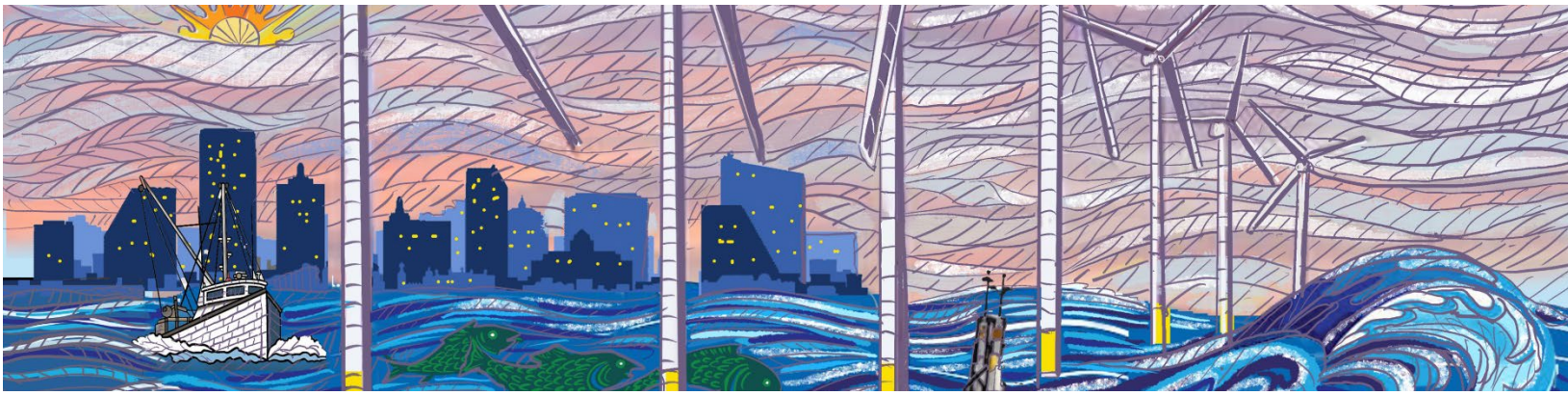

Appendix I-F3

Project 2 CVA Verification Plan

May 2024

CVA Scope of Work
Atlantic Shores Project 2

Atlantic Shores Offshore Wind, LLC

Customer Reference: ASOW-363-RFP-01
DNV doc No: 236143_1_ASOW2_SOW_2022-08-19
Date of first issue: 2022-08-19
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Customer Details

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DNV doc. No. :	236143_1_ASOW2_SOW_2022-08-19

About this document

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Confidentiality

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for DNV Renewables Certification USA, LLC

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Rev. No.	Date	Reason for Issue	Prepared by	Approved by
0	2022-08-19	First issue	PHICRA	DAMAL
1	2023-05-26	Project organization	PHICRA	ARMMOH
2	2023-10-02	Updates after comments from client	OCEK	ARMMOH

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1 INTRODUCTION

Atlantic Shores Offshore Wind, LLC (Atlantic Shores) has requested a Scope of Work (SoW) from DNV Renewables Certification USA, LLC (DNV) to provide CVA services for the Atlantic Shores Offshore Wind Project 2 (the Project). This SoW will be delivered as part of the Project CVA Nomination to BSEE, in accordance with the US Code of Federal Regulations, Title 30 – Mineral Resources, Chapter II – Bureau of Safety and Environmental Enforcement, Department of the Interior, Subchapter B – Offshore, Part 285 – Renewable Energy and Alternative Uses of Existing Facilities on the Outer Continental Shelf (30 CFR 285).

The SoW below shall be read in conjunction with the Statement of Qualification 236143_1_ASOW2_QUAL_SPE_COP_2022-08-19 (Ref. /2/).

Following the nomination, the CVA will perform the CVA duties as required by Subpart G of 30 CFR 285 regarding Facility Design Review (FDR), Fabrication and Installation Review (FIR) and Modification & Repair Report. In addition to Subpart G of 30 CFR 285, this SoW follows well established certification schemes in terms of structure, i.e. modules, but please note that the CVA will confirm compliance to 30 CFR 285 as defined by this SoW and in agreement with the Lessee.

The Project is in the New Jersey Wind Energy Area approximately 9 miles east of the New Jersey coastline near Atlantic City, in the lease area OCS-A 0499, Figure 1. The complete lease area has the potential to generate 2.5 GW of clean, renewable energy. DNV understands this solicitation covers Project 2, in the southern portion of the lease area as shown in the figure below.

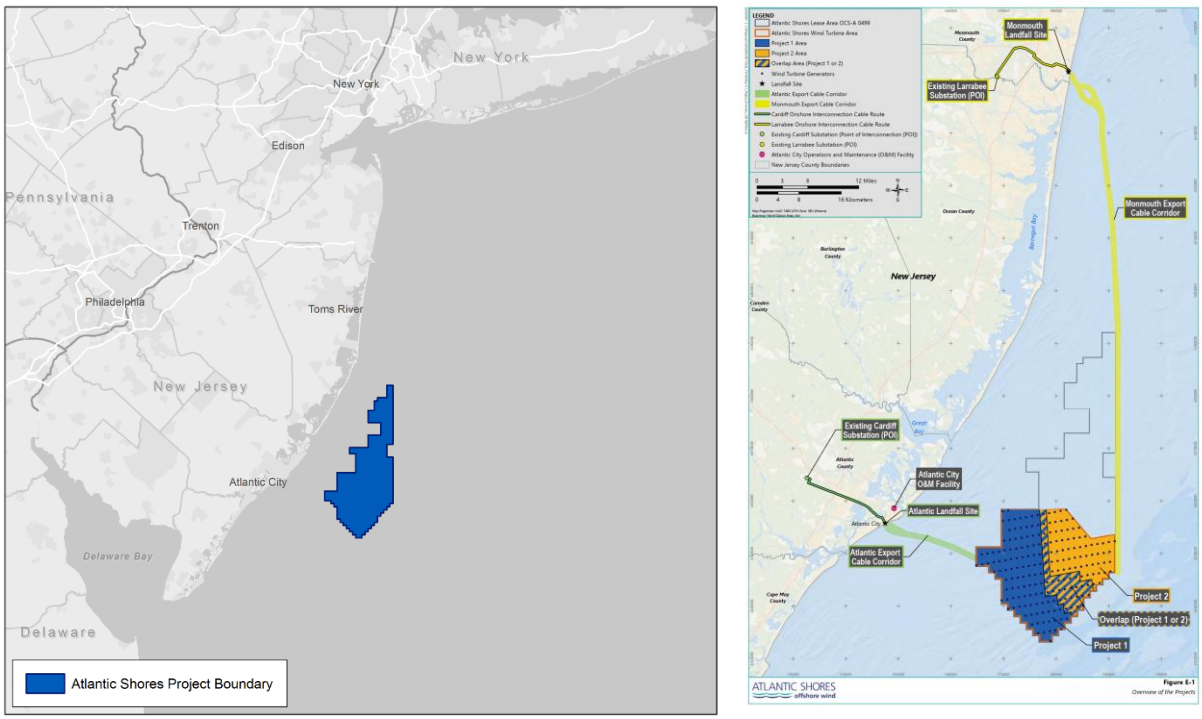

Figure 1: Atlantic Shores Wind Lease Area OCS-A 0499, (Ref. Atlantic Shores COP)

The project configuration is shown in Table 1 below, and forms the baseline for the scope of work. As the Project design and arrangement is still under development, this configuration may change.

Table 1: Project configuration

Number of WTG foundations	89
Number of Offshore Substations	Base case: 2 HVAC/HVDC Alternative: up to 5 HVAC/HVDC
Expected COD	2029
Water depths	17-37m
Export location	Larrabee, NJ
WTG Foundation type	Monopile & TP
OSS Foundation type	Post-piled jacket
Marshalling / Construction Port	NJ or NY

2 COMPANY INFORMATION

2.1 DNV in brief

We are the independent expert in risk management and assurance. Driven by our purpose, to safeguard life, property and the environment, we empower our customers and their stakeholders with facts and reliable insights so that critical decisions can be made with confidence. As a trusted voice for many of the world's most successful organizations, we use our knowledge to advance safety and performance, set industry benchmarks, and inspire and invent solutions to tackle global transformations.

2.2 In the energy industry

We provide assurance to the entire energy value chain through our advisory, monitoring, verification, and certification services. As the world's leading resource of independent energy experts and technical advisors, we help industries and governments to navigate the many complex, interrelated transitions taking place globally and regionally, in the energy industry. We are committed to realizing the goals of the Paris Agreement, and support our customers to transition faster to a deeply decarbonized energy system.

2.3 In offshore wind

With more than 35 years of experience in wind energy, DNV has been providing certification and verification services to the global offshore wind industry from the very beginning and to date has conducted certification or verification for more than 100+ offshore wind projects, representing well beyond 10 GW of installed offshore capacity. This experience includes offshore wind projects in numerous jurisdictions, each with unique regulatory and stakeholder requirements. As a leading certification body, DNV has conducted extensive work to establish standards for design, fabrication, installation, and operations of offshore energy projects. DNV also provides marine warranty survey for offshore wind transportation and installation activities which, when combined with our certification and verification services, can provide significant synergies and efficiency to the project.

DNV takes a leading role in developing and revising international standards through active involvement on several International Electrotechnical Commission (IEC) committees, as well as U.S., European, and national standards bodies. Additionally, DNV is actively establishing independent standards to cover gaps where no international standards exist or provide sufficient guidance.

3 CVA SCOPE OF WORK

The CVA services relating to WTG, OSS and Power Cables are detailed in this proposal. The governing standards and overarching Project specifications will be described in the projects' Hierarchy of Standards and shall be settled at latest within the Design Basis Evaluation. Once the Design Basis is established, we will ensure design compliance for each asset and will similarly confirm compliance with 30 CFR 285 Subpart G and ensure consistency with the Approved COP, as appropriate.

Four assets are defined, namely the WTG (RNA & support structures), OSS (Offshore Substation), Inter Array Cables and Offshore Export Cable. These assets are commonly treated separately, as they are handled by different project teams within the developer's organization, this is reflected in the CVA process and the proposed organization for the CVA assignment at DNV. To ensure the coordination of the four assets there is an overall project manager who will ensure a single point of contact of the project and overseeing interfaces between the assets. Please note that given the similar nature in the verification of all subsea power cables, the Inter Array and Offshore Export cables are detailed together in Sec. 3.2.6. CVA deliverables are described in in Sec. 3.5.

3.1 General for Design Phase

DNV will review the Project's design documentation per the scope of work (SOW) defined in this section. The CVA review activities are documented in several Evaluation Reports, see Sec. 3.6, for subparts of the Design, the sum of which will verify the customer's documents as requested for the Facility Design Report (FDR) listed in § 285.701 and the Fabrication and Installation Report (FIR) listed in § 285.702.

Each Evaluation Report will document a specific Asset and module, as well as the efforts performed by the CVA to confirm compliance with approved SOW. The Evaluation Reports will include a detailed list of all verified design documentation provided by the Project, including information taken as "For-info", as well as summarize the Basis for the verification, i.e. the agreed SOW, C&S and National Regulations. Upon successful documentation of a specific module, the Evaluation Report can be issued with No Outstanding Issues and an accompanying Statement of Compliance will also be issued. There may be open conditions which will require additional actions in subsequent phases. These conditions should be of a nature which can only be addressed in another module or be safely postponed. The conditions are a structured way to control interfaces amongst the project packages often with multiple contributors. However, Outstanding Issues of important to the safety of the structure cannot be accompanied by a Statement of Compliance, but an Evaluation Report can be issued documenting the efforts to date and the Outstanding Issues. Please note that the deliverables described in the detailed sections below only refer to an Evaluation Report, but it is implied that a Statement of Compliance will also be issued. Lastly, the Statement of Compliance will clearly state to which process and basis it is being issued against.

The subdivision of the verification activities follows the timeline of the project and enable the Evaluation Reports to be used to meet the requirement in item §285.712 (a) "The CVA must also submit interim report to Project and BOEM, as requested by the BOEM". Further, this de-risk the Project as BSEE's position on the verification will be known as the project develops.

