manufactured in conformity with design assumption, specific standards and other technical requirements. Type Certificate is mandatory for serial production of wind turbines by a wind turbine manufacturer in the country.

1.2.3 Project Certification

A wind farm project certificate covers one or more wind turbines, including the foundation(s) evaluated for specific external conditions at an installation site, grid compliance mechanism, performance assessment (optional), etc. The project certification includes Pre-commissioning, Installation & Commissioning and Post commissioning evaluation of the project. A Project Certificate streamlines the mechanism for micro-siting, installation, commissioning and commercial operations of the wind turbine / windfarm in the country.

1.2.4 Failure reporting

The failure reporting, assessment and dissemination are required to facilitate the safe and secure operation of wind turbines. All the catastrophic failures of wind turbines connected to the grid shall be reported by the Owner of the Project to the accredited CB and NIWE for facilitating preventive and corrective actions for the safe operation of the wind turbines in the country.

1.2.5 Safety and Performance assessment of installed wind turbines

The safety and performance assessment are required to evaluate the safety of the wind turbines while ensuring the performance within limits. The assessment shall be carried out by the CB, for all the existing wind turbines connected in the grid, which are in operation for more than 80% of its design life. The owner of the wind turbine / wind farm shall conduct the safety and performance assessment at regular intervals as specified in this document and the same shall be ensured by the Utility / SNA for continued operation of the wind turbine in the grid.

1.2.6 Decommissioning and Safe Disposal

Decommissioning and safe disposal of the unsafe wind turbines shall be ensured by the respective SNA / Utilities so as not to endanger public safety. Based on the Safety & Performance Assessment of the Wind Turbines by CB, the grid authorities shall disconnect the wind turbines from the grid and the same shall be notified to SNA for decommissioning and safe disposal.

1.3 Compliance to Other legislation / Statutory Requirements

Compliance with IWTCs and certificate issued to this effect do not absolve any person, organisation or corporation, of the responsibility for following and adhering to applicable guidelines, procedures, rules, regulations, and protocols of other statutory bodies.

1.4 Terms and definitions

For the purposes of this document, the following terms and definitions apply, together with the relevant definitions contained in ISO/IEC 17000, ISO/IEC Guide 2 and IS/IEC 60050-415.

1.4.1 Accreditation

Procedure by which an authoritative body gives formal recognition that a body is impartial and technically competent to carry out specific tasks such as certification, tests, specific types of tests etc.

The authoritative body under IWTCs is as per National Lab Policy i.e., NABL for testing agencies and NABCB / BIS for certification bodies. RETL & RECB are also recognised as per IECRE scheme.

NOTE: Accreditation is awarded following successful assessment and is followed by appropriate surveillance.

1.4.2 Applicant

Entity applying for certification. The applicant includes a wind turbine manufacturer / developer/ Owner / Independent Power Producer.

1.4.3 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.

1.4.4 Certification

Procedure by which an accredited Certification body gives written assurance that a product, process or service conforms to specified requirements, also known as conformity assessment

1.4.5 Certification body

Accredited body that conducts certification of conformity for wind turbines. Certification Body (CB) shall be NIWE or any CB accredited by NABCB / BIS as per ISO/IEC 17065 or recognized as RECB under IECRE.

1.4.6 Certification system

System that has specific rules for procedure and management to carry out certification of conformity

1.4.7 Commissioning

Process that encompasses functional safety checks, connecting the wind turbine to the grid and putting it into commercial operation

1.4.8 Conformity statement

Document issued upon successful completion of evaluation of a certification module. The statement includes identification of the receiver, the object, the main normative standards, evaluation & measurement reference reports, validity and certification body.

1.4.9 Evaluation for conformity

Systematic examination of the extent to which a product, process or service fulfils specified requirements

1.4.10 Final evaluation report

Report containing the results of conformity evaluations relating to type certification, the basis for the decision to issue the type certificate

1.4.11 Inspection

Systematic examination of the extent to which a product, process or service fulfils specified requirements by means of measuring, observing, testing or gauging the relevant characteristics

1.4.12 Installation

Process that encompasses site fabrication, assembly and erection

1.4.13 Manufacture

Process that encompasses fabrication and assembly in a factory or workshop

1.4.14 Manufacturer

Entity manufacturing the wind turbine or, where relevant, main components of the wind turbine.

1.4.15 Modification

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

1.4.16 Operating body

Body that conducts certification of conformity, testing or inspection

1.4.17 Project certificate

Document issued upon successful completion of project certification

1.4.18 Project certification

Procedure by which an accredited CB gives written assurance that one or more specific wind turbines including support structure and possibly other installations are in conformity with requirements for a specific site.

1.4.19 Rotor Nacelle Assembly (RNA)

Part of a wind turbine carried by the support structure.

1.4.20 Repair

Repair of a unit or a piece of equipment to its original design/specification as mentioned in type certificate.

1.4.21 Replacement

Replacement of a unit or a piece of equipment in conformance with its original design/specification as mentioned in the type certificate.

1.4.22 Support structure

Part of a wind turbine consisting of the tower, sub-structure and foundation.

1.4.23 Surveillance

Continuing monitoring and verification of the status of procedures, products and services, and analysis of records in relation to referenced documents to ensure specified requirements are met or adhered.

1.4.24 Type certificate

Document issued upon the successful completion of type certification.

1.4.25 Type certification

Procedure by which an accredited CB gives written assurance that a wind turbine type conforms to specified requirements.

1.4.26 Type testing

Action of carrying out tests for a given wind turbine type according to specified procedures by accredited TL.

1.4.27 Testing laboratory

Testing laboratory (TL) is a body that conducts testing for wind turbines. Testing Laboratory (TL) shall be NIWE or a body accredited by NABL / BIS as per ISO/IEC 17025 or recognized as RETL under IECRE.

1.4.28 Wind turbine type

Wind turbines of a common design, materials and major components, subject to a common manufacturing process and uniquely described by specific values or ranges of values of machine parameters and design conditions

1.5 Symbols and abbreviations

1.5.1 Symbols

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

1.5.2 Abbreviations

The following abbreviations are used in IWTCS.

Short form	In Full
BIS / IS	Bureau of Indian Standards / Indian Standards
CB	Certification Body
CEA	Central Electricity Authority
GCC	Grid Compliance Conformity

GL	Germanischer Lloyd
IEC	International Electro technical Commission
IECRE	IEC System for Certification to Standards relating to Equipment for use in Renewable Energy Applications
IPP	Independent Power Producer
ISO	International Organization for Standardization
ITAM	Indian Type Approved Model
IWTCS	Indian Wind Turbine Type Certification Scheme
ITCS	Indian Type Certification Scheme
LVRT	Low Voltage Ride Through
MNRE	Ministry of New and Renewable Energy
NABCB	National Accreditation Board for Certification Bodies
NABL	National Accreditation Board for Laboratories
NIWE	National Institute of Wind Energy
OEM	Original Equipment Manufacturer
O&M	Operation and Maintenance
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
RECB	Renewable Energy Certification Body
RETL	Renewable Energy Testing Laboratory
RLDC	Regional Load Despatch Center
RLMM	Revised List of Models and Manufacturers of Wind Turbines
RNA	Rotor and Nacelle Assembly
RPC	Regional Power Committee
SLDC	State Load Despatch Center
SNA	State Nodal Agency
TL	Testing Laboratory
WFPCS	Wind Farm Project Certification Scheme
WTSPCS	Wind Turbine Safety and Performance Certification Scheme

1.6 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.

IS / IEC 60050-415:1999: Electro technical Vocabulary - Part 415: Wind Turbine Generator Systems

IS/IEC 61400 (Part 21): 2008: Wind turbines - Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines

IS/IEC 61400 (Part 24): 2010: Wind turbines – Part 24: Lightning protection

IS/IEC/TS 61400 (Part 13):2001: Wind turbines generator systems – Part 13: Measurement of mechanical loads

IS 16589 (Part 4:2017) / IEC 61400-4:2012: Wind turbines – Part 4: Design requirements for wind turbine gearboxes (IEC 61400-4)

Doc. ETD 42 (6718): Wind turbines – Part 11: Acoustic noise measurement techniques (IEC 61400-11)

IS /IEC 61400-22: Wind turbines – Part 22: Conformity Testing and Certification

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

IS Standards as approved by ETD42 Committee and published by BIS

IEC/ISO 17000:2004, Conformity assessment – Vocabulary and general principles

IEC/ISO 17020:2012, Conformity assessment – Requirements for the operation of various types of bodies performing inspection

IEC/ISO 17021:2006, Conformity assessment – Requirements for bodies providing audit and certification of management systems

IEC/ISO 17025:2005, General requirements for the competence of testing and calibration laboratories

ISO/IEC 17065: 2012, Conformity assessment – Requirements for bodies certifying products, processes and services

ISO 9001:2015, Quality management systems – Requirements

Applicability of earlier or withdrawn editions of the referenced IS/IEC / ISO /IEEE normative document including standards and their transition would be dealt as per the transition rules decided by IECRE / respective standards making bodies or a maximum period of three years, whichever is earlier.

If IS standard is available for the corresponding IEC standard mentioned in IS / IEC 61400-22, only IS standard shall be applicable.

2.0 MANAGEMENT OF THE SYSTEM

2.1 General

IWTCS enables all the stakeholders including manufacturers, developers, IPPs, Investors etc., to comply with and to document the compliance with the rules in force for safe, secure and orderly growth of wind power development in the country.

2.2 Approval of IWTCS and Nodal Organization

2.2.1 Ministry of New and Renewable Energy (MNRE)

IWTCS is approved and issued by Ministry of New and Renewable Energy (MNRE), Government of India.

2.2.2 National Institute of Wind Energy (NIWE)

National Institute of Wind Energy (NIWE), an Institution under MNRE shall act as a nodal organization for IWTCS and provide the necessary support to MNRE in all the technical matters related to IWTCS and maintenance of IWTCS. In addition, NIWE acts as a National Repository for all the matters related to IWTCS.

2.3 Steering Committee

A steering committee with the following composition shall be constituted by MNRE to handle the matters of IWTCS, as detailed below:

- I. Secretary, MNRE - Chairman
- II. Joint Secretary (Wind) - Member
- III. Director (Wind), MNRE - Member
- IV. Director (Technical), IREDA - Member
- V. Representative from CEA of the rank Chief Engineer and above-Member
- VI. Representative from POSOCO with the rank of Director and above-Member
- VII. Representatives (SNA/utility) from 2 windy states (on rotation basis)- Members
- VIII. Representative from BIS with the rank of Director and above-Member
- IX. Director General, NIWE - Member Secretary

Representation from (VII) is on rotation for the period of two years.

The steering committee shall address the following matters of IWTCS:

- i. Interpretation and clarification in connection with IWTCS.
- ii. Amendments to IWTCS.
- iii. Framing new guidelines to be incorporated in IWTCS.
- iv. Handling of complaints related to compliance of IWTCS.
- v. Issues related to compliance of testing and certification bodies.

2.4 Recognized Certification Schemes

The following certification schemes shall be recognised under IWTCS:

- i. Indian Type Certification Scheme (ITCS) as per IS /IEC 61400-22: Wind turbines – Part 22: Conformity Testing and Certification along with additional requirements as per Volume II of IWTCS.
- ii. IECRE -Type and Component Certification Scheme

In addition, for the wind turbine models which are already included in RLMM list issued by MNRE (as on the effective date) and also for wind turbines having type certificates / under certification as per the existing certification schemes approved by MNRE (IEC /GL Schemes), the transition period specified in clause 3.2 of Volume I is applicable. Post transition period, all wind turbine model shall comply with the requirements of ITAM.

2.5 Indian Type Approved Model (ITAM)

Indian Type Approved Model (ITAM) is a procedure applicable for Indian wind turbine manufacturers for enlisting the wind turbines' models to be installed in India. The ITAM would replace the present RLMM mechanism. The wind turbine manufacturer desirous of enlistment for wind turbine model has to apply for the same through an online-automated process. The documentation requirements to obtain ITAM are given below:

- i. The wind turbine manufacturer shall provide a valid type certificate issued by the CB for the wind turbine model being applied for ITAM as per recognized certification scheme of [Clause 2.4](#) of this Volume (Volume-I) along with Conformity Statements, Final Evaluation Report and Certified Power Curve.
- ii. The wind turbine manufacturers providing Type certificate issued as per IECRE type certification scheme shall, in addition, provide Grid Compliance Conformity (GCC) as per the requirements of CEA Technical Regulations in vogue described in [Clause 3.6](#), of Volume II

for the wind turbine model being applied for ITAM, issued by CB based on the measurements carried out for the wind turbine model by TL.

- iii. The Type Certificate shall mandatorily include the manufacturing process (as per IS/IEC 61400-22) of Hub and Nacelle assembly/manufacturing facility in India and such facility(ies) should have ISO 9001:2015 certification.
- iv. Valid ISO 9001:2015 Certificate for Quality Management System for all the manufacturing, installation, Commissioning and O&M process issued in the name of Wind Turbine Manufacturer by an accredited system certification body.
- v. Technical collaboration details for the wind turbine model being applied, if applicable.
- vi. Copy of Accreditation Certificates of CB, TL and ISO bodies.
- vii. Certificate of Incorporation of the wind turbine manufacturer issued by Registrar of Companies, Ministry of Corporate Affairs, Government of India.
- viii. Affidavit and Indemnity Bond in the prescribed format.
- ix. Document authorizing the Signatory of the applicant company.
- x. Validity of ITAM is subjected to maintain the valid Type Certificate and ISO certificate and no changes introduced in Type certificate, Company, Collaboration, ISO Certificate and other documents submitted for ITAM. In case of any changes introduced in the submitted documentation, such changes / documents shall be provided voluntarily in order to maintain the validity of ITAM.
- xi. The Provisional Type Certificate along with Conformity Statements, Final Evaluation Report and Certified Power Curve is also recognised for inclusion in the ITAM, subject to the following:
 - a) In case of such certificates, it shall clearly list all the outstanding issues.
 - b) A statement of confirmation from the CB body that
 - i. the outstanding issues are not related to safety and
 - ii. the wind turbine model is eligible for serial production.
 - c) In case of any modifications in the wind turbine component or design or any other issues addressed from the Provisional Type Certification to Type Certification, the same needs to be incorporated in all the wind turbines installed based on the Provisional Type Certificate.

