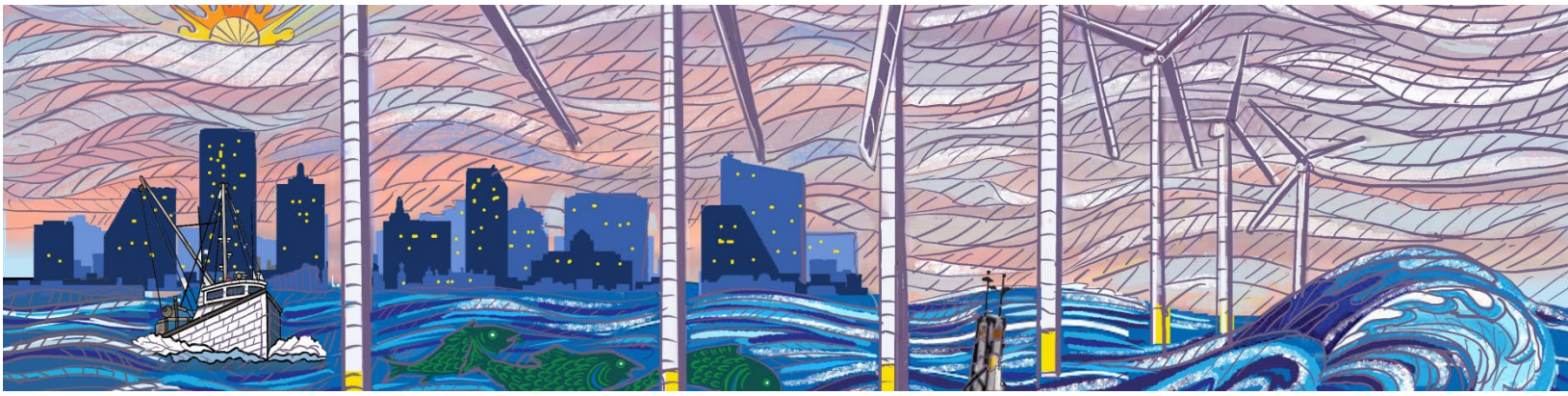


Appendix I-F

Project 1 Certified Verification Agent Nomination

In accordance with 30 CFR 585.706, Atlantic Shores is submitting this Certified Verification Agent (CVA) Nomination for Project 1. Atlantic Shores will submit the CVA Nomination for Project 2 in Q3 2023.

Appendix I-F1

Project 1 CVA Verification Plan

CVA Verification Plan

Atlantic Shores Offshore Wind Project 1

Bureau Veritas North America

Revision 7 – 2022/07/29

Bureau Veritas North America, Inc.
16800 Greenspoint Park Dr suite 300 s, Houston, TX 77060
Tel : (281) 986-1300 - www.bvna.com

PROJECT INFORMATION

Client: **Atlantic Shores Offshore Wind, LLC** Hereafter called “Atlantic Shores”	Local Bureau Veritas : **Bureau Veritas North America Inc.** 16800 Greenspoint Park Dr suite 300 S, Houston, TX 77060 Tel : (281) 986-1300 www.bvna.com
Contact person: **Meaghan Ryan,** Verification Lead Meaghan.Ryan@atlanticshoreswind.com **Rain Byars**, Atlantic Shores Technical and Delivery Director Rain.Byars@atlanticshoreswind.com	**Ahmed Phuly,** CVA Lead & Project Manager **+1 832-266-8523** ahmed.phuly@bureauveritas.com **Gael Pochin,** Evaluation Leader gael.pouchin@bureauveritas.com

Project name:	Atlantic Shores Offshore Wind Project 1
Project number:	200821-0039
Verification scheme:	CVA
Verification standard:	30 CFR 585

Revision	Date	Author	Reviewer	Approver	Reason for issue
1	2021/11/23	Ahmed PHULY	-	-	For Client Review
2	2021/11/29	Ahmed PHULY	-	-	For Client Review
3	2021/12/03	Ahmed PHULY	Gael POCHIN	-	For Client Review
4	2021/12/10	Ahmed PHULY	Gael POCHIN	-	For Client Review
5	2022/05/16	Ahmed PHULY	Gael POCHIN	-	For Client Review
6	2022/07/14	Ahmed Phuly	Gael POCHIN	-	For Client Review
7	2022/07/29	Ahmed Phuly	Gael POCHIN	-	For Client Review

TABLE OF CONTENTS

ABBREVIATIONS

ALS	Accidental Limit State
COM	Commissioning
CRS	Comment Response Sheet
DB	Design Basis
DE	Design Evaluation
DEL	Damage Equivalent Loads
EPC	Engineering Procurement Construction
FAT	Factory Acceptance Test
FE	Finite Element
FLS	Fatigue Limit State
HSE	Health Safety and Environment
HV	High Voltage
IA	Independent Analysis
IAC	Inter Array Cables
IEC	International Electrotechnical Commission
ILA	Integrated load Analysis
ISO	International Organization for Standardization
ITP	Inspection Testing Plan
ITT	Invitation to Tender
KOM	Kick-Off Meeting
LV	Low Voltage
MAN	Manufacturing
MDR	Master Document Register
MV	Medium Voltage
MWS	Marine Warranty Surveyor
NDT	Non-Destructive Testing
NSO	New Strudl Offshore
OEM	Original Equipment Manufacturer
OSS	Offshore Substation
OWF	Offshore Wind Farm

PQP	Project Quality Plan
QM	Quality Management
RNA	Rotor / Nacelle Assembly
SLS	Service Limit State
SOW	Scope of Work
STR	Structure
SWT	Samcef for Wind Turbines
TC	Type Certification
TI	Transport & Installation
ULS	Ultimate Limit State
WPS	Welding Procedure Specification
WTG	Wind Turbine Generator

This CVA Verification Plan for the Atlantic Shores Offshore Wind Project 1 includes a detailed description of the verification process, methodology, scope of work, and deliverables, including inspection frequency and extent.

1. PROJECT GENERAL DESCRIPTION

The Project 1 is an approximately 1,510 MW offshore wind project sited within Atlantic Shores' OCS-A 0499 Lease Area, located off the coast of New Jersey between Atlantic City and Barnegat Light. The Project 1 wind turbines and offshore substations will be located in an approximately 102,055-acre (413-square kilometer [km2]) Wind Turbine Area (WTA) located in the southern portion of the lease area OCS-A 0499 (see Figure 1).

The Project 1 base case includes 105 – 136 wind turbines mounted on monopile foundations and up to 5 OSS. The wind turbines will connect to the OSS via 66-150 kV subsea inter-array cables. The inter-array cables will be located at an optimal location to limit electrical losses from transmission and minimize cable length. For each cable circuit, the subsea cables will consist of three cables bundled together in a common shield and armoring and include the fiber optic cable. From the offshore substations, export cables will carry the power produced to the onshore substations. The export cables will make landfall via horizontal directional drill (HDD) in Atlantic City, New Jersey.