In addition to the Evaluation Reports, a separate FDR-FIR certification letter will be developed meeting the requirements per §285.701 and §285.702 respectively. The requirements to the CVA's reporting requirements such as oversight by a licensed Professional Engineer and details of by whom and when the CVA activities were performed towards BSEE per 30 CFR §285.712 is considered in this letter to BSEE. This is further detailed in Sec. 3.6.

The design phase constitutes the verification work required for the Facility Design Report and Fabrication and Installation Report. During the Execution Phase, actual fabrication, transportation, and installation aspects of all four assets will be witnessed and verified to ensure compliance with the Design Phase and documented in a Final FIR.

The subdivision of the design verification activities is detailed below for the WTG asset:

- Design Basis = Site Conditions Assessment + Design Basis Evaluation
- Design = Integrated Load Analysis + Rotor-Nacelle Assembly + Support Structure

This subdivision is further supplemented by detailed evaluation modules, which has proven effective given the various Project partners, allowing efficient Project communication and respecting confidentiality agreements.

As the RNA and tower is part of the turbine OEM's supply, the site-specific RNA and Tower verification is documented in separate Evaluation reports.

The tower is part of the Support Structure and is integrated into this report through reference to the Site-specific tower evaluation report. As part of this integration the tower/substructure interface will be verified.

Likewise, the Site-specific Rotor-Nacelle evaluation will be integrated into the Wind turbine Generator Integration Evaluation Report, which is the final, albeit brief, report verifying the interfaces amongst the modules.

Compared to the WTG asset, the evaluation reporting structure for OSS and Cables can be simplified as the load – structural interaction is far less influencing the design of these assets. Consequently, there will be two evaluation reports for each of the OSS and cables assets, namely:

- Design Basis
- Design

All of the CVA deliverables are further summarized in Sec. 3.6.

3.1.1 Site Conditions Assessment - RNA and Support Structure

The purpose of the Site Conditions Assessment (SCA) is to verify of all the external influences (environmental, electrical, and ground conditions) from across the site which impact the design of the structure.

During the review of the site conditions, the following shall be assessed:

a. Meteorological conditions incl. hurricane study
b. Marine conditions incl. hurricane conditions and wave breaking
c. Geotechnical conditions incl. seabed topography, seabed mobility and geotechnical data, e.g. soil profiles, soil stiffness, soil strength, soil damping, and cyclic degradation parameters
d. Other environmental conditions
e. Earthquake conditions, if applicable
f. Electrical power network conditions*
g. Hazards, both anthropogenic and natural

*This is the summary of factual information regarding the electrical network conditions at this stage, e.g. supply frequency and cable voltage.

DNV shall evaluate whether assessment of the site conditions have been adequately undertaken and documented according to the Codes and Standards Hierarchy. The site conditions assessment shall include any particular inputs needed for the design and/or installation of the structure type(s) to be used on the project.

US offshore sites frequently only have limited project specific metocean measurements available and data from nearby locations are typically utilized. Transformation of such data shall consider changes due to water depths and seabed topography. Hindcast of ocean data will be used to extend the measured time series and to interpolate the data to the Project location. Proper calibration of the hindcast model shall be performed to ensure that the hindcast data results comply with available measured data.

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

Deliverable

A satisfactory site conditions evaluation is concluded with a Site Conditions Evaluation Report. The Evaluation report shall include a list of the verified reports provided by the Project.

3.1.2 Design Basis Evaluation - RNA and Support structure

The purpose of the project Design Basis Evaluation (DBE) is confirm that the Project has established the basic assumptions, specifications, methods, and requirements to safely design and execute the Project.

As part of the DBE module, DNV will also review the provided Type or Component Certificate for the Rotor-Nacelle-Assembly (RNA) and possible RNA infrastructure located in the Tower to ensure that any and all conditions are being met by the Project. The governing codes and standards shall be settled within the Design Basis Evaluation.

The project design basis shall identify and include:

a. applicable codes, standards, regulations, and project requirements*
b. geographical locations of the wind turbines
c. general description of wind turbine type and wind power plant layout
d. conditions deriving from Type or Component Certificate incl. site specific adaptations, e.g. Tuned Mass Dampers
e. project co-ordinate system and well-defined vertical reference including project datum
f. water depth ranges
g. allowable frequency range
h. type of substructure and foundation
i. design lifetime
j. design values for wind conditions and other environmental conditions, e.g. wake effects
k. design values for soil stiffness, soil strength and soil damping, incl. cyclic degradation
l. methods and principles used for prediction of extreme design loads and fatigue design loads, and methods and principles for response analyses
m. design load cases incl. robustness check, e.g. duration and number of simulations
n. application of load and material factors
o. technical interface, e.g. to adjacent components
p. materials and welding
q. corrosion protection strategy / corrosion control concept, e.g. alignment with fatigue design requirements
r. manufacturing and storage methods and requirements
s. transportation and installation methods and requirements
t. operation and maintenance methods and requirements

This is not an exhaustive list and additional items may be warranted depending on the specific project details.

*Note on Codes and Standards: The “Design Basis” approach per the BOEM COP Guidelines rev. 4 May 2020 is a feasible way to establish a consistent set of codes and standards for the project. The CVA review of the C&S hierarchy is formally hosted in the Design Basis Evaluation Report. At the time the DBE ER is forwarded to BSEE for assessment, the project will have progressed in the design and potential objections by BSEE could be inconvenient for the project. To de-risk the latter it is advisable to develop a Codes and Standards hierarchy for review by the CVA. Following the CVA’s

acceptance, a letter detailing the CVA review activities performed can be forwarded to BSEE for assessment together with the Project's C&S Hierarchy. This process will front load the BSEE assessment and learn about possible objections by BSEE that can then be remedied earlier in the process.

Further, based on DNV's experience, BSEE will require the developer/OEM to perform a gap analysis between the international codes and standards applied in the RNA/tower type/component certificate and the applicable US codes and standards. Tower is included here if this is part of the Type Certificate. In the event this is not the case this is covered by the scope of work in Section 3.1.5. This should be included as part of the C&S hierarchy as part of the RNA. The gap analysis shall identify US-specific issues such as hurricane conditions, and requirements to electrical systems to be considered, and is subject to review and approval by the CVA. This will require additional studies, for example arc flash studies, to be made and verified as part of the site-specific approval of the RNA and Tower (Sec. 3.1.4 & 3.1.5). Given the integration of the RNA and Tower, it is feasible to perform the gap analysis jointly for these two components.

In case of multi-contracting, the design basis may comprise three parts that together form the design basis for the project:

A	site conditions and general requirements
B	wind turbine specific requirements, including definition of design load cases and design wind parameters, load factors and turbine design methodology
C	structure-specific requirements, including interpretation of geotechnical and environmental (e.g. met-ocean) data for design, specification of design methodology including principles, procedure, materials and requirements for installation and commissioning and for operation and maintenance.

Deliverable

A satisfactory Project Design Basis evaluation is concluded with a Design Basis Evaluation report. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.3 Integrated Load Analysis – RNA and Support Structure

The purpose of the Integrated Load Analysis (ILA) is to examine whether the site-specific loads and load effects on the integrated wind turbine structure, including the RNA and Support Structure, are according to the SCA and DBE.

Please note that for RNA and Support Structure, the design loads are interdependent and cannot be decoupled. Further, the ILA should not be confused with the Independent Load Calculation (ILC), see below Sec. 3.1.3.1.

The load analyses shall be performed by the Project. The load analysis shall account for the complex structural dynamics and environmental conditions and shall as a minimum document the following:

a. the RNA and Support Structure shall be analyzed in accordance with the approved Design Load Cases (DLC) approved in the DBE
b. the wake effects from neighboring wind turbines shall be taken into account using the method described in the approved design basis
c. where relevant, the load cases shall be selected such that load cases are included that represent situations with low aerodynamic damping. Such cases may include misaligned wind directions, yaw error due to grid loss or malfunction of the control system
d. the loads and responses in the design reports shall be presented in a form that allows for design checks and verification
e. as part of the documentation the calculated time histories shall be supplied to DNV in a readable format.

f. the wave and wind loads should preferably be combined and applied to the calculation model to enable simulation in the time domain. The expected foundation stiffness variations due to soil and structural properties as well as water depth variations shall be considered in the calculations
g. the load cases shall be selected such that load cases are included that represent situations with low aerodynamic damping. Such cases may include misaligned wind and wave directions, yaw errors due to grid loss or malfunctions of the control system

The CVA shall perform its verification based on document review for completeness and compliance with the approved design basis. This review will be supplemented by an independent load calculation as detailed in Sec. 3.1.3.1.

3.1.3.1 Independent Load Calculation

The Independent Load Calculation (ILC) is performed with an independent fully integrated model of the RNA and support structure.

The ILC will be documented in a technical report which will be limited to document the support structure loads. The ILC will include the ILC loads also for the RNA loads and will be used as part of the RNA verification and is subject to confidentiality towards the RNA supplier.

The DNV ILC is used to support the review of the design loads submitted for verification by the OEM/designer and enhance the CVA's understanding of the load documentation. The ILC will be documented in a factual technical report, which upon successful completion of the load verification will be forwarded to the customer.

It is assumed that a single ILC for a selected position will be performed. However, depending on the base case selected for the specific project, and variations throughout the site in water depth, soil conditions, foundation diameter, and other parameters, it may be necessary to perform additional ILC's.

For the ILC DNV will make use of the HAWC2 or Bladed software. The HAWC2 and Bladed software programs are industry standard software for performing aero-elastic and hydrodynamic calculations of wind turbine response in time domain.

If the wind turbine is a standard turbine which has been analyzed during previous DNV type/component approvals, the structural model of the RNA should be ready for use, and only the support structures and the site-specific tower will need to be modified. The software and model validation of the RNA and the turbine controller software is performed as part of the type/component certification process.

It is assumed that the wind turbine OEM allows DNV to use the Aeroelastic model including controller used for the Type/Component certification for our independent analysis. Alternatively, a turbine description package (including the control and safety DLL file) for the machine for the Atlantic Shores project shall be provided to DNV. A minimum of four weeks is required by DNV to establish and validate the model prior to commencing the Independent Load Analysis.

Deliverables:

A satisfactory integrated load analysis is concluded with an Integrated Load Analysis Evaluation Report and an Independent Load Calculation Technical Report. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.4 Site-specific Rotor Nacelle-Assembly

The purpose of the Site-specific Rotor Nacelle Assembly (RNA) Design module is to demonstrate that the design of the RNA is in compliance with the project design basis and the approved Type Certificate.

The Site-specific RNA Design module documents site specific design changes which are not covered by the Type Certificate and as shall as a minimum:

a. external conditions assumed for the RNA design including the grid conditions
b. prove that the type certification design loads cover the verified project design loads
c. requirements for manufacturing
d. requirements for transportation and installation
e. requirements for operation and maintenance
f. specification for the interfaces between RNA and support structure
g. commissioning plan/ minimum functional and safety test plan
h. spill containment

The RNA shall be evaluated with respect to the specific project and site-specific conditions. The CVA shall perform its verification based on document review for completeness and compliance with the approved design basis. DNV shall also verify that a valid type certificate is in place. The certificate shall be valid at the date of issue of the statement of compliance for the design phase and may also be valid at the date of issue of the project certificate. The purpose of a valid type certificate is to implement an approved RNA design into the project. Therefore, design changes to the certified design shall be addressed.

The additional documentation requirements identified as part of the Gap analysis performed, shall be documented, and reviewed as part of this module. For example, the CVA would expect that a Arc-flash study be performed for the Project.

The site-specific module will also include the FDR as well as the FIR requirement. There is only limited site-specific verification activity related to these items as general fabrication and installation requirements are already verified as part of the Type/Component Certification. For provisional Type/Component certificates, the FIR requirements might result in pending conditions that need to be closed out as they are a part of 30 CFR 285 requirements.

Deliverable

A satisfactory Site-specific RNA design evaluation is concluded with a Site-specific RNA Design Evaluation Report. The evaluation report shall include a list of the verified reports provided by the Project.

Please note that the Site-specific RNA Design approval is assumed to include the RNA and Tower part of the Independent Load Analysis module. Hence, the Site-specific RNA Design Evaluation report is referenced in the ILA module as it covers the scope requirements for RNA and Tower of the ILA module.