A committee with following composition shall be constituted by MNRE to enlist the wind turbine models and manufacturers under ITAM:

- | | | |
|-----------------------------|---|----------|
| (i) Joint Secretary (Wind) | - | Chairman |
| (ii) Director General, NIWE | - | Member |

- (iii) Director (Wind), MNRE - Member
- (iv) Representatives from CEA - Member
- (v) Head, S&C, NIWE - Member Secretary

The committee shall mandatorily meet at least once in three months.

The overview of the ITAM process is illustrated in Figure 1.1 and the process for ITCS and IECRE Certificate for ITAM are illustrated in Figure 1.2 &1.3.

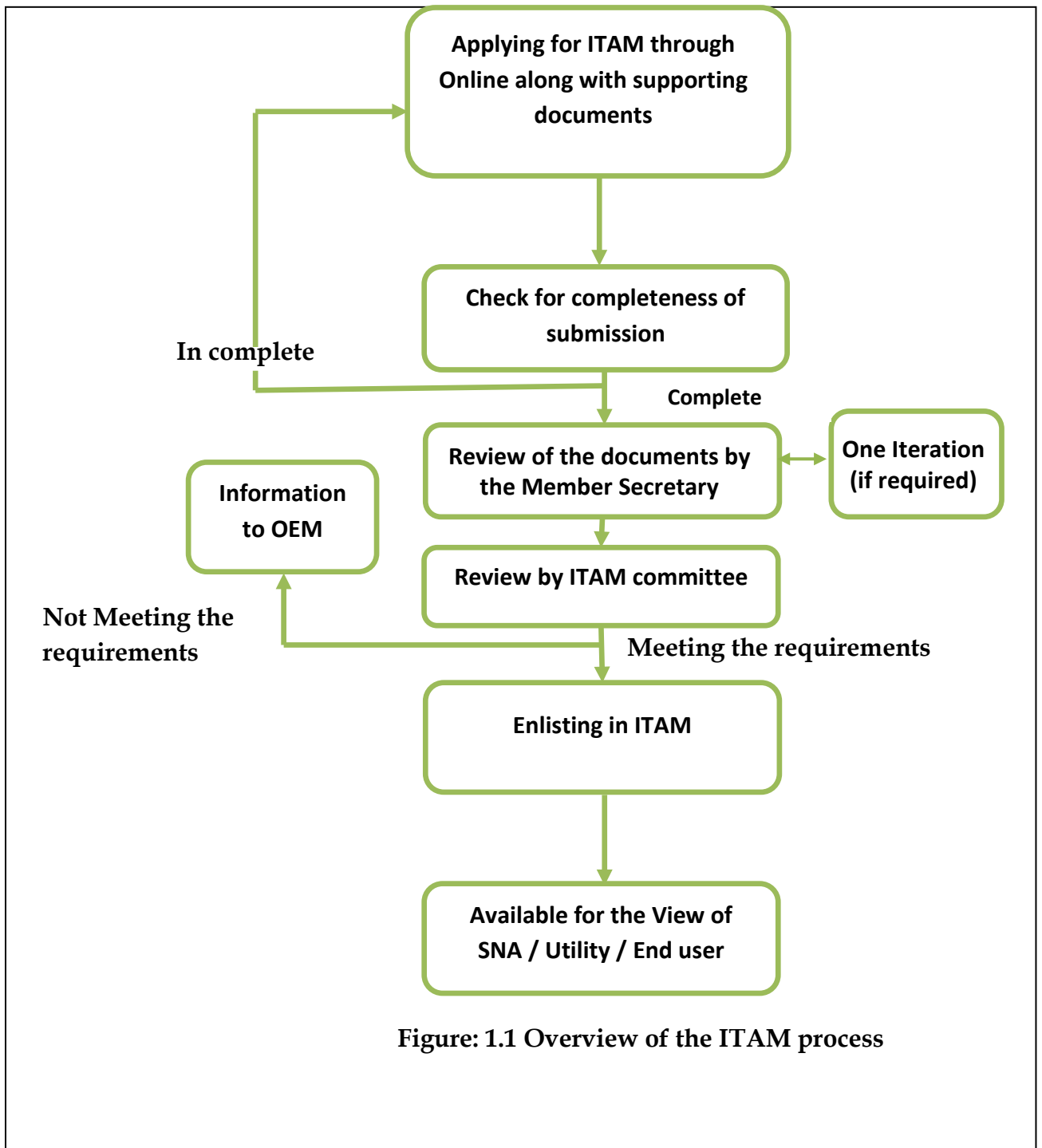


Figure: 1.1 Overview of the ITAM process

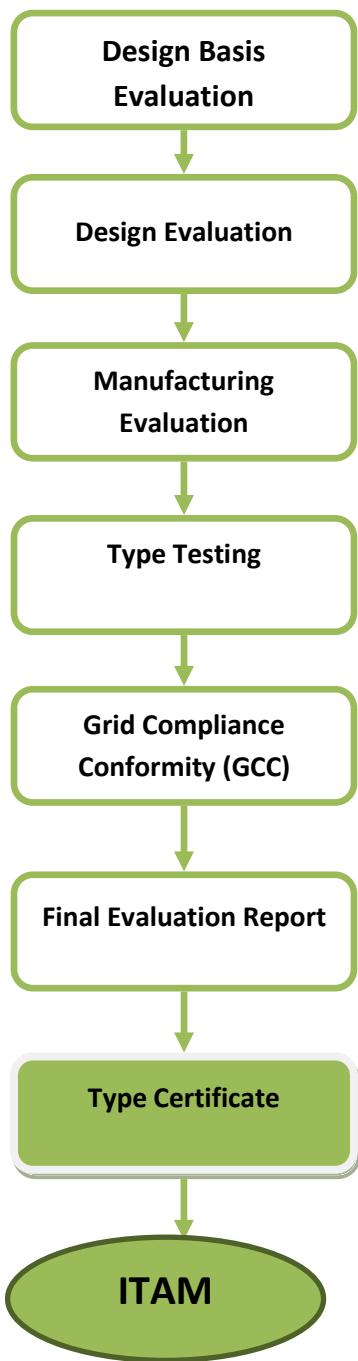


Figure: 1.2 ITCS Certificate

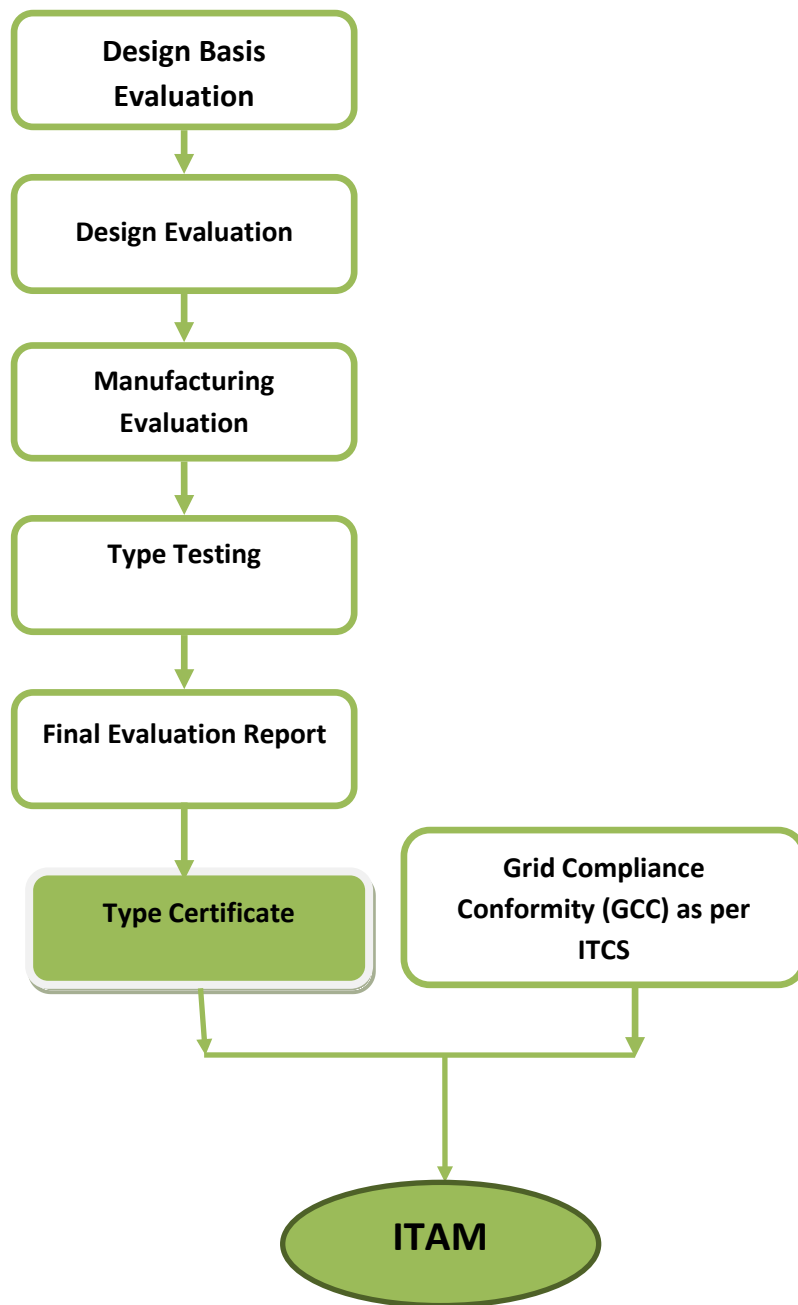


Figure: 1.3 IECRE Certificate for ITAM

2.6 Recommendation for Grid Synchronization for Prototype Wind Turbine Type Testing

The recommendation for Grid Synchronization of Prototype Wind Turbine/ Type testing of wind turbine is a procedure applicable for Wind Turbine Manufacturer interested to obtain a recommendation letter for grid synchronization of a new prototype wind turbine or existing type certified wind turbine with a significant change in their design for the purpose of type testing in order to obtain type certification or for research and developmental works of type certified wind turbine (including provisional). The recommendation for grid synchronization shall be issued by NIWE for a specific site. The wind turbine types applied for type testing and type certification under IWTCs are eligible to obtain prototype grid synchronization.

The significant design modification in the existing type certified wind turbine, which requires type testing for obtaining updated type certification, shall include:

- a) A change in rotor diameter of more than 2%
- b) A change in rotor rotational speed of more than 2%
- c) A different design of the safety system
- d) A different way of limiting the power output
- e) Modified blade profiles
- f) Modifications which lead to a significant increase in the load spectrum (a change of 5% in the load value in any of the load cases shall be considered as a significant change)
- g) Increase of the power output by more than 5%
- h) Major changes in the wind turbine design

The major documentation requirements for obtaining grid synchronization recommendation are given below:

- i. Prototype certificate or Provisional Prototype Certificate as per the recognized certification scheme mentioned in *Clause 2.4* of this Volume issued by CB.
- ii. Agreements / Contracts shall only be entered with CB and TL as per the recognized certification scheme mentioned in *Clause 2.4* of this Volume.
- iii. Agreements / Contracts entered with CB and TL for obtaining Grid Compliance Conformity / measurements for compliance to CEA Technical standards for connectivity to the Grid in vogue (which includes the LVRT, Power quality measurements etc.) for the wind turbine model applied.
- iv. Information on Company, Collaboration (if available) /Design rights ownership and NOC from collaborator, etc.,

In addition, the following categories of wind turbines are also eligible to apply for obtaining prototype grid synchronization:

1. Foreign wind turbine manufacturers desiring to have type testing in India, the same shall be carried out only through NIWE test facility.
2. Already type certified wind turbine model (but not included in ITAM), which is to be installed for demonstration purpose (not for commercial operation), the same would be permitted as per this guidelines.

2.6.1 Requirements to be complied:

- i. The prototype wind turbines shall be owned by the concerned wind turbine manufacturer and shall not be sold to any party, until the model is included in Indian Type Approved Model (ITAM).
- ii. Serial production of installed prototype wind turbine model shall not be allowed until the wind turbine model is included in ITAM.
- iii. The components / items procured / imported for manufacturing of the prototype wind turbines shall be new and unused. No second hand components / machines shall be allowed.
- iv. The duty exemption for components / items procured / imported for manufacturing of the prototype wind turbines will be governed by the notifications issued by appropriate authorities.
- v. The prototype wind turbines shall be commissioned / grid synchronized within a period of 18 months from the date of issuance of a recommendation letter from NIWE.
- vi. For each prototype wind turbine model, wind turbines up to a cumulative capacity of 15 MW will be allowed for grid synchronization / commissioning for research and developmental purpose and for demonstration. However, these turbines shall be in the name of the applicant company.
- vii. Commissioning certificate / grid synchronization report for the prototype wind turbines, issued by the concerned State utility / SNA shall be provided by manufacturer to NIWE, within a week from the date of commissioning / grid synchronization.
- viii. No changes can be made to the prototype wind turbine without the approval of the accredited type certification body. If any modifications or changes are carried out, approval of the accredited type CB shall be obtained. Such approvals shall be provided mandatorily by the wind turbine manufacturer(s) to NIWE without any delay.
- ix. A letter issued by the TL and CB on the status of type testing and type certification shall be provided to NIWE every year (before 31st of December).