The proposed facility locations for development of the Project have been selected based upon the preliminary environmental and engineering site characterization studies that have been completed to date. The location of Project facilities will be further refined by the final engineering design as well as ongoing and continuing discussions, agency reviews, public input, and the National Environmental Policy Act review process. The anticipated Project 1 major components are described in Table 1.

Table 1 – Project 1 Design Assumptions

Activities and Asset Assumptions	Project 1
Water Depths	17-37m range, 25m average
Quantity of WTG / WTG Foundations	105-136
WTG Foundation Type	Piled, Suction Bucket, or Gravity Based Foundations
Quantity of Offshore Substations (Topsides / Substructures)	2 – 5
OSS, detail	Unmanned, AC or DC

OSS Foundation Type	Piled, Suction Bucket, or Gravity Based Foundations
Expected COD	Phase 1 – 2027 Phase 2 – 2028
Overall Schedule Duration	March 2021 – June 2028
Inter-Array and Inter-Link Cables	*Inter-array cables:* 66-150 kV HVAC *Inter-link cables:* 66–275 kV HVAC
Export Cables	4x 230–275 kV HVAC cables *or* *1x 320-525kV HVDC cable*
Marshalling / Construction Port Location	US East Coast
Expected COD	Phase 1 – 2027 Phase 2 – 2028

Multiple design locations and multiple fabrication locations are planned to accommodate these major components, and those locations are yet to be determined.

The aforementioned project details could be subject to change. For most current project details, please refer to Volume I, Section 4.0 and Table 1.1-1 of the Atlantic Shores COP covering Lease Area OCS-A 0499.

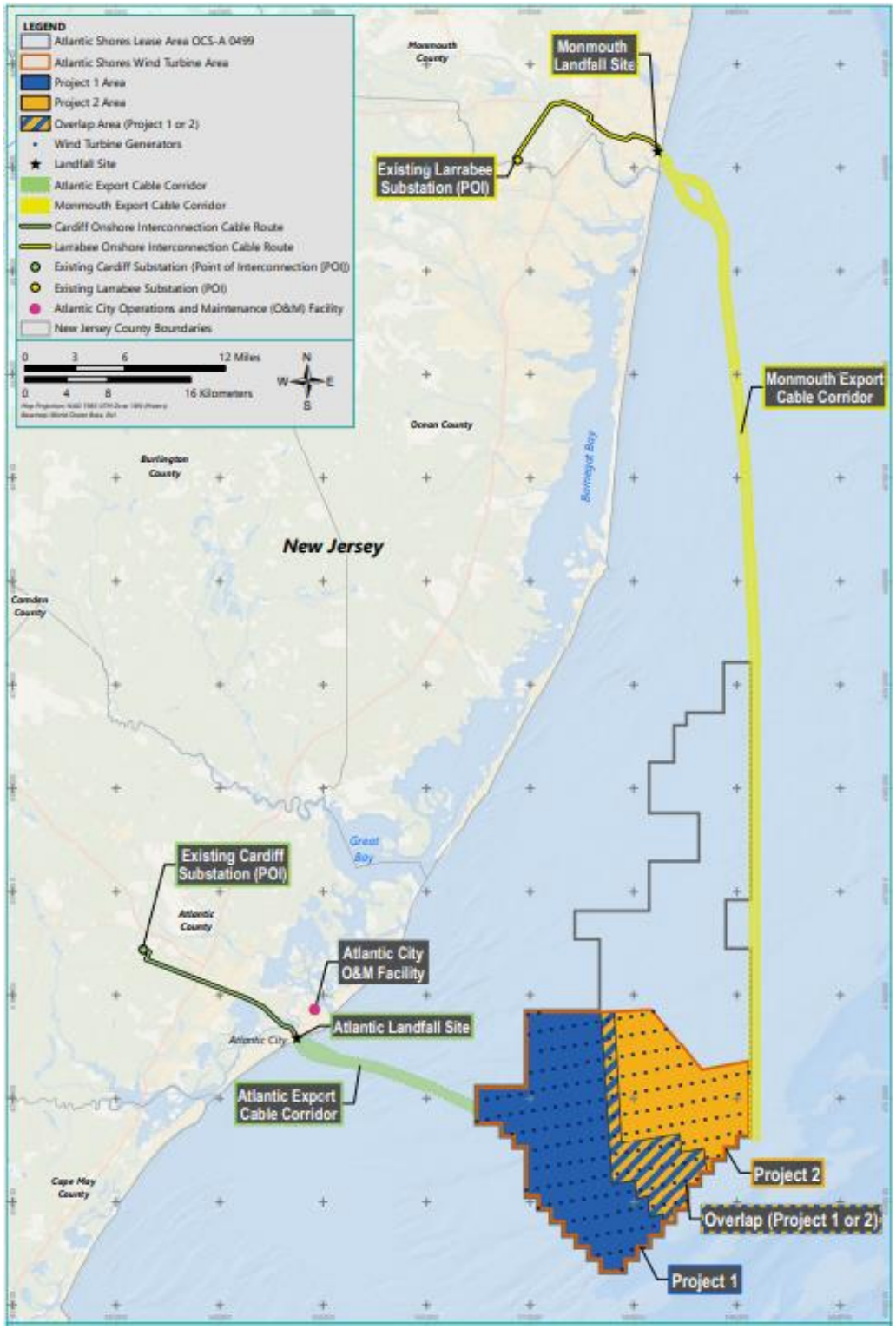


Figure 1 – COP South, Project 1 Area

2. CVA VERIFICATION PLAN

This section summarizes the main information and assumption relevant for the CVA services to be provided. It is based on information extracted from the details submitted by Atlantic Shores.

To get approval for construction and operation of an offshore Wind farm in federal waters, US regulations require that an independent third party be appointed to certify the design, fabrication and installation to BOEM. The CVA is nominated by the offshore wind facility's developer for approval by BOEM, on behalf of which the CVA preforms its activities. The CVA duties outlined in the US Code of Federal Regulations match the systems and schemes applied for the approval of offshore wind farms internationally, though updates to accommodate US specific requirements are adopted. The scope of work described herein is made to outline such work, enabling the CVA to define the detailed scope of work required to cover US requirements and to carry out such work in accordance with the requirements outlined in the U.S. Code of Federal Regulations (CFR), 30 CFR 585.

2.1. Scope of Work

2.1.1. Scope of Work Coverage

The CVA work shall cover the following Project assets:

- Wind Turbine Generator (WTG)
- Wind Turbine Foundation (FOU)
- Offshore Substation(s) (OSS)
- Inner Array Cable (IAC), and
- Export Cable (EC)

The submarine cables in state waters are included in the CVA verification plan. The CVA verification of the export cable shall extend to the termination at the landing.

The scope of work for satisfying the CVA requirements as set forth in 30 CFR 585 Subpart G includes:

- Continued evaluation of design interactions from FEED to detailed design in order to ensure final design will meet applicable codes, standards and regulations;
- Technical verification of the Facility Design Report (FDR) and the Fabrication and Installation Report (FIR);
- Certifying that the facilities are designed, fabricated, installed and commissioned in accordance with accepted engineering practices and the above reports;

- Certifying that project components are fabricated and installed in accordance with the approved Construction and Operations Plan (COP), as described in 585.708(5); and
- Providing BOEM with timely reports of all findings affecting the design, fabrication and installation.

