

ClassNK Wind Turbine Certification and Related Services

[Website public version]

01 May 2024

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<Attention>

- ❑ This paper is created to inform the policy of wind turbine certification and related services of ClassNK.
- ❑ Please check the latest version on the website because the contents of this paper will be update.

<Update history>

Version	Released date	Changes
RD2101	August 2021	Newly enacted
RD2101_R01_20230814	14 August 2023	Updating contents for introducing Registered Conformity Assessment Body
RD2101_R02_20240501	01 May 2024	<ul style="list-style-type: none"> ■ Newly added an overview of the Certification Sub-Committee / Section Meeting in the case of onshore wind farms (p.13) and partially amended the assessment flow for foundations (p.16). ■ Reflects changes to the organization of the Supporting Structures Certification Sub-Committee in the case of offshore wind farms (p.26 newly added and part of p.28 amended).



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6. Other related services

1. ClassNK Wind Turbine Certification

Type certification

Large wind turbine type certification

Conducts evaluations based on various technical standards related to wind turbines, such as design conformity assessments and type testing assessments using test units, and ultimately issues a type certificate.



Small wind turbine type certification

Evaluates the conformity of small wind turbines to the requirements in international and domestic standards (performance and safety) and issues a type certificate.



Wind farm certification

Wind farm certification

Evaluates the environmental conditions of the site where the wind farm is to be constructed, evaluates and confirms that the strength and safety of the wind turbine and support structure are secured in terms of the design based on these environmental conditions, and issues a Certificate / Conformity Statement.



Wind turbine support structure: Material certification

Certification assumes the wind turbine support structure is made of materials that do NOT fall under any of the following:

- Building Standards Act, Article 37: “Designated building materials”
- Materials approved by the Minister of Land, Infrastructure, Transport and Tourism
- Materials approved in terms of performance assessments pertaining to technical standards conformity for wind power generation facilities

Wind turbine certification [Large wind turbines]

Design conformity assessment

- Assesses whether the wind turbine is designed and documented according to the design assumptions, specific standards, and other technical requirements

Prototype certification

- Design evaluation specialized in verifying safety when constructing test units

Type testing

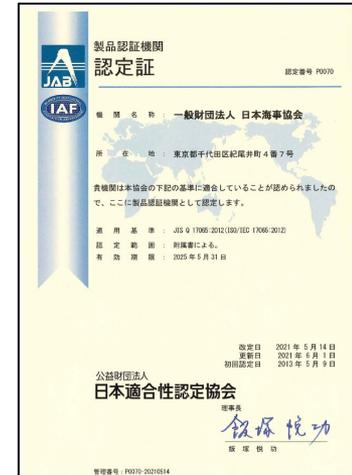
- Verifies the output performance and performs an experimental safety verification through the actual operation of the test unit

Manufacturing evaluation

- Assesses whether the wind turbine is manufactured according to the design documents verified during the design evaluation

Type certification

- A certificate is granted to wind turbines that satisfy every requirement in the design evaluation, type test, and manufacturing evaluation



Wind Turbine Certification
Body Certificate
(Japan Accreditation Board)

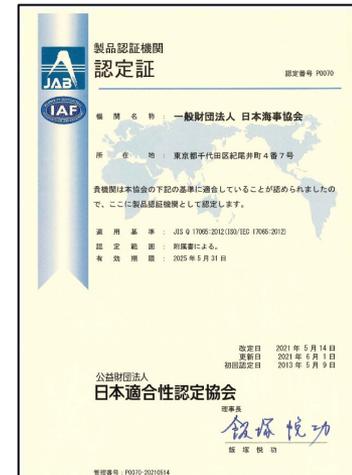
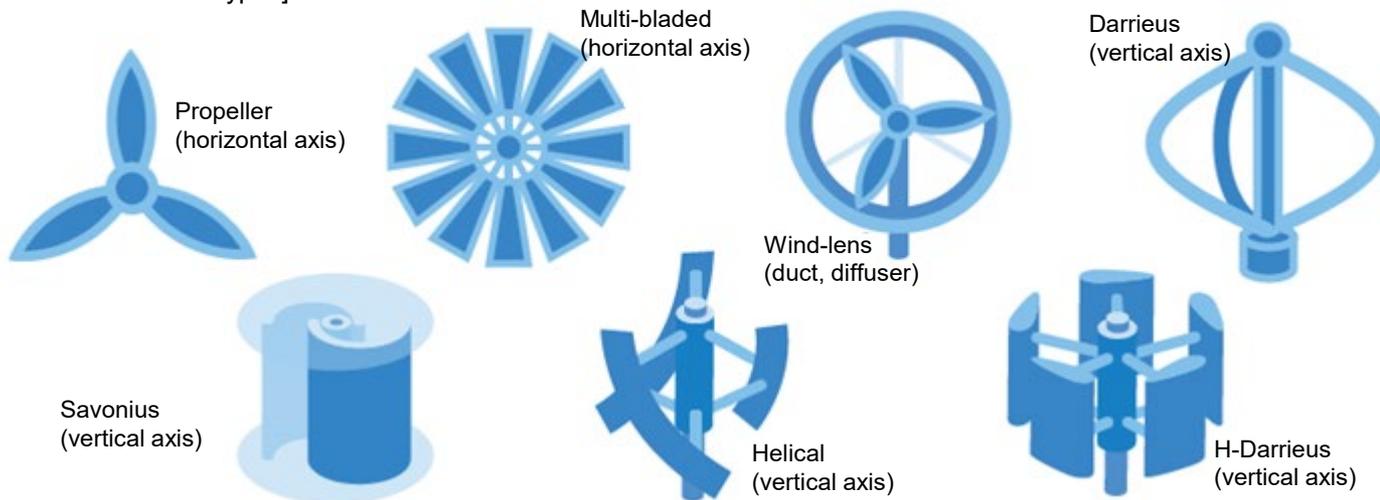
Wind turbine certification [small wind turbines]

- Verifies whether the performance and safety of the wind turbine complies with the requirements specified in the Japan Small Wind Turbines Association Standards (JSWTA0001).
- Certification procedures comply with the “Guidelines for Certification of Wind Turbines and Wind Farms”

Small wind turbine definition

- Swept area: less than 200 m²
- Output: less than 20 kW

[Small wind turbine types]



Wind Turbine Certification Body Certificate (Japan Accreditation Board)

Wind farm certification overview

Evaluates the environmental conditions of the site where the wind farm is to be constructed and verifies that the strength and safety of the wind turbine and support structure are secured in terms of the design based on the environmental conditions. (This certification is unique to Japan and is intended for conformity to the Technical Standards for Wind Power Generation Facilities.)

- In principle, wind farm certification is for wind farms in Japan that have an output of 500 kilowatts or more, consist of one or more wind turbines (RNA) and their support structures (tower and foundation), and are subject to the Electricity Business Act.
- The purpose of wind farm certification is to assess whether the design for type-certified wind turbines (RNA) and their support structures (tower and foundation) are in conformity with the external conditions and the requirements under the Electricity Business Act.

<Main compliance criteria for wind farm certification>

- ◆ Ministerial Ordinance Prescribing Technical Standards for Wind Power Generation Facilities (Ministry of Economy, Trade and Industry, Ordinance of the Ministry of International Trade and Industry No. 53 of March 27, 1997)
- ◆ Interpretation of Technical Standards for Wind Power Generation Facilities (Ministry of Economy, Trade and Industry, No. 20230310, Bureau of Commerce No. 2, March 20, 2023)
- ◆ Guidelines for Design of Wind Turbine Support Structures and Foundation (Japan Society of Civil Engineers, 2010)

NIPPON KAIJI KYOKAI is accredited by the Japan Accreditation Board as an ISO/IEC 17065 (JIS Q 17065) Product Certification Body based on the Board's "Wind Power Generation System: Windfarm" accreditation criteria.



- Japan Accreditation Board website, accredited Product Certification Bodies: <https://www.jab.or.jp/system/service/product/accreditation/detail/453/>

Wind turbine support structure: Material certification overview

Certification assumes the wind turbine support structure is made of materials that do NOT fall under any of the following:

- Building Standards Act, Article 37: “Designated building materials”
- Materials approved by the Minister of Land, Infrastructure, Transport and Tourism
- Materials approved in terms of performance assessments pertaining to technical standards conformity for wind power generation facilities

<Review scope>

- Tower flanges
- Flange joint bolt and nut flat washer sets
- Anchor bolts
- Steel plates

<Review criteria>

- The review criteria used in the Ministry of Land, Infrastructure, Transport and Tourism Minister’s certification process apply mutatis mutandis (in the course of the technical review, a fatigue strength evaluation, which is important for wind power generation facilities, may be added)

<Review details>

- Technical review (statistical assessment)
 - Chemical property value stability (component ratio of present elements, especially weldability, crack sensitivity, etc.)
 - Physical property value stability (dimensions, hardness, strength, tolerance, variance, relaxation, delayed fracture resistance, etc.)
- Quality control system review
 - A quality management system equivalent to ISO 9001 is in place.
 - A subcontract management system is in place and properly operated.
 - A receiving system is in place and an inspection system at each stage within the company has been established.
 - Testing and inspection equipment are properly managed.

2. Wind Farm Certification [Onshore Wind Power Plant]

Guidelines: Wind Farm Certification - Onshore Wind Farm edition

- ClassNK has compiled the requirements as formulated based on a number of examples of past wind farm certification reviews for onshore wind farms and issued this compilation as a new set of guidelines in July 2021. Revised edition was issued in March 2023.
 - ✓ **Since the start of certification services in 2016, ClassNK has issued Wind Farm Certificates for 180 onshore wind farms (as of the end of June 2023).**
Registration of wind farm certification (Onshore) :
https://www.classnk.or.jp/hp/pdf/authentication/renewableenergy/en/windfarm/RE-081-02_onshore_e.pdf
- The revised edition includes the contents about Registered Conformity Assessment body designated by revised Electricity Business Act entered force on March 2023.
- In addition to certification review requirements, the guideline's annexes cover a comprehensive range of content, including details on implementation and verification methods for air flow analysis and wind pressure coefficients for the nacelle cover, which are based on the results of independent examinations by ClassNK.