- x. Regular maintenance and service shall be carried out for the prototype wind turbines installed. The CB shall provide a certificate at the end of the year regarding regular operation and maintenance of prototype wind turbines. Failing which the wind turbines are liable to be disconnected from the grid.
- xi. Validity of recommendation shall be limited to the validity of Prototype Certificate. However, the maximum period of validity of recommendation for a specific site is 3 years, subject to maintaining the validity of Prototype Certificate.
- xii. Type certificate for prototype wind turbine model shall be obtained from CB as per the recognized certification scheme mentioned in [Clause 2.4](#) of this Volume within 3 years from the date of issuance of a recommendation letter from NIWE for the specific site, failing which such prototype wind turbines shall be immediately disconnected from the grid by the respective State utility / SNA and uprooted at the cost of a manufacturer(s).
- xiii. However, if the Type Certificate is not obtained within the above said period, then the wind turbine manufacturer shall reapply and follow the due process as described above.
- xiv. The above condition of 3 years validity for a specific site does not apply when the prototype wind turbines are installed in the test bed at Wind Turbine Test Stations owned and operated by accredited type testing body or NIWE.
- xv. An indemnity bond has to be submitted by the manufacturers to the State utility/ SNA and NIWE for complying to the above conditions. The format of Indemnity bond can be obtained from NIWE.
- xvi. If one or more of the conditions mentioned above are not satisfied, the permission granted for the prototype installation and testing can be withdrawn unilaterally in the interest of safety and security.

2.7 Management of IWTCS

2.7.1 Operating bodies

Operating bodies of the IWTCS shall be the following:

- i. Operating body that conducts certification shall be any CB accredited as per ISO/IEC 17065 for the recognized type certification schemes of IWTCS or accepted as RECB under IECRE or NIWE, which herein after designated as CB in the document.
- ii. Operating body that conducts type testing shall be any testing body accredited as per ISO/IEC 17025 for the type testing standards defined in recognized type certification schemes of IWTCS or

accepted as RETL under IECRE or NIWE, which herein after designated as TL in the document.

2.7.2 Agreement with testing / certification bodies

Under IWTCS, the Agreement shall be mandatorily entered into with the accredited test / certification bodies or NIWE. Any Agreement entered with the agencies, which are not accredited for testing / certification (even though the agency may be part of the parent company or affiliate of the accredited testing/certification bodies) shall not be recognised.

2.7.3 Storage of Documentation and Retention Period

The accredited certification bodies shall keep all the received documentation that is relevant to the certificate or conformity statement. The documentation shall be kept in a place with restricted access for at least 5 years beyond the design lifetime of the wind turbine.

2.7.4 Confidentiality

Complete confidentiality shall be maintained by the CB and TL on the documents submitted by wind turbine manufacturer / developer.

2.7.5 Complaints

- a) Any Complaints regarding non-compliance of IWTCS shall be submitted to the Member Secretary of the Steering Committee.
- b) Any instances of serious or repetitive violation of any of the provision of the IWTCS and incidences of persistent non-compliance of the directions of the MNRE shall be submitted to the member-secretary of the Steering Committee in order to facilitate healthy and orderly growth of the wind power sector.

The Steering Committee shall meet at least once in six months or earlier depending upon the requirements to resolve the issues and suggest the way forward. MNRE is the appellate authority over the decisions made by Steering Committee of IWTCS.

Notwithstanding anything contained in these regulations, MNRE may also take suo-motu action against any person / organization, in case of non-compliance of any of the provisions of the IWTCS

2.7.6 Accountability

IWTCS shall not absolve the wind turbine manufacturers of their responsibilities for following and adhering to other applicable guidelines, procedures, rules, regulations, and protocols of other statutory bodies towards their product and services.

2.8 Validity of certificates

The period of validity of the type certificates shall not exceed 5 years from the date of issue or validity as per the type certificate, whichever is earlier. The period of validity of a prototype certificate shall not exceed 3 years from the date of issue or validity as per the prototype certificate, whichever is earlier.

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

A project certificate is valid for the installation at the site specified in the certificate subjected to the design life of various components in the project. However, the wind turbine and its associated components shall be re-assessed at the end of 80 % of the design lifetime, which shall be carried out as per the Volume IV. 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 CB shall not exceed 1 year.

The period of validity of the Safety and Performance assessment certificate shall be 2 years or validity as mentioned in the certificate, for continued operation of the wind turbine in the grid.

3.0 TRANSITION

3.1 Effective Implementation Date

IWTCS will come into force from the date of notification by MNRE.

3.2 Transition Period

- i. The wind turbine models which are already included in RLMM list issued by MNRE (as on the effective date) is valid for one revision of

type certificate or for a period of three years from the effective date of implementation of IWTCS, whichever is earlier.

- ii. A six months Transition period from the effective date of implementation of IWTCS is provided for inclusion in RLMM / ITAM for the wind turbines having type certificates / under certification as per the existing certification schemes approved by MNRE (IEC /GL Schemes) with a validity as described in (i) above.
- iii. Post Transition period, all the wind turbine model shall comply the requirements of ITAM.

INDIAN WIND TURBINE CERTIFICATION
SCHEME

VOLUME - II

INDIAN TYPE CERTIFICATION
SCHEME

INDIAN WIND TURBINE CERTIFICATION SCHEME

VOLUME - II

INDIAN TYPE CERTIFICATION SCHEME

1.0 INTRODUCTION

This volume details the guidelines for obtaining Prototype Certification, Type Certification & Grid Compliance Certification and describes the requirements to be fulfilled by the wind turbine manufacturer. The type certificate issued under IS/IEC 61400-22 scheme and IECRE scheme are recognized under IWTCS. In this volume, the certification schemes to be carried out under IS/IEC 61400-22 along with additional requirements is discussed briefly. The process under IECRE scheme shall be governed as per rules and procedures of IECRE.

The Type Certificate shall confirm that the wind turbine type is designed in conformity with the design assumptions, specific standards and other technical requirements for wind turbines. It shall also confirm that the manufacturing process, component specifications, inspection and test procedures, and corresponding documentation are in conformity with the design documentation and that the manufacturer operates a quality system as per the standards in vogue. Furthermore, it also covers the type testing of the wind turbine.

The CB shall require an applicant to provide documentation that meets all the requirements detailed in this Volume. The wind turbine type shall be evaluated for compliance with the technical requirements of this Volume and also the relevant IEC /IS standards. Any additional assumptions and requirement stated in the design basis by the designer and agreed with the CB need to be documented and provided.

The type certificate is valid for the wind turbine type specified in the certificate. The specification includes alternate components and configurations. The allowable components / configurations of alternatives shall be clearly identified in the type certificate.

In addition, all the wind turbine types certified under either of the schemes shall comply with the Grid connectivity requirements, stipulated by Central Electricity Authority (CEA), Government of India from time to time. The Grid Compliance Conformity (GCC) along with an evaluation report shall be issued, based on the measurements carried

out for the specified wind turbine type for all the parameters stipulated in CEA technical regulation in vogue by the CB.

The type certification is briefly described in [Clause 3.0](#) of this volume.

1.1 Stakeholders

As per the [Clause 1.1](#) of Volume- I

1.2 Operating bodies

As per [Clause 1.4.16](#) of Volume - I.

1.3 Scope

The scope of this Volume describes the methodology for issuing a Prototype Certificate (PTC) and Type Certificate (TC) by the CB for a specified wind turbine type.

2.0 PROTOTYPE CERTIFICATION

2.1 General

The purpose of wind turbine prototype certification is to enable testing of a new wind turbine type in order to obtain type certification.

A prototype certificate shall be issued for a wind turbine type that is not yet ready for serial manufacturing, at a specific site and for a specified period as per [Clause 2.8](#) of Volume-I.

CB shall evaluate that the prototype is safe during the specified period. If a prototype is modified during the specified period, which affects the safety of the wind turbine, a new prototype certificate is required.

The documentation shall be provided as per the requirements specified in IS/IEC 61400-22 for obtaining Prototype Certification.

2.2 Evaluation for Prototype Certification

Evaluation for Prototype Certification shall be carried out as per IS/IEC 61400-22. Prototype certification consists of the following modules:

- i. basic design evaluation;
- ii. prototype test plans evaluation; and
- iii. safety and function test.

Basic design evaluation includes the mandatory modules' viz., design basis evaluation and wind turbine design evaluation described in IS/IEC

61400-22. The evaluation can be limited to control and protection system, loads and load cases, rotor blades, main structural & electrical components and personnel safety issues.

A test plan for the prototype shall be defined by the applicant and submitted for evaluation to CB. The test plan shall specify main components to be tested during the test period and loads to be documented during the tests.

An approved prototype test plan comprises as a minimum the elements described in Type Testing module of IS/IEC 61400-22. The safety and function test shall be carried out and evaluated as part of prototype certification.

NOTE: A provisional prototype certificate may thus be issued with a condition stating that the "safety and function" testing should be carried out at a well-defined point in time such as "before unattended operation". Any unattended operation of the prototype wind turbine shall be permitted only after obtaining Prototype Certification.

2.3 Final Evaluation

The purpose of final evaluation is to provide a report containing the documentation of the findings of evaluation of the modules of the Prototype certification.

2.4 Prototype Certificate

CB shall issue a Prototype Certificate based on satisfactory evaluation for completeness and correctness of the final evaluation report.

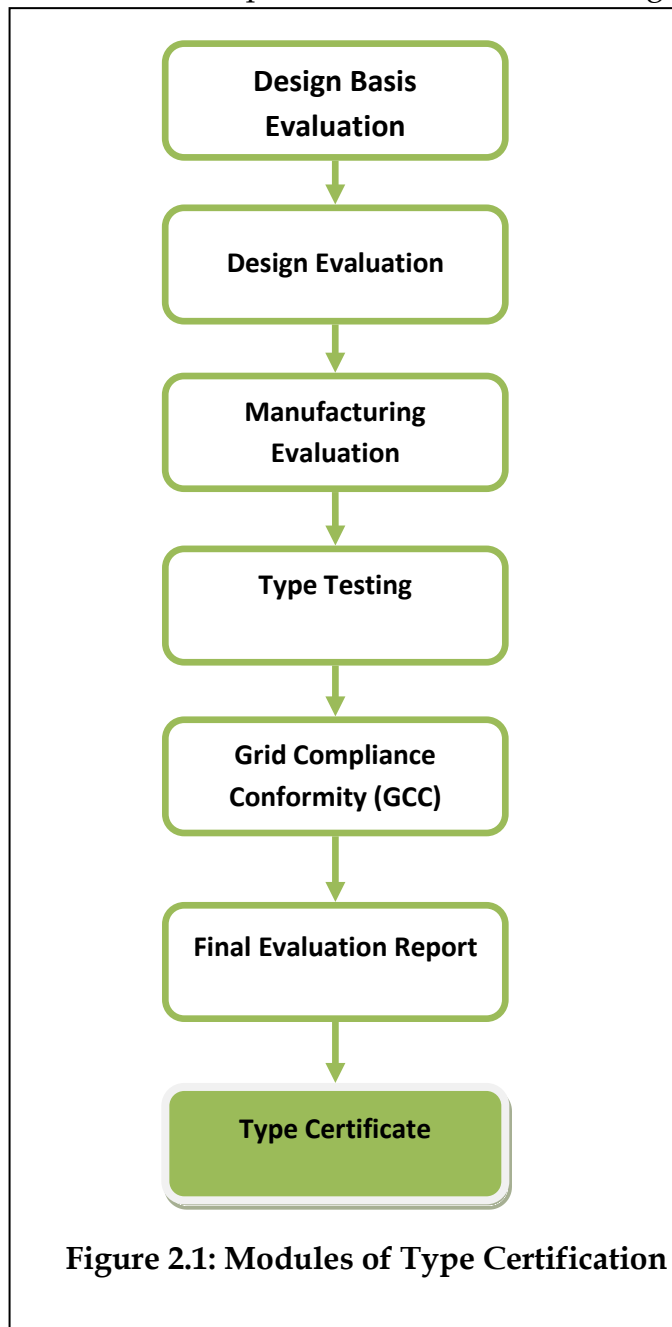
3.0 TYPE CERTIFICATION

3.1 General

The purpose of wind turbine type certification is to confirm that the wind turbine type is designed, documented and manufactured in conformity with design assumptions, specific standards and other technical requirements.

A type certificate shall be issued for a wind turbine type that is ready for serial manufacturing, with a specific validity period.

Type Certification modules as per IWTCS is as shown in Figure 2.1:



3.2 Design basis Evaluation

The purpose of design basis evaluation is to examine whether the design basis is properly documented and sufficient for safe design of the wind turbine type.

The design basis shall identify all requirements, assumptions and methodologies, which are essential for the design and the design documentation.

Evaluation shall be carried out as per IS/IEC 61400-22.

3.3 Design evaluation

The purpose of design evaluation is to examine whether the wind turbine type is designed and documented in conformity with the design basis, i.e. the applicable standards in the IEC 61400 series and other applied codes and standards used for design.

An applicant shall submit all the necessary documents for carrying out design evaluation. Evaluation shall be carried out as per IS/IEC 61400-22. The results of evaluation shall be documented and evaluation report(s) shall be prepared as per IS/IEC 61400-22.