It is Bureau Veritas' experience that the CVA Scope of work as defined in the U.S. Code of Federal Regulations (CFR), 30 CFR 585 can be fully addressed and delivered through the proposed technical approach, and associated Verification Tasks outlined in the proposed CVA Scope of Work.

The scope of the evaluation is presented in the sections below.

Note: The term "foundation" is used as synonym of the term "substructure". It also include the secondary structures. It covers the structure below the tower base flange.

2.1.2. Structure of scope in tasks

Prior to BOEM's formal acceptance of CVA nomination and at the request of the Developer, Bureau Veritas will provide early CVA support in order to assist Atlantic Shores in de-risking technical decisions. These early CVA activities are described in section 4 of this document and will include verification of Codes and Standards hierarchy, Design Basis Evaluation and verification of Site Condition Assessment.

Bureau Veritas has developed a strategy for the CVA activities where the CVA verification scope is divided into a total of 16 tasks plus additional items as needed. The split in tasks is due to the different requirements for competences for each of the assets, but also for the different competences required for design, fabrication inspection and installation inspection.

The tasks are assigned by phases of activities (Design, Fabrication and Installation) and Project assets as shown on figure below.

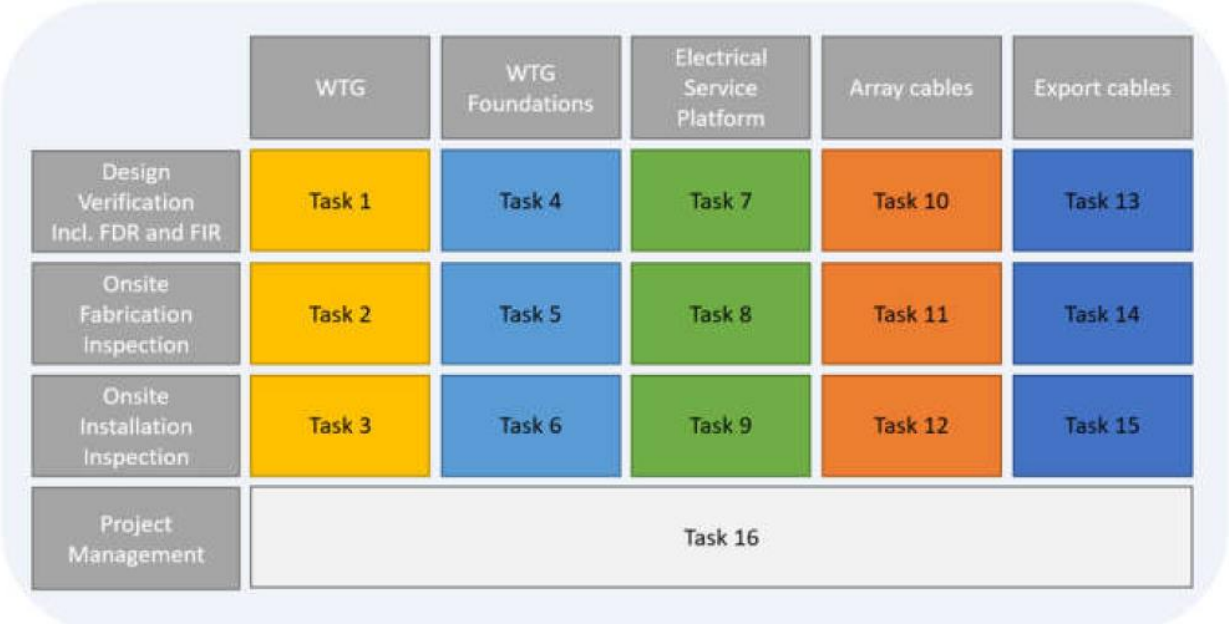


Fig. 2: Proposed Tasks

The evaluation process and the general approach suggested to fulfil CVA's duties are described in detail in Section 3 of this document. A detailed description of each the 16 tasks is provided in section 5 of this document.

2.1.3. Exclusions

- The CVA verification activities will primarily focus on the structural integrity and human safety.
- It will in particular not cover the availability and power performance of the WTGs and other assets.

3. THE VERIFICATION PROCESS

3.1. General Approach Suggested to Fulfil CVA's Duties

The CVA requirements as set forth in 30 CFR 585 Subpart G, §§ 585.705 – 585.714 outline the duties of the CVA as well as some high-level information about the different tasks to be conducted by the CVA and to be confirmed towards BOEM. However, a complete CVA Verification scheme for an offshore wind farm project, detailing the review steps and process, components to be regarded and tasks to be performed to verify the safety of all parts of the asset is not given. We suggest to fill this gap by seeking guidance from the international standard IEC 61400-22:2010-05, "Wind turbines – Part 22: Conformity testing and certification", Edition 1.0 and its successive document IECRE OD-502:2018-10 to formulate a verification plan. This is fully in line with the requirements of 30 CFR 585

Subpart G, §§ 585.705 – 585.714 as shown in the following. The standard IEC 61400-22, (or its successor IECRE OD-502) describing the requirements for the verification process, i.e. the verification scheme, needs to be combined with a technical standard, defining the design and technical requirements for the different components of the wind farm. For the wind turbines we suggest to apply the standard IEC 61400-3-1, "Wind turbines – Part 3: Design requirements for offshore wind turbines", (or its successive version). This standard, as an international standard, is explicitly designed to be used in connection with any local design standard for detailed calculations of e.g. steel structure design, geotechnical design, etc. Therefore, IEC 61400-3-1 only provides the level of safety to be applied to the design (and manufacturing, transport and installation, etc.) by detailing design load cases as well as partial safety factors for loads and resistance (material). These can add to the requirements of ACP OCRP-1: Offshore Compliance Recommended Practices (2021) (or its successive version) and API RP 2A-WSD as well as all other relevant ISO and ANSI codes that is relevant for the design in US federal waters. It is anticipated that BOEM will accept a "design-basis" approach whereby the applicant proposes which criteria and standards to apply, and then justifies why each particular criterion and standard is appropriate.

The following sections define how the different deliverables will comply to the CVA requirements of 30 CFR 585 Subpart G, §§ 585.705 – 585.714. This includes discussion of framework for the facility design review and fabrication and installation review of the WTGs, their support structures, and the OSS including support structure as well as the inter-array and export cables.

The Verification Plan will be updated as more information on the project design and planning is received. At the start of each CVA phase, Bureau Veritas will submit a detailed Evaluation Plan to Atlantic Shores. The Evaluation Plan will describe the evaluation process in details, together with the working methods and the primary planning. At the start of each CVA phase, BOEM shall receive at least an overview of the detailed Evaluation Plan for that phase when it is developed.

It is important to mention that the Type Certificate (TC as per IECRE OD-501) documentation of the WTG shall be provided in advance of the Integrated Load analysis and Manufacturing surveillance phase.

In case the WTG type certificate on only available after start of the production, this may have an impact on Integrated Load Analysis and Manufacturing Surveillance phase. Depending on the completion of different modules of the WTG type certificates, different mitigation measures can be foreseen.