3.1.5 Site-specific Tower

The purpose of the Site-specific Tower Design module is to demonstrate that the design of the Tower is in compliance with the project design basis.

The Site-specific Tower Evaluation will focus on the primary structure of the tower. The tower includes essential infrastructure for the RNA which is expected to be covered by Type/Component Certificate; in case this is not covered it can be performed on a project specific basis.

The Site-specific Tower Design module shall document as a minimum:

a. Tower design loads are within the results of the ILA
b. detailed design calculation reports for ULS, SLS, FLS and ALS
c. design drawings and manufacturing specifications with respect to requirements in standards, codes and with respect to assumptions in calculations regarding dimensions, materials, tolerances and testing
d. design of corrosion protection system

e. confirm design basis assumptions, e.g. material selection
f. design implementation of manufacturing and installation requirements, however only with respect to the structural integrity of the final installed (permanent) support structure
g. requirements for transportation and installation
h. requirements for operation and maintenance
i. personnel access
j. spill containment
k. lifting devices
l. commissioning plan/minimum functional and safety test plan

The verification encompasses the Primary structure. The verification of the Secondary structures is limited to its impact of the Primary Structure and the impact of primary steel deflections on secondary steel loading. Personnel safety will be reviewed against the requirements described in the projects' *Safety Management Plan* /3/. Environmental protection will be reviewed against requirements in the projects *Oil Spill Response Plan* /4/,

Deliverable

A satisfactory Site-specific Tower design evaluation is concluded with a Site-specific Tower Design Evaluation Report. The evaluation report shall include a list of the verified reports provided by the Project.

Please note that it is DNV's experience that the Site-specific RNA and Tower Evaluation reports facilitates the verification process. This is because the RNA and Tower documentation is almost solely produced by the turbine OEM and parts of the documentation will be supplied to the CVA under a non-disclosure agreement (NDA) between the CVA and the OEM limiting some documents from being disclosed to the Project, i.e. Lessee. Even if documentation covered by the NDA between the CVA an OEM and therefore not submitted to the Lessee, it still needs to be submitted to BOEM directly from the OEM as part of the FDR-FIR Project Submission.

3.1.6 Support Structure

The purpose of the Support Structure Design module is to demonstrate that the design of the Support Structure is in compliance with the project design basis.

The support structure (tower, substructure and foundation) design shall be evaluated for compliance with the approved project design basis as well as the standards listed therein.

Tower Integration

The tower evaluation is documented in the Site-specific Tower Design Evaluation Sec. 3.1.5. As the tower is part of the support structure the tower evaluation is referenced in this Support Structure Design Evaluation and consistency (interface) amongst documents are verified as part of integrating the tower evaluation into and completing the Support Structure Design evaluation report.

Substructure (Foundation) design evaluation

The Substructure Design module shall document as a minimum:

a. substructure design loads are within the results of the ILA
b. confirmation that stiffness and damping of the support structure are within the ILA
c. detailed structural design calculation reports for ULS, SLS, FLS and ALS (including boat impact by defined service vessel)
d. geotechnical calculation methods, stability and failure modes
e. detailed geotechnical design calculations for ULS, FLS, SLS and, if relevant, ALS
f. design documentation regarding soil preparation, tolerances and scour protection

g. design drawings and manufacturing specifications with respect to requirements in standards, codes and with respect to assumptions in calculations regarding dimensions, materials, tolerances and testing
h. design of corrosion protection system
i. confirm design basis assumptions, e.g. material selection
j. design implementation of manufacturing and installation requirements, however only with respect to the structural integrity of the final installed (permanent) support structure
k. requirements for transportation and installation
l. requirements for operation and maintenance
m. commissioning plan/ minimum functional and safety test plan
n. spill containment.

The verification encompasses the Primary structure. The verification of the Secondary structures is limited to its impact of the Primary Structure. The geotechnical and structural verification is the key part of this module. Additionally, the support structure requirements to the FIR are verified as part of this module.

The requirements to Operation & Maintenance (O&M) can be addressed by compiling the design assumptions to be maintained during the structure's lifetime in a document termed “Input to Operation and Maintenance Manual “. Though all this information is provided in the Design documentation, the compilation in a concise document will ensure that design assumptions are clearly communicated to the O&M organization when established and included in the O&M manuals.

Deliverable

A satisfactory Substructure Design evaluation is concluded with a Substructure Design Evaluation Report. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.7 Wind Turbine Generator Integration

The purpose of this module is to demonstrate that the Site-specific RNA Design Evaluation Report and Site-Specific Tower Evaluation Report is in compliance with the other now completed project modules.

When the Site-specific RNA Design Evaluation Report and Site-Specific Tower Evaluation Report are issued, it is likely that some of the referenced modules were close to, but not finally approved. This is unavoidable as the documents are interdependent and verified in separate evaluation reports, such as the Support Structure Design Evaluation.

The pending final approval of some documents from other modules are addressed through conditions in the Site-specific RNA and Tower evaluation reports. With the other evaluation reports now complete, the open conditions are then subject to verification in this final module.

Minor updates in documents are frequently seen in later phases of the verification where some module evaluation reports, and project documents, have been issued to the project and BSEE. This report can then be used to identify updates between document revisions and if possible, verify that that the updates do not influence the verifications previously performed. In such cases, we will document the updates made between design revisions and confirm why the verification of these updates do not affect the previously issued evaluation reports. This can eliminate the need for unnecessary updates of already issued evaluation reports and referenced customer documents.

Deliverable

A satisfactory Wind Turbine Generator Integration Design is concluded with a Wind Turbine Generator Integration Design Evaluation Report. Evaluation report shall include a list of the verified reports provided by the Project.

3.1.8 Offshore Substation (OSS)

Regulation affecting the design of OSS is found in 30 CFR 285 which also addresses the use of renewable energy on the OCS and the role of the CVA.

The CVA scope of work for the OSS will ensure that the installation will be designed, manufactured, and operated in compliance with 30 CFR 285. For safety related aspects, the CVA will review the project-specific design of the OSS and the overall safety functions. In reviewing the design of safety related systems and their interdependencies, compliance with the overall safety objectives will be ensured. More specifically, personnel safety will be reviewed against the requirements described in the projects' *Safety Management Plan* /3/. Environmental protection will be reviewed against requirements in the projects *Oil Spill Response Plan* /4/.

It is assumed that the conformance of underlying sub-systems and components with applicable codes is demonstrated by the provision of type approvals.

The proposed CVA scope of work does not include the type approvals and is limited to the verification of the system design. DNV will review the approvals and certificates for modules and sub-components of these systems to establish compliance of the entire design with the applicable requirements. This is described in more detail in section 3.1.8.5. The CVA activities towards the structural design are detailed in sections 3.1.8.3 and 3.1.8.4

30 CFR 285.702 stipulates that the Fabrication and Installation Report must demonstrate, among other things, that

- the projects facilities will be fabricated and installed in accordance with the design criteria identified in the Facility Design Report, and that
- responsibilities from 30 CFR 285.105(a) are maintained. These are, among others, to ensure to the extent practicable that the design of the project and all related activities are executed in manner that ensures safety and will not cause undue harm or damage to the environment.

To satisfy the FIR requirements outlined in Sec. 3, it is understood that the scope of the CVA needs to cover the relevant design aspects pertaining to the execution phase of the OSS. The overall safety level can be obtained by complying with the prescriptive requirements given in the design codes for structural design and equipment design, as applicable to the type of offshore installation. This is to be combined with a risk assessment that assures that all additional risks not covered by the prescriptive requirements are identified and mitigated to satisfactory safety level. This might be achieved by applying international codes for specific aspects of the design or by utilizing a performance-based approach using project specific criteria where no prescriptive requirements can be applied directly.

As far as practical, all work associated with the design, construction and operation of the offshore substation shall be such as to ensure that no single failure will lead to life threatening situations for any person or to unacceptable damage to the environment or the installation. Single failures shall include realistic sequences or combinations of failures that result from a single common cause.

To the understanding of DNV, this holistic approach needs to address the following aspects of the OSS design in order to ensure the required overall level of safety:

- structural design
- electrical design
- fire and explosion protection
- access and transfer design
- emergency response
- consideration of aspects of construction, in-service inspections and maintenance relevant for the design

A systematic review will be carried out for all phases to identify and evaluate that the consequences of single failures and series of failures have been addressed, and that necessary remedial measures have been planned for. The extent of the review or analysis shall reflect the criticality of the installation, the criticality of a planned operation, and previous experience with similar systems or operations. For this systematic review, typically a Hazard Identification Workshop (HAZID) will be performed. Based on the conceptual design of the OSS, potential hazards will be identified for different categories like structural of electrical hazards. The likelihood and severity of each identified hazard will be evaluated with respect to personal, environmental and economical implication.

During detail design verification, the performance of mitigation will be assessed, ensuring that all identified risks are addressed by checking the traceability from the identified risk towards the implementation of mitigation in the design.

3.1.8.1 Site Condition Assessment

The SCA for the OSS will be verified as described under section 3.1.1 of the scope of work. A separate SCA Evaluation Report will not be delivered, but will instead be incorporated into the Design Basis Verification Report as described in Sec. 3.1.8.2.

3.1.8.2 Design Basis Evaluation

The purpose of the project Design Basis Evaluation (DBE) is confirm that the Project has established the basic assumptions, specifications, methods, and requirements to safely design and execute the Project.

DNV will address the first 4 steps of the process shown in the figure 3 in the scope of the review of the Design Basis. The fifth step defines the scope of work for the review of the Design.

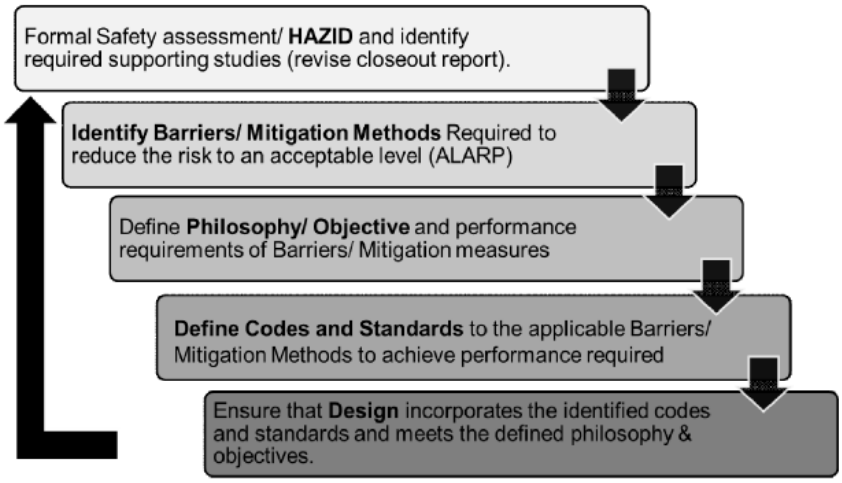

Figure 3: Five step process to risk based design

Activities:

During the review of the Design Basis, the following will be assessed:

a. standards, codes and requirements

b. design criteria

c. transport, installation, fabrication and commissioning requirements

d. operation and maintenance requirements.

The design of the integrated structure of the substation shall be based on the specific site conditions as well as the methods and principles applicable to OSS design. Design criteria shall be specified by establishing a Codes and Standards Hierarchy.

The documentation for the individual engineering disciplines shall include the safety philosophy, the main design methodology and information regarding design aspects and design parameters.

Input from Project:

- Design Basis/Brief for Topside and Support Structure. The documents shall cover the below items:
    - Environmental conditions (wind, waves, currents, ice, etc.). Principles and methods that shall be applied. Establishment of design parameters / load cases / acceptance criteria etc.
    - Overall platform philosophy, operation and manning assumptions including fire & safety principles
    - Platform substructure and topside general design, incl. implications for operation and maintenance and principles for load-out, sea transport and lift/installation.
    - Geotechnical Interpretive Report (GIR)
    - Applicable standards
- Design Basis/Brief for Topside Equipment. .

The documentation for the individual engineering disciplines shall include the following:

- safety philosophy
- main design methodology
- design aspects and design parameters.

Deliverable

A satisfactory Design Basis Evaluation for the OSS is concluded with a Design Basis Evaluation Report and will cover both the OSS Foundation and Topside. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.8.3 Design, Foundation - Primary and Secondary Structures

This covers verification of the design for the primary and secondary structures. Design verification of the secondary steel will focus on its impact of the primary steel structure. Please note that only load carrying structures will be reviewed.