3.3.1 Design evaluation conformity statement

The CB shall issue a conformity statement based on satisfactory evaluation of a design evaluation report(s). The conformity statement shall include:

- i. identification of the wind turbine type;
- ii. identification of the applicant;
- iii. reference to main codes and standards applied;
- iv. specification of external conditions with reference to the wind turbine class and other principal data; and
- v. reference to evaluation report(s).

3.4 Type Testing

The purpose of type testing is to provide data needed for the CB to verify the aspects that are critical to safety, power performance and additional experimental verification and any other aspects that cannot be reliably evaluated by analysis.

In addition, the CB shall carry out type inspection to evaluate that testing, as applicable, has been carried out on a wind turbine or

component of a wind turbine representative of the type to be certified. The inspection records shall be completed, preferably prior to the tests, to demonstrate satisfactory conformity of the wind turbine or component with the design documentation.

The type testing elements given in IS/IEC 61400-22 shall be carried out. The detailed test program shall be defined by the applicant and be subjected to approval by the CB on a case-by-case basis. The Applicant shall submit the Type Test report(s) issued by any TL.

The CB shall evaluate the Type Test report(s) as per IS/IEC 61400-22. The results of evaluation shall be documented and evaluation report shall be prepared.

3.4.1 Type test conformity statement

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

- i. the tests carried out;
- ii. the test standards applied; and
- iii. identification of the test reports.

3.5 Manufacturing Evaluation

The purpose of manufacturing evaluation is to assess if a specific wind turbine type is manufactured in conformity with the design documentation verified during the design evaluation. This evaluation shall include the following elements:

- i. quality system evaluation; and
- ii. manufacturing inspection.

The manufacturing evaluation presupposes that the applicant operates a quality system. The quality system shall be in conformance with ISO 9001 and the system certification shall be carried out by an accredited body that operates according to ISO/IEC 17021.

The evaluation requires manufacturing of at least one representative specimen of the wind turbine type under certification.

The manufacturing evaluation shall be carried out as per IS/IEC 61400-22.

3.5.1 Manufacturing conformity statement

A satisfactory manufacturing conformity evaluation is concluded with a manufacturing conformity statement.

3.6 Grid Compliance Conformity (GCC) as per CEA Technical Regulations in vogue

The electrical characteristics measurements and the Grid compliance as per the relevant CEA Technical Regulations in vogue requirements is mandated (as per the CERC order dated 05.01.2016). The measurements shall confirm with the relevant IEC 61400 standards and wherever the standards/guidelines are not available, a suitable mechanism shall be given by MNRE.

The CB shall evaluate that electrical characteristics measurement has been carried out on a turbine representative of the type to be certified. Inspection records shall be completed prior to the measurements in order to demonstrate satisfactory conformity of the turbine with design documentation.

The measurements and test results shall be documented in a test report and shall be evaluated by the CB in conformity with the relevant CEA regulations. CB shall evaluate that the measurements have been carried out in accordance with an approved detailed program and that the report properly documents the characteristic required for certification.

A satisfactory evaluation is concluded with a conformity statement issued by the CB.

3.6.1 Assessment of Grid Compliance Certificate as per CEA Technical Regulations in vogue

The CB shall evaluate the documents provided by the wind turbine manufacturer and assess the compliance for grid connectivity requirements for wind turbines stipulated by CEA. The scope of the assessment shall cover all the parameters stipulated in CEA Technical Regulations in vogue.

The wind turbine manufacturer shall provide the following documentation:

1. Complete Technical specifications of the wind turbine type along with the schematic and line diagrams.
2. Brief description along with the control block diagram of entire electrical system of wind turbine.

3. Brief description on the control capabilities along with the block diagram of the wind turbine, to comply with the requirements stipulated by CEA (such as LVRT, active power control, reactive power control, harmonics, flicker, DC current injection, frequency response, etc.,)
4. Data sheet of the electrical components (Generator, Converter, Transformer, Pitch, Yaw and Control and Protection system)
5. Electrical simulation model (both steady state and dynamic) of the wind turbine (including .dll files), which can be used in the standard power system simulation software.
6. Field Measurement report of the model (measurement to be carried out for each variant - change in generator, power converter and control system) included in the Type Certification being applied for ITAM on all the parameters as per CEA Technical Regulations in vogue, as per the procedure and requirements specified in IEC 61400-21.

3.6.2 Evaluation Report

The results of the evaluation shall be documented in an assessment report. The report shall contain the documents reviewed, documents referred, Standards and Guidelines, Scope of Evaluation, technical specification of the wind turbine type assessed, list of test reports and its parameters, values & summary, comparison of test report results and simulation results, etc.

The report shall also contain a summary table explaining status of compliance for all the parameters stipulated by CEA.

3.6.3 GCC on CEA Technical Regulations in vogue

The CB shall issue a GCC based on satisfactory assessment of grid connectivity requirements stipulated by Central Electricity Authority. The GCC shall include:

- i. identification of the wind turbine type;
- ii. identification of the applicant;
- iii. the tests carried out;
- iv. the test standards applied and reference to main codes and standards applied;
- v. identification of the test reports and reference to evaluation report(s).

3.7 Final Evaluation

The purpose of final evaluation is to provide a report containing the documentation of the findings of all operating bodies involved in the evaluation of the elements of the type certificate. The final evaluation report shall be prepared as per IS/IEC 61400-22.

3.8 Type Certificate

The CB shall issue a Type Certificate based on satisfactory evaluation for completeness and correctness of the final evaluation report as per IS/IEC 61400-22.

The type certificate is valid for the wind turbine type specified in the certificate. The specifications may include alternative components and configurations. The different combinations of alternatives, which are permitted, shall be clearly identified and reported in the type certificate.

3.9 Maintenance of type certificate

In order to maintain validity of the type certificate, the requirements as stipulated in IS/IEC 61400-22 shall be met by the applicant and the CB.

3.10 Dealing with outstanding matters

A provisional certificate or associated conformity statement can be issued as per IS/IEC 61400-22 to allow for 0-series manufacture as well as to allow for outstanding matters with no safety implication. The outstanding matters should be limited to:

- i. matters with no safety implication within the period of validity (maximum 1 year); and
- ii. matters related to the finalization of manuals and quality control procedures.

In case of any modifications in the wind turbine component or design or any other issues addressed from the Provisional Type Certification to Type Certification, the same needs to be incorporated in all the wind turbines installed based on the Provisional Type Certificate.

3.11 Corrective actions

The CB shall be informed if, from log-book data or other information brought to the attention of the certificate holder, a wind turbine or project in question is shown 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 turbine, project or the surroundings is involved shall be reported to the respective CB and NIWE without delay. Failure reporting shall comply with the requirements mentioned in Volume - IV of IWTCS.

After preliminary evaluation if the CB determines a serious defect affecting the safety of a wind turbine in question, the certificate shall be immediately suspended. The CB shall subsequently carry out a thorough evaluation of the defect. This evaluation shall result in either reaffirmation or withdrawal of the certificate.

**INDIAN WIND TURBINE CERTIFICATION
SCHEME**

VOLUME – III

**WIND FARM PROJECT
CERTIFICATION SCHEME
(WFPCS)**

INDIAN WIND TURBINE CERTIFICATION SCHEME

VOLUME - III

WIND FARM PROJECT CERTIFICATION SCHEME

1.0 INTRODUCTION

This volume details the guidelines for obtaining project certification of wind farms and describes the technical requirements during pre-commissioning, installation and commissioning and post commissioning as shown in Figure 3.1 & 3.2.

The Project certification under IWTCS shall confirm that the wind turbines (approved under ITAM) and its foundation designs meet the requirements of site-specific external conditions and the wind farm project is in conformity with applicable CEA regulations, State & Central grid codes and other guidelines issued by statutory authorities.

This scheme is prepared broadly based on IS /IEC 61400-22.

The Project certification shall ensure that the Project adheres to all the stipulated guidelines in this volume. However, the certification may also incorporate the ancillary infrastructure of the wind farm Project, such as Substations (e.g. transformer, protection and metering systems etc.,) and their support structures, based on the stakeholder's request.

The Power curve verification test and energy production demonstration test is optional at the discretion of investor / financial institution with the criteria agreed with developer / OEM.

The Project Certificate shall be in place before the commercial operation of the wind farm and the same shall be ensured by the concerned utilities and other stakeholders.

If the manufacturing and transportation surveillance are complied during project certification (pre-commissioning) stage (wherein the quality process of the wind turbines is ensured), then there is no need for additional Grid compliance test during project certification (post commissioning) stage as per CEA criteria (as the type certified turbines have already complied with Grid code). If not, then Grid compliance test as per CEA and as per the sampling criteria to be carried out during post commissioning of the project.

The Project Certification is applicable for all the grid-connected wind farms except those wind turbines, which are commissioned as part of distributed generation (connected to the mixed feeder of 11 kV or below).

The project certification is also applicable for the projects considered under repowering & intercropping within the wind farms. The brief layouts of the project certification process (options 1 &2) are shown in Figures 3.1 & 3.2. The Project Certificate, along with the final evaluation report, is issued at the end of the certification procedure given that all mandatory modules have been successfully completed.

In case, the project is commissioned in a phased manner, the project certificate shall be issued for each of the phases clearly describing the layout of the phase and the turbine numbering. After completion of the entire project, consolidated project certificate shall be issued in addition to the phased project certificate.

In case, the project is distributed in different locations or connected to different grid sub stations, then each location is treated as a separate project.

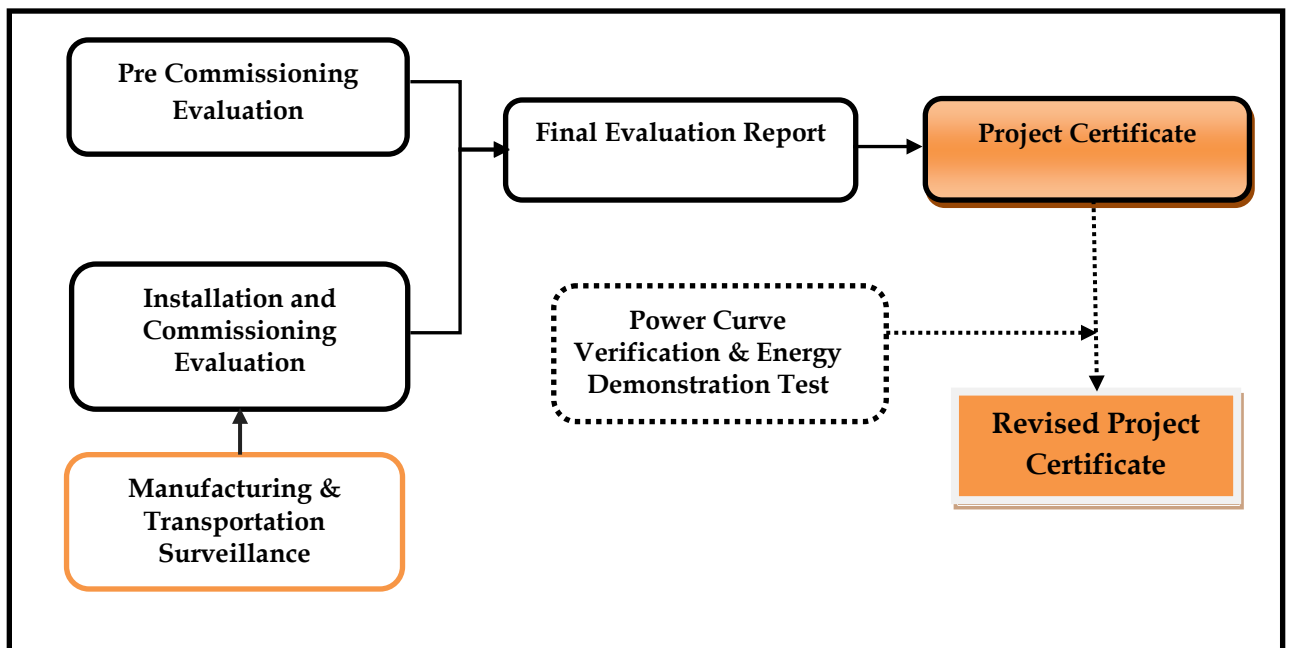


Figure 3.1: Brief Layout of the Project Certification (Option-1)

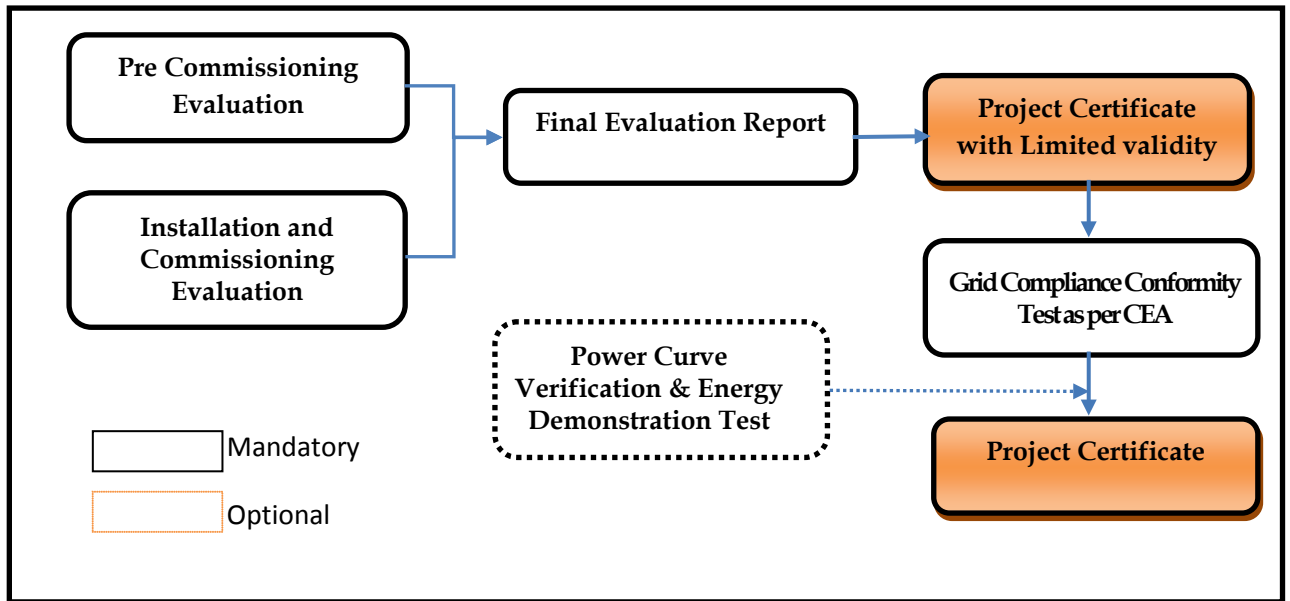


Figure 3.2: Brief Layout of the Project Certification (Option - 2)

1.1 Stakeholders

As per the [Clause 1.1](#) of Volume- I.