The O&M plan for each project asset will be reviewed to verify the suitability of the intended requirements and to ensure consistency with the assumptions for the design.

3.2. WTG TC Risk mitigation

The following table is summarising the risk related to each phase of the WTG TC completion in case the module is not completed and the remedial action plan.

Module	Risk	Impact on	Action Plan
Design Evaluation	High	Substructure Design Evaluation ILA	In case the Design Evaluation module is not completed. (1) A confirmation letter from the type certification body is expected, defining the applicable conditions to the Design Evaluation module will be requested by Bureau Veritas (2) ILA and design evaluation module will be performed based on preliminary WTG loads. Then a post loop verification of the loads will be carried out.
Manufacturing	Medium	Manufacturing	In case this module is not fully finalized, (1) A confirmation letter from the type certification body is expected, defining the applicable conditions to the manufacturing surveillance module will be requested by Bureau Veritas. (2) In addition depending on the level of completion, it can be decide to increase the number of inspections in particular to ensure the ability of the facilities to achieve the required quality level
Testing	Medium	Substructure Design Evaluation ILA	In case the validation of the WTG loads by the testing module is not completed. The mitigation measure will be similar to the one described for the Design Evaluation module.
Final evaluation	Low	Substructure Design Evaluation ILA Manufacturing	At this stage it is assumed that Provisional Type Certificates will be available and that most of the outstanding issues will be closed. Based on the review of the provisional TC, Bureau Veritas will analyse the conditions and the remaining outstanding issues. Remedial action will be limited and selected among the here above described mitigation measures.

Table 2. - WTG TC Mitigation Strategy

3.3. Reference documents

3.3.1. Applicable standards

Early work will also include CVA review of proposed codes and standards hierarchies for the Project. Bureau Veritas has experience with codes and standards hierarchies for U.S. offshore wind farms. For the COP the key is to have the top-level code and standards hierarchy in place.

Regarding design standards, Bureau Veritas will rely on BOEM document: “Guidelines for Information Requirements for Renewables Energy Construction and Operations Plan (COP)” Version 3.0: April 7, 2016, Attachment C: Design Standards & Environmental Loading for offshore Wind Energy. Here BOEM writes that, “For offshore wind turbines, BOEM will accept a “design-basis” approach whereby

the applicant proposes which criteria and standards to apply, and then justifies why each particular criterion and standard is appropriate."

The purpose of standard hierarchy is to define the overarching verification standards scheme and the top-level standards for the design and execution phases. Furthermore, standards considered important to suppliers for the project are also included. The intention is not to provide a full and detailed account of all standards needed for the project.

The objective of the CVA review of the standard hierarchy is to ensure the following:

- Compliance with BOEM Guideline for design standards;
- That the standards are consistent and not in contradiction; and
- That the standards are not mixed so that the overall safety level would be modified from the intended level in the considered systems of standards.

If it was required to use international standards in lieu of US standards, the CVA will review a gap analysis conducted by the asset designer.

A CVA verification letter of Standards Hierarchy for the COP is then issued to BOEM to confirm that the "Standards Hierarchy" has been successfully verified by the CVA in accordance with the purpose and objectives mentioned above. Once the COP application is filed, the design work and verification activities can proceed accordingly based on the BOEM approved Standards Hierarchy and CVA scope of work. The codes and standards will be supplemented by standards emerging from the Design Basis Evaluation modules for the WTG/ WTG Support Structure, Offshore Substation (OSS) and Cables.

Atlantic Shores will prepare Design Basis parts, each with a list of applicable standards. BV will review proposed codes and standards in the Design Basis. This approach is consistent with 30 CFR 585 and BOEM guidelines. Bureau Veritas has experience with codes and standards hierarchies for U.S. offshore wind farms.

BOEM's renewable energy regulations are not prescriptive regarding the design standards used for an offshore wind energy installation. There are various United States, European, and international standards that could be applied to an offshore wind energy installation, but no single standard has yet been determined to be a comprehensive design standard for application in the offshore waters of the United States.

Specific standards to be used on each relevant design aspect will be defined as part of the Design Basis.

Tropical cyclones load cases shall be investigated in accordance with ACP Offshore Compliance Recommended Practices.

It is expected that safety aspects of wind turbines will be addressed as part of the Type certification. ACP OCRP recommends several exceptions and additions to IEC 61400-3-1 to meet US safety

standards and best practices. Some safety aspects may not covered under the type certification, for example, tower internals work platforms, guards, access, cranes and lifting beams, etc. In this case, the CVA will review any safety aspects specified in the Design Basis, which are not already covered in the Type certificate.

Bureau Veritas is used to working with all internationally recognized offshore standards and guidelines. Except otherwise notified, the latest version of the standard shall be applicable.

It is assumed that the electrical designers will seek guidance from the published Offshore Wind Electrical Safety Standards Harmonization: Workshop Proceedings.

Safety-related equipment inspections shall be performed by the CVA. Alternatively, PE inspection output will be provided to the CVA for review. A full list of safety related systems and devices shall be developed within future phase Evaluation Plans. Evaluation Plans shall be provided to BOEM at the start of each phase.

3.4. Methodology

3.4.1. Evaluation Plan

The CVA evaluation process is expected to consist of document review, independent analyses and inspections, depending on the module under consideration.

3.4.2. Project Master Document Register

Bureau Veritas will review the Master Document Register (MDR) to be submitted by Atlantic Shores. This MDR will list all documents produced as part of the project and relevant for the CVA verification plan. It will also include target issuance dates for each document in order to be used as a planning tool for the review process.

Based on this MDR, Bureau Veritas will indicate the documentation that shall be submitted for review or for information. The MDR will also be checked for completeness in order to ensure that all required documents are listed in the MDR.

Documents showing material designations must be included per CFR 585.707. This includes metals, welds and post-weld treatments, grouting, concrete material and testing processes, ballast, etc.

The O&M plan for all project assets will be reviewed to verify the suitability of the intended requirements and to ensure consistency with the assumptions for the design.

3.4.3. Document review

A large part of the evaluation consists in reviewing calculation notes, specifications, drawings, data sheets, reports, certificates, etc. The evaluators will verify the completeness of the provided documentation and its conformity to the reference set of standards for the verification. The CVA will verify that the critical design documents including geotechnical, civil, structural, electrical and

mechanical disciplines for the project are PE stamped and accompanied by a report(s) from each designer(s) demonstrating that compliance with applicable Primary Standards found in the approved design basis for each asset.

A typical document verification process consists of two successive reviews: one initial review and one review loop, as presented in Figure 3. Upon completing the initial review, Bureau Veritas will issue a list of comments to be considered by Atlantic Shores. A second review is then performed to confirm that all these remarks have been correctly implemented in the updated document. Review cycles will continue until CVA comments are fully addressed and the CVA accepts the document.