Guidelines: Wind Farm Certification - Onshore wind farm edition Table of contents

Chapter 1. General	Annex A. Measurement data evaluation methods [normative]
Chapter 2. Site conditions assessment	Annex B. Airflow analysis and verification of its validity [normative]
Chapter 3. Design basis evaluation	Annex C. Evaluation method for wind conditions [informative/normative]
Chapter 4. Integrated load analysis evaluation	Annex D. Equivalent wind pressure coefficient for the nacelle cover [informative]
Chapter 5. Wind turbine (RNA) design evaluation	Annex E. Measurement testing for fluctuating pressure characteristics acting on a nacelle surface [informative]
Chapter 6. Support structure design evaluation	Annex F. Design methodologies for tower structures [normative]
	Annex G. Design methodologies for foundation [normative]

Download form here : https://www.classnk.or.jp/hp/pdf/authentication/renewableenergy/ja/windfarm/NKRE-GL-WFC01_March2023_Jpn_20230331.pdf

Wind Farm Certification modules [for Onshore Wind Farms]

[M1] Site conditions assessment (wind conditions)

[M2] Wind turbine (RNA) design evaluation

(including site conditions assessment, design basis evaluation, and integrated load analysis)

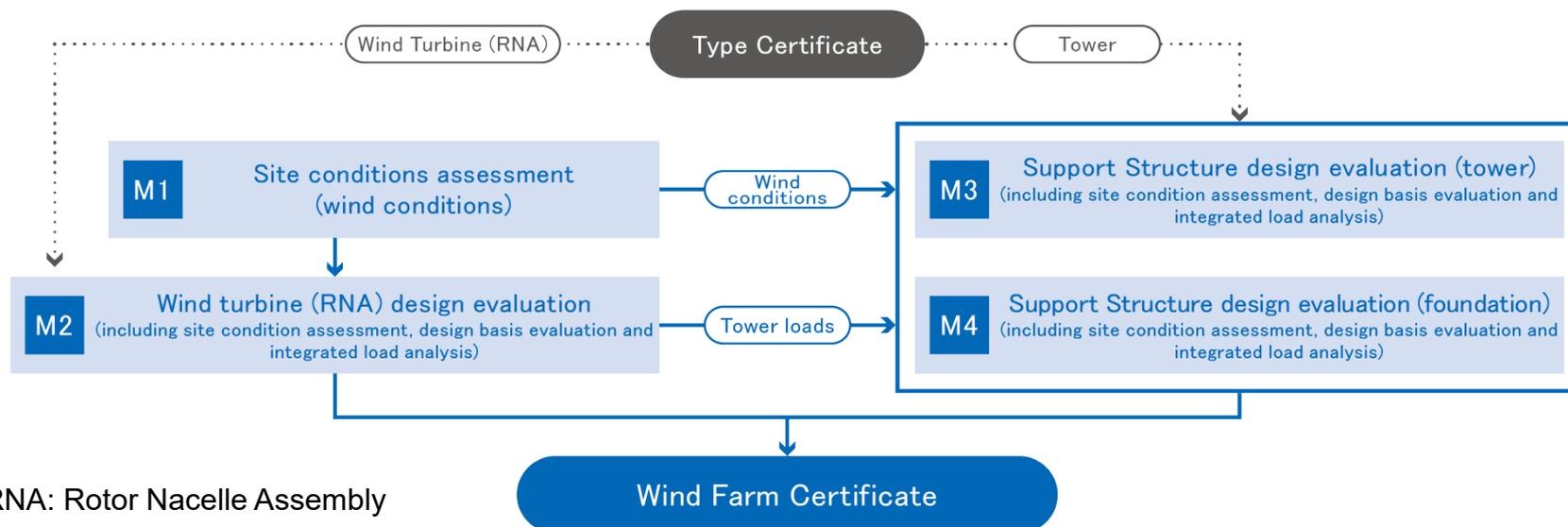
[M3] Support structure design evaluation (tower)

(including site conditions assessment, design basis evaluation, and integrated load analysis)

[M4] Support structure design evaluation (foundation)

(including site conditions assessment, design basis evaluation, and integrated load analysis)

- In the case of onshore wind farms, the applicant may specify whether they will implement all modules or only some modules, according to the applicant's judgement.
 - Considering the application for Registered Conformity Assessment Body, recommend to implement all modules.
 - The same as before, different applicants may apply for each module.



Overview of Certification Subcommittee / Section Meeting

Large Wind Turbine Certification Subcommittee

Evaluation items: [M1] Site conditions assessment (wind conditions)
[M2] Wind turbine (RNA) design evaluation (including site condition assessment, design basis evaluation, integrated wind load analysis)

Support Structure Certification Subcommittee / Tower Section Meeting

Evaluation items: [M3] The Support structure design evaluation (Tower) [including site conditions assessment, design basis evaluation and integrated load analysis] items that deviate from the Guidelines for Design of Wind Turbine Support Structures and Foundation (JSCE 2010).

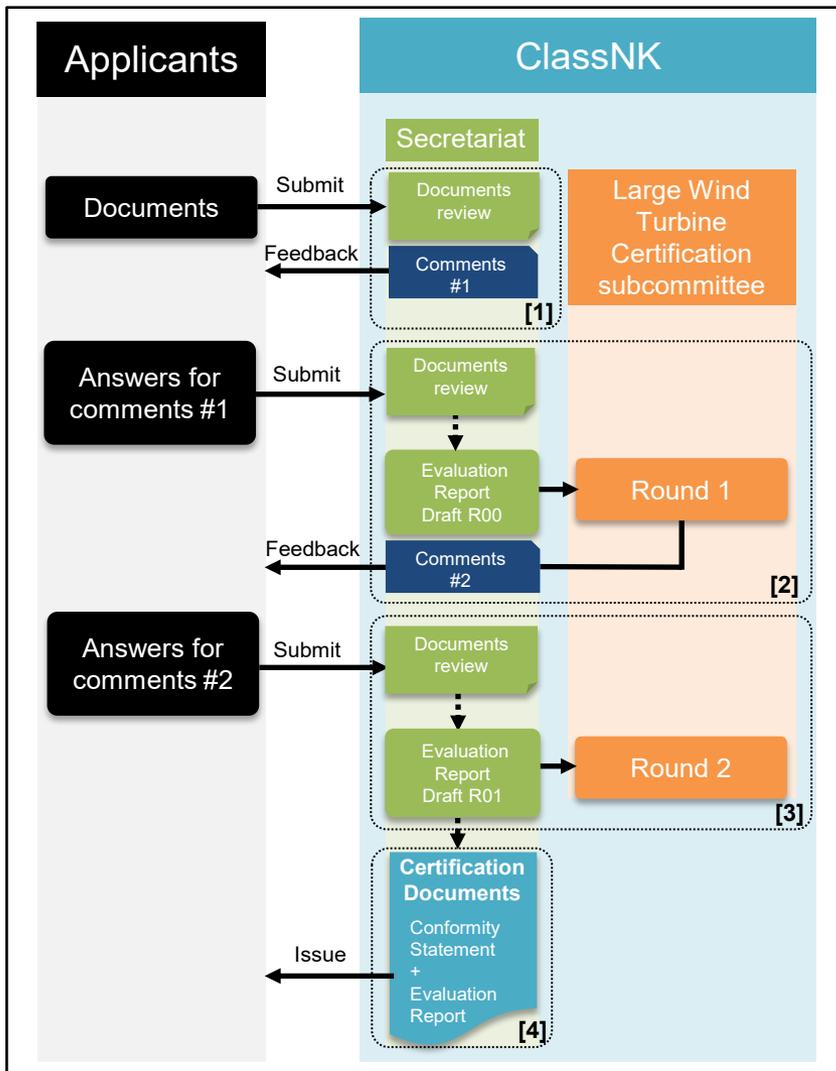
*Among the items to be examined by the Tower Section Meeting as deviations from the Guidelines for Design of Wind Turbine Support Structures and Foundation(JSCE 2010), the items for which the corresponding design methods have been established are summarized in Annex F of NKRE-GL-WFC01. If there is deviation in an item not listed in Annex F, or if a method that is different to the methods listed in Annex F is to be applied, the requirements shall be determined separately by the Tower Section Meeting.

Support Structure Certification Subcommittee / Ground & Foundation Section Meeting

Evaluation items: [M4] The Support structure design evaluation (Foundation) [including site conditions assessment, design basis evaluation and integrated load analysis] items that deviate from the Guidelines for Design of Wind Turbine Support Structures and Foundation (JSCE 2010).

*Among the items to be examined by the Tower Section Meeting as deviations from the Guidelines for Design of Wind Turbine Support Structures and Foundation(JSCE 2010), the items for which the corresponding design methods have been established are summarized in Annex G of NKRE-GL-WFC01. If there is deviation in an item not listed in Annex G, or if a method that is different to the methods listed in Annex G is to be applied, the requirements shall be determined separately by the Tower Section Meeting.

Review process : [M1] Site conditions assessment (wind conditions) + [M2] Wind turbine (RNA) design evaluation



[1] Documents submitted by applicants for review are firstly reviewed by the secretariat.

→ Comments for each documents are informed to applicants.
(In some cases, comments is informed after step [2].)

[2] Based on the answers against comments at step [1], the draft Evaluation Report is completed. The secretariat explain their review results to the members of the Large Wind Turbine Certification Subcommittee.

→ All comments at the subcommittee are informed to applicants.