1.2 Operating bodies

As per [Clause 1.4.16](#) of Volume - I

1.3 Scope

The scope covers the whole life cycle of the project viz., Site conditions' evaluation, Site-specific wind turbines design evaluation, Evaluation on micro-siting layout, Power evacuation assessment, Evaluation of wind turbine design, Environmental acceptability evaluation, Evaluation of personnel safety, Installation and commissioning surveillance as the mandatory module. In addition, either the Manufacturing & Transportation Surveillance evaluation or Grid compliance tests as per CEA are also mandatory modules to be exercised by the Investors / Developers. The procedure for dismantling of the wind turbine and their safe disposal shall be part of the documentation requirements under the project certification. The detailed Project Certification process (option 1 & 2) are illustrated in Figure 3.3 & 3.4.

1.4 Wind Farm sampling criteria

The Operating body is mandated to select the samples, which shall truly represent the entire wind farm for project certification. As a minimum, the following sampling criteria to be adhered to:

- i. For less than 50 turbines, 10% of wind turbines subject to minimum of 2 wind turbines.
- ii. For 50 to 150 wind turbines, 8% of wind turbines subject to minimum of 5 wind turbines.
- iii. For above 150 turbines, 6% of wind turbines subject to minimum of 12 wind turbines.

In addition, it shall be ensured that

- a. If the wind farms are developed in different phases, at least one wind turbine shall be selected in each phase of wind farm.
- b. If the wind turbines are connected in different feeders, at least one wind turbine is to be selected from each of the intra wind farm feeder. This would ensure that the sample represents the entire layout of the wind farm.

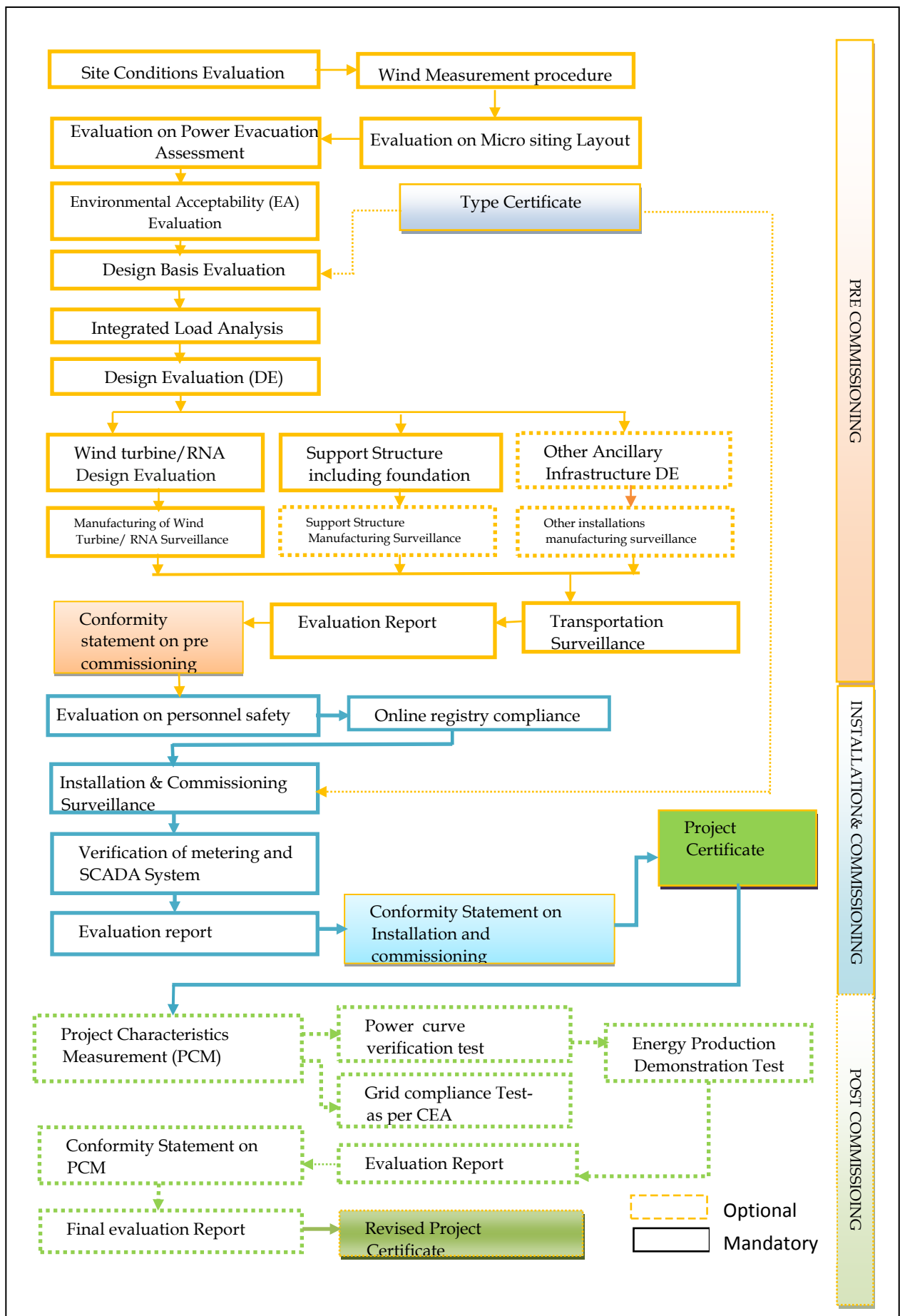


Figure 3.3. The general structure of the Project Certification Process Module (Option 1)

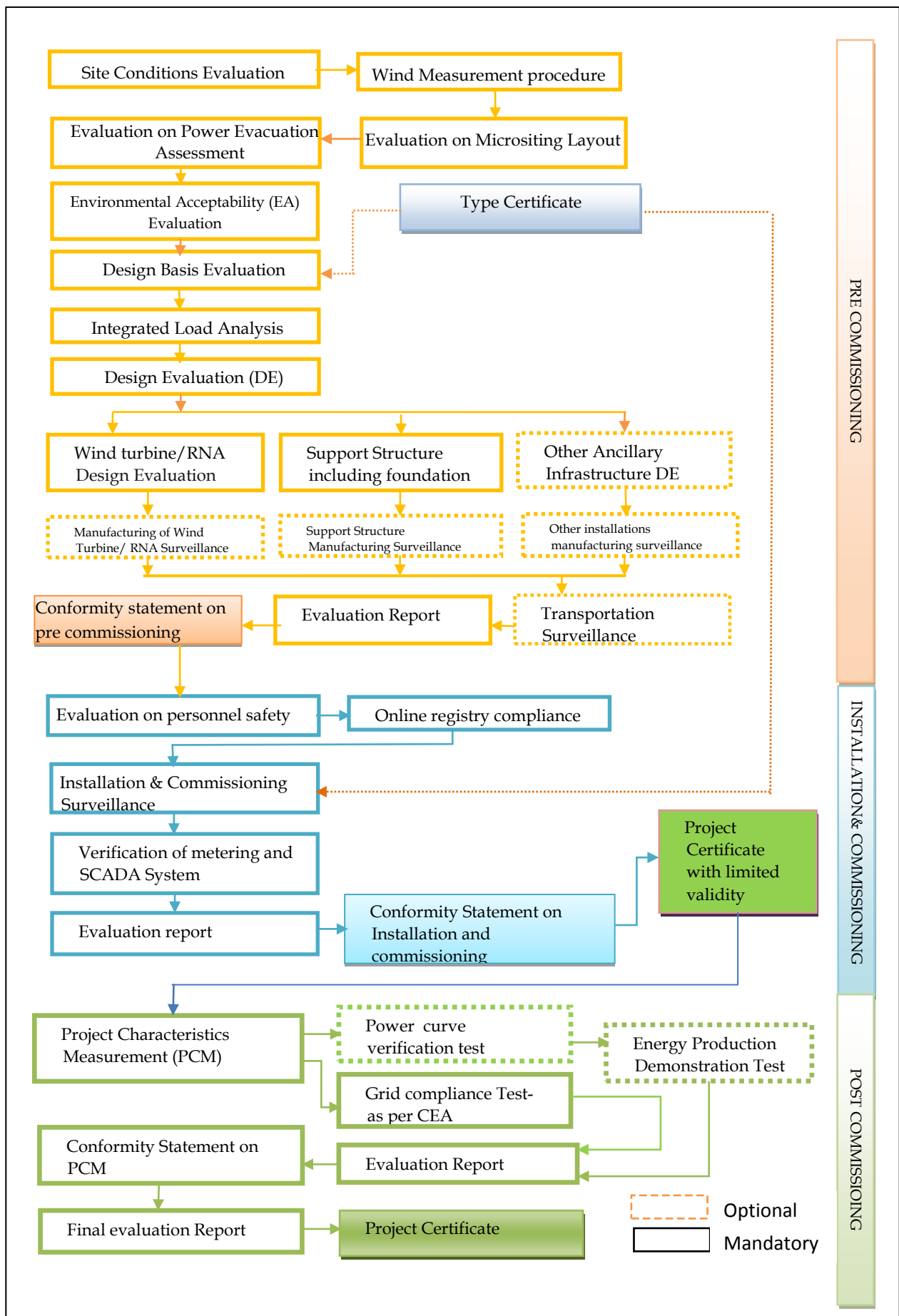


Figure 3.4. The general structure of the Project Certification Process Module (Option 2)

PART I -PRE-COMMISSIONING

2.0 PRE COMMISSIONING

2.1. Site Conditions Evaluation

2.1.1 General

The purpose of site conditions evaluation is to examine whether the environmental, electrical and soil properties at a site conform to the parameter values defined in the design documentation.

2.1.2 Site conditions evaluation requirements

The CB shall evaluate whether the assessment of the site conditions as per IS/IEC 61400-22 and as detailed in IEC 61400-1 (for onshore projects) or IEC 61400-3 (for offshore projects) have been adequately undertaken and documented.

Measurements of the external conditions of the site shall be carried out by TL and the CB shall verify the satisfactory quality and reliability of the measurements.

The CB shall require that qualified personnel carry out the data acquisition, analysis and reporting of the external conditions at the site. The CB shall evaluate that relevant reports properly document the external conditions as well as the data acquisition, the applied statistical methods and the design parameters for the external conditions.

The CB shall ensure the following are available:

- i. Valid NOC issued for the site by the concerned State Nodal Agency / Utility.
- ii. The site being selected for the wind power project can be legally used for the purpose and all regulations regarding land use/land cover are complied with.

2.2 Wind Conditions

Wind Conditions evaluation requirements shall comply with IS/IEC 61400-22. Site-specific measurements shall normally be correlated with data from a nearby location for which long-term measurements exist or with NWP data. The monitoring period for the site-specific measurements shall be adequate and the data is sufficient & reliable to arrive at the project economics. The

wind speed measurements shall comply with requirements specified in IEC 61400-12-1.

2.2.1 Wind Measurement procedure

The wind measurement shall be carried out through meteorological mast and / or Remote Sensing Devices (RSD). The equipment and instrumentation shall comply with IEC-61400-12-1 and the support structure shall comply with relevant Indian Standards such as IS 800, IS 875 and other relevant standard / guidelines.

The site-specific wind measurements shall comply with the following requirements:

- i. Procedure methodology, equipment, height of the mast, measurements at various levels shall be as per the requirements of IEC 61400-12-1 and in addition, measurements at 10m & 50m heights also shall be carried out. The period of measurement should be adequate for assessing the wind potential and with a minimum of one-year continuous wind data. The height of the primary wind measurement level shall be at least 2/3 of the planned hub height.
- ii. As per IS/IEC 61400-22, the wind measurements shall be carried out by the TL. Any non-accredited agency (Developer / IPP /Investor) can be permitted for wind measurements with due permission and approval from NIWE. NIWE shall ensure that the measuring instruments, measurement technique, data and uncertainty estimation comply with the requirements of IEC 61400-12-1.
- iii. All the wind turbines proposed to be installed in the wind farm shall be located within the representative radii of the wind mast. The representative radius shall be 10 km for a simple flat terrain and 2 km for a complex terrain (the terrain slopes greater than 0.3, i.e., approximately 17 degrees), while keeping the associated combined uncertainties at lower value acceptable to the investor.