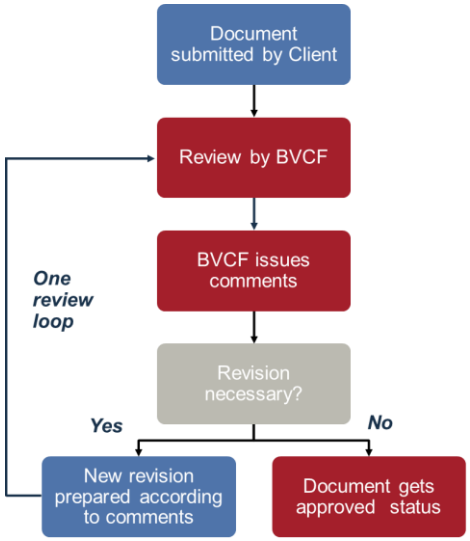


Figure 3 – Overview of the review process

3.4.4. Independent analyses

Bureau Veritas may perform independent calculations based on its own assumptions and methods. The goal of these independent calculations is to verify some key characteristics of the project. They do not prevent Atlantic Shores from performing its own sensitivity analyses.

Independent analyses are usually performed for the most critical cases only and not as a standard basis. They are based on inputs provided by Atlantic Shores.

3.4.5. Review schedule

It is noted that CVA verification activities are closely dependent on actions from other contractors on the project, Bureau Veritas would like to stress that an active collaboration and open communication between all stakeholders are key to a smooth and efficient CVA verification process. In order to keep the turnaround time at a low level, an “in-parallel” approach shall be implemented.

3.4.6. Inspections and surveillance

The evaluation plan will be provided to BOEM at the beginning of each phase for information. The surveillance of a specific process (manufacturing, transportation, installation, etc.) consists of verifying that the implemented procedures meet specified requirements. This verification usually involves several methods:

- Evaluation of the quality system
- Verification of the compliance of the procedures with the specified requirements
- Verification of the effective application of the procedures

The quality system evaluation is normally limited to the verification that the quality systems of the different manufacturers or operators involved are certified according to ISO 9001. This quality system certification shall have been carried out by an accredited certification body operating according to ISO/IEC 17021. If the quality system is not properly certified, Bureau Veritas will have to evaluate that it meets sufficient quality management requirements.

The evaluation of the compliance of the procedures usually consists of reviewing the different documents related to the process under scrutiny (manuals, checklists, reports, etc.) and verifying their compliance to the specified requirements.

Finally, the verification of the correct application of the procedures involves review of records and reports related to the process under scrutiny and several on-site inspections of the process. The exact scope and extent of the inspections depend on the process itself and particularly on its estimated criticality.

A specific scope will be defined for the audits and inspections to be carried out as part of the project. The surveillance activities will be detailed in the Evaluation Plan. This specific scope will be prepared once sufficiently detailed information about the manufacturing and site activities are available, and in any case before the start of the surveillance activities.

Initial audits for fabricators of all Project asset shall be conducted. The key aspects of the initial audit will focus on the review of:

- Valid Quality Management (QM) certificate according to ISO 9001: note Revision and Validity
- Project Quality Plan (PQP)
- Inspection and Testing Plans (ITPs)

For all the various parts, when non-conformities are found, they must be reported and tracked. Additionally, they must be communicated to BOEM and the CVA should verify the supplier/contractor or OEM identifies the cause and put mitigations in place to prevent the non-conformity from occurring again.

The CVA recommends a minimum baseline inspection frequency of 10% of each asset (WTG, tower, substructure, foundation, OSS (topside and foundation), IAC, and export cables) be looked at during fabrication and installation. The baseline inspection frequency for manufacturing and installation of all Project assets can be modified up (more than 10%) but not down (less than 10%) - based on supplier performance, track record, complexity of work, impact of NCR. The detailed inspection rate for each project asset will be provided in the detailed Evaluation Plan at the beginning of each phase.

Any review of NCR or TQ linked to manufacturing scope will be sent to the CVA and dealt with on a case-by-case basis depending on the criticality of each finding.

The Interface between CVA and Marine Warranty Surveyor is discussed in section 5.6.2 of this document. However, the detailed Evaluation Plan for the transportation and installation phases will show more specifics details covering the interface for each asset.

The CVA will review which goods are considered "critical" on a project-specific basis according to manufacturing risk assessment. An incoming good inspection will be carried out:

- During initial audit to ensure that the procedure for reception and storage of the good are well prepared.
- On a regular basis by the inspector to ensure that the product is stored in the proper environment and that the corresponding certificates are well-checked and stored.
- On a project-specific frequency for identified "critical" goods.

4. EARLY CVA ACTIVITIES

Prior to BOEM's formal acceptance of CVA nomination and at the request of the Developer, Bureau Veritas will provide early CVA support in order to assist Atlantic Shores in de-risking technical decisions. This work may including the following:

4.1. Codes and Standards Hierarchy

Early work will also include CVA review of proposed codes and standards hierarchies for the Project. Bureau Veritas has experience with codes and standards hierarchies for U.S. offshore wind farms. For the COP the key is to have the top-level code and standards hierarchy in place.

Regarding COP requirements, the CVA will rely on BOEM document: "Guidelines for Information Requirements for Renewables Energy Construction and Operations Plan (COP)" Version 3.0: April 7, 2016, Attachment C: Design Standards & Environmental Loading for offshore Wind Energy. Here BOEM writes that, "For offshore wind turbines, BOEM will accept a "design-basis" approach whereby the applicant proposes which criteria and standards to apply, and then justifies why each particular criterion and standard is appropriate."

The purpose of standard hierarchy is to define the top-level standards for the design and execution phases. Furthermore, standards considered important to suppliers for the project are also included. The intention is not to provide a full and detailed account of all standards needed for the project. Bureau Veritas review shall include the following:

- Review of Atlantic Shores' selection of design codes, industry standards, and other guidelines to be used including design, fabrication, transportation, installation, and operation.
- Review of hierarchy and/or interaction of such guidance.

The objective of the CVA review of the standard hierarchy is to ensure the following:

- Compliance with BOEM Guideline for design standards;
- That the standards are consistent and not in contradiction;
- That standard systems are not mixed so that the overall safety level would be modified from the intended level in the considered systems of standards; and
- That BOEM receives the results of codes and standards review very early in the CVA process.

As a part of the Codes and Standards review, the CVA shall verify the proposed Codes and Standards are appropriate for the proposed location.

4.2. Site Environmental Conditions

Bureau Veritas assumes that all environmental conditions, including the wake effect from neighbouring wind turbines, are based on site investigations or designer's calculations performed as part of the feasibility study of offshore wind farm project.

4.2.1. Metocean conditions

This module covers the verification of the assessment of the meteorological and oceanographic environmental conditions at the site. Meteorological conditions refer to wind, temperature, humidity, pressure, air density, solar radiation, precipitation and salinity. Oceanographic conditions refer to waves, currents, water levels, sea ice (if relevant) and marine growth.

The evaluation consists in the review of the metocean report and associated documents.