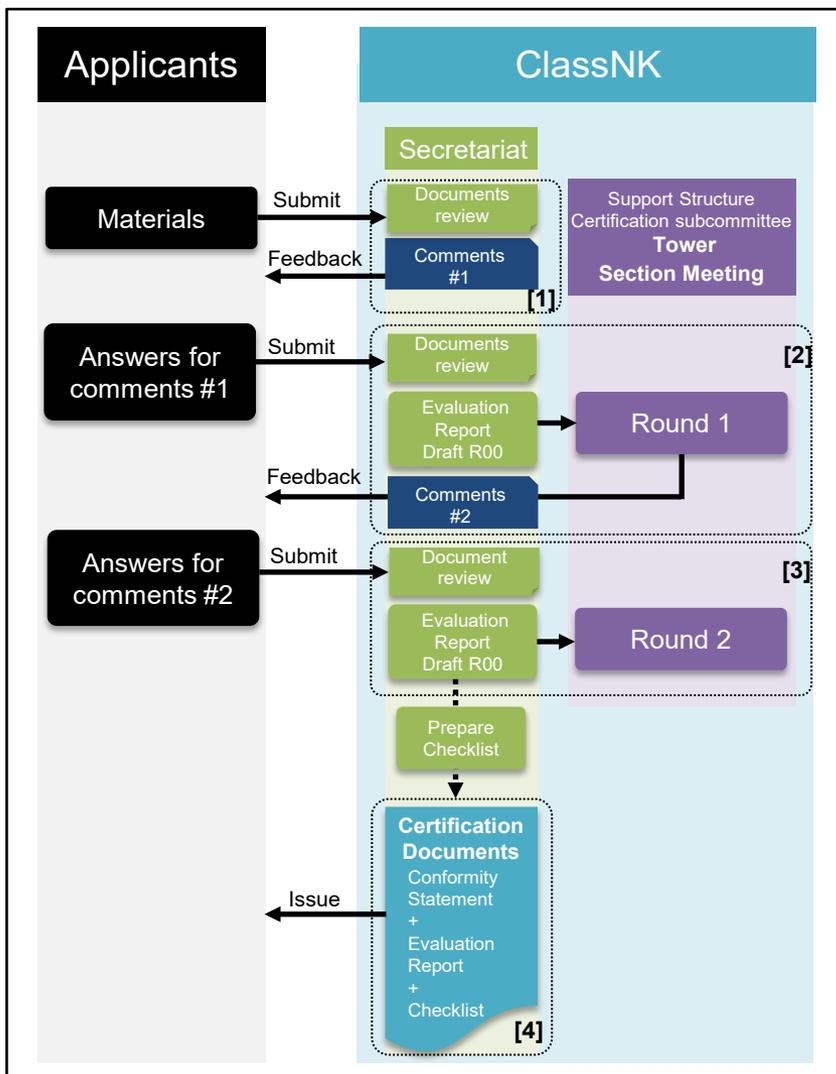
[3] Based on the answers against comments at step [2], the draft Evaluation Report is revised. The secretariat explain the review results of the answers against comments to the members of the Large Wind Turbine Certification Subcommittee.

→ Go to step [4] if no more additional comments.

→ Repeat step [2] and [3] when additional comments are remaining.

[4] Conformity statement and Evaluation Report are issued formally.

Review process : [M3] Support structure design evaluation (tower)



[1] Review materials submitted by applicants for review are first reviewed by the secretariat.

→ Comments for each documents are informed to applicants.
(In some cases, comments is informed after step [2].)

[2] Based on the answers against comments at step [1], the draft Evaluation Report is completed. The secretariat explain their review results to the members of the Support Structure Certification Subcommittee / Tower.

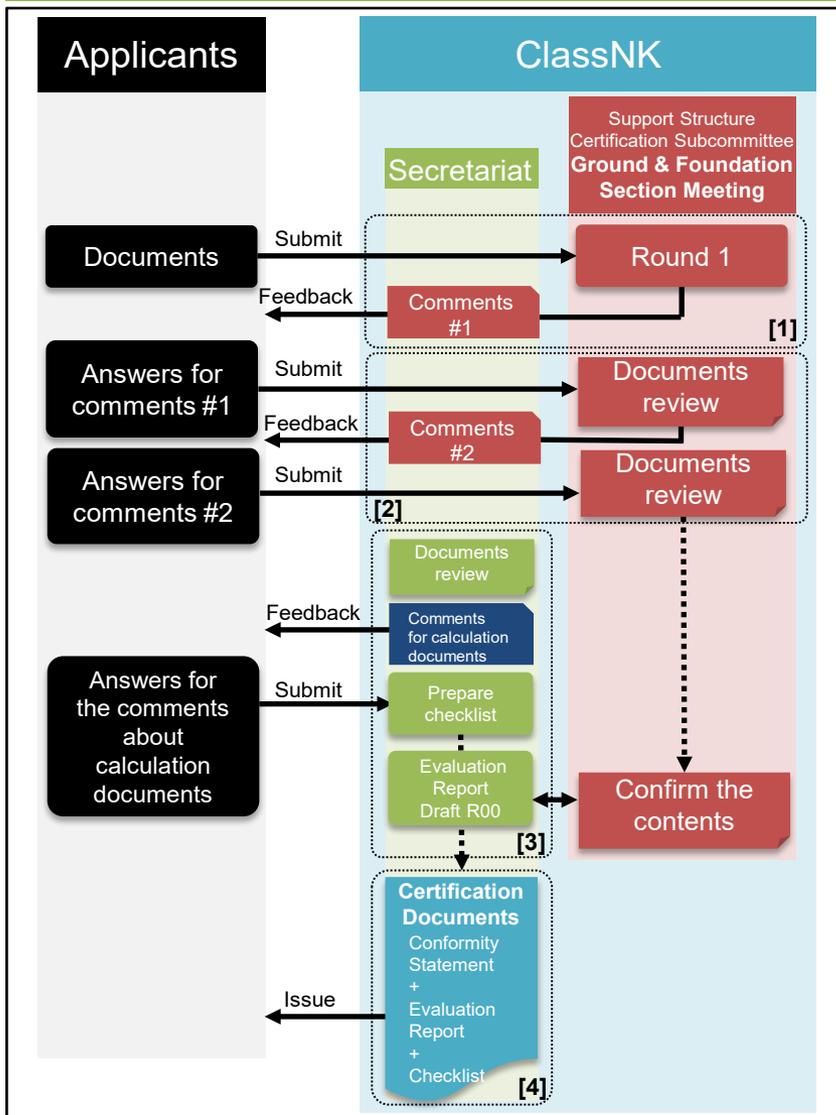
→ This review covers deviated from Guidelines and explanation for the design of support structures of wind power generation facilities (Japan Society of Civil Engineers, 2010), and the others are reviewed by the Secretariat only.
→ All comments at the subcommittee are informed to applicants.

[3] Based on the answers against comments at step [2], the draft Evaluation Report is revised. The secretariat explain the review results of the answers against comments to the members of Support Structure Certification Subcommittee / Tower.

→ Go to step [4] if no comments.
→ Repeat step [2] and [3] when additional comments are remaining.

[4] Conformity statement, Evaluation Report and Checklist are issued formally.

Review process : [M4] Support structure design evaluation (foundation)



In the design of foundations, if there are any deviations from the Guidelines for Design of Wind Turbine Support Structures and Foundations [2010 Edition], start from [1]. If there are no deviations, start from [3].

[1] Based on the documents submitted by the applicants, members of the Support Structure Certification Subcommittee / Ground & Foundation review with a focus on those items which are deviated from Guidelines and explanation for the Design of Wind Turbine Support Structures and Foundations [2010 Edition].

→ The Support Structure Certification Subcommittee utilizes a format in which the operator, support structure design firm, and wind turbine manufacturer directly explain the design to the experts in each field that serve as committee members.

[2] The answers to comments during the step [1] are confirmed by document review. Documents review is similarly conducted for additional study documents and newly added comments.

→ Go to Step [3], when applicants answered against all comments and received no more new comment about their answers and additional study documents.

→ Depending on the comments and answers against comments, 2nd subcommittee will be held instead of documents review.

[3] The secretariat conducts a review of calculation documents and exchanges comments and prepare checklist. Also, reviewed results at the Support Structure Certification Subcommittee / Ground & Foundation Section Meeting which is mentioned in the evaluation report is confirmed by its members.

[4] Conformity statement, Evaluation Report and Checklist are issued formally.

Wind Farm Certificate and Certification Assessment Report Issuance System [for Onshore Wind Farms]

[M1] Site conditions assessment (wind conditions)

Site Conditions Conformity Statement

Evaluation Report (site conditions assessment, wind conditions)

[M2] Wind turbine (RNA) design evaluation

RNA Design Conformity Statement

Evaluation Report (wind turbine design evaluation)

[M3] Support structure design evaluation (tower) / [M4] Support structure design evaluation (foundation)

Support Structure Design Conformity Statement

Evaluation Report (support structure design evaluation, tower)

Evaluation Report (support structure design evaluation, foundation)

Checklist

Support Documents for Registered Conformity Assessment Body

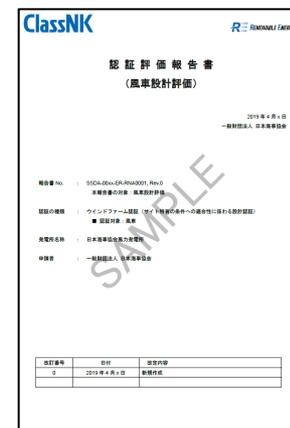
Windfarm Certificate

Conformity checklist of technical standards for wind power generation facilities (Article 4,5 and 7)

- Wind Farm Certificate will be issued in case when an application for all of modules ([M1] to [M4]) are submitted. (This certificate will be issued for power utility operator if applications for review is made separately for each module.)
- In case where no application for any of four (4) modules, a checklist with only the items for the modules that have been evaluated will be issued. (No Windfarm Certificate will be issued.)



Example of a Conformity Statement



Example of a Certification Assessment Report

3. Wind Farm Certification [Offshore Wind Power Plant]

Wind Farm Certification module [Offshore Wind Power Plant]

[OM1] Site conditions assessment

- Assess environmental conditions at the construction site (environmental conditions include general weather conditions, such as wind conditions, temperature conditions, and humidity conditions, as well as marine conditions (for offshore wind farms), altitude conditions, landforms, topography, earthquakes, lightning, and changes in operating methods related to grid interconnections)

[OM2] Design basis evaluation

- Evaluates whether appropriate design criteria (design policies, etc.) considering the site conditions have been set based on the design criteria applied at the time of type certification for the purpose of safe design and project execution

[OM3] Integrated load analysis evaluation

- Evaluates whether the loads and load effects for the site-specific environmental conditions on the integrated wind turbine structure, including the wind turbine, support structure, and supporting soils, have been calculated in conformity with the design basis.