Activities:

a. Design review and independent design analysis including:
    a. Review of Design calculations of primary structure for Ultimate Limit State (ULS), Fatigue Limit State (FLS) and Accidental Limit State (ALS, boat impact by defined service vessel)
    b. SLS will be evaluated with respect to foundation settlement and deflections. Furthermore, maximum overall foundation deflections will be evaluated to assure the intended distribution of loads between supported topside and the support structure.
    c. Review of Design drawings and fabrication specifications

d. Pile and piling documentation review
e. Review of fabrication methods - with respect to structural integrity
f. Review of Corrosion protection measures (painting specifications and cathodic protection), with a view to design life, standards and codes, maintenance
g. Independent analyses of support structure incl. grouted connection covering ULS and FLS in-place condition
h. Review of Eigenfrequency and vortex shedding analyses
i. impact of primary steel deflections on secondary steel loading
j. personnel access

b. Geotechnical design verification including assessment of:
    a. Review of calculation methods, stability and failure modes
    b. Geotechnical design calculations for ULS, SLS and ALS
    c. Design documentation regarding soil preparation, tolerances and scour protection
    d. Stiffness and damping of the support structures

c. Fabrication, Transportation, installation, operation and maintenance review, including:
    a. Schedules
    b. Fabrication information
    c. Installation process information
    d. Concept and procedures (relevant for design)
    e. Marine loads (load out, sea transportation, offshore lifting and installation)
    f. Relevant permits
    g. Environmental information

Input from Project:

- Load assumptions for in-place analysis and load-out, transportation, lift and installation
- Design documentation, drawings and specifications, overall O&M principles
- Permits

Deliverable

A satisfactory Design Evaluation for the OSS Foundation is concluded with a Design Evaluation Report. Please note that this Evaluation Report may be combined with the conclusions of Sec. 3.1.8.4 & 3.1.8.5, where each topic is covered by a separate appendix. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.8.4 Design: Topside Structure

This covers verification of the design for the primary and secondary structures. Design verification of the secondary steel will focus on its impact of the primary steel structure. Please note that only load carrying structures will be reviewed.

Activities:

- Design review, including:
    - Design calculations for Ultimate Limit State (ULS), Serviceability Limit State (SLS), Fatigue Limit State (FLS) and Accidental Limit State (ALS), e.g. for dropped objects
    - Review of Design drawings and fabrication specifications
    - Review of Fabrication methods - with respect to structural integrity
    - Corrosion protection measures, with a view to design life, standards and codes, maintenance

- Vortex shedding analyses
- personnel access
- spill containment
- lifting devices
- commissioning plan/minimum functional and safety test plan

Personnel safety will be reviewed against the requirements described in the projects' *Safety Management Plan* /3/. Environmental protection will be reviewed against requirements in the projects *Oil Spill Response Plan* /4/,

- Fabrication, Transportation, installation, operation and maintenance review, including:
  - Schedules
  - Fabrication information
  - Installation process information
  - Concept and procedures (relevant for design)
  - Marine loads (load out, sea transportation, offshore lifting and installation)
  - Relevant permits
  - Environmental information
  - Commissioning plan / minimum functional and safety test plan

Input from Project:

- Load assumptions for in-place analysis and load-out, transportation and installation
- Design documentation, drawings and specifications, overall O&M principles
- Permits

Deliverable

A satisfactory Design Evaluation for the OSS Topside is concluded with a Design Evaluation Report. Please note that this Evaluation Report may be combined with the conclusions of Sec. 3.1.8.3 & 3.1.8.5, where each topic is covered by a separate appendix. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.8.5 Design, Topside Equipment and Safety

In verifying the arrangement principles, it will be ensured that the layout and configuration of the installation is such that risks to persons on the platform are reduced to the lowest practicable level.
Furthermore, the design aspects with regards to safety of the installation will be reviewed during the verification of the design basis. The criteria need to satisfy the overall level of safety which is defined by the acceptance criteria for probability and severity of an undesired event. During verification of design and Fabrication, maintenance of these criteria will be accessed.

In the assessment of the platforms electrical design, DNV will assess that the electrical design objectives are met. DNV will verify the functional and operational requirements to establish an acceptable level of electrical safety during operation and maintenance and limits fire and explosion hazards.

The primary equipment (above LV distribution, e.g. main transformer and GIS) of the OSS is subject to the proposed certification scope insofar as aspects of technical safety are affected. Further performance criteria are not addressed.

The focus of the verification shall be on the safety of the installations as defined in the design basis. Risks having a severe effect on aspects of personal safety and/or structural integrity of the OSS, e.g. a transformer fire, shall be assessed for compliance with standards, codes and requirements specified in the hierarchy of standards.

The verification of the fire and explosion protection will assess the performance of the fire alarm system, and the design of the active and passive fire protection reviewing the following information:

a. fire protection philosophy and specification

b. fire zone layout

c. general arrangement of all rooms showing fire insulation and draught stops

d. fire integrity of walls and decks; insulation material specification and position; deck and surface coverings material specification and positions

e. ventilation system layout including dimensions and penetrations of ducts through fire divisions

f. fire pumps, fire mains, hydrants and hoses, deluge, sprinkler and spray systems, and other active fire protection systems

g. fixed fire detection and alarm systems in accommodation spaces, machinery spaces, and product storage spaces; specification and location of detectors, equipment alarms and call points; wiring diagrams.

As described above, the CVA will establish conformance of the design with the applicable criteria by focusing on the system level and ensure interaction of the sub-systems and components. The detailed design of underlying components is not subject to the verification. These components will be verified only by reviewing certificates. For the fire and explosion protection this applies to the following: penetrations of cables and pipes through fire walls, details of fire dampers, fire pumps, fire mains, hydrants and hoses, components of deluge, sprinkler and spray systems, and other active fire protection systems.

The CVA will verify the underlying safety philosophy and design principles of the access and transfer design. This will ensure that the adequate and effective facilities are provided with the safe docking or landing of vessels, equipment for safe transfer of personnel and cargo onto and on the installation and the rescue of injured personnel. DNV will review the design which is based on the access and transfer concepts. It will be assessed against the safety criteria and improved until the review is satisfactory.

DNV will review the design of facilities for safe and controlled emergency response during defined accidental events when personnel is present on the platform. This includes escape routes, rescue of injured personnel and the safe evacuation of the unit or installation.

DNVs assessment will identify whether performance criteria for emergency response are aligned with those defined in the formal safety assessment. An important consideration is the time required to escape, muster or evacuate taking into consideration human factors and casualties.

Platform layout and safety systems shall be evaluated with regard to hazard identification and safety for humans, the environment and the asset considering alarms and communications, shutdown, escape routes and muster areas and evacuation, rescue and recovery.

For the assessment of the selection of emergency response equipment it is assumed that the performance of this will be demonstrated by certificates for compliance with applicable standards.

The fabrication requirements, as well as the transport and installation documentation (e.g. installation manuals, method statements, drawings will be verified in during the verification of the FIR.

Input from Project:

- Design documentation, drawings, Single Line Diagrams (SLD), Piping & Instrumentation Diagrams (P&ID), Cause & Effect diagrams and specifications,
- Type approval documentation, or equivalent, for components and safety related sub-systems (e.g. for fire alarm system, components of the fire extinguishing system, e.g. nozzles, and components of passive fire protection, fire rated walls, including penetrations, etc.)

Deliverable

A satisfactory Design Evaluation for the OSS Topside Equipment and Safety is concluded with a Design Evaluation Report. Please note that this Evaluation Report may be combined with the conclusions of Sec. 3.1.8.3 & 3.1.8.4, where each topic is covered by a separate appendix. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.9 Power Cables (Inter Array and Offshore Export)

The power cables consist of Array Cables and Export Cables. The design of these two cable types are different, so that the design verification has to be performed for each of type of cable individually. Note that the verification of the export cable extends up to the cable termination at the landfall location even though this portion of the cable is in state not federal waters.

Design criteria for the Power Cables shall be specified by establishing a Codes and Standards Hierarchy. Where appropriate, and as outlined by the accepted codes and standards hierarchy, the power cables will be verified against US codes and standards.

3.1.9.1 Site Condition Assessment

The SCA for the cables will be verified as described under section 3.1.1 of the scope of work. A separate SCA Evaluation Report will not be delivered, but will instead be incorporated into the Design Basis Verification Report as described in section 3.1.9.2.

The SCA will focus on relevant for offshore subsea power cables and the interface at the turbines and OSS (top layer of the seabed), incl. soil types and potential burial requirements, sediment mobility, thermal conductivity, and possible cable route risks/obstructions (including Munitions and Explosives of Concern).

3.1.9.2 Design Basis Evaluation and Design Evaluation

The purpose of the project Design Basis Evaluation (DBE) is confirm that the Project has established the basic assumptions, specifications, methods, and requirements to safely design and execute the Project.

This design basis shall include documentation of the following and shall be subject to verification:

a. standards and requirements for cables and cable route(s)

b. design criteria

c. fabrication, transport, installation and commissioning requirements

d. operation and maintenance requirements

e. power cable type(s).

Deliverable

A satisfactory Project Design Basis evaluation for the Power Cables is concluded with a Design Basis Evaluation report. This report maybe combined to cover both the Export and Inter Array power cables or issued individually. The evaluation report shall include a list of the verified reports provided by the Project.

3.1.9.3 Design Evaluation

The purpose of the Design module is to demonstrate that the design of the Power Cables is in compliance with the Project design basis.

The design documentation for power cabling shall include documentation of the following and shall be subject to verification:

a. cable selection philosophy

b. cable sizing and specifications, including fire properties – where relevant – and certificate reference, if applicable

c. cable specifications, design and testing plan (incl. ampacity and thermal calculations)

d. cable interface at wind turbine or substation (including J-tubes or similar, if relevant), e.g. arrangements, layout, sizing, forces

e. landfall design, if applicable

f. cable routing sketch

g. cable route risks and burial assessment, including immediate vicinity of the turbine sub-structure, if relevant

h. burial strategy (incl. monitoring plan and verification of successful burial)

i. cable schedules

j. cable installation and fixing (incl. assessment of loads during installation)

k. operations and maintenance.

The focus is on the power cable installation parts such as:

- power cores and fibre optic elements
- cable joints
- cable route and protection (includes landfall)
- cable termination systems (interface at turbine / substation)
- hang-off and cable protection
- risers and fixation components.

Deliverable

A satisfactory Project Design evaluation for the Power Cables is concluded with a Design Basis Evaluation report. This report maybe combined to cover both the Export and Inter Array power cables or issued individually. The evaluation report shall include a list of the verified reports provided by the Project.

3.2 Onsite Fabrication Inspection

DNV will conduct fabrication surveillance to verify compliance between the approved design, the applicable fabrication requirements, and the asset under consideration: WTG (RNA and Tower), WTG substructure/foundation, OSS (substructure/foundation and Topside) and Power Cables (inter array and offshore export)

The onsite fabrication will comply with 30 CFR 285 especially clauses 708 and 709. DNV's surveillance work will be carried out using good engineering judgement and practice and will closely monitor the fabrication being conducted at the specified sites of appointed contractors and their suppliers. The focus of the surveillance activities is on structural fabrication and integration of safety systems. For the components used in these systems, e.g. control cabinets, pipes or nozzles for firefighting systems, compliance with national requirements will be ensured by checking accompanying certificates issued by nationally accepted/ accredited labs for these components.

For the purposes of the description below, fabrication surveillance is defined to comprise of the following steps:

- Hold Kick-off meeting – to make a plan including communication matrix
- Review submitted QA-QC documentation
- Perform initial audit, and discuss comments, if any, from QA-QC documentation reviews
- Perform periodic inspections
- Handle submitted TQ/NCR
- Preparation of final reporting (Evaluation Report)

It is assumed that DNV gets access to the relevant construction, fabrication and assembly sites and permissions required by suppliers will be provided to DNV by the developer or contractor.