Bureau Veritas will verify that the measurements were performed in compliance with the relevant standards in terms of extent, quality and relevance. The hindcast models used to complement the measured data will be verified, in particular regarding their calibration and interpretation. Finally the derivation of site-specific design parameters by the designer on the basis of these measurements and hindcast data will be verified. The correctness and completeness of the submitted reports is checked, with particular attention to the following aspects:

- Quality of the testing laboratories and companies carrying out the measurements (ISO/IEC 17025 accreditation or experience in the selected fields in particular)
- Quality of the testing equipment (instrumentation, calibration, etc.)
- Conformity of the measurements or testing procedures to the relevant codes and standards and to the industry best practices
- Processing of the measured data (data filtering, correction of inconsistent data, etc.)
- Calculation of the design parameters, in particular extrapolation to determine extreme parameters
- Documentation and reporting

4.2.2. Geotechnical conditions

This module covers the verification of the geophysical and geotechnical investigations and of the derivation of the soil characteristics and geotechnical design parameters for the support structure foundations.

The evaluation is based on the review of the Ground Investigation Report.

This verification covers the following activities:

- Review of the codes and standards used as a basis for geotechnical investigation and geotechnical design
- Review of the geophysical and geotechnical survey plans (number, type and location of samples; technical specifications; data interpretation; etc.)
- Review of the laboratory tests (test plan; quality; test results; etc.)
- Review of the methodologies for derivation of the geotechnical design parameters
- Completeness and correctness of the design documentation regarding geotechnical design calculations (design parameters; calculation methods; stability and failure modes; etc.)
- Review of the design documentation regarding seabed preparation and tolerances

4.2.3. Site conditions summary for WTG, Substructure and Foundation

This module covers the review of interpretation documents, in particular the WTG Site Conditions Assessment, the Wind Assessment and the Marine Assessment.

4.2.4. Site condition assessment for OSS

The soil conditions at the OSS location will be reviewed, including in particular:

- Ground investigation report

- Geotechnical design soil profiles
- Cyclic soil properties
- Geotechnical design briefs
- Report for cyclic loads on foundation

The geotechnical interpretation will be reviewed.

A review of the seabed stability and scour assessment will be performed.

Regarding the review of the soil conditions, the review will be based on a selected methodology based on the approved design basis.

Bureau Veritas will review the proposed methodology for the specific soil and site-specific p-y curves proposed by the designer. These p-y curves may rely on various approaches as determined in the design basis.

4.2.5. Site condition assessment for IAC and Export Cables

The soil conditions at the IAC and Export Cables locations will be reviewed, including in particular:

- Ground investigation report
- Geotechnical design soil profiles along cable routs

A review of the seabed stability along cable routes will be performed

4.3. Design Basis Evaluation

The purpose of the design basis evaluation is to verify that the design basis is sufficient for a safe design and execution of the project, i.e. that it is coherent, exhaustive, sufficiently documented and that it meets all requirements related to the CVA verification references.

The evaluation of the Design Basis will cover:

- The Design Basis Part A (Site Conditions and Employer Requirements), including a review of the environmental data used as inputs
- The Design Basis Part B (WTG)
- The Design Basis Part C (Support Structure)
- The Design Basis Part D (Inter Array and Export Cable)
- The Design Basis (OSS)

The coherence between the multiple parts of the Design Basis that will be evaluated, as well as the completeness of the combined Design Basis. The coherence of the design methodologies, assumptions and requirements will be evaluated.

A specific review of each part of the Design Basis will be performed as described below.

This evaluation is mostly based on documentation review.

4.3.1. Design Basis Evaluation - Site Conditions

The Design Basis Part A will be reviewed for coherence with the Site Conditions Assessment documentation and conformity with the approved reference standards.

4.3.2. Design Basis Evaluation - WTG

The Design Basis Part B is the responsibility of the WTG Supplier, and typically includes:

- Interpretation of wind and environmental input (turbulence, wind shear, etc.)
- Definition of design load cases
- Design parameters (e.g. damping)
- Partial safety factors for the load simulations
- Turbine Type certificate and possible deviations from the certificate.

The evaluation will consider the conformity of the Design Load Cases (DLC) to the selected design standards, and the validity of the methodology and assumptions for the load simulation. The determination of the turbulence intensity including the wake effect from neighbouring turbines will be verified.

Bureau Veritas review the Design Briefs is to verify that they at least cover the following aspects and include detailed information on the identified risks, focus areas of the assessment and critical aspect;

- Seabed variability and scour assessment
- Natural frequencies
- Extreme Events
- Fatigue Analysis
- Driveability
- Flanged connection / Grouted connection
- Corrosion protection
- Scour protection
- Ship impact
- Geotechnical interpretation
- Primary structure design

- Secondary structure design
- Provisional structures
- Transportation
- Installation
- Decommissioning.

4.3.1. Design Basis Evaluation - WTG Support Structure

The Design Basis Part C is generally the responsibility of the support structure designer, and describes the general design requirements, methodology and assumptions for the design of the support structure. Bureau Veritas will check that the codes defined as references are appropriate and adapted to the specificities of the project and that the selected codes are compatible. The coherence of the design methodologies and assumptions will be evaluated.

The following issues should be addressed (if applicable):

- Description of the support structure concept
- Design environmental parameters
- Geotechnical interpretation of the soil data
- Applicable codes and standards
- Design requirements and methodologies for the geotechnical and structural design analyses, including:
    - Natural frequencies analysis
    - Ultimate Limit State (ULS)
    - Serviceability Limit State (SLS)
    - Fatigue Limit State (FLS)
    - Accidental Limit State (ALS)
- Primary structure design requirements and methodology ■ Secondary structure design requirements and methodology
- Provisional structures design requirements and methodology
- Design requirements and methodologies for bolted connections / grouted connections
- Interface with WTG supplier, in particular regarding load calculations
- Corrosion protection strategy
- Scour protection strategy (for offshore projects)

- Requirements for manufacturing, transportation, installation and commissioning (in particular environmental conditions relevant for installation)
- Requirements for operation and maintenance, in particular the inspection scope and frequency
- Requirements for decommissioning

4.3.2. Design Basis Evaluation - OSS

Bureau Veritas will review the OSS Design Basis and Design Briefs for issues related to structural design of the OSS topside and support structure with regards to conformity with the agreed applicable standards.

The verification will cover the following aspects:

- Clarification of applicable standards and their hierarchy
- Applicable codes and standards and their hierarchy
- Review of design parameters
- Review of design methodology
- Review of load cases
- External conditions for the design
- Transport, installation and commissioning requirements
- O&M requirements.

4.3.3. Design Basis Evaluation – Inter-Array Cables and Export Cables

The Design Basis to be evaluated will cover the following:

- List of applicable standards
- Meteocean conditions, cable-soil interaction aspects, interface at turbines and substations
- Type of power cables, including a description of the system connection
- Design criteria including: cross section, on bottom stability, installation loads, mechanical and electrical capability and ultimate strength.
- Methods for transport, installation, commissioning and maintenance strategy

The above documents will be reconfirmed upon receipt of the MDR, content of documents are expected to be as followed:

- The design basis of the power cable configuration (with ancillary equipment, top and bottom (if any) connections, etc.), the envelope of loadings applied on the power cable (curvature,

tension, combined tension and curvature during installation), the conditions of use, the design life, etc.