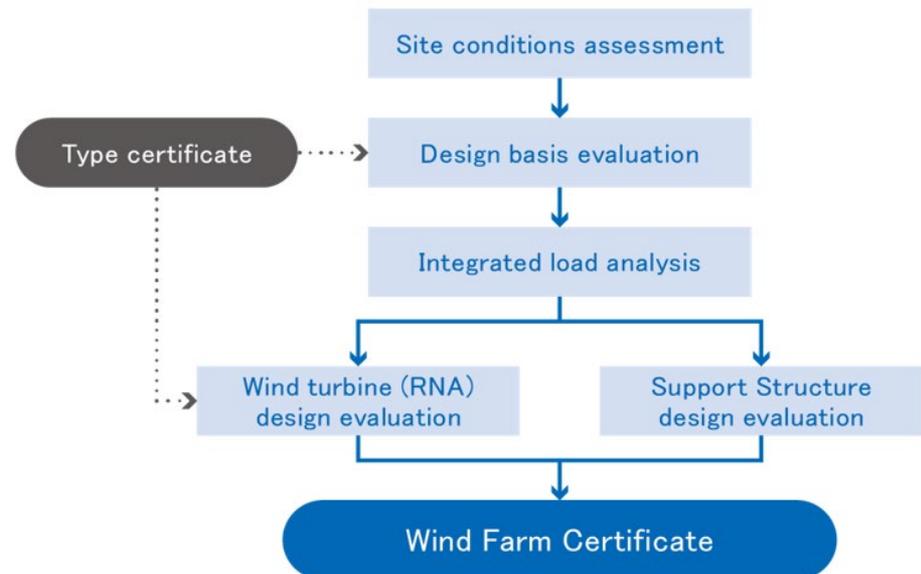
[OM4] Wind turbine (RNA) design evaluation

- Evaluates whether the type-certified wind turbine (RNA) has structural integrity against the environmental conditions of the construction site

*RNA: Rotor Nacelle Assembly

[OM5] Support structure design evaluation

- Evaluates the structural integrity of the support structure against the environmental conditions of the construction site



*In the case of offshore wind farms, only the power utility operator can apply for review. (Applications for review cannot be made separately for each module)

[OM1] Site conditions assessment [1]

- Evaluates whether the following value settings for environmental and external conditions at the construction site as provided by the operator are valid.

Classification	Item (examples)	Setting methods, etc. (examples)
Wind conditions	<p>[1] Wind conditions during wind turbine operations (wind turbine position and hub height)</p> <ul style="list-style-type: none"> - 10-minute average wind speed, turbulence intensity, wind shear exponent, air density, etc. <p>[2] Wind conditions during wind turbine storm standby (wind turbine position and hub height)</p> <p>[50-year recurrence periods]</p> <ul style="list-style-type: none"> - 10-minute average wind speed, turbulence intensity, 3-second average wind speed, wind shear exponent, air density, etc. 	<p>[1] Wind conditions during wind turbine operations</p> <ul style="list-style-type: none"> - Calculate values at each wind turbine position and hub height based on observation data at the site and simulations <p>[2] Wind conditions during wind turbine storm standby</p> <ul style="list-style-type: none"> - Calculate values at each wind turbine position and hub height based on the reference wind speed under the Building Standards Act or other simulations
Marine conditions	<p>[1] Marine conditions during normal states (during wind turbine operations) (wind turbine position)</p> <ul style="list-style-type: none"> - Significant wave height, significant wave period, tide level, currents, etc. <p>[2] Marine conditions during storm waves (wind turbine position)</p> <p>[50-year recurrence interval]</p> <ul style="list-style-type: none"> - Significant wave height, significant wave period, tide level, currents, etc. 	<p>[1] Marine conditions during normal periods</p> <ul style="list-style-type: none"> - Calculate values at each wind turbine position based on observation data at the site and simulations <p>[2] Marine conditions during storm waves</p> <ul style="list-style-type: none"> - In addition to existing wave observation and wave prediction data, calculate the values at each wind turbine position with reference to design values for nearby port and coastal protection facilities

[OM1] Site conditions assessment [2]

- Evaluates whether the following value settings for environmental and external conditions at the construction site as provided by the operator are valid.

Classification	Item (examples)	Setting methods, etc. (examples)
Soil and geology	[1] Submarine topography of the sea area [2] Soil composition, structure, and properties at the wind turbine position (physical properties, mechanical properties, etc.)	[1] Conduct a submarine topography survey [2] Set the required values for the design at each wind turbine position based on the results of geophysical exploration, ground boring and sampling, field tests, and laboratory tests
Earthquake	Seismic waves at the wind turbine position [1] Spectrally matched waves [2] Observed waves [3] Site waves	Set [1] and [2] as rarely occurring earthquake ground motions and extremely rarely occurring earthquake ground motions specified in “Interpretation of Technical Standards for Wind Power Generation Facilities” Set [3] as Port and Harbor Level 1 earthquake ground motions specified in the Technical Standards for Port and Harbor Facilities in Japan (consideration should also be given to Port and Harbor Level 2 earthquake ground motions as necessary)
Other environmental conditions	Tsunamis, snow cover, sea ice and ice accumulation, marine growth, temperature and humidity, sea water density, lightning	Set site-specific values based on relevant laws and regulations, local ordinances, and observation data at the site, etc.

[OM2] Design basis evaluation

- Assesses whether the design criteria considering the site conditions (design policies, etc.), as indicated below, have been appropriately set based on the design criteria applied at the time of type certification for the purpose of safe design and project execution.

Design Criteria Part A Site conditions (Examples)	Design Criteria Part B Wind turbines and towers (Examples)	Design Criteria Part C Foundation (Examples)
Prepared by: Operator	Prepared by: Wind turbine manufacturer	Prepared by: Foundation designer
1) Wind turbine installation location 2) Wind conditions 3) Wave conditions 4) Other marine conditions 5) Soil and geological conditions 6) Seismic conditions 7) Other environmental conditions 8) Constraints, etc. *Includes items that overlaps with the site conditions assessment	1) Applicable criteria and standards 2) Site conditions 3) Wind turbine and tower specifications 4) Design policy (required performance, reference items, materials used, etc.) 5) Design parameters related to the load calculations, and the validity of the applied load analysis method 6) Load case table 7) Partial safety factor 8) Overview of the load analysis model 9) Simulation details 10) Extreme and fatigue design loads and response analysis 11) Materials and welds 12) Coatings and corrosion prevention systems	1) Applicable criteria and standards 2) Site conditions 3) Support structure specifications (including additional installations) 4) Design policy (required performance, reference items, materials used, etc.) 5) Design parameters related to the load calculations, and the validity of the applied load analysis method 6) Load case table 7) Partial safety factor 8) Overview of the load analysis model 9) Simulation details 10) Extreme and fatigue design loads and response analysis 11) Materials and welds 12) Coatings and corrosion prevention systems

[OM3] Integrated load analysis evaluation

- Assesses whether the loads and load effects for the site-specific environmental conditions on the integrated wind turbine structure, including the wind turbine, support structure, and supporting soils, have been calculated in conformity with the design basis.

<Main assessment items>

1. Combinations of external and design conditions

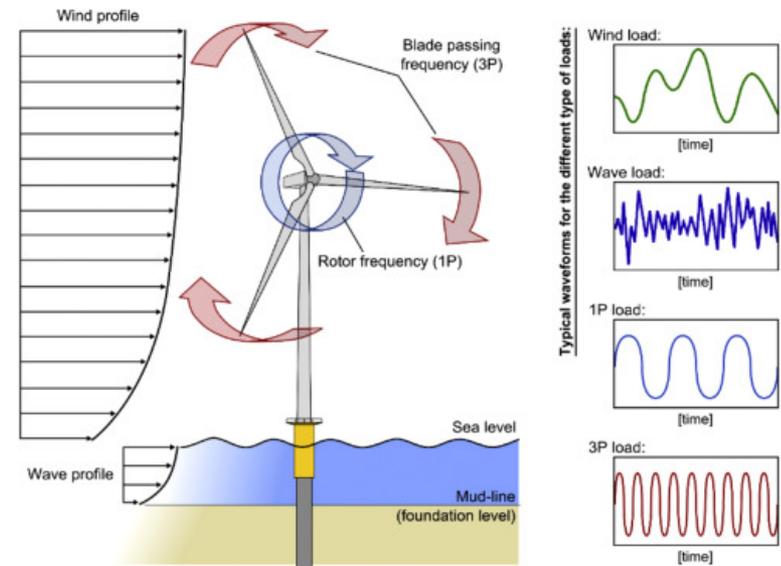
- Wind turbine in operation (wind conditions + normal marine conditions during wind turbine operation)
- Wind turbine during storm standby (wind conditions during wind turbine storm standby + marine conditions during storm waves)
- During an earthquake (during wind turbine operations/wind turbine emergency shutdown/wind turbine standby)

2. Design load cases defined with reference to site conditions, as well as to wind turbine operational and safety systems

3. Partial safety factor

4. Calculation methods (simulation procedures, number of simulations, and combinations of wind and wave loads, etc.)

5. Analytical model employed as the integrated load analysis and validation outcome for its results



Analysis Concept for a Wind Turbine During Operations
(analysis is conducted in consideration of the effects of wind turbine operations, wind, waves, flow, and soil at the same time)

Source: Wind Energy Engineering, A Handbook for Onshore and Offshore Wind Turbines, P. 276

[OM4] Wind turbine (RNA) design evaluation

- Assesses whether the type-certified wind turbine (RNA) has structural integrity against the environmental conditions of the construction site