The surveillance will be conducted at the fabricator's premises and includes

- review of fabrication / facilities
- review of quality management system, if ISO 9001 certificate is not available
- product related quality audits
- surveillance of contractor's quality assurance activities.
- periodic surveillance

The surveillance will be based on relevant standards together with design and fabrication documentation submitted to DNV. The following documentation shall be made available to DNV for the surveillance as relevant:

- workshop qualification (e.g. workshop approval)
- fabrication process mapping
- general arrangement drawings and specifications
- fabrication drawings, specifications and instructions
- Inspection and Test Plan (ITP)
- Project Quality Plan (PQP)
- welding procedure specifications and related welding procedure qualification records

- fabrication and erection procedures
- dimensional control procedures
- work procedures specification for NDT and corrosion protection
- inspection check sheets, NDT reports, and measurements reports
- certificates of personnel qualifications (e.g. for welding and NDT testing).
- repair procedures
- material quality control procedures
- traceability procedures
- production schedules
- Technical Queries (TQ) and Non-Conformance Reports (NCR), if any

Each surveillance will be documented in a detailed report including photo documentation whenever deemed necessary. It is assumed that photographic permissions required by suppliers shall be provided to DNV.

The surveyor will ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded, and acted upon. For this purpose, the CVA will review all forwarded non-conformity reports (NCRs) from fabrication. All NCRs impacting the certification process will be listed in the Fabrication and Installation Report. Furthermore, the CVA will carry out review of as-built documentation, including the projects NCR register. By this means it is assured that all deviations from verified design and codes and standards are captured in the verification.

The reporting format for the NCRs will cover:

- Description of non-conformity
- Root Cause Analysis
- Correction
- Corrective action (to assure against repeat recurrence)
- Close-out action

Fabrication surveillance includes document review, initial audits of project related components followed by periodic inspections. The purpose of the initial audit is to check the qualification of the fabrication company prior to commencement of production and to check the documentation forming the basis for production.

The proposed scope of the fabrication surveillance of the WTG (RNA and Tower) is detailed in sections 3.2.1 and 3.2.2 below and similarly for the WTG substructure/foundation in section 3.2.3 below. The proposed scope of the fabrications surveillance of the OSS (substructure /foundation and topside) is detailed in sections 3.2.4 and 3.2.5 below. The proposed scope for the fabrication surveillance of the Power Cables is detailed in section 3.2.6 below.

The extent and number of the inspections will be further evaluated by DNV closer to the start-up of the fabrication (after initial audits have been conducted). This will also depend on DNV's previous experience with the fabrication as well as the volume and severity of findings from the inspection work itself. The basic approach is to assume a 10% sample size when determining the appropriate number of surveillance visits. However, there are several assumptions behind these values as detailed in the sections above and the number of visits is subject to change depending on the actual project, fabrication and installation plans, as well as observed quality. Section 3.5 gives the expected number of audits and inspections.

Instances in which DNV would recommend increasing the level of inspection include:

- Lack of Quality Management System
- Observed lack of experience during initial inspections
- Repeated findings and repairs
- Introduction of new subcontractors

3.2.1 WTG RNA

Inputs

- Project Quality Plan (PQP)
- Inspection and Test plan (ITP)
- Other Quality Control and Quality Assurance documents
- Production schedules
- Approved design drawings and specifications
- Open conditions, if any, from earlier modules to be followed up in the fabrication phase.

Activities

The following components of the WTG RNA and the described processes will be covered in the fabrication surveillance, either by at site fabrication inspection, incoming goods inspection or as-built document review:

- rotor blades
- rotor hub
- rotor shaft and axle journal
- main bearing
- main bearing housing(s)
- gearbox
- generator
- transformer
- frequency converter
- high-voltage switchgear
- generator structures (direct drive only)
- main and generator frame
- hub assembly and test
- nacelle assembly and test.

The above list may be adjusted after review once further details of the WTG (RNA) fabrication become available.

The surveillance of the assembly of hub and nacelle is completed in the wind turbine fabrication assembly workshop. The surveillance is carried out on a random basis and will be focused on:

- compliance with quality plan requirements including status of quality control (including NCRs)
- visual inspection of units under assembly
- visual inspection of electrical installation
- documentation review (components certificates, production worksheets and final documentation).

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

Assumptions

To provide this scope of work, DNV utilized the following assumptions:

- One QA-QC documentation review (one review round) and an initial audit at the main manufacturer is assumed, implying that all work ongoing at each production and assembly site is covered under the quality management system of the RNA manufacturer.
- Two sites (inclusive production and assembly) are assumed, namely blade fabrication and RNA assembly. Periodic inspections throughout the start, mid, and end stages of the production process are assumed for each site. Section 3.5 gives the expected number of audits and inspections.
- It is assumed that sub-suppliers of turbine components will be well-known beforehand by DNV and have been validated under the Type Certification. Components from WTG sub-suppliers relevant for each site are addressed in the surveillance as inspection of incoming goods. It is further assumed that a serial production is running in all sites subject to inspection such that all witness points in the Inspection and Test Plan for one component can be seen in one visit. To the extent possible DNV will aim to minimize the re-inspection of non-structural, type-certified components
- All WTG sub-supplier sites have been validated under the type certification
- The Manufacture holds an ISO 9001 and EN 1090 or equivalent Certification.

3.2.2 WTG Tower

Inputs

- Project Quality Plan (PQP)
- Inspection and Test plan (ITP)
- Other Quality Control and Quality Assurance documents
- Production schedules
- Approved design drawings and specifications
- Open conditions, if any, from earlier modules to be followed up in the fabrication phase

Activities

The surveillance will be conducted and include on a random basis (10% sample size):

- compliance with quality plan requirements including status of quality control

- incoming goods inspection
- welding procedures specification (WPS)
- non-destructive testing procedures (NDT)
- welder's qualification
- material certificates and traceability
- dimensional control, tolerances and alignment (including flanges, flange flatness and control of flatness during any proposed weld repair)
- construction drawings (shop drawings) versus reviewed drawings (design drawings)
- visual inspection of on-going jobs
- witnessing of non-destructive testing and its documentation
- repair work
- painting
- visual inspection of finished sections before shipping
- personnel safety
- final documentation review.

Secondary steel (ladders, etc.) is not mandatory part of the fabrication surveillance, except in those instances where it impacts the primary steel. Personnel safety will be reviewed against the requirements described in the projects' *Safety Management Plan* /3/.

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

Assumptions

- Initially one QA-QC documentation review (one review round) and one initial audit followed by periodic inspections will be assumed throughout the start, mid, and end of production at the Manufacturer. Section 3.5 gives the expected number of audits and inspections.
- One manufacturer with one fabrication site for the towers is assumed
- The Manufacture holds an ISO 9001 and a welding approval or equivalent Certification.

3.2.3 WTG Substructure/ Foundation

Inputs

- Project Quality Plan (PQP)
- Inspection and Test plan (ITP)
- Other Quality Control and Quality assurance documents
- Production schedules

- Approved design drawings and specifications
- Open conditions, if any, from earlier modules to be followed up in the fabrication phase.

Activities

Surveillance of WTG Substructure/Foundation will be conducted on a random basis (10% sample size) and will focus on:

- compliance with quality plan requirements including status of quality control
- incoming goods inspection
- welding procedures specification (WPS) and welding procedures qualification (WPQ)
- welder qualifications
- non-destructive test procedures (NDT)
- NDT operator qualifications
- material certificates and traceability
- dimensional control, tolerances and alignment (including flanges, flange flatness and control of flatness during any proposed weld repair)
- construction drawings versus reviewed drawings
- visual inspection of on-going jobs
- repair work
- corrosion protection systems (inclusive splash zone)
- witnessing of non-destructive testing and review of its documentation
- visual inspection of finished structures before shipping
- final documentation review

Surveillance of secondary structures will consist of the main structural elements of the external platform and will be completed at the fabrication shop or at the fabricators' premises. The surveillance will be carried out on a random basis (10% sample size) and will focus on:

- compliance with quality plan requirements including status of quality control
- welding procedures specification (WPS) and welding procedures qualification (WPQ)
- welder qualifications
- non-destructive test procedures specification (NDT)
- NDT operator qualifications
- material certificates and traceability
- dimensional control, tolerances and alignment
- construction drawings versus reviewed drawings

- visual inspection of on-going jobs
- witnessing of non-destructive testing and its documentation
- visual inspection of finished structures before shipment
- final documentation review

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

Assumptions

- Initially one QA-QC documentation review (one review round) and one initial audit followed by periodic inspections will be assumed throughout the start, mid, and end of production at the Manufacturer. Section 3.5 gives the expected number of audits and inspections.
- Two sites are assumed, namely monopile and transition piece fabrication. Periodic inspections throughout the start, mid, and end stages of the production process are assumed for each site. Section 3.5 gives the expected number of audits and inspections.
- Inspections relating to secondary steel structures such as TP internal platforms are not included at this stage.
- The Manufacture holds an ISO 9001 and a welding approval or equivalent Certification.

3.2.4 OSS Substructure / Foundation

Inputs

- Project Quality Plan (PQP)
- Inspection and Test plan (ITP)
- Other Quality Control and Quality assurance documents
- Production schedules
- Approved design drawings and specifications
- Open conditions, if any, from earlier modules to be followed up in the fabrication phase.

Activities

Surveillance of OSS substructure/foundations will be conducted on a random basis, and will focus on:

- compliance with quality plan requirements including status of quality control
- incoming goods inspection
- welding procedures specification (WPS) and welding procedures qualification (WPQ)
- welder qualifications
- non-destructive test procedures specification (NDT)
- material certificates and traceability
- dimensional control, tolerances and alignment

- construction drawings versus reviewed drawings
- visual inspection of on-going jobs
- repair work
- corrosion protection systems (inclusive of splash zone)
- witnessing of non-destructive testing and review of its documentation
- visual inspection of finished structures before shipment
- final documentation review

Assumptions

- Initially one QA-QC documentation review (one review round) and one initial audit followed by periodic inspections will be assumed. Number and frequency of the periodic inspections shall be agreed per project spread across the start, mid, and end of production at the manufacturer is assumed. Section 3.5 gives the expected number of audits and inspections.
- Inspections relating to secondary steel structures are not included as this stage.
- The Manufacture holds an ISO 9001 and a welding approval or equivalent Certification.

3.2.5 OSS Topsides

Inputs

- Project Quality Plan (PQP)
- Inspection and Test plan (ITP)
- Quality Control and Quality assurance documents
- Production schedules
- Approved design drawings and specifications
- Fire-fighting, life-saving and escape-route general drawings
- Layout and arrangement of the topside equipment and systems.
- Open conditions, if any, from earlier modules to be followed up in the fabrication phase.

Activities

The surveillance of the Topsides will cover:

- compliance with quality plan requirements including status of quality control
- welding procedures specification (WPS) and welding procedures qualification (WPQ)
- welder qualifications
- non-destructive test procedure specification (NDT)

- NDT Operator qualification
- material certificates and traceability
- dimensional control, tolerances and alignment
- erection procedure (to guard against overstressing)
- construction drawings versus reviewed drawings
- visual inspection of on-going jobs
- witnessing of non-destructive testing and its documentation
- witnessing of installation and tests for mechanical completion and harbor acceptance test (HAT) of
    - electrical systems
    - fire insulation
    - fire-fighting appliances
    - fire detection
    - escape routes
    - life-saving arrangement and equipment
- visual inspection of finished sections before shipment
- final documentation review.

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

Assumptions

- Initially one QA-QC documentation review (one review round) and one initial audit followed by periodic inspections will be assumed. Number and frequency of the periodic inspections shall be agreed per project spread across the start, mid, and end of production at the manufacturer is assumed. Section 3.5 gives the expected number of audits and inspections.
- For the inspection of the HAT, five consecutive working days are assumed.
- The Manufacture holds an ISO 9001 and a welding approval or equivalent Certification.

3.2.6 Power Cables (Inter Array and Offshore Export)

Inputs

Relevant design information previously submitted to DNV will be used as input.

DNV will require evidence of valid type test records or type approval for the chosen cable design. Each survey is to be completed at the fabrication premises and the following types of documentation shall be made available for the surveillance:

- General arrangement drawings and specifications
- Fabrication drawings, specifications and instructions
- Inspection check sheets, test reports and measurement reports
- Other Quality Assurance and Quality Control documentation

- Certificates of personnel qualifications
- Open conditions, if any, from earlier modules to be followed up in the fabrication phase.