{This mechanism is adopted from MEASNET procedure}

2.2.2 Wind Measurements by non-accredited agency (Developer / IPP /Investor):

- i. Any non-accredited agency (Developer / IPP /Investor) desirous to install the wind mast for collecting wind data at specific locations shall carry out such activity as per [Clause 2.2.1](#) of this volume.
- ii. The non-accredited agency shall apply to NIWE along with all the necessary documentation including location details, met mast drawing & design documents, calibration certificates issued by the accredited laboratories.
- iii. It is necessary that the required GPS enabled data logger and communication system needs to be established for real-time transfer of data from the wind monitoring station to NIWE. NIWE would act as a data repository and shall not use these data for any other commercial purpose including transfer to third party.
- iv. At the end of every quarter, all the measured data including the data in the binary format shall be submitted to NIWE for validation and verification of the measurement data.
- v. The non-accredited agency would apply for certificate for authenticity of the wind data to NIWE and the same would be examined with other long-term data and shall provide the certificate for authenticity of the wind monitoring station data.
- vi. The non-accredited agency would be provided an opportunity to develop the wind farm within a period of five (5) years from the date of installation of the wind mast. After this period, the data would be posted in the NIWE database and would be made available for other prospective investors / developers.

2.3 Evaluation on Micrositing Layout

The CB shall evaluate the micro-siting report with respect to the following guidelines:

- i. A minimum distance of $2 \times RD$ (RD-Rotor Diameter) distance perpendicular to the predominant wind direction and $3 \times RD$ distance in the predominant wind direction from the boundary line of each adjoining land of other developer(s) with appropriate offsets shall be maintained.
- ii. A distance of $HH+1/2 RD+ 5m$ (Hub Height+ Half Rotor Diameter +5 meters) from Public Roads, railway tracks, highways, buildings and public institutions shall be maintained. In case of overhead electrical lines, the spacing shall be as per IE rules in vogue.

- iii. The inter machine spacing within the wind farm shall be decided based on an optimized micro-siting plan agreed to between the developer and end user. However, it shall be ensured that wake effect losses (in terms of energy) are less than 10% with appropriate spacing / offset between the wind turbines within the project as well as with the adjoining projects.
- iv. The wind turbines shall be located beyond 500m of human habitat considering the acoustic levels and shadow flickers.

2.4 Evaluation of Power Evacuation Assessment

The CB shall evaluate the power evacuation report in terms of meeting the requirements of CEA regulations and the State & Central grid code.

It is suggested that the annual energy loss in the intra wind farm electrical network shall be kept less than 5%.

2.5. Environmental Acceptability (Ea) Including Acoustic and Shadow Flicker Evaluation

The Environmental Acceptability shall address the following:

- 1 If the site being selected falls in the area of forestland or in the vicinity of habitat of migratory birds and their flight routes, civil aviation, defense and heritage establishments then the project developer should ensure availability of necessary clearances from concerned authorities.
- 2 The wind farm operator shall establish a noise complaint mitigation protocol to receive, assess and respond to potential noise complaints.
- 3 Noise levels must not exceed 45dB(A) during normal operation of wind turbines at any of the receptors surrounding the project area within 500 m.
- 4 For a new wind farm development, the predicted equivalent noise level (L_{eq} , 10 minute), adjusted for any excessive levels of tonality, amplitude modulation or low frequency, but including all other normal wind farm characteristics, should not exceed 45dB(A) while the wind turbines are in operation or the background noise should not exceed 5dB(A) while the wind turbines are not in operation (L_{90}).
- 5 Shadow flicker on the existing dwellings/ human habitat (at the time of commissioning) should not exceed 30 hours per year or continuous period of 5 minutes. {Source: *Department of Energy and Climate Change Shadow Flicker FINAL REPORT*}

2.6 Design Basis Evaluation

The purpose of design basis evaluation is to examine that the design basis is properly documented and sufficient for a safe design and execution of the project. Design basis evaluation shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.7 Integrated Load Analysis

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 design basis. Integrated load analysis shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.8 Design Evaluation

2.8.1 Site-Specific Design Evaluation of Wind turbine/RNA

The design of the site-specific wind turbine shall be evaluated for compliance with the design basis. In the case of a site-specific support structure design, the evaluation shall only comprise the Rotor and Nacelle Assembly. Site - specific design evaluation on wind turbine including RNA shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.8.2 Site-specific support structure design evaluation including foundation

The site-specific support structure (tower, sub-structure and foundation) design shall be evaluated for compliance with the approved design basis as well as the standards listed therein. Site-specific support structure design evaluation shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.8.3 Other ancillary infrastructure (optional)

The other ancillary infrastructure (substations, transmission systems, cables, etc.) design shall be evaluated for compliance with the approved design basis as well as the standards listed therein. Other ancillary infrastructure design evaluation shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.9 Wind Turbine/RNA Manufacturing Surveillance*

The manufacturing inspection during type certification is based on one specimen only. 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 and with the intended quality. Wind turbine/ RNA manufacturing surveillance shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.10 Transportation Surveillance*

The purpose of transportation surveillance is to verify the conformity with the requirements of the design basis and to verify that the loads on components and subsystems of the wind turbines are not exceeding the design envelope during transportation and that possible transportation and/or handling damages are being detected. Transportation surveillance shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.11 Support Structure and other installation & foundation Manufacturing Surveillance (optional)

Support Structure and other installation & foundation Manufacturing Surveillance are optional modules at the discretion of the investor /utility / developer. The evaluation shall be carried out as per IS/IEC 61400-22 and an evaluation report shall be issued by the CB.

2.12 Evaluation report for pre commissioning

Based on the evaluation of the above-mentioned requirements i.e., 2.1 to 2.10 and 2.11 (if applicable) and as per the requirements of IS/IEC 61400-22, the CB shall issue a Pre commissioning evaluation report.

Note: () The Wind turbine/RNA manufacturing and Transportation Surveillance modules are optional at the discretion of the investor /utility / developer. In that case, the Grid compliance test as per the requirements of CEA Technical Regulations in vogue shall be carried out during post commissioning.*

2.13 Conformity Statement on Pre-commissioning:

The CB shall issue a conformity statement based on satisfactory evaluation of the pre-commissioning evaluation report(s). The conformity statement shall include:

- i. Identification of the applicant;
- ii. Identification of the wind turbine type;
- iii. Location details;
- iv. List of standards, codes and guidelines used; (IS, IEC, grid codes, CEA guidelines, etc.)
- v. Specification of external conditions with reference to the WT class and other principal data; and
- vi. Specific reference to evaluation report(s).

PART -II DURING INSTALLATION AND COMMISSIONING

3.0 INSTALLATION AND COMMISSIONING EVALUATION

3.1 Evaluation of Personnel Safety

The CB shall verify that personnel safety aspects as specified in the design documentation are properly implemented. Personnel safety aspects to be considered shall include:

- i. safety instructions;
- ii. climbing facilities;
- iii. access ways and passages;
- iv. standing places, platforms and floors;
- v. hand rails and fixing points;
- vi. lighting;
- vii. electrical and earthing system;
- viii. fire resistance;
- ix. emergency switching off buttons;
- x. provision of alternative escape routes;
- xi. availability of PPE with necessary validity

3.2 Installation Surveillance

The installation surveillance have to comply with IS/IEC 61400-22 requirements.

In addition, it is required that the following shall be complied during this process.

- i. Verification of Safety procedures and safety manuals
- ii. Verification of availability of certified manuals for transportation, Installation, Commissioning, O&M, Decommissioning & Safe Disposal are in place.
- iii. Sample inspection (as per sampling criteria defined in [Clause 1.4](#) of this Volume) of wind turbine installation process.
- iv. Complete (100%) physical inspection of all the Wind Turbines in the wind farm (with respect to availability of Type certified components including components required for grid compliance and network infrastructure)

3.3 Online Registry Compliance

In order to comply with the CEA regulations, every wind turbine shall be geographically tagged and will be identified with a unique ID in the 'Online Registry of Wind Turbines' by NIWE.

3.4 Commissioning Surveillance

The purpose of commissioning surveillance is to verify that the wind turbines installed in a specific project at a specific site are commissioned in conformity with the relevant manuals included in the design documentation.

The CB shall evaluate whether the commissioning of the wind turbine(s) is in conformance with the certified commissioning procedures and manual and in accordance with relevant parts of the IEC 61400 series.

Commissioning evaluation shall be carried out as per IS/IEC 61400-22 and sampling size for witnessing of commissioning shall be as per the sampling criteria ([Clause 1.4](#) of this Volume).

In addition, the CB shall ensure that following tests are conducted as a minimum, before commissioning:

- i. Test Run: To witness and evaluate the 96 hrs test run of the newly installed wind turbines.
- ii. All unforeseen stoppages and Grid failures during the test run will be noted.
- iii. The demonstration of functionality of various control and protection system of the selected wind turbine will be witnessed and noted.
- iv. The mandatory pre commissioning test / procedures of the ancillary infrastructure such as electrical protection system, switchgears, transformer, etc.,

3.5 Verification of Metering and SCADA System

The purpose of Verification of Metering and SCADA system is to verify that the wind turbines connected substations have special energy meters (SEM) with a functionality as defined in CEA Installations and Operation of meters regulations and respective grid code, in vogue. In addition, the SCADA system should be in place for a real time transfer of data to SLDC, REMC and to NIWE. The SCADA facility of the wind farm shall have necessary control mechanism for active power control, reactive power control and frequency response based on real time communication from SLDC/REMC.

As a minimum, the following parameter of wind turbine level SCADA data in real time (with a sampling rate of atleast every 5 sec) shall be transmitted to SLDC, REMC and to NIWE.

- i. Wind speed
- ii. Wind direction
- iii. Ambient temperature
- iv. Cumulative Energy Produced
- v. Active Power
- vi. Reactive Power
- vii. Frequency
- viii. Power Factor
- ix. Voltage
- x. Current
- xi. Wind Turbine Status
 - a. WTG Operational
 - b. Grid Shutdown
 - c. WTG Shutdown
 - d. WTG Available

In addition, the SCADA data of the pooling sub-station shall also be transmitted to SLDC, REMC and to NIWE as per the requirement of the respective utilities.

3.6 Evaluation report

Based on the evaluation of the above mentioned requirements i.e., 3.1 to 3.5 and as per the requirements of IS/IEC 61400-22, the CB shall issue an evaluation report for installation and commissioning.

3.7 Conformity Statement on installation and commissioning:

The CB shall issue a conformity statement based on satisfactory evaluation of the installation and commissioning evaluation report(s). The conformity statement shall include:

- i. Identification of the applicant;
- ii. Wind farm capacity;
- iii. Identification of the wind turbine type;
- iv. Location details;
- v. Pooling station details;
- vi. Connectivity type (STU / CTU);
- vii. Specific reference to evaluation report(s).

3.8 Project Certificate

The CB 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. The project certificate is valid for wind turbine(s) and additional installation(s) as installed at the site specified in the certificate at the date of issue. The project certificate shall reference in an appropriate way the standards and normative documents used. The Period of validity of Project Certificate shall not exceed 80% of the design lifetime of the majority of the wind turbines in the wind farm.

If the Wind Turbine/RNA Manufacturing and Transportation Surveillance have not been carried out during pre commissioning, then the CB shall issue the Project Certificate with one-year validity only. In such cases, the Grid compliance test as per the requirements of CEA Technical Regulations as per the [Clause 4.2](#) of this volume shall be carried out within a period of one year or one windy season, whichever is later.

PART -III POST COMMISSIONING

4.0 PROJECT CHARACTERISTIC MEASUREMENTS (VALIDATION TESTS)

4.1 General

The purpose of project characteristics measurements within project certification is to establish performance-related characteristics of wind turbine(s) as per the sampling criteria as per [Clause 1.4](#) of this Volume, in addition to the measurements done for a single turbine within the type certification. The project characteristics measurements shall be in line with the requirements of the National Lab Policy. The test comprise the following elements:

- i. Grid compliance validation as per the requirements of CEA Technical Regulations in vogue (such as LVRT, Power quality, Active power control, Reactive power control, Frequency response, etc.,) on the samples of wind turbines as per [Clause 1.4](#) of this Volume.
- ii. Power Curve Verification Test on the samples of wind turbines as per [Clause 1.4](#) of this Volume (optional).
- iii. Energy production demonstration test for the wind farm project (optional).

The Grid compliance test as per the requirements of CEA Technical Regulations in vogue shall be carried out if the Wind turbine/RNA Manufacturing and Transportation Surveillance modules are not carried out during the pre-commissioning stage.

The Power curve verification test and energy production demonstration test can be optional modules at the discretion of investor / financial institution with the criteria agreed with developer / OEM.

4.2 Grid compliance test as per the requirements of CEA Technical Regulations

Grid compliance test as per the requirements of CEA Technical Regulations in vogue (such as LVRT, Power quality, Active power control, Reactive power control, Frequency response, etc.) shall be carried out by TL. The sample size of wind turbines at which these measurements are to be carried out shall be as per [Clause 1.4](#) of this Volume. The measurements procedure shall conform with IEC 61400-21 requirements.

The CB shall verify the conformity of these tests as per IEC 61400-21 and test results shall conform to the CEA Technical regulation as in vogue.

4.3 Power Curve Verification test (Optional)

Power Curve Verification test shall be carried out by TL. The sample size of wind turbines at which these measurements are to be carried out shall be as per [Clause 1.4](#) of this Volume. The site-specific power curve verification test shall be assessed through the following:

1. Measurement of Power Curve as per the requirements of IEC 61400-12-1 & 2 standards. Measurement shall be carried out by TL.
2. The deviation between the measured power curve and the certified power curve shall be mutually agreed between the investor and OEM.