<Main assessment items>

- ❑ Closely examines the following items to verify whether the wind turbine is structurally safe against the site-specific load based on the site conditions obtained from the integrated load analysis
 - [1] Comparison of the design load set at the time of type certification (certified design load), and the site-specific load obtained from the integrated load analysis
 - [2] Detailed calculation/analysis results for each component when the site-specific load exceeds the design load set at the time of type certification (certified design load)
 - [3] Specifications and the validation results for any parts and systems that are NOT fully covered by type certification and that have been newly modified or reinforced for the site
- ❑ Assesses connection part between tower top and RNA
 - Closely examines strength evaluation results for tower top load receiving from RNA
- ❑ Strength assessment of nacelle cover
 - Closely examines whether the nacelle cover has been satisfied with requirements as Wind Farm Certification
- ❑ Assesses the natural frequency
 - Confirm whether the resonance is correctly prevented by comparing natural frequency including support structure and modal frequency with operating wind turbines
- ❑ Assesses corrosion prevention (Assesses about corrosion measures for RNA)
- ❑ The protection design for the power cable (that passes from the seafloor surface into the wind turbine foundation)
 - Closely examines parts to protect the power cable (In addition, closely examine the adjustment with support structure design evaluation)

[OM5] Support structure design evaluation

- Assesses whether the support structure has structural integrity against the environmental conditions of the construction site

<Main assessment items>

- ❑ Closely examines the following items to verify whether the support structure (including tower / substructure and foundation / floating structure and mooring equipment / each connecting system) is structurally safe against the site-specific load based on the site conditions obtained from the integrated load analysis
 - [1] Closely examines validation of drawing and detailed strength calculation statement for the support structure
 - Strength evaluation for the limit states (ULS/FLS/SLS/ALS) associated by designer
 - [2] Closely examines validation of drawings and calculation statements for additional installations (such as landing facilities, ladders, platforms, the power cable protection)
 - Strength evaluation for the limit states (ULS/FLS/SLS/ALS) associated by designer
 - Strength detail evaluation for the connection to support structures
- ❑ SLS evaluation for support structures
 - Evaluation for wind turbine limitation, such as the residual rotation argument of foundation and natural frequency
- ❑ Design for scour protection (if necessary)
 - Evaluation for location and required volume of bagged compaction materials and edge settlement at the location
 - Evaluation for the validation of associated design and inspection / maintenance plan
- ❑ The protection design for the power cable (that passes from the seafloor surface into the wind turbine foundation)
 - Evaluation for such as location and required volume of pouched foot protection works which fix the power cable and edge settlement at the location
 - Evaluation for the conformity and validation of associated design and inspection / maintenance plan

Overview of Certification Subcommittee / Section Meeting

Large Wind Turbine Certification Subcommittee

Evaluation items: [OM4] Wind turbine (RNA) design evaluation (common to both offshore bottom fixed type and offshore floating type)

* Includes the part of [OM1] Site condition assessment / [OM2] Design basis evaluation / [OM3] Integrated load analysis related to [OM4].

Support Structure Certification Subcommittee / Offshore Bottom Fixed Type Section Meeting

Evaluation items: [OM5] Support structure design evaluation (Offshore Bottom Fixed Type)

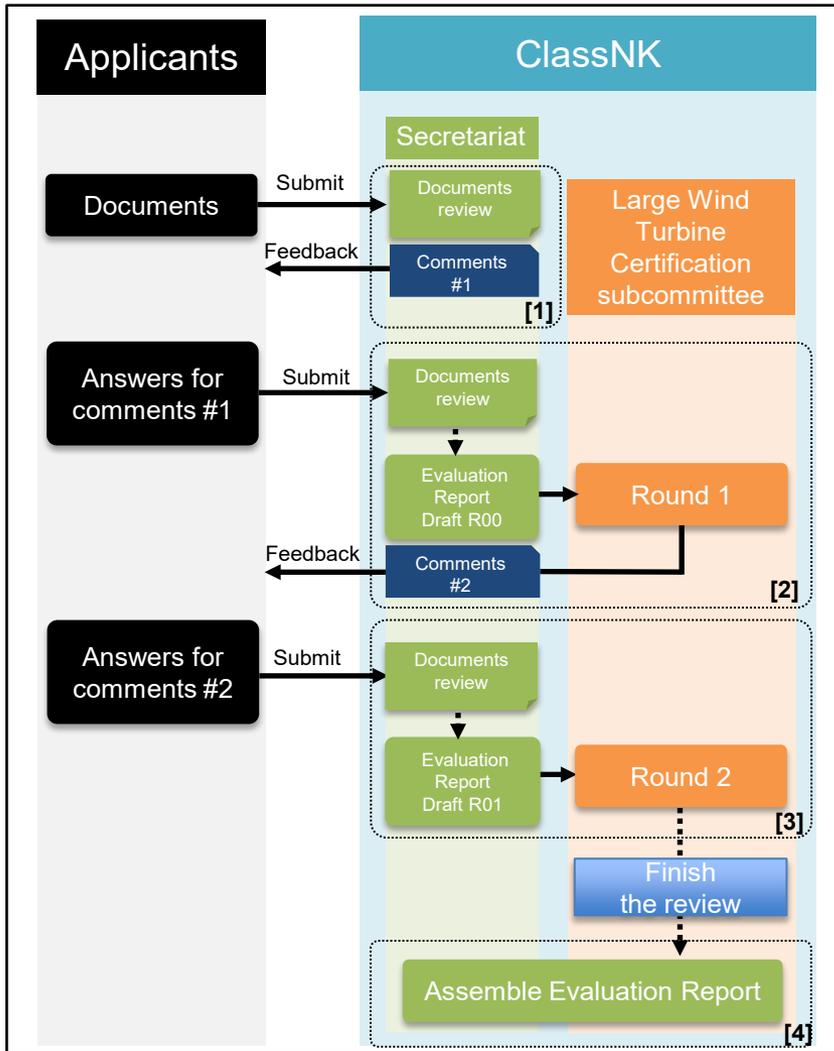
* Includes the part of [OM1] Site condition assessment / [OM2] Design basis evaluation / [OM3] Integrated load analysis related to [OM5].

Support Structure Certification Subcommittee / Offshore Floating Type Section Meeting

Evaluation items: [OM5] Support structure design evaluation (Offshore Floating Type)

* Includes the part of [OM1] Site condition assessment / [OM2] Design basis evaluation / [OM3] Integrated load analysis related to [OM5].

Review process: [OM4] Wind turbine (RNA) design evaluation (including RNA-related items of [OM1] Site conditions assessment , [OM2] Design basis evaluation and [OM3] Integrated load analysis evaluation)



[1] Documents submitted by applicants for review are firstly reviewed by the secretariat.

→ Comments for each documents are informed to applicants. (In some cases, comments is informed after step [2].)

[2] Based on the answers against comments at step [1], the draft Evaluation Report is completed. The secretariat explain their review results to the members of the Large Wind Turbine Certification Subcommittee.

→ All comments at the subcommittee are informed to applicants.

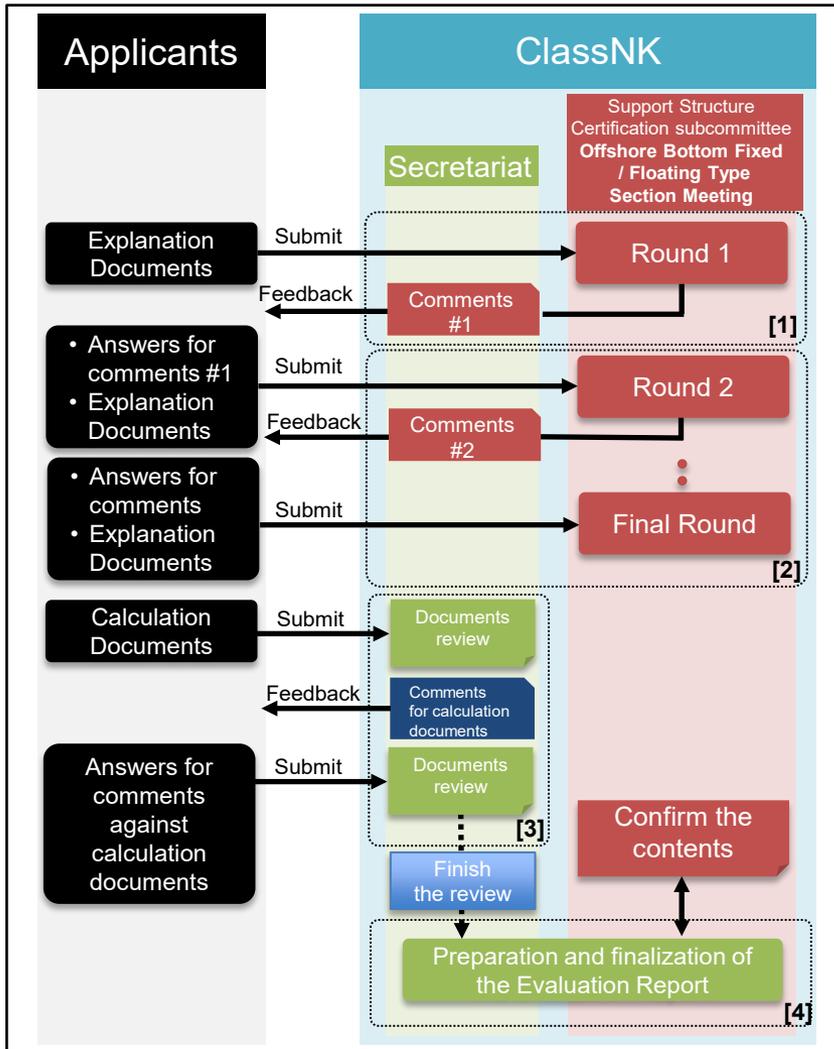
[3] Based on the answers against comments at step [2], the draft Evaluation Report is revised. The secretariat explain the review results of the answers against comments to the members of the Large Wind Turbine Certification Subcommittee.

→ Go to step [4] if no more additional comments.

→ Repeat step [2] and [3] when additional comments are remaining.