Activities

The fabrication surveillance of the cables will consist of documentation reviews, initial audits and followed by periodic inspections, and attendance at factory acceptance tests (FATs).

The surveillance of the fabrication will be conducted on a random basis and the surveyor will focus on:

- Incoming goods inspection
- Storage and handling of defective goods
- Stranding and armor welding procedures
- Application of factory joints
- Packaging and dispatch
- Attendance at cable FAT / Routine tests

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

Assumptions

- Initially a minimum of one audit, periodic inspections, and FAT (as appropriate) will be proposed for planning purposes: at start, mid, and end of production at each manufacturer. This applies for each the inter array cables and the offshore export cable. Section 3.5 gives the expected number of audits and inspections.
- The aim is to complete the surveillance of minimum 10% of produced cable lengths during the FAT, typically including high voltage withstand and partial discharge tests.
- In the event that the manufacturer does not hold a valid ISO 9001 certificate the number of surveillance visits to be completed by DNV may be increased to evaluate the quality management system.

3.3 Onsite Installation Inspection

3.3.1 General

DNV will conduct periodic surveillance of the transportation and installation to verify compliance between the approved design, the applicable transportation and installation requirements, and the asset under consideration: WTG (RNA and Tower), WTG substructure/foundation, OSS (substructure/foundation and Topside) and Power Cables (inter array and offshore export).

The transportation and installation surveillance will comply with 30 CFR 285 especially clauses 708, 709, and 710. DNV's surveillance work will be carried out using good engineering judgement and practice and will closely monitor on a periodic basis the transportation and installation activities being conducted by the appointed contractors and their suppliers.

The surveillance of the transportation and installation is defined to start with the loadout at the manufacturers' production sites and ends with the installation at the approved location offshore.

It is assumed that the developer or contractor will arrange for DNV to have access to the relevant sites, and will provide DNV with the permissions required by the appointed contractors.

The transportation and installation surveillance will be followed up by a detailed surveillance report. This surveillance report will include photo documentation whenever deemed necessary. It is assumed that the developer or contractor will arrange for DNV to have permissions required by contractors for on-site photography.

The proposed scope of the transportation and installation surveillance of the WTG (RNA and Tower) is detailed in section 3.3.2 below and similarly for the WTG substructure/foundation in section 3.3.3 below. The proposed scope of the transportation and installation surveillance of the OSS (Topside and substructure/ foundation) is detailed in section 3.3.4 below. The proposed scope for the transportation and installation surveillance of the Cable (inter array and offshore export) is detailed in section 3.3.5 below.

The extent and number of the inspections will be further evaluated by DNV closer to the start-up of the transportation and installation. This will also depend on DNV's previous experience with the contractor as well as the volume and severity of findings from the inspection work itself. The basic approach is to assume a 10% sample size when determining the appropriate number of surveillance visits. However, there are several assumptions behind these values as detailed in the sections above and the number of visits is subject to change depending on the actual project, fabrication and installation plans, as well as observed quality. Section 3.5 gives the expected number of visits.

3.3.2 WTG (RNA plus Tower)

Inputs

Prior to the transportation of the WTG (RNA plus Tower) to the wind farm, drawings, method statements for transportation and installation manuals including loading and unloading shall be issued for DNV review.

Relevant design information previously submitted to DNV will also be used as input. DNV also expects that open conditions, if any, from earlier modules to be followed up in the transportation and installation phase will be sufficiently addressed by the Project. Lastly, we also expect to receive Technical Queries (TQ) and Non-Conformance Reports (NCR), if any, in order to assess the need for additional DNV efforts.

Quality assurance and quality control procedures:

- welding procedure specifications and related welding procedure qualification records
- work procedures specification for NDT and corrosion protection
- inspection check sheets, NDT reports, and measurements reports
- certificates of personnel qualifications (e.g. for welding and NDT testing).

3.3.2.1 Transportation surveillance

Activities

The transportation surveillance will cover the surveillance of the handling of the WTGs (RNA plus Tower) including placement and sea fastening.

A DNV surveyor will be present during the first transportation and during other transportations randomly chosen among the remaining WTGs (RNA plus Tower). The need for further presence during transportation will be evaluated depending of the volume and severity of findings from the initial presence. Section 3.5 gives the expected number of visits.

In particular the surveyor will focus on the following:

- surveillance of lifting, skidding operations during loading
- surveillance of welding of fastening to structure.

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

The sea transport (towing operation) manual shall cover all relevant procedures and limiting conditions and will be reviewed by DNV.

During the surveillance, the surveyor will focus on the following:

- review of transportation (towing operation) records
- surveillance for damage prior to cutting of fastening

If welding is to be performed for transportation, the following will be subject to inspection:

- surveillance of preparation for welding including correct use of materials, fit up, weather protection
- surveillance of welding performance including adherence to welding procedures, preheating, tack welding, welding, post weld heat treatment, weld repairs
- surveillance of NDT activities including performance of NDT, verification of results and of the extent of the NDT.

For bolted connections the focus during the surveillance shall be on:

- surveillance of fit-up
- bolt pre-tensioning.

3.3.2.2 Installation surveillance

A DNV surveyor will be present during installation of the first WTG (RNA plus Tower) and during other installations randomly chosen among the remaining WTGs (RNA plus Towers). Section 3.5 gives the expected number of visits. The need for further presence during the installation will be evaluated depending of the volume and severity of findings. The surveyor will focus on the following:

- surveillance of lifting, skidding operations during installation as relevant
- surveillance of installation
- surveillance for damage after the cutting of the sea-fastenings

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

When welding is performed, the following shall be subject to inspection:

- preparation for welding including correct use of materials, fit up, weather protection
- welding performance including adherence to welding procedures, preheating, tack welding, welding, post weld heat treatment, weld repairs
- NDT activities including performance of NDT, verification of results and of the extent of the NDT.

For bolted connections the focus during the surveillance shall be on:

- surveillance of fit-up

- flange gapping
- bolt pre-tensioning.
- commisioning procedures/ minimum functional and safety tests

The final as-built documentation shall be issued for DNV review. The review shall focus on general deviations from approved design in order to verify that the design is still sufficient.

3.3.3 WTG Substructure/ Foundations

Inputs

Prior to the transportation of the WTG substructure/foundations (substructure) to the wind farm, method statements for transportation and installation manuals including loading and unloading shall be issued for DNV review. Relevant design information previously submitted to DNV will also be used as input. DNV also expects that open conditions, if any, from earlier modules to be followed up in the transportation and installation phase will be sufficiently addressed by the Project. Lastly, we also expect to receive Technical Queries (TQ) and Non-Conformance Reports (NCR), if any, in order to assess the need for additional DNV efforts.

3.3.3.1 Transportation surveillance

Activities

The transportation surveillance will cover the surveillance of the handling of the WTGs (substructure/ foundations) including laying and fastening.

A DNV project certification surveyor will be present during the first transportation and during other transportations randomly chosen among the remaining WTGs (substructure/foundations). Section 3.5 gives the expected number of visits. The need for further presence during transportation will be evaluated depending of the volume and severity of findings from the initial presence.

In particular the surveyor will focus on the following:

- surveillance of lifting, upending, skidding operations during loading as relevant
- surveillance of welding of fastening to structure.

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

The sea transport (towing operation) manual shall cover all relevant procedures and limiting conditions, and shall be approved by DNV.

During the surveillance, the surveyor will focus on the following:

- review of transportation (towing operation) records
- surveillance for damage prior to cutting of fastening

If welding is to be performed for transportation, the following will be subject to inspection:

- surveillance of preparation for welding including correct use of materials, fit up, weather protection

- surveillance of welding performance including adherence to welding procedures, preheating, tack welding, welding, post weld heat treatment, weld repairs
- surveillance of NDT activities including performance of NDT, verification of results and of the extent of the NDT.

For bolted connections the focus during the surveillance shall be on:

- surveillance of fit-up
- flange gapping
- bolt pre-tensioning.

3.3.3.2 Installation surveillance

Activities

A DNV surveyor will be present during installation of the first WTG (substructure/foundation) and during other installations randomly chosen among the remaining WTGs (substructure/ foundations). Section 3.5 gives the expected number of visits. The need for further presence during the installation will be evaluated depending of the volume and severity of findings. The surveyor will focus on the following:

- surveillance of lifting, upending, skidding operations during installation as relevant
- surveillance of installation and testing of grouting system
- design-actual comparison installation coordinates for the foundations
- surveillance for damage after the cutting of the sea-fastenings

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

When welding is performed, the following shall be subject to inspection:

- preparation for welding including correct use of materials, fit up, weather protection
- welding performance including adherence to welding procedures, preheating, tack welding, welding, post weld heat treatment, weld repairs
- NDT activities including performance of NDT, verification of results and of the extent of the NDT.

For bolted connections the focus during the surveillance shall be on:

- surveillance of fit-up
- bolt pre-tensioning.

The final as-built documentation shall be issued for DNV review. The review shall focus on items such as (if relevant) the following in order to verify that the design is still sufficient:

- pile driving records (for monopiles)
- 28-day grout strength (for grouted MP/TP or TP/Tower connections)
- bolt tension measurements (for bolted MP/TP or TP/Tower connections)
- flange levelness
- temporary navigation aids if required

- temporary weathering for overwintering if required
- general deviations from approved design.

3.3.4 OSS

Inputs

Prior to the transportation of the OSS (topside and substructure/foundation) to the wind farm, method statements for transportation and installation manuals including loading and unloading shall be issued for DNV review. Relevant design information previously submitted to DNV will also be used as input. DNV also expects that open conditions, if any, from earlier modules to be followed up in the transportation and installation phase will be sufficiently addressed by the Project. Lastly, we also expect to receive Technical Queries (TQ) and Non-Conformance Reports (NCR), if any, in order to assess the need for additional DNV efforts.

Quality assurance and quality control procedures:

- welding procedure specifications and related welding procedure qualification records
- work procedures specification for NDT and corrosion protection
- inspection check sheets, NDT reports, and measurements reports
- certificates of personnel qualifications (e.g. for welding and NDT testing).

3.3.4.1 Transportation surveillance

Activities

The transportation surveillance will cover the surveillance of the handling of the OSS (Topside and substructure/foundation) including placement, laying and fastening.

A DNV surveyor will be present during the transportation the OSS and the same for the substructure/foundations. Section 3.5 gives the expected number of visits.

In particular the surveyor will focus on the following:

- surveillance of lifting, upending, and skidding operations during loading as relevant
- surveillance of welding of fastening to structure.

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

The sea transport (towing operation) manual shall cover all relevant procedures and limiting conditions, and shall be approved by DNV.

During the surveillance, the surveyor will also focus on the following:

- review of transportation (towing operation) records
- surveillance for damage prior to cutting of fastening

If welding is to be performed for transportation, the following will be subject to inspection:

- surveillance of preparation for welding including correct use of materials, fit up, weather protection

- surveillance of welding performance including adherence to welding procedures, preheating, tack welding, welding, post weld heat treatment, weld repairs
- surveillance of NDT activities including performance of NDT, verification of results and of the extent of the NDT.

For bolted connections the focus during the surveillance shall be on:

- surveillance of fit-up
- bolt pre-tensioning

3.3.4.2 Installation surveillance

Activities

A DNV surveyor will be present during the installation of the OSS topside and substructure/ foundation. Section 3.5 gives the expected number of visits.

The surveyor will focus on the following:

- surveillance of lifting, upending, skidding operations during installation as relevant
- surveillance of installation and testing of grouting system, as relevant
- design-actual comparison installation coordinates for foundation
- surveillance for damage after the cutting of the sea-fastenings

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

When welding is performed, the following shall be subject to inspection:

- preparation for welding including correct use of materials, fit up, weather protection
- welding performance including adherence to welding procedures, preheating, tack welding, welding, post weld heat treatment, weld repairs
- NDT activities including performance of NDT, verification of results and of the extent of the NDT.

For bolted connections the focus during the surveillance shall be on:

- surveillance of fit-up
- bolt pre-tensioning.

The final as-built documentation shall be issued for DNV review. The review shall focus on items such as the following (if relevant) in order to verify that the design is still sufficient:

- pile driving records
- 28-day grout strength
- general deviations from approved design.