The CB shall evaluate compliance for the Power Curve Verification Test as per IEC 61400-12-1 and with specific criteria established mutually by the investor and OEM.

4.4 Energy Production Demonstration Test

The energy production demonstration test for the wind farm shall be carried out by TL based on the measured power curve and certified power curve with the wind distribution data considered in the pre commissioning stage.

The measured power curve for this test shall be weighted average of measured power curves of the individual wind turbine models of sample considered as in [Clause 4.3](#).

The deviation in energy production of the wind farm based on the measured power curve and the certified power curve shall be mutually agreed between the investor and OEM.

The CB shall evaluate compliance for the energy production demonstration test with specific criteria established mutually by the investor and OEM.

4.5 Evaluation report

Based on the evaluation of the above-mentioned requirements i.e., as per the [Clause 4.2](#), [Clause 4.3](#) and [Clause 4.4](#) and as per the requirements of IS/IEC 61400-22, the CB shall issue an evaluation report for Project characteristics measurements.

4.6 Conformity Statement on Project characteristics measurements

The CB shall issue a conformity statement based on satisfactory evaluation of the Project characteristics measurements evaluation report(s). The conformity statement shall include:

- i. Identification of the applicant;
- ii. Wind farm capacity;
- iii. Identification of the wind turbine type;
- iv. Location details;
- v. Pooling station details;
- vi. Connectivity type (STU / CTU);
- vii. Specific reference to evaluation report(s).

4.7 Final Evaluation report

The purpose of final evaluation is to provide documentation of the findings of all operating bodies involved in the evaluation of the elements of the project certificate. Following evaluation of the evaluation reports and conformity statements, the final evaluation report shall be prepared, consisting of:

- i. a reference list of all supporting product and project documentation for the project certificate; and
- ii. report of all conformity statements issued for the project certification modules for outstanding issues.

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

4.8 Revised Project Certificate

The CB shall issue a revised 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. The project certificate is valid for wind turbine(s) and additional installation(s) as installed at the site specified in the certificate at the date of issue. The project certificate shall reference in an appropriate way the standards and normative documents used. The Period of validity of Project Certificate shall not exceed 80% of design lifetime of the majority of the wind turbines in the wind farm.

5. Non Compliance of GCC

This section gives the utility including system operator, the right to test wind turbine in the windfarm.

- i. The utility or system operator, who has reasonable ground to believe that the wind turbines connected in the windfarms project may not comply with the grid code or CEA technical regulations, shall request the testing of such wind turbines by giving notice in writing.
- ii. If a notice is given under paragraph (a) the utility or system operator shall conduct the test(s) by TL or NIWE as per GCC at that time agreed between them.
- iii. Both the parties shall cooperate in conducting the test(s) requested under paragraph (a).
- iv. The cost of test requested under paragraph (a) are to be borne by the utility or system operator unless the equipment question determined by the test does not comply with the grid code or CEA regulations. In that case all cost of the tests shall be borne by wind farm owner.
- v. In case the wind turbines are not in compliance with the CEA Technical Regulations in vogue at the time of commissioning, then the wind farm shall be disconnected from the Grid and suitable action as notified by MNRE would be imposed.

**INDIAN WIND TURBINE CERTIFICATION
SCHEME**

VOLUME - IV

**WIND TURBINE SAFETY & PERFORMANCE
CERTIFICATION SCHEME -
(WTSPCS)**

**FAILURE ASSESSMENT, SAFETY AND
PERFORMANCE ASSESSMENT &
DECOMMISSIONING**

INDIAN WIND TURBINE CERTIFICATION SCHEME

VOLUME -IV

FAILURE ASSESSMENT, SAFETY & PERFORMANCE ASSESSMENT AND DECOMMISSIONING

1. INTRODUCTION

This volume details the procedures and guidelines for safety & performance assessment of wind turbines, which includes reporting of failures of wind turbines, design life evaluation and decommissioning mechanism.

Failure reporting, assessment and dissemination of the information obtained are required to facilitate the safe and secure operation of wind turbines. All the types of failures categorized in this Volume shall be mandatorily reported by the wind farm owner / investor to NIWE and MNRE in addition to the respective utility. The utility shall ensure that the failures are also reported to the concerned agencies including CEA and RPC (Regional Power Committee). In addition, the insurance companies shall notify to NIWE and MNRE about any insurance claim for the failures categorized in this Volume to ensure the failures are investigated.

The Utility shall be responsible for maintaining the PPAs of wind turbines based on the safety and performance assessment and deciding the disconnection of the wind turbines, which fail the assessment. The safety and performance assessment is critical as the wind turbines are located in the open field and being a rotating machinery at a height may cause safety concerns for the general public, operating personnel and also to the livestock.

1.1 Transition Plan for Safety & Performance test

The safety and performance test shall be carried out for all the turbines, which have crossed 80% of its design life in a phased manner. In the first phase (within one year from the date of notification of IWTCs), safety and performance shall be carried out for all the wind turbines which have crossed their design life. In the second phase (the second year after the phase one) safety and performance shall be carried out for all the wind turbines which have crossed 90% of its design life. In the third phase (the third year) safety and performance shall be carried out for all the wind turbines which have crossed 85% of its design life.

From the fourth year after notification of IWTCS, the utility shall ensure the process of safety and performance assessment once the wind turbines crosses 80% of its design life, as there could be reduction in life of the turbine due to external operating site specific conditions (in general the design life of the wind turbine as per the type certification is 20 years).

1.1.1 Stakeholders

As per the [Clause 1.1](#) of Volume- I.

1.1.2 Operating bodies

As per the [Clause 1.4.16](#) of Volume – I and Utilities and SNAs.

1.1.3 Scope

The scope includes Failure reporting, Failure evaluation, Safety & Performance assessment and decommissioning & safe disposal.

PART-I: FAILURE REPORTING OF WIND TURBINE

2.0 General

In general the failures are defined as catastrophic, functional & superficial. As per this guideline the catastrophic failure of all the existing and upcoming wind turbines connected to the grid shall be reported to NIWE.

The individual failure events and the investigation reports shall be maintained by NIWE and summary of failures occurred in each quarter is consolidated and submitted to MNRE. In case, the failures are repetitive in nature and is of critical importance, MNRE would constitute an expert committee to examine these failures.

2.1 Failure Definition

Under this guideline the catastrophic failures are to be reported. The catastrophic failures shall include falling or disintegration of blades, falling of Rotor and Nacelle Assembly, falling of the structure and major fire leading to shut down of the wind turbine. In addition, any major component failures in the wind turbines, which leads to insurance claims such as major cracks in the blade, nacelle frame, shaft and gear assembly, tower and support structure and loss of human life due to accidents in the wind turbine shall also be reported to the accredited type certification bodies and NIWE.

The general structure of failure reporting and assessment of wind turbine is presented below as a means of a flow chart, in Figure 4.1.

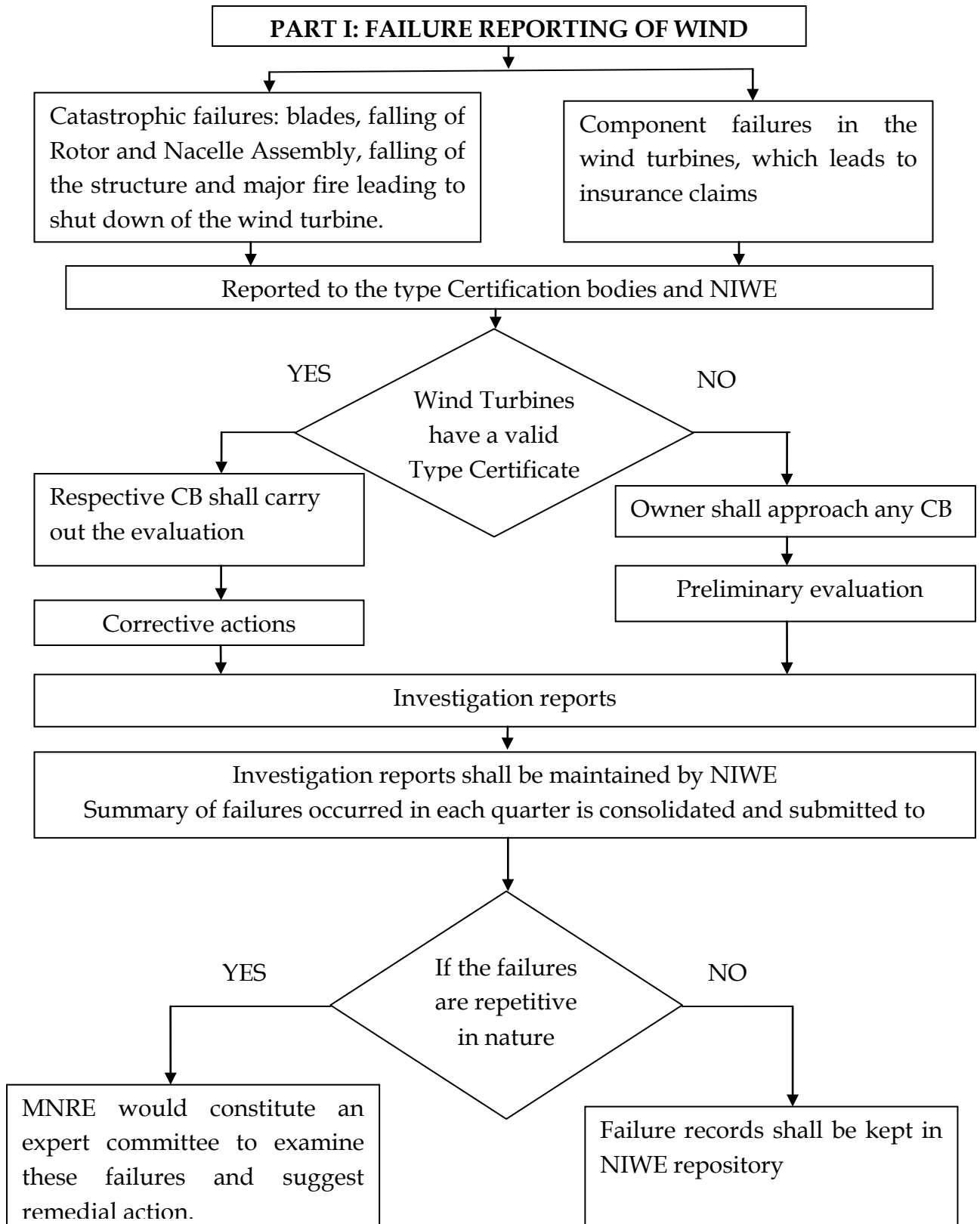


Figure: 4.1 General structures of failure reporting and assessment

2.2 Failure Reporting

Failures in the Wind turbine system, as defined above in [Clause 2.1](#), resulting in the shutdown / underperformance of the wind turbine and/or any failure requiring claim / information to Insurers need to be reported by the Owner of the Project, within 48 (forty eight) hours of the occurrence of the failure, to the NIWE & the Certification bodies who have issued the type certificate of the wind turbine and Project certificate for the Project.

- a) In case the wind turbine has a valid type certificate, the failure evaluation report from the respective CB needs to be submitted to NIWE as per IS/IEC 61400-22 or as per the certification scheme of the wind turbine.
- b) If the wind turbine model's type certificate has expired then the wind farm owner shall have to obtain the evaluation report from CB.

2.3 Failure Evaluation

- a) In case the wind turbine have a valid type certificate, the respective CB shall carry out the evaluation as per IS/IEC 61400-22 requirements and notify the corrective actions as per the requirement of Clause 6.6 of IS/IEC 61400-22.

On a thorough evaluation, the CB shall report whether the certificate needs to be withdrawn as per Clause 6.6 of IS/IEC 61400-22. In such cases, the CB shall report the modification to be carried out for the existing wind turbines which are in operation (of same model and the revision series) so that these existing wind turbines are safe to operate.

- b) In case the wind turbine model's type certificate has expired then the owner shall approach CB and carry out the preliminary evaluation. The preliminary evaluation shall determine whether it is a serious defect affecting the safety of the wind turbine and if other wind turbine installations of the same model would also be impacted, those details shall be informed to NIWE. In such cases, MNRE can notify an alert message (through available channels) to all the wind farm owners who has this wind turbine model to undertake necessary precautionary measures.

On a thorough evaluation, the CB shall report the modification to be carried out for the existing wind turbines which are in operation (of same model and the revision series) so that these existing wind turbines are safe to operate.

In all the above cases, if the failures are repetitive in nature and are of critical importance, MNRE would constitute an expert committee to examine these failures and suggest remedial action.

PART-II: SAFETY AND PERFORMANCE ASSESSMENT

3.0 General

The owner of the wind turbine / wind farm shall conduct the safety and performance assessment at a regular interval as specified in this document and the same shall be ensured by the Utility / SNA for continued operation of the wind turbine in the grid.

The safety and performance assessment shall be carried out by the CB, for all the existing wind turbines connected to the grid which are in operation for more than 80% of the design life and shall be ensured by the Utility / SNA. The assessment approach shall be based on the availability of detailed design documentation and also the type certificate. The safety assessment shall involve inspection of each wind turbine, site-specific load evaluation and limited load measurements. The performance assessment shall be based on Energy-yield ratio.

The outcome of the assessment shall result in extending the project certificate/permission to operate the turbine for next 2 years or be recommended for decommissioning and safe disposal as per Part III of this document.

3.1 Safety Assessment

The safety assessment methods shall be classified based on the categories of the wind turbines shown in Table 4.1 below. Based on the category of the wind turbines the assessment methods and flow are detailed in Figure 4.2.