[4] The review will be finished when no additional comments are received from the subcommittee. In addition, the Evaluation Reports of each module are assembled . (confirm the adjustment with support structure design evaluation)

Review process: [OM5] Support structure design evaluation (including Support structure-related items of [OM1] Site conditions assessment , [OM2] Design basis evaluation and [OM3] Integrated load analysis evaluation)



- [1] Based on the documents submitted by the applicants, members of the Support Structure Certification.**
 - The Support Structure Certification Subcommittee utilizes a format in which the operator, support structure design firm, and wind turbine manufacturer directly explain the design to the experts in each field that serve as committee members.
 - When the design is not yet complete, the review can be accelerated to the extent possible as a preliminary review.
 - Preliminary review is not mandatory. (Preliminary review is conducted upon the request of the applicant.)
- [2] At the after second subcommittee meetings, the responses to the comments in [1] and other new items shall be reviewed. This process is repeated until all items to be reviewed are completed and there are no more comment.**
 - subcommittee meetings will be set according to the progress of the design and the wishes of the applicant for review.
 - Go to Step [3], when applicants answered against all comments and received no more new comment.
- [3] The secretariat will conduct a document review of the calculation documents, exchange comments, and complete the review when there are no additional comments.**
- [4] Prepare and finalize the Evaluation Report for each module. (The consistency with the RNA side evaluation results shall be checked.)**
 - The contents of the Evaluation Report will also be reviewed by the members of the Supporting Structures Certification Subcommittee.

Windfarm Certification Assessment Report Issuance System [for offshore farms]

Windfarm Certificate

Site Condition Conformity Statement

Evaluation Report (site conditions evaluation)

Design Basis Conformity Statement

Evaluation Report (design basis evaluation)

Integrated Load Analysis Conformity Statement

Evaluation Report (integrated load analysis)

RNA Design Conformity Statement

Evaluation Report (wind turbine design evaluation)

Support Structure Design Conformity Statement

Evaluation Report (support structure design evaluation)

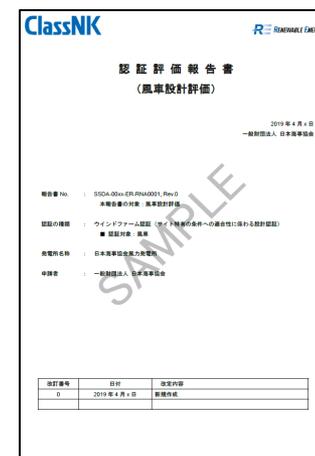
Support Documents for permits and approvals, such as Registered Conformity Assessment Body, etc.

Conformity checklist of interpretation of technical standards for offshore wind power generation facilities

Conformity checklist of technical standards for wind power generation facilities (Article 4,5 and 7)



Example of a Conformity Statement

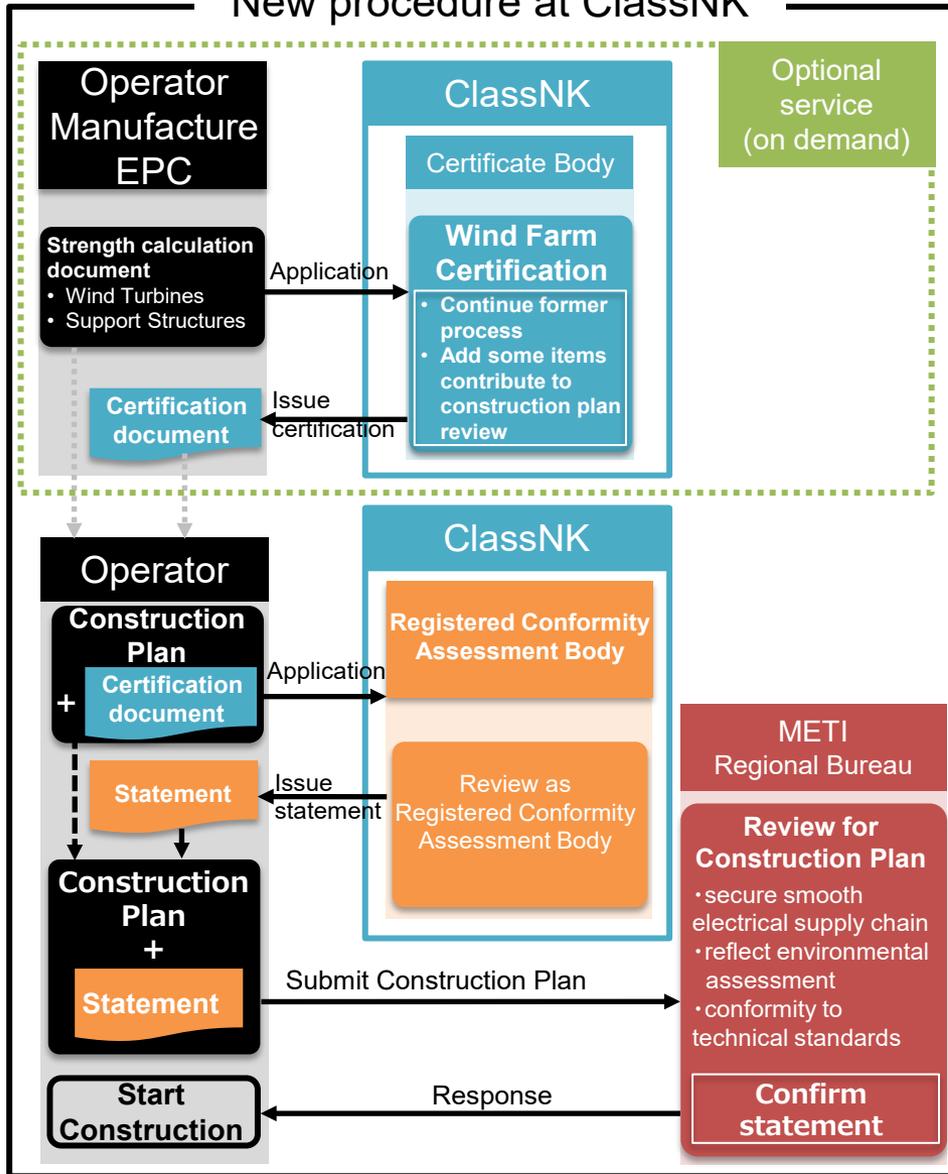


Example of a Certification Assessment Report



4. Registered Conformity Assessment Body designated by Electricity Business Act

New procedure at ClassNK



Wind Farm Certification (WFC)

- ❑ WFC is not mandatory requirement by the Electricity Business Act.
- ❑ In the case of WFC, ClassNK can flexibly review such as implementing each module before completing wind turbine and support structure site –specific designs.
- ❑ Conformity assessment for Technical Standards for wind power generation facilities article 4,5 and 7 is completed at the review of WFC.



Registered Conformity Assessment Body

- ❑ In case where WFC has been acquired in advance, it is basically treated as the conformity assessment for Technical Standards for wind power generation facilities article 4,5 and 7 has been already completed.
- ❑ Further information about Registered Conformity Assessment Body is [Registered Conformity Assessment Body](#) on the website and refer to the following materials ;

<references>

- ◆ [Outlines and explanation of Registered Conformity Assessment Body](#)
- ◆ [Business regulations of Registered Conformity Assessment Body \[NKRE-SP-0009\]](#)

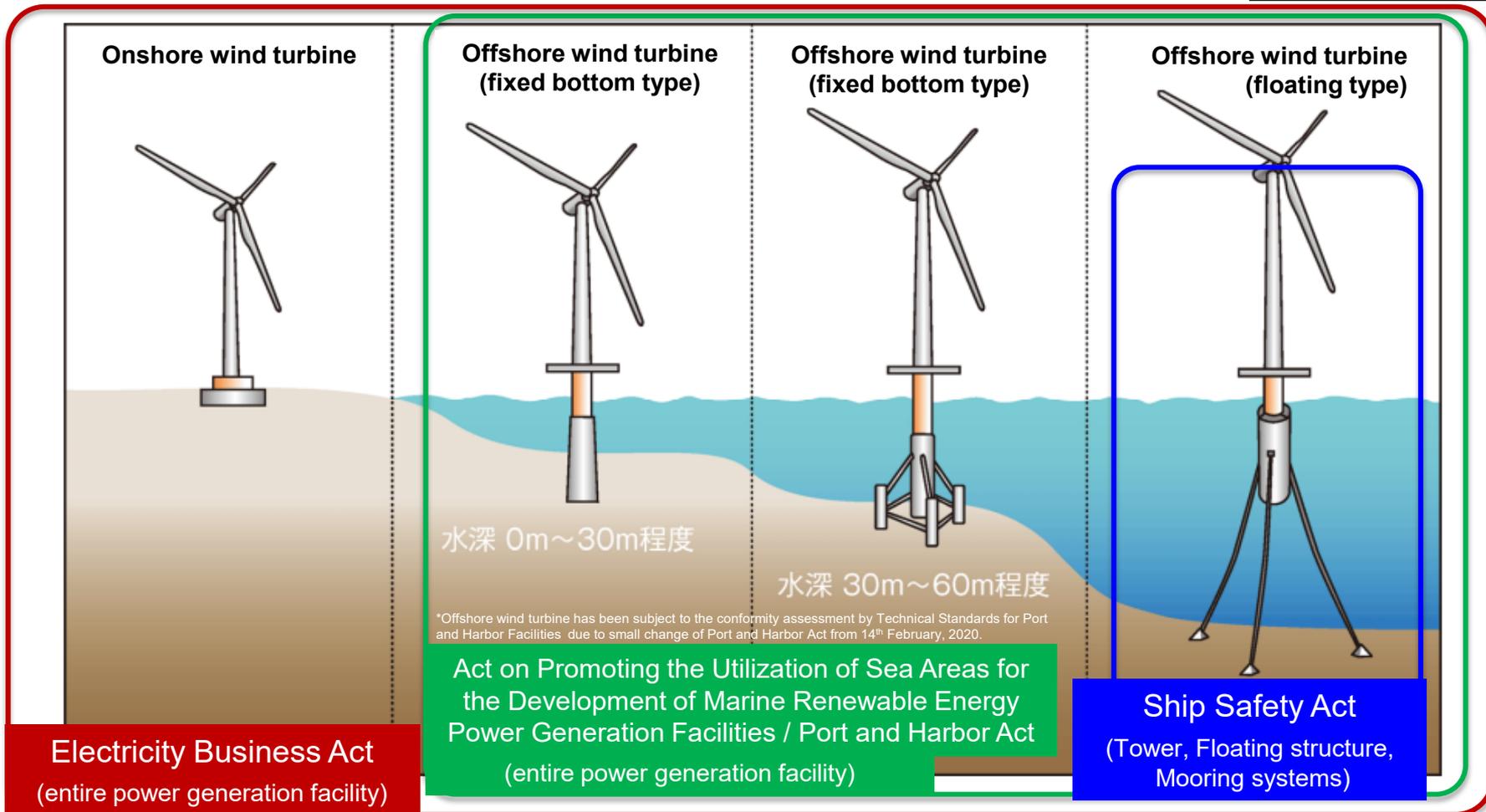
* These reference documents are Japanese Version only.