- A power cable design report covering detailed cross -section (lay angle of components), the termination drawings, the design in the power cable current length (design criteria for the different parts, load sharing, etc.)
- A material selection report of the power cable and its components , including justification of the
- Long-term suitability (effect of ageing, thermal effect, etc.)
- The CVA is expecting to receive the type approval certificates of the cable or its sub component, as well as 3.2 certificates for all subcomponent of the cables (the cables, the armor any connector or termination).

5. CVA EVALUATION PLAN

Upon the acceptance on the CVA nomination, Bureau Veritas shall conduct design verification activities that will include a review of all FDR and FIR materials including the following design evaluation tasks.

5.1. Task 1 - WTG design

5.1.1. Load Calculations

Bureau Veritas will verify the WTG Supplier and WTG Substructure Supplier load calculations. This review will take two forms:

- Review of the calculation methodology
- Independent calculations based on an integrated model.

Bureau Veritas will verify the calculations by reviewing the load reports, focussing in particular on the comparison of the applied calculation methodology with the Design Basis and the reference standards (wind and wave models used, simulation characteristics, statistical extrapolation of extreme loads, etc.).

Particular care will be addressed to the methodology and assumptions for the transfer of data at the interface between the WTG Supplier and the WTG Substructure Supplier.

5.1.2. Independent model

In addition to the documentation review, the largest part of the verification will be based on independent calculations. A complete integrated model will be built including the RNA, tower,

substructure and foundation, and taking into account the specific soil conditions. This independent load analysis will carried out in two different loops.

The verification will consider the following aspects:

- Check of correct model representation and implementation of support structure and Rotor-Nacelle-Assembly (RNA) including control and protection system as well as soil conditions
- Substructure model and hydrodynamic loads (WTG Substructure Supplier)
- Transfer of data at the Tower / substructure interface
- Derived extreme and fatigue load levels

The independent calculation will be performed in parallel to the designer calculations, in order to provide confidence in the results at each step of the iteration process.

Two different models will be built to cover the range of environmental conditions expected at the site (Extreme condition: ULS and redundant loading: FLS). In addition, two different models will be built to cover the range of soil conditions across the site. It is assumed that the RNA and Tower will be the same for both models.

Note: the selection of the model location can be for instance cover the softest and the stiffest soil location or any other relevant location that may potentially show an interaction between the rotor harmonics and the natural frequency of the structure.

As a first step, a calibration will be performed on each model, to evaluate the change in the modal shapes and frequencies to variations of the structure properties or various environmental conditions. Based on these initial results, on previous experience and on discussions with the designers, specific DLCs will be selected for load comparison. The loads obtained by independent analysis will be compared with the designer loads, typically at the substructure-tower interface, at a couple of intermediate heights and at the seabed level as a minimum. If possible, loads may also be compared at blade root, Tower top and along the Tower.

It should be mentioned that Bureau Veritas would carry out the calculation of the selected DLCs in a similar manner to the requirements from IEC: this means for example running 6 different seeds for the FLS load cases. Also, wind and wave conditions will be generated independently by Bureau Veritas based on the same environmental input conditions as the WTG supplier. This should ensure that the comparison with the WTG Supplier and substructure designer calculations are performed on similar basis.

Bureau Veritas may perform an assessment of the damping level during the calibration phase, based on damped modal analysis or on simple decay tests for the integrated structure. This should ensure that the independent model correlates well with the WTG supplier’s model with regards to the damping level, prior to entering into any more detailed load calculation.

In the same respect, load cases with misaligned wind and wave are expected to have a large importance for the design, since aerodynamic damping is very low in the cross-wind direction. Such load cases would therefore typically be included in Bureau Veritas independent analysis on a spot-check basis.

If the Project is located on a seismic area, load case deriving from seismic load will be reviewed and taken into account.

Tropical cyclones load cases shall be investigated in accordance with ACP OCRP-1 Offshore Compliance Recommended Practices. Similarly, idling load cases will have to be considered for fatigue loads, since aerodynamic damping is low in idling or parked conditions. Such load cases (e.g. DLC 6.4 of IEC 61400-3) would therefore also be included in Bureau Veritas independent analysis on a spot-check basis.

To summarize, for FLS load cases, Bureau Veritas typically runs between 10 and 15 DLCs (with 6 seeds each), aiming to cover about 10% of total probability of occurrence / fatigue damage. This will cover typically DLCs from families 1.2 (normal operation) and 6.4 (idling / parked configuration).

For ULS load cases, Bureau Veritas typically runs around 10 DLCs (with 6 seeds each), aiming to cover the design driving load cases. This will cover typically DLCs from families 1.6 (Power production in severe sea state), 6.1 and 6.2 (idling in extreme conditions plus grid loss).

Based on the proposed project schedule, the following approach is proposed for a single load iteration:

- In advance to Load iteration :
    - Modelling of the WTG and associated calibration
    - Modelling of the substructure and foundation and associated calibration
- Load iteration :
    - Calculation of a selection of DLC and comparison with the design loads to verify the plausibility of the design loads
    - Review of the load documentation packages
    - Review of the deliverables from the WTG Supplier’s certification body
    - Upon validation of the module, issue of evaluation reports

5.1.3. Simulation software

For the determination of the loading on the wind turbine and the support structure, Bureau Veritas uses the aero-elastic code Samcef for Wind Turbines (SWT, developed by LMS Samtech) intended for the calculation of the wind turbine response in time domain. This software is part of the SIEMENS PLM software suite (as NX NASTRAN). SWT is able to simulate all load cases required for the

integrated load analysis taking into account wind, wave, current and soil external conditions as well as the control system and grid conditions (yaw error, exceedance of cut-out speed, and sensor failure).

The structural part of the code is based on a multi-body approach using beam elements. The turbine is modelled as an assembly of bodies connected with constraint equations (rigid coupling, bearing, prescribed fixed bearing angle, etc.).

The aerodynamic part of the code is based on the blade element momentum theory and on the Kaimal turbulence, capable of handling dynamic inflow, dynamic stall, skew inflow, shear effects on the induction and effects from large deflections.

The soil model is based on non-linear springs modelling the deflection of the foundation with respect to the soil resistance. The waves are generated based on the Jonswap spectra.

5.1.4. Documents necessary for the evaluation

Bureau Veritas will need to review the following documentation as a minimum:

- Load reports from the WTG Supplier and WTG Substructure Supplier, including extreme and fatigue loads
- Time series of loads for the selected DLCs
- Mode shapes and frequencies analysis
- Description of the software used for the calculations, including a validation file.

All references not publicly available listed in the documents shall be provided to the CVA upon request. The documentation provided shall address the issues described in the above sections.

For the independent model, Bureau Veritas will require the following data and information from the WTG Supplier:

- General description of the turbine
- CoG positions
- Main dimensions
- Mass and stiffness distributions
- Blade aerodynamic properties
- Description of the Control and Protection philosophy
- Control and Protection System dll, including a clear description of its inputs and outputs in a Bladed format.

For the independent model, Bureau Veritas will require the following data and information from the WTG Substructure Supplier:

- General description of the substructure
- CoG positions
- Main dimensions
- Mass and stiffness distributions
- Hydrodynamic coefficients
- Marine growth and corrosion allowance
- Soil properties (p-y curves).