Table 4.1: Categories of Wind Turbines

Category	Design Documentation as per Type Certificate	Condition Monitoring	Log History for 10 years	O&M procedure followed properly
Category-A	✓	✓	✓	✓
Category-B	✓	×	×	×
Category-C	×	×	×	×

✓ -Available

× - Not available

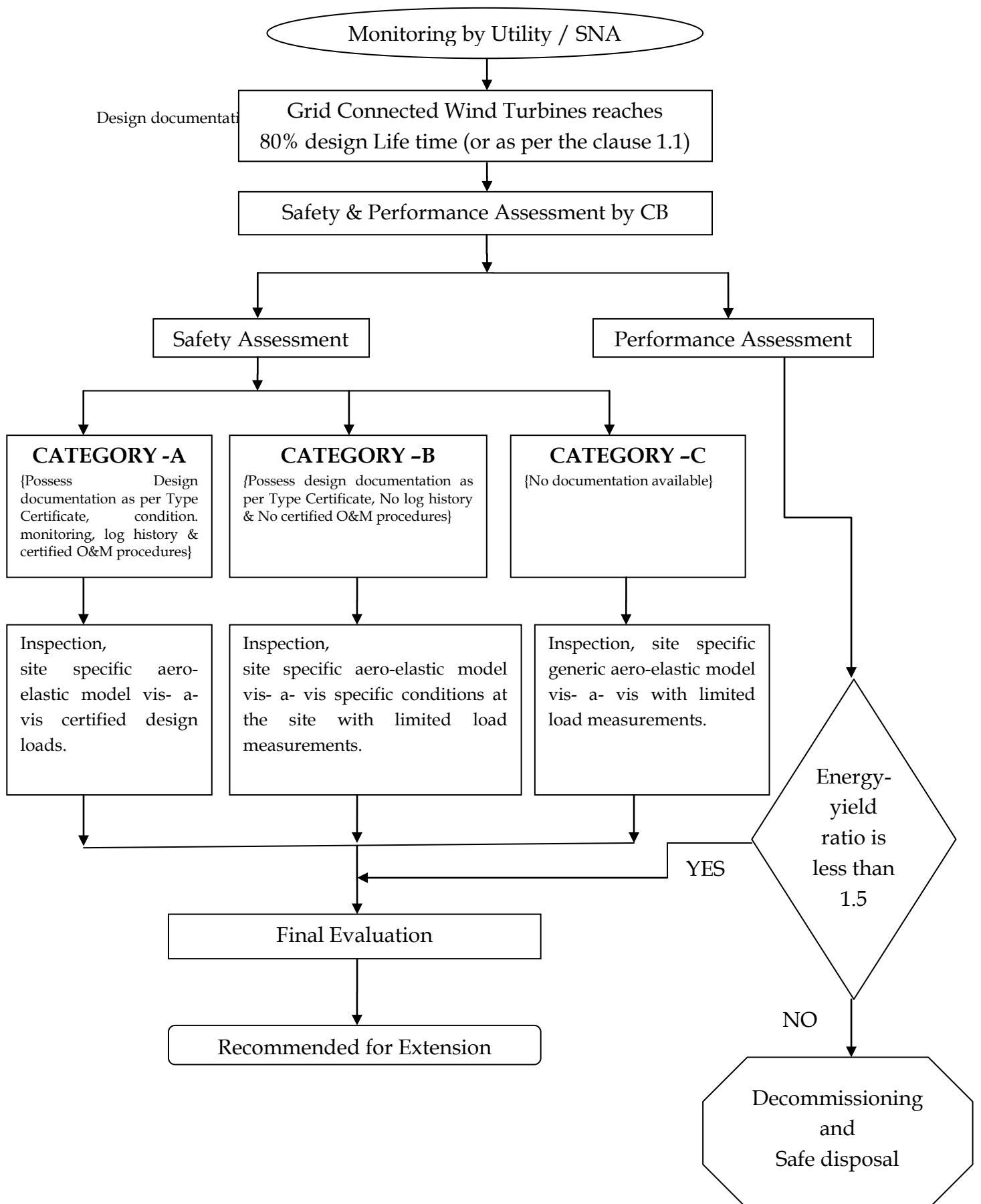


Figure 4.2: Assessment methods for different Categories of Wind Turbines

3.1.1 Category A – The wind turbines having design documentation as per type certificate, condition monitoring, documentation of log history atleast for last ten years and having documented evidence to demonstrate the compliance of certified O&M procedures being followed throughout the operational years and have completed 80% of the design lifetime shall come under this category.

The assessment shall be carried out by the CB based on the inspection of the wind turbine along with site specific inputs to aero-elastic model. The approach compares the output from the site specific aero-elastic model vis a vis certified design loads. The assessment report and the observation / results from the log history shall result in the evaluation report.

The assessment certificate can be issued with the validity till the completion of design lifetime. Thereafter, the assessment certificate shall be valid for two years.

3.1.2 Category B – The wind turbine possessing design documentation as per type certificate and not having the necessary documentation of log history, condition monitoring and O&M procedure and having completed 80% of design lifetime shall come under this category.

The assessment shall be carried out by the CB based on the inspection of the wind turbine along with site-specific inputs to aero-elastic model. The inspection as per the Table 3.2 shall be carried out on each wind turbine under this category. The approach compares the output from the specific aero-elastic model as per the original design vis a vis specific conditions at the site. The model shall be validated with limited load measurement at the site i.e., One blade, tower bottom, shaft bending moments and natural frequencies. The limited load measurements shall be carried out on each wind turbine. The load measurement shall be carried out as per the requirements of IEC 61400-13 in vogue. The assessment report and the observation / results from the inspection and limited load measurement shall result in the evaluation report.

The limited load measurements shall be carried out for every alternate assessment.

3.1.3 Category C– The wind turbine not possessing design documentation as per type certificate, the necessary documentation of log history, O&M procedure and condition monitoring are not available, and have completed 80% of design life time shall come under this category.

The assessment shall be made using the generic wind turbine model. The evaluation shall be carried out based on the inspection of the wind turbine along with site-specific inputs to a generic wind turbine aero-elastic model. The inspection as per the Table 4.2 shall be carried out for individual turbines under this category. The approach compares the output from the generic model with the limited load measurements at the site i.e., One blade, tower bottom, shaft bending moments and natural frequencies. The limited load measurements shall be carried out on each wind turbine. The load measurement shall be carried out as per the requirements of IEC 61400-13 in vogue. The assessment report and the observation / results from the inspection and limited load measurement shall result in the evaluation report.

The limited load measurements shall be carried out for every assessment.

3.2 Inspection

The wind turbine components as well as the connections between these components shall be inspected as specified in the Table 4.2 for the safety assessment. The Investor/ Owner shall demonstrate control and protection functions of each wind turbine during inspection.

Table 4.2 - Inspection of wind turbine

Sl.no.	Description	Inspection
1	Tower	
1.a	Tower Structure	D,Co,C,Sp
1.b	Ladder, fall protection	D,Co,F,Sp
1.c	Bolted connections	Co,Ps,C
1.d	Foundation, embedded section	D,Co,C
1.e	Foundation	D,C
1.f	Grounding/Earthing Strip	Cf,D,Co
2	Nacelle	
2.a	Yaw bearing	T,N,Co,L
2.b	Gear	F,L,W,C
2.c	Nacelle foundation/main frame	D,Co,C
2.d	Nacelle cover	D,Co,C
3	Drive train	
3.a	Hub	D,Co,C
3.b	Main shaft	D,Co,C
3.c	Coupling	D,C
3.d	Main shaft bearings	T,N,L
3.e	Gearbox	T,N,L,W
3.f	Torque support	D,Co,C
3.g	High speed shaft	D,Co,C
3.h	Generator	D,N,L
3.i	Cooling system/circuit	Cf,D,T,C
3.j	Bolted connections	Co,Ps
3.k	Protective covers	D,Co

Sl.no.	Description	Inspection
4	Rotor Blades	
4.a	Blade Structure	D,C
4.b	Blade connection	D,T,Co,C
4.c	Bolted connections	Co,Ps
5	Pitch Mechanism	
5.a	Blade trip brakes	D,F,Co
5.b	Blade adjustment	T,F,N,L,W
5.c	Blade bearing	T,N,W
5.d	Coupling elements	D,Co,L,C
5.e	Pitch Mechanism	D,F,N,Co,L,C
5.f	Hydraulic Components	D,T,F,Co
6	Safety System	
6.a	Rotor locking device	D,Co,Sp
6.b	Yaw locking device	D,Co,Sp,C
6.c	Mechanical brake	F,Co,C,W,C
6.d	Hydraulic components	D,T,F,Co
6.e	Vibration switch	Cf,D,F
6.f	Over speed gauge	F
6.g	Emergency push buttons	F
6.h	Cable twist sensor	F
6.i	Short circuit operation	F
6.j	Fire extinguisher, first aid box	E
7	Wind Sensors	Inspection
7.a	Anemometer	D,F,Co
7.b	Wind Vane	D,F,Co
8	Yaw Mechanism	
8.a	Yaw drive, gear, pinion	D,F,N,Co,L
8.b	Brake	F,C,W,Ps
8.c	Hydraulic components	D,T,F,Co
9	Hydraulics	
9.a	Pump	T,F,Co
9.b	Accumulator	T,Co,L,Ps
9.c	Hoses including couplings	D,T,Co,C
10	Control and Electrical Installations	
10.a	Cabling	Cf,D,C
10.b	Grounding, machine component	Cf,D
10.c	Grounding, lightning protection	Cf,D
10.d	Sliding Contacts, main shaft	Cf,D,W
10.e	Hazard beacon	F
10.f	Emergency light, tower	Cf,D,F
10.g	Switch cabinet	D,T,Co,Sp
10.h	Control System	F
10.i	Grid loss	F
10.j	Converter	Sp,D,Cf,T
10.k	Transformer station	Cf,D,T,Sp
10.l	Medium-Voltage system	D,Co,Sp
10.m	Power transformer	Cf,D,T,Sp

Tested for:

Damage	D	Connection/fitting	Cf
Examined	E	Tightness	T
Noise	N	Function	F
Cracks	C	Corrosion	Co
Safety sign plates	Sp	Oil level	L
Pre-stress	Ps	Wear	W

The observations identified in the inspection shall be recorded and results in evaluation report.

3.3 Performance Assessment

The CB shall evaluate degradation of performance in terms of energy of the wind turbine between each assessment period. Also, the CB shall evaluate the Energy-yield ratio (ratio of normalized and average generation from the wind turbines commissioned during the last five years in nearby land area or project location (similar wind regime) to that of the generation from the assessed wind turbine).

The wind turbines shall be classified as having completed successful assessment if the reduction in energy generation between the two successive assessment periods is less than 5% and the energy-yield ratio is less than 1.5.

3.4 Final Evaluation Report

Based on the successful assessment of safety and performance, a conformity statement shall be issued. The conformity statement along with the inspection report shall result in assessment certificate having validity for next two years.

The wind turbines that are classified as not successful as per the safety assessment and/or performance assessment shall be recommended for decommissioning and for safe disposal.

3.5 Safety and Performance Certificate

The CB shall issue a Certificate based on satisfactory evaluation for completeness and correctness of the final evaluation report.

PART-III : DECOMMISSIONING

4.0 General

Decommissioning refers to the complete removal of the wind turbine/ farm including all hardware assets and equipment from site (i.e. dismantling and transport) and extensive restoration of the original site state (including sub soil) as per the statutory guidelines.

4.1 Decommissioning Procedure

Based on the Safety & Performance Assessment of the Wind Turbines by the CB and disconnection from the grid the wind turbines are to be dismantled and safely disposed. The detailed procedure for decommissioning is as follows:

1. The CB recommends decommissioning of wind turbines based on the procedure followed as per Part II of this Volume -IV and gives the report to the owner with a copy to the concerned SNA /Utility and NIWE.
2. The utility terminates the PPA and disconnects the recommended wind turbine from the grid and shall notify SNA /Utility and NIWE (for records).
3. SNA /Utility shall inform the concerned owner / OEM to submit detailed decommissioning manual / documentation along with the plan and schedule. SNA /Utility would also de-register these wind turbines from Geo tagging and notify to NIWE and other statutory agencies within six months from the date of recommendation of decommissioning.
4. SNA /Utility shall inform the owner / OEM to decommission as per the certified decommissioning procedure and safe disposal of debris. If required, SNAs can engage CB for inspection and compliance. These procedures shall be completed within one year from the date of recommendation of decommissioning.

Upon successful completion of decommissioning and safe disposal of the wind turbine components including foundation, a report shall be obtained from the CB and to be submitted to SNA / Utility. SNA /Utility shall notify NIWE after decommissioning and restoration of the site duly following the statutory guidelines.

4.2 Decommissioning of wind turbines whose owners are unknown

Once the IWTCS is notified, all the SNAs and Utilities shall list and submit the details of the wind turbines to NIWE within six months for decommissioning in following cases:

- i. The wind turbines which are not Geo tagged,
- ii. The wind turbines which are not functioning for the last two years,
- iii. The wind turbines for which PPAs are not extended for want of furnishing of the Safety & Performance assessment certificate.

The listed wind turbines have to be decommissioned by following due process mentioned above (Volume IV- Part III [Clause 4.1](#)). In case the owners are not traceable or unwilling, considering safety of the general public the concerned SNA / Utility shall dismantle these wind turbines as per the procedure mentioned above (Volume IV- Part III [Clause 4.1](#)). In case, if no certified decommissioning document is available NIWE shall prepare the safe decommissioning procedure. SNA /Utility can recover the cost of dismantling by auctioning the salvaged materials.

4.3 Decommissioning Certificate

The CB shall issue a Certificate based on satisfactory evaluation of decommissioning.