5. Compliance with laws and regulations for offshore wind turbines

Outlines of laws and regulations applied to the safety of wind power generation facilities

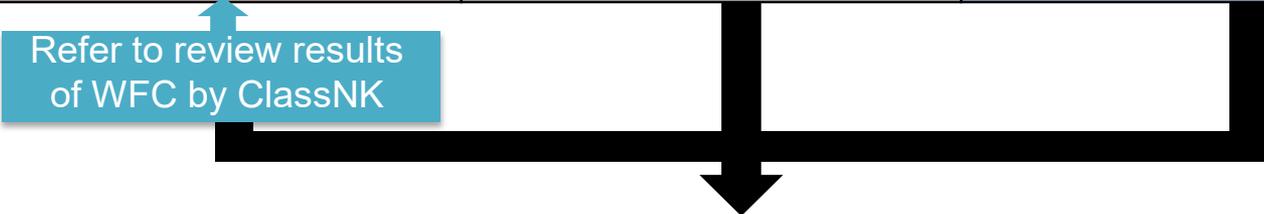
- ❑ Wind turbine and entire power generation facility : Electricity Business Act
- ❑ Offshore wind turbine (fixed bottom and floating type) : Port and Harbor Act
- ❑ Tower, Floating structure and Mooring systems (floating type) : Ship Safety Act

From 1st July, 2019



source: : NEDO, Renewable Energy White Paper

	Electricity Business Act (present)	Port / Harbor Act	Ship Safety Act
Onshore wind farm	Applied	N/A	N/A
Offshore wind farm (fixed bottom type)	Applied	Applied	N/A
Offshore wind farm (floating type)	Applied	Applied	Applied
Approval format	Construction Plan Notification [directly reviewed by Japanese Government] + [Registered Conformity Assessment Body]	Conformity Verification by CDIT, a confirmation agency registered with the Minister of Land, Infrastructure, Transport and Tourism	Classification Survey by ClassNK, a classification society registered with the Minister of Land, Infrastructure, Transport and Tourism



- ❑ ClassNK continues the jointly review about the same items of the support structure of offshore wind farms and their additional installations for Wind Farm Certification under conformity assessment with CDIT.
- ❑ The results of this joint review are effective even after ClassNK applied as Registered Conformity Assessment Body. (no additional joint review is required.)

Electricity Business Act regulation

- When a person intends to implement a construction project to install or modify wind power generation facilities for business use, the person must notify the competent minister of plan for the construction project. (Article 48)
- When a person installs special electric facilities for business use must be confirmed Order for Conformity to Technical Standards by Registered Conformity Assessment Body. (Article 48)
 - When a person intends to construct wind farm that have an output of 500 kilowatts or more, the person must submit prior notification. (Appended table 2, Electricity Business Act Enforcement Regulations)
 - Special electric facilities are defined as wind turbine and support structures of wind power generation facilities.
- A person that installs electric facilities for business use must maintain the electric facilities for business use to ensure that they conform to the technical standards established by order of the competent ministry. (Article 39)
 - In case of wind power generation facilities : Technical Standards for wind power generation facilities established by order of the competent ministry. (Ordinance of Ministry of International Trade and Industry No. 53 of 1997)
 - In case of floating offshore wind turbine : support structures of wind power generation facilities (floating structure, mooring system, tower) must be conformed Ship Safety Law due to the following regulations;
 - <Technical Standards for Wind Power Generation Facilities>
(Structure to support the wind turbine)
Article 7. The structure supporting the wind turbine shall be structurally safe against its own weight, loading capacity, snow and wind pressure, and against earthquakes and other vibrations and impacts.
 - <Interpretation of Technical Standards for Wind Power Generation Facilities>
(Ministerial Ordinance Article 7) Article 16
(2) The structure supporting the wind turbine (limited to those structures subject to the provisions of Article 2, Paragraph 1 of the Ship Safety Act) shall conform to the provisions of the same paragraph.

- Further detailed information about Registered Conformity Assessment Body is written in p.11 or refer to [Registered Conformity Assessment Body](#) on the website.

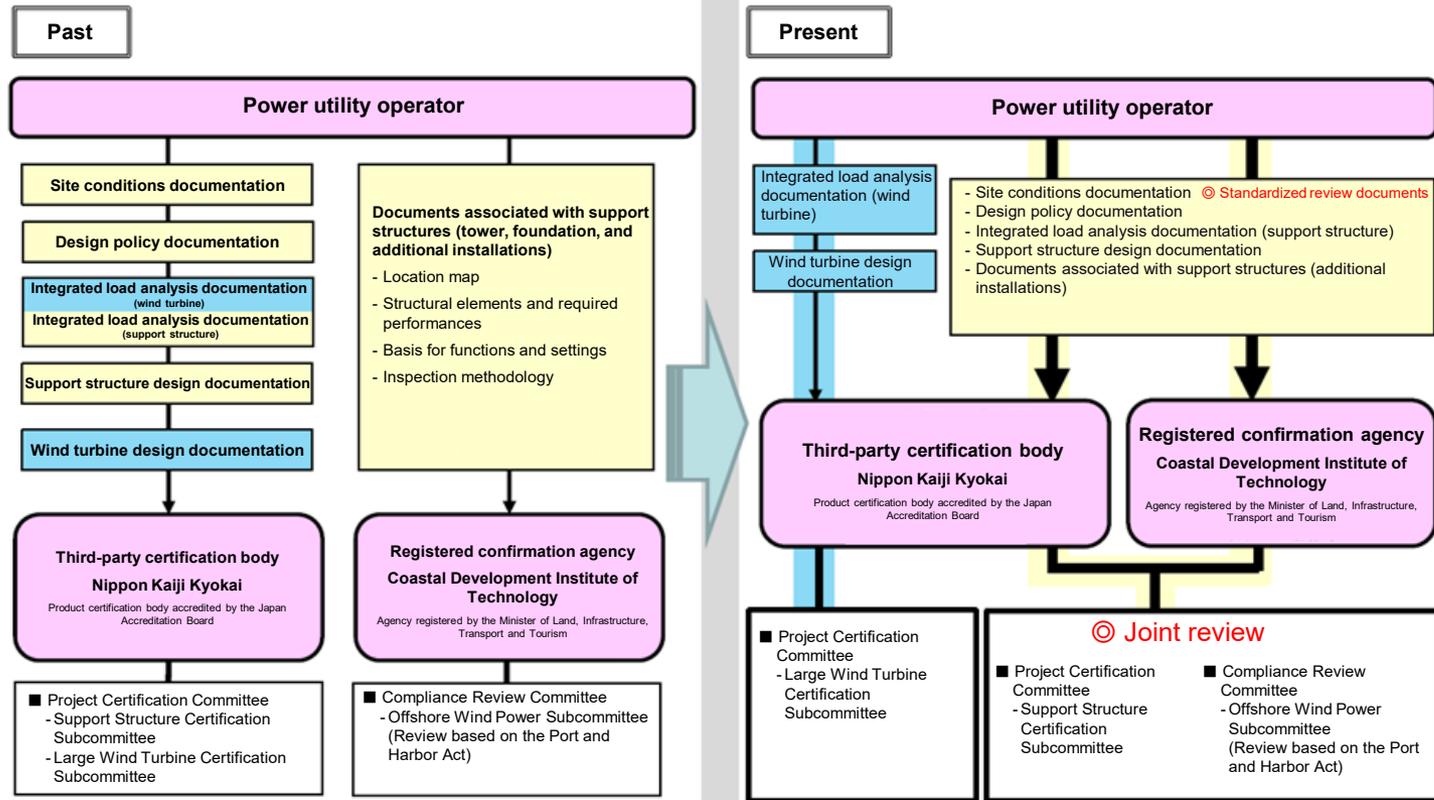
Port and Harbor Act compliance

■ The NK Support Structure Certification Subcommittee and CDIT Offshore Wind Power Subcommittee hold joint sessions

Note: In case of a dispute over translation, Japanese text shall prevail

Unified review system overview

- Standardizing the review documents for offshore wind farm support structures and submitting the same documents to both organizations reduces the burden on power utility operators.
- Unifying the process through a joint review shortens the review duration.



Ship and Safety Act regulation

Ship Safety Law

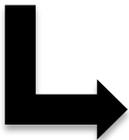
Article 2 Ships shall be outfitted pursuant to the provisions of ordinances of the Ministry of Land, Infrastructure, Transport and Tourism (ordinances of the Ministry of Land, Infrastructure, Transport and Tourism and ordinances of the Ministry of Agriculture, Forestry and Fisheries only with regard to fishing vessels) with regard to the following matters:

- (i) Hull
- (ii) to (xiii) (omitted)

[Reference] Public Notice Establishing Vessels with Special Structures or Equipment under Article 1, Paragraph 4 of the Ordinance for Enforcement of the Ship Safety Act

Ships with special structures or equipment as established in the Public Notice under Article 1, Paragraph 4 of the Ordinance for Enforcement of the Ship Safety Act are as follows:

- (i) to (iii) (omitted)
- (iv) Floating offshore wind power facilities



Technical Standards for Floating Offshore Wind Power Facilities

Kokkaian No. 194 dated April 23, 2012
Partially Amended Kokkaian No. 286 dated March 3, 2020

Technical standards establishing the requirements for structures and facilities based on the Ship Safety Act

Ministry of Land, Infrastructure, Transport and Tourism website: Promoting the use of floating offshore wind power facilities

- Establishing technical standards for ensuring safety -

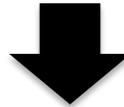
https://www.mlit.go.jp/maritime/maritime_fr6_000006.html

Ship and Safety Act regulation

Ship Safety Law

Article 8

Under Article 25-47 applied mutatis mutandis pursuant to Article 23-69 and Article 25-72, ship out of passenger ship (the capacity is over 12 people ; hereinafter the same as) that have been surveyed by ClassNK , “Classification Society authorized by the Minister of Land, Infrastructure, Transport and Tourism” (hereinafter the “Classification Society”), and that have registered as classification are regarded as having undergone inspection about what is listed in the Article 2 Cause 1 each number, such as load line / radio telegraph, and to have passed such by the maritime authorities excluding inspection established by order of the Minister of Land, Infrastructure, Transport, and Tourism during having effective certification.