3.3.5 Power cables (Inter Array and Offshore Export)

Transportation and installation surveillance of the cables (array and export) will be carried out to verify compliance between the approved method statements and the works conducted.

Inputs

Prior to the transportation and installation of the cables (array and export) method statements for transportation and installation manuals including loading and unloading shall be issued for DNV review. Relevant design information previously submitted to DNV will also be used as input. DNV also expects that open conditions, if any, from earlier modules to be followed up in the transportation and installation phase will be sufficiently addressed by the Project. Lastly, we also expect to receive Technical Queries (TQ) and Non-Conformance Reports (NCR), if any, in order to assess the need for additional DNV efforts.
Transportation and Installation schedules.

Activities

The surveillance (documentation review and inspection) of the transportation and installation will cover:

- Review of documentation and offshore processes related to cable storage, load-out and transport
- Review of cable laying method and testing
- Review of cable pull-in method at offshore and landfall (export cable)
- Review of cable burial method, including burial tools and their characteristics
- Review of cable jointing method
- Inspection during cable laying activities
- Inspection during cable burial activities
- Inspection during cable pull-in at WTG and OSS
- Inspection to onshore cable termination site (export cable)

The surveyor will also ascertain that non-conformities and deviations from the verified design, drawings and procedures are identified, recorded and acted upon.

The surveyor will be present during the first installation and during one other installation (array and export separately) randomly chosen from the remaining cable lengths. Section 3.5 gives the expected number of visits. However, the final number of installations to be attended by the surveyor may be larger depending on the project details as these become available. The minimum aim is to be present during 10% of the transportation and 10% of the installation of each cable type.

The final as-built documentation shall be issued for DNV review.

3.4 Commissioning

3.4.1 General

The aim of the Commissioning Surveillance is to evaluate that the commissioning of the project's wind turbines conforms to the instructions supplied by the manufacturer. As minimum the following activities must be performed:

a. assessment of the commissioning manual
b. commissioning surveillance
c. inspection of installations and review of commissioning records.

During commissioning, the extent of DNV's Scope of Work shall focus on functional witnessing of the safety critical systems and DNV will only be present for the commissioning (demonstration of functionality) of those systems. The extent of the DNV's physical attendance during commissioning will be limited to commissioning of one complete wind

turbine at the start of commissioning. The verification of commissioning of the remaining wind turbines will be performed through review of commissioning records for a predefined number of selected turbines.

Inputs

Prior to commissioning checklists, commissioning manuals and post-commissioning records shall be issued for DNV review. Relevant design information previously submitted to DNV will also be used as input. DNV also expects that open conditions, if any, from earlier modules to be followed up in the commissioning phase will be sufficiently addressed by the Project. Lastly, we also expect to receive Technical Queries (TQ) and Non-Conformance Reports (NCR), if any, in order to assess the need for additional DNV efforts.

3.4.2 WTGs

Activities

A DNV surveyor will be present during the commissioning of the WTGs. A DNV surveyor will be present during commissioning of the first WTG and during other commissioning randomly chosen among the remaining WTGs. Section 3.5 gives the expected number of visits. The following procedures are to be witnessed by DNV or tested in presence of the attending surveyor:

- Commissioning procedures supplied by the manufacturer
- Starting and stopping routines of the wind turbine in automatic and manual mode
- Checking of the control system software version and settings
- Function test of all components of the protection system
- Safe shutdown
- Safe emergency shutdown
- Safe shutdown from over-speed or a representative simulation of such shutdown
- Automatic start-up and operation of wind turbine.
- Test of the emergency lighting
- Test of emergency power supply
- Behavior at grid loss
- Test of firefighting systems (if relevant)
- Visual inspection of the entire installation (including fall protection)
- Safety equipment including navigational aids
- Remote monitoring systems
- The wind turbines shall undergo an inspection of the entire wind turbine. This inspection shall be performed after the commissioning has been carried out.

Deliverable

A satisfactory Commissioning evaluation is concluded with a Commissioning Evaluation Report. The evaluation report shall include a list of the verified reports provided by the Project.

3.4.3 Offshore Substation

Activities

A DNV surveyor will be present during the commissioning of the OSS. Section 3.5 gives the expected number of visits. The following procedures are to be witnessed by DNV or tested in presence of the attending surveyor:

- Test of the emergency lighting
- Test of emergency power supply
- Behavior at grid loss
- Test of firefighting systems
- Visual inspection of the entire installation (including fall protection)
- Safety equipment including navigational aids
- Remote monitoring systems
- Test operation of ballast system and bilge pumps, if applicable

Deliverable

A satisfactory Commissioning evaluation is concluded with a Commissioning Evaluation Report. The evaluation report shall include a list of the verified reports provided by the Project.

3.4.4 Power Cables (Array and Export)

Subsea cables and fiber optic elements shall subsequently be commissioned after successful laying and installation. Fixation, testing and termination works shall be carried before the cables will be put into operation. Site Acceptance test reports will form the input that shall be reviewed by CVA.

3.5 CVA surveillance visits – summary

Tables 2 through 4 below provide a summary of the overall assumed inspection plans considering 89 wind turbines and 2 offshore substations . The basic approach is to assume a 10% sample size when determining the appropriate number of surveillance visits. However, there are several assumptions behind these values as detailed in the sections above and the number of visits is subject to change depending on the actual project, fabrication and installation plans, as well as observed quality. The minimum number of audits and inspections shall be discussed and agreed with the Project and BSEE prior to commencement.

Table 2: Fabrication Phase Inspections (estimated minimum)

Module	Initial Audits	Periodic Inspections
WTG RNA	2	18
WTG Tower	1	9
WTG Substructure / Foundation	2	18
OSS Substructure/Foundation	1	20
OSS Topside	1	30

Cables (array and export)	2	10

Table 3: Installation Phase Inspections (estimated minimum)

Module	Loadout / Transfer	Installation – Offshore
WTG RNA & Tower	2	9
WTG Substructure / Found.	2	9
OSS Foundation & Topside	4	12
Cables (array and export)	4	20

Table 4: Commissioning Inspections (estimated minimum)

Module	
WTG Commissioning	4
OSS Commissioning	4

3.6 CVA Deliverables

The verification process will be based on review of the project documentation where comments raised by the CVA will be documented by Verification Comment Sheets (VCS), supplemented by follow-up telephone calls, TEAMS/Zoom/Skype and physical meetings when required. All responses and updates to the documentation will be tracked by subsequent revisions of the VCS, allowing for traceability of the verification process and ultimately the acceptance of the project documentation.

Upon successful completion of an individual module, for example the WTG Design Basis Evaluation, the corresponding Statement of Compliance and accompanying Evaluation Report are then issued. This process continues until modules are closed out. Further, section 3 describes how the CVA deliverables such as FDR, FIR reporting requirements are met through these deliverables. An approach that has been approved by BOEM on earlier projects. Deviations from the formal requirements of 30 CFR 285, such as splitting the FDR, shall be discussed, and approved by BOEM, formally through a Departure Request (30 CFR 285.103).

In addition to the evaluation reports, each submittal will be accompanied by an interface FDR/FIR letter. The purpose of this letter is to:

- summarize the status of the project deliverables
- provide an opportunity to highlight items of interest
- provide an executive summary of the conclusions reported in the evaluation report
- document who did the work and when
- facilitate documentation of our Professional Engineering (P.E.) supervision

This letter will be updated with each deliverable and will ultimately culminate with our acceptance of the FDR and FIR. Table 5 below provides a complete summary of the final CVA deliverables for the Design Phase. Please note that several of these deliverables could be combined, e.g. Inter Array and Export design certificates, depending on the project schedule.

Support Structure Design Evaluation (SSDE)

Table 5: Design Phase Deliverables

Module	Evaluation Report	Statement of Compliance
Site Conditions Assessment (SCA)	X	X
Design Basis Evaluation (DBE)	X	X
Integrated Load Analysis (ILA)	X	X
Site-specific Rotor Nacelle Assembly Design Evaluation	X	X
Site-specific Tower Design Evaluation	X	X
Support Structure Design Evaluation (SSDE)	X	X
Wind Turbine Generator Integration Design Evaluation	X	X
WTG Independent Load calculation (ILC Factual Report)	X	N/A
OSS Design Basis	X	X
OSS Support Structure & Topside Design Evaluation	X	X
OSS Independent Load calculation (ILC Factual report)	X	N/A
Inter Array Design Basis	X	X
Inter Array Design Evaluation	X	X
Export Design Basis	X	X
Export Design Evaluation	X	X

With respect to the execution phase, the CVA will utilize the following deliverables.

- Surveillance report per visit for both fabrication and installation
- Once the surveillance has been satisfactorily completed, the CVA will certify in a report that the fabrication/installation was executed in accordance with good engineering practices and the applicable standards, the COP, the approved FDR and FIR.
- Statement of Compliance for the corresponding fabrication/installation module.

In addition, for the OSS, an onshore site acceptance test (SAT), will also be provided.

Tables 6 through 8 below provide a summary of Fabrication, Installation, and Commissioning Phase deliverables.

Table 6: Fabrication Phase Deliverables

Module	Surveillance Report(s)	Evaluation Report	Statement of Compliance
WTG (RNA & Tower)	X	X	X
WTG Substructure / Foundation	X	X	X
OSS Substructure / Foundation & Topside	X	X	X
Cables (array and export)	X	X	X

Table 7: Installation Phase Deliverables

Module	Surveillance Report(s)	Evaluation Report	Statement of Compliance
WTG (RNA & Tower)	X	X	X
WTG Substructure / Foundation	X	X	X
OSS Substructure / Foundation & Topside	X	X	X
Cables (array and export)	X	X	X

Table 8: Commissioning Phase Deliverables

Module	Surveillance Report(s)	Evaluation Report	Statement of Compliance
WTG Commissioning	X	X	X
OSS Commissioning	X	X	X

In addition to the deliverables outlined above, DNV will also ensure that BOEM is notified regarding “all incidents that affect the design, fabrication, and installation of the project or its components”, in accordance with 30 CFR 285.705(a)(3). DNV will utilize a letter format together with attachments, as necessary, to report the incident to BOEM.

4 DNV MANAGEMENT SYSTEM

The DNV Management System is an integrated quality, HSE (health, safety and environment) and business administration management system.

DNV's Management System is certified to ISO 9001, ISO 14001, ISO 27001 and ISO 45001. There is one ISO 9001 certificate for each of DNV's business areas, while Group wide certificates apply for the ISO 14001, ISO 27001 and ISO 45001 certification.

All certificates are issued by the Dutch accredited certification body DEKRA Certification B.V. in Appendix B.

A description of DNV's quality and HSE policy and Management System is provided in Appendix A.

5 REFERENCES

This proposal has been developed on the basis of the documents referenced in the table below.

/1/ Request for Proposal (RFP) for Project 2 Certified Verification Agent (CVA):
Part 1 – RFP Process and Instruction / ASOW-363-RFP-01, 2022-07-13.

/2/ DNV / CVA Statement of Qualification – Atlantic Shores Project 2
Doc. 236143_0_ASOW2_QUAL_SPE_COP_2022-08-19.

/3/ HSSE Safety Management System Atlantic Shores Offshore Wind. To be reviewed and approved by BOEM/BSEE as part of the COP approval process, doc. No. to be established.

/4/ Oil Spill Response Plan for Atlantic Shores Offshore Wind, LLC. Appendix I-D in COP South as submitted to BOEM.

APPENDIX A
DNV Management System

General

The DNV Management System (DMS) documents are sorted under 17 strategic areas as an index for the management system. The DMS seeks to be independent of the organisational structure, and able to show the main processes of the company.

The management system documentation consists of:

- The DMS – DNV's Management System documentation. This is a 2-tier system. The top tier is owned, issued and maintained at DNV Group level and is valid for all in DNV. The ownership of the various groups of strategic areas has been assigned to DNV Group directors, to ensure anchoring with top management, focus and development.
- The second tier is owned, issued and maintained at DNV Business Area level and is valid for all in the respective DNV Business Area.
- Local Operating Procedures (OPs) which are specific for an operating unit, or part of the line organisation, i.e. Regional OPs.
- Country specific OPs which are valid for a country, typically covering employment items and general compliance with national legislation.

All management system documentation is available to all employees on the DNV Intranet.

DNV monitors, measures and improves the effectiveness of its management system on a continuous basis where opportunities for improvement are identified through internal and external audits, experience feedback, after-action reviews and, most importantly, through dialogue with and feedback received from our customers. The annual Management System Review is an important instrument in this regard.

DNV has a common tool for follow-up of all events such as audits, non-conformities, complaints and potential quality issues called Quality Event Tracker - QET. All quality events shall be registered in QET. QET facilitates the use of root cause analysis and ensures that events are handled and closed after proper actions have been taken.

Quality

DMSG-12-0 Quality Policy

DNV's ambition is to have a leading position in all industries where we operate whilst never compromising on integrity and quality.

We commit ourselves to:

- Deliver in accordance with stakeholders' expectations
- Continually improve our performance

This is achieved through:

- Serving our customers with a high degree of pro-activeness and responsiveness
- Complying with applicable standards and regulations
- Continually improving our services
- Continually improving our management system
- Continually investing in research and innovation

- Striving to be at the forefront of technology
- Striving to attract, develop and retain leading competence

Quality Management System

The strategic areas most important in relation to quality of customer-facing activities and project deliverables are:

- Customer management
- Service lines
- Production
- Innovation, research and development
- IT and information management
- Quality and management system

Under the strategic area Production there are governing documents addressing:

- Project management
- Internal verification of project work and approval of deliverables
- Performance of various categories of services
- Requirements to certain types of deliverable documents
- Competence management and requirements

Further document types are:

- DNV Service Specifications
- Internal Service Instructions
- Internal Service Guidelines

Quality Management System Certificate

The ISO 9001:2015 certificate is enclosed below.

Health, Safety and Environment (HSE)

HSE Policy

- We know that our work is never so urgent or important that we cannot take time to do it safely. We feel confident and empowered to stop work and to intervene where inappropriate behaviour or unacceptable conditions are encountered.
- We identify and assess risks to the health and safety of people, property or the environment in our work. We ensure they are effectively managed and that areas for improvement are prioritised.
- We foster a culture where everyone is actively involved in setting a good example and pursuing, adopting and sharing good HSE practice.
- We develop, resource and implement HSE plans to deliver continual improvement in HSE performance. We openly report and appraise our HSE performance and measure our achievements against our plans and goals and take action to address shortcomings.
- We treat incidents including near misses and hazards and feedback from employees and customers as an important learning opportunity.
- We select our sub-contractors and suppliers based on their ability to provide services which meet our safety, health and environmental requirements.

- We work to the principles of the UN's Global Compact and participate in the World Business Council for Sustainable Development.
- We will visibly demonstrate leadership and commitment to high standards of health, safety and environmental performance.

HSE Management System

HSE is a separate strategic area, under which there are governing documents addressing:

- Environment aspects identification and management
- Emergency preparedness
- Implementation support and control processes, e.g. HSE risk assessment, HSE audits, incident reporting and investigation
- Health and Safety e.g. occupational health, substance abuse, field work, laboratory and test site, travelling and driving
- HSE Performance reporting and Management System Review

HSE Management System Certificates

DNV Management System.

The ISO 14001:2015 and ISO 45001:2018 certificates are enclosed below.

Information Security Management

Information Security Policy

- We know that our work is never so urgent or important that we cannot take time to do it safely. We feel confident and empowered to stop work and to intervene where inappropriate behaviour or unacceptable conditions are encountered.
- Have a holistic and integrated information security perspective across silos in everything we do.
- Have a risk-based approach to information security and prioritize resources accordingly.
- Assign ownership of critical business environments, processes, applications (including supporting systems/networks) and information to capable individuals, to achieve individual accountability for information and systems, and give their owners a stake in their protection.
- Have a group-wide information classification scheme, based on the confidentiality of information, to ensure that information is protected in line with its assigned level of classification.
- Protect personal data from unintentional disclosure, to prevent inappropriate use and ensure compliance with personal data protection, legal and regulatory requirements.
- Have processes in place to identify, report, and resolve information security incidents quickly and effectively, to minimize their business impact and reduce the risk of similar incidents occurring.
- Protect critical facilities against accidents, attacks or unauthorized physical access, to restrict access to authorized individuals, ensure that critical equipment is available when required and to prevent important services from being disrupted by loss of, or damage to, equipment or facilities.
- Creating a culture where security behavior is embedded, where all relevant individuals make effective risk-based decisions and protect critical and sensitive information from being compromised, by providing mandatory security awareness training to all DNV employees, sub-contractors/ non-employees who have access to VerIT

platforms and sub-contractors/ non- employees with no VerIT access and no information security policies of their own, but who have access to sensitive information.

- Configure all information systems and networks correctly and securely, and keep them updated, to ensure that they operate as intended and do not compromise security requirements.
- Develop and deploy information systems in accordance with a documented information system development methodology, to ensure that information systems (including those under development) meet business and information security requirements.
- Protect business critical information systems and networks, to ensure cyber security and thereby ensure availability, reduce the likelihood of information system disruptions, provide resilience against disruption, and minimize impact to the organization in the event of a disaster or emergency.
- Implement controls on information running over networks, to protect sensitive information in transit.
- Protect the exchange of information through all types of electronic communication, to ensure that we can interact securely with all stakeholders.
- Have enterprise-wide identity and access management arrangements that provide effective and consistent user administration, identification, authentication, and access control mechanisms, to restrict information system access to authorized users and protect the integrity of important user information.
- Have arrangements for detection of malware, to protect DNV against malicious software, to detect malicious intrusions and enable us to respond to malware infection within critical timescales.

Information Management System Certificate

DNV Management System.

The ISO 27001:2013 certificate is enclosed below.

DNV

DEKRA

CERTIFICATE

Number: 2169389

The management system of the organizations and locations mentioned on the addendum belonging to:

DNV AS
Business Area Energy Systems

Veritasveien 1
1363 Høvik
Norway

including the implementation meets the requirements of the standard:

ISO 9001:2015

Scope:
Provision of advisory and testing services across the energy systems value chain, for renewable power and oil & gas production, energy transport, power transmission & distribution and energy use, including the development of software, monitoring systems and digital platforms.

Certificate expiry date: 1 January 2024
Certificate effective date: 9 April 2021
Certified since*: 1 January 2015

This certificate is valid for the organizations and locations mentioned on the addendum.

DEKRA Certification B.V.

B.T.M. Holtus
Managing Director

R.C. Verhagen
Certification Manager

MGMT.SYS RvAC 013

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem, The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.nl Company registration 09085396

CERTIFICATE

Number: 2213711

The environmental management system of the organizations and locations mentioned on the addendum belonging to:

DNV AS

Veritasveien 1
1363 Høvik
Norway

including the implementation meets the requirements of the standard:

ISO 14001:2015

Scope:
Risk Management, Verification, Advisory, Certification (excluding Management System Certification), Laboratory Testing, Product Inspection, Systems Assessment, Independent Technical and Engineering Services, Development of Software systems, Delivery of Training.

Certificate expiry date: 25 September 2023
Certificate effective date: 26 May 2021
Certified since*: 25 September 2014

This certificate is valid for the organizations and locations mentioned on the addendum.

DEKRA Certification B.V.

B.T.M. Holtus
Managing Director

R.C. Verhagen
Certification Manager

* against this certifiable standard / possibly by another certification body

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem, The Netherlands
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DNV

DEKRA

CERTIFICATE

Number: 2213712

The management system of the organizations and locations mentioned on the addendum belonging to:

DNV AS

Veritasveien 1
1363 Høvik
Norway

including the implementation meets the requirements of the standard:

ISO 45001:2018

Scope:
Risk Management, Verification, Advisory, Certification (excluding Management System Certification), Laboratory Testing, Product Inspection, Systems Assessment, Independent Technical and Engineering Services, Development of Software systems, Delivery of Training.

Certificate expiry date: 25 September 2023
Certificate effective date: 26 May 2021
Certified since*: 25 September 2014

This certificate is valid for the organizations and locations mentioned on the addendum.

DEKRA Certification B.V.

B.T.M. Holtus
Managing Director

R.C. Verhagen
Certification Manager

* against this certifiable standard / possibly by another certification body

MGMT.SYS RvA C 013

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem, The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.nl Company registration 09085396

DNV

CERTIFICATE

Number: 2254773

The management system of the organizations and locations mentioned on the addendum belonging to:

DNV AS
Veritasveien 1
1363 Høvik
Norway

including the implementation meets the requirements of the standard:

ISO/IEC 27001:2013

With this certificate, the organization also complies with the conditions of NEN-EN-ISO/IEC 27001:2017.

Scope:
Information security related to the provision of Classification, statutory, advisory, and product certification services; Verification, certification, laboratory testing, inspection, testing and non-destructive testing; Provision of products and tools, digital platforms and digital services; Development of software systems and Delivery of training.

The selection of the risk reducing measures is documented in the statement of applicability; version DMSG-9-10-A2, 2021-04-08, Rev 1

Certificate expiry date: 31 December 2023
Certificate effective date: 7 June 2021
Certified since*: 7 June 2021

This certificate is valid for the organizations and locations mentioned on the addendum.

DEKRA Certification B.V.

B.T.M. Holtus
Managing Director

R.C. Verhagen
Certification Manager

* against this certifiable standard / possibly by another certification body

DEKRA Certification B.V. Meander 1051, 6825 MJ Arnhem P.O. Box 5185, 6802 ED Arnhem, The Netherlands
T +31 88 96 83000 F +31 88 96 83100 www.dekra-certification.nl Company registration 09085396

APPENDIX B
Accredited Certification Body

DNV Renewables Certification is an Accredited Certification Body according to ISO/IEC 17065, Ref. Accreditation Certificate D-ZE-11053-01-00. The accredited certification body is Germanischer Lloyd Industrial Services GmbH, while DNV Renewables Certification is the trading name of DNV's certification business in the renewable energy industry.

The lead accreditation body is the Deutsche Akkreditierungsstelle (DAkkS). To achieve the accreditation our management system, methods and technical competences have been and are continuously inspected and audited by this Accreditation Body.

DAkkS is the national Accreditation Body for the Federal Republic of Germany. Pursuant to Regulation (EC) No. 765/2008 and the Accreditation Body Act (AkkStelleG), it acts in the public interest and as the sole provider of accreditations in Germany. Germany is a member of the International Accreditation Forum (IAF). The German Accreditation Body DAkkS is signatory of the IAF Multilateral Agreement (MLA). The MLA supports the world-wide acceptance of certification deliverables issue by DNV.

Please find in the following our accreditation certificate displayed. The current valid accreditation certificate incl. annex with the details of the scope covered by the accreditation is available on request or at the DAkkS website following the link https://www.dakks.de/en/accredited-body.html?id=D-ZE-11053-01-00.

DAkkS
Deutsche
Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH attests that the certification body

Germanischer Lloyd Industrial Services GmbH
DNV Renewables Certification

with the locations

Brooktorkai 18, 20457 Hamburg, Germany
Gostritzer Straße 63, 01217 Dresden, Germany
Tuborg Parkvej 8, 2900 Hellerup, Denmark
30 Stamford Street Vivo Building, 4th floor, SE1 9LQ London, United Kingdom

is competent under the terms of DIN EN ISO/IEC 17065:2013 to carry out certifications of products, processes and services in the following fields:

Wind turbines and their components, wind farm projects, wind power and photovoltaic plants, small wind turbines, ocean energy converters and related services and technologies;
Grid connection of power generating units, generating plants and energy storage for wind energy, photovoltaics and other energies;
Marking of offshore installations

The accreditation certificate shall only apply in connection with the notice of accreditation of 28.06.2021 with the accreditation number D-ZE-11053-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 18 pages.

Registration number of the certificate: **D-ZE-11053-01-00**

Berlin, 28.06.2021

Dr Heike Manke
Head of Division

The certificate together with the annex reflects the status as indicated by the date of issue.
The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH https://www.dakks.de/en/content/accredited-bodies-dakks.

See notes overleaf.

About DNV

We are the independent expert in risk management and quality assurance. Driven by our purpose, to safeguard life, property and the environment, we empower our customers and their stakeholders with facts and reliable insights so that critical decisions can be made with confidence. As a trusted voice for many of the world's most successful organizations, we use our knowledge to advance safety and performance, set industry benchmarks, and inspire and invent solutions to tackle global transformations.