Bureau Veritas may need to exchange data with LMS Samtech in order to build the independent model. In such a case, this data exchange will be covered by a project-specific Non-Disclosure Agreement.

5.1.5. RNA validation - Site Specific WTG RNA Design Evaluation

Verification of Type certificate

Bureau Veritas will verify that the wind turbine (or as a minimum the RNA) holds a valid type certificate according to IECRE OD 501. The TC conditions and limitations shall be compared to the actual site conditions as given in the design basis and it shall be proven that the site-specific conditions are covered by the TC. These include for example:

- Temperature (cold climate sites would necessitate appropriate mitigation measures)
- Humidity
- Solar radiation
- Rain, hail, snow and ice (in particular risk of icing on the rotor blades)
- Chemically active substances
- Mechanically active particles
- Salinity
- Electrical conditions
- Lightning

In particular, the risk of corrosion shall be carefully assessed, and appropriate protection measures shall be enforced. Special attention shall be given to the effects of the site specific conditions on electrical components such as generator, converter, transformer, switch gear and enclosures.

It is expected that safety aspects of wind turbines will be addressed as part of the Type certification. All safety features regarding the RNA itself are considered to be part of the Type certification. The

CVA shall verify fire and safety aspects of electrical equipment located in the tower sections. The CVA shall also verify escape route and evacuation plans for the RNA and Tower. The CVA will ensure that fire hazard analysis, short circuit analysis, and overcurrent protective device coordination study were conducted.

ACP OCRP recommends several exceptions and additions to IEC 61400-3-1 to meet US safety standards and best practices. Also, some safety aspects may not covered under the Type certification. In this case, Bureau Veritas will review any safety aspects specified in the Design Basis which are not already covered in the Type certificate.

The Type Certificate shall ensure that the WTG stops safely and automatically in the following cases: when the rotational speed has increased significantly, or when the functioning of the control equipment for the wind turbine has deteriorated.

Verification of load level

As the wind turbine shall already be type-certified, there is no need for a detailed investigation of the stability of each component as long as both the following conditions are satisfied:

- The design of the component to be installed is the same as the design that has been certified.
- The calculated site-specific loads on the component are not higher than the design loads considered in the type certificate.

A comparison of the site-specific loads with the design loads specified in the wind turbine Type Certificate shall be performed by the wind turbine supplier, confirmed by the type certification body and a summary is provided to Bureau Veritas.

Any increase in load level or any change in vibration modes or natural frequencies shall be stated and carefully evaluated. This evaluation shall consider the relevance and validity of load measurements, functional testing and component tests such as blade test.

Furthermore, the evaluation shall also identify components that will require reinforcement or modifications.

If the loading on the machine implied by the actual site conditions is higher than the design loads, it shall be demonstrated that the increased loads do not endanger the structural integrity of the wind turbine. A specific approval from the Type Certification body might be required in such a case.

Modifications

In case of site-specific modifications that are not covered by the TC, a specific assessment will be made on a case-by-case basis to evaluate the level of additional verification to be performed. The documentation provided shall include a full description of all modifications and reinforcements compared to the original, type-certified design.

Independent analysis may be carried out by Bureau Veritas on critical structures and components (including nacelle and bearing, hub, nacelle frame, bolting, tower, gearbox, blades, etc.), especially on those which are reinforced or modified compared to the versions certified as part of the wind turbine TC. The dynamical behaviour of the transmission chain may also be investigated. To carry out independent analyses, FE models covering mesh and element information, material properties and boundary conditions shall be made available to Bureau Veritas; they could be exported from commercial software such as ANSYS, ABAQUS, etc.

Independent analyses include modal analysis, extreme & fatigue analysis and stability analysis. The exact scope of the required independent mechanical / structural calculations will be determined on a case-by-case basis depending on the site conditions, on the TC characteristics and on relevant project specificities.

5.1.6. WTG Tower Design Evaluation

Bureau Veritas will evaluate the conformity of the design of the tower with the design assumptions specified in the Design Basis.

This includes in particular the review of:

- Material properties
- Tower structure
- Ultimate strength
- Fatigue
- Buckling
- Door opening reinforced with frame
- Bolted connections
- Natural frequency
- Manufacturing procedures
- Transportation procedures
- Installation procedures
- Maintenance procedures.

In addition, an independent calculation will be performed and may cover the following aspects depending on the dimensioning criteria (strength, fatigue, stiffness):

- Data base set up
- Ultimate strength

- Fatigue
- Buckling
- Bolted connections
- Natural frequency.

5.1.7. Electrical systems

The CVA may review and evaluate design documentation on WTG electrical systems to include as a minimum:

- Charging equipment for batteries
- Emergency generator(s)
- Transformers
- Converters (if applicable)
- Switch and protection equipment
- Switchgear
- Capacitors
- Transmission equipment
- SCADA

The CVA review will include the lightning protection design of the WTG. Lightning protection of the turbine is covered by the type certificate, so review shall be limited to a holistic review of the turbine and substructure.

5.2. Task 2 – WTG Fabrication - RNA and Tower

Evaluation

The evaluation plan will be provided to BOEM at the beginning of the fabrication phase for information. This evaluation includes the following elements:

- Quality system evaluation
- Manufacturing inspection and surveillance

The quality system evaluation is limited to the verification that the quality system of the manufacturer is certified according to ISO 9001 by an accredited certification body that operates according to ISO/IEC 17021. As part of the scope, the assumption is made that a valid ISO 9001 certificate will be

provided for each manufacturing place involved. If this is not the case, an additional specific evaluation will have to be performed.

As a general rule, the manufacturing inspection and surveillance will include:

- An initial audit to evaluate the ability of the supplier to produce the component under consideration according to the approved design specifications and with the intended quality level.
- Periodical on-site inspections covering all critical phases of the fabrication process, including the non-destructive testing (NDT) when applicable, including:
    - Verification that design specifications are properly documented in workshop drawings, workshop instructions, purchase specifications, fabrication methods and procedures, including in particular special processes, and welding and NDT procedures when applicable
    - Review of manufacturing records
    - Visual inspection of ongoing manufacturing processes for compliance with the approved manufacturing procedures
- Review of Non Conformities all along the manufacturing phase

In any case, Bureau Veritas mission should not be considered as a duplication or substitution of vendor / manufacturer QC nor repetition of EPC contractor work.

The surveillance activities will be detailed in a Manufacturing Evaluation Plan, as part of the global Evaluation plan. This specific plan will be prepared once more detailed information about the manufacturing activities are available, and before the start of the manufacturing surveillance activities.

Inspection and Test Plan Review

Prior to any surveillance activity at a specific supplier, a Pre-Inspection meeting (or Kick-off meeting) will be organized with the supplier to be inspected. During the meeting Bureau Veritas shall obtain from the manufacturer the manufacturing schedule, clarify all relevant requirements (from quality point of view), receive ITP (Inspection Testing Plan) with manufacturer QC interventions marked up and identify all possible sub-contractors (if applicable).

After the Pre-Inspection