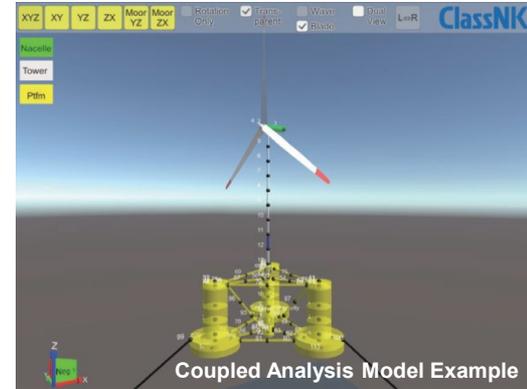
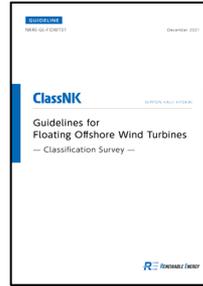
- ◆ ClassNK is a “Classification Society authorized by the Minister of Land, Infrastructure, Transport and Tourism” as prescribed in Article 8 of the Ship Safety Law.
- ◆ Floating offshore wind power facilities that have been surveyed by ClassNK, a “Classification Society authorized by the Minister of Land, Infrastructure, Transport and Tourism,” and that have registered as classification are regarded as having undergone inspection and to have passed such by the maritime authorities.

*maritime authorities : the headquarter of Transport Bureau or Maritime Bureau dealing with ship register

Classification Survey (as a Classification Society authorized by the MLIT)

Design Review

- Review designs for floating structures, towers, and mooring lines based on the Guidelines for Floating Offshore Wind Power Facilities.
- Review site condition (wind conditions, marine conditions, etc.) settings, wind turbine and floating structure coupled analyses, and support structure design evaluations at the same time as wind farm certification.
- Confirm that the steel plate and fittings to be used are approved by NK.



Inspection of construction and on-site work

- Conduct a witness survey for the following items:
 - Witness survey during floating structure and tower manufacturing
 - Shipment survey for chains, anchors, etc. used in mooring lines
 - Attendance at manufacturing plant tests (water pressure tests, etc.) and installation work tests (holding capacity tests, etc.)



Completion Survey

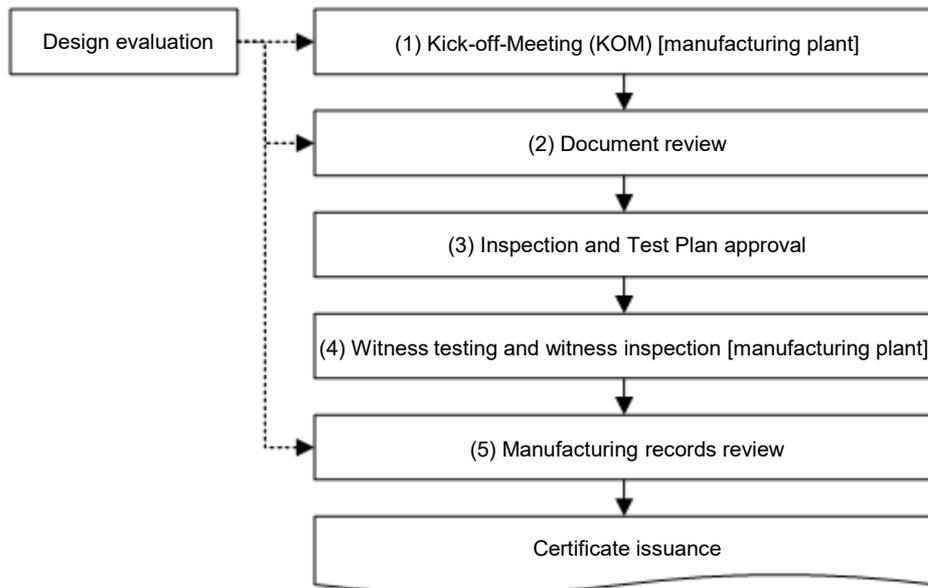
- After installation at the site is complete, ClassNK will attend verification tests of wind turbine control systems and floating structure ballast systems, etc.



6. Other related services

Wind turbine support structure: Manufacturing evaluation

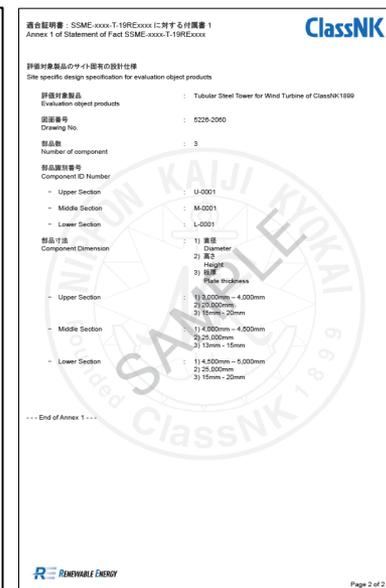
- This service covers wind farms that are subject to the Electricity Business Act and that have an output of 500kW or more, where one or more wind turbines are installed. The scope of this service includes manufacturing evaluation for the wind turbine support structures (tower and foundation) as required for acceptance of the Construction Plan Notification for such wind farms.
- This service assumes that the wind turbine support structures to be evaluated have been appropriately designed based on the local site conditions of the planned construction location, and have either obtained a Wind Farm Certificate from ClassNK regarding the details or have satisfactorily undergone design evaluation by a third party.



Evaluation Module and Flowchart



Certificate Example



Wind turbine support structure: Manufacturing evaluation [for onshore wind farms]

Requirement items for support structures of onshore wind farms [NKRE-GL-WFC01, March 2023]

6.1.1 General

-1. The structural integrity of the support structure for the site conditions is confirmed by using integrated load analysis to indicate that there is sufficient strength against the site-specific loads. In addition, for the tower of the support structures, the prerequisites are that the design has obtained type certification, and that the tower has been manufactured at a manufacturing site specified in the certification documents pertaining to the type certification.

<Tower design>

- When the tower is included in type certification:
 - Evaluate through wind farm certification (verify that the design approved during type certification is appropriate for the site conditions).
- When the tower is NOT included in type certification:
 - Evaluate through WF certification (verify that the tower design for the site is appropriate for the site conditions).

<Tower manufacturing evaluation>

- When the tower is included in type certification:
 - No specific requirements. However, this is limited to the case where the tower is manufactured by a manufacturer authorized during type certification.
- When the tower is NOT included in type certification:
 - Add the tower to type certification or conduct a “Wind turbine support structure manufacturing evaluation” .
 - After WF Certification is issued, manufacturing evaluation should be conducted until the authorized date in the certificate document.

Wind turbine support structure: Manufacturing evaluation [for onshore wind farms]

Manufacturing evaluation by type certification

Evaluates whether units are manufactured according to the design documents verified during design evaluation in terms of the following items:

1. Quality system evaluation
2. Manufacturing inspection (representative unit check)

- This evaluation covers the manufacturing plant, and the actual manufacturing of the towers to be delivered is NOT inspected.

Wind turbine support structure: Manufacturing evaluation

Evaluates whether units are manufactured according to the design documents verified during design evaluation in terms of the following items:

1. Quality system evaluation
2. Manufacturing inspection

- Evaluated items are the same as those under manufacturing evaluation by type certification.
- Evaluates individual manufacturing processes based on the results of the design evaluation for the site.
- Conducts witness inspections during the manufacturing processes for the towers to be delivered to the site.

As part of the wind turbine support structure manufacturing evaluation, a witness inspection is carried out during the manufacture of the towers to be actually constructed at the site, thereby acting as verification by a third party and creating a record trail that includes inspection reports.

Wind turbine support structure: Manufacturing evaluation [for offshore wind farms]

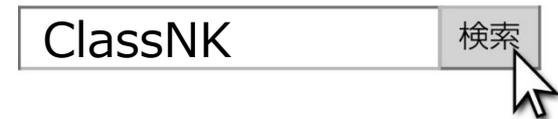
- In the case of offshore fixed-bottom wind farms, the wind turbine tower is also designed for each site and the foundation is generally made of steel. Under the Electricity Business Act, operators are responsible for quality control related to power plant construction.
- If an application is submitted for an offshore fixed-bottom wind farm, ClassNK conducts a manufacturing evaluation of the wind turbine tower and foundation (monopile/jacket).
- The “Wind turbine support structure manufacturing evaluation” for offshore fixed-bottom wind farms conducted by ClassNK is limited to a third-party assessment based on a private-sector contract. As a third party, ClassNK basically conducts its evaluation from the viewpoint of whether units are manufactured according to the order specifications.

<Application reasons assumed with offshore fixed-bottom wind farms>

- [1] When a developer / operator requires explanations to the lender from the viewpoint of project financing, or requires the EPC or contractor manufacturing the tower/foundation to undergo a third-party evaluation from the perspective of avoiding risks related to licensing.
 - [2] When the lender requires the developer / operator to undergo a third-party evaluation related to tower/foundation manufacturing from the perspective of project financing.
 - [3] When the EPC intends to acquire a third-party evaluation related to tower/foundation manufacturing from the perspectives of providing explanations to developer / operator and of avoiding various risks.
 - [4] When the tower/foundation manufacturer intends to acquire a third-party evaluation from the perspective of providing explanations to the ordering party and of avoiding various risks.
- In the case of offshore floating wind farms, an inspection equivalent to “Wind turbine support structure manufacturing evaluation” as part of classification inspection is carried out on the support structures (Tower, Floating structures, Mooring systems).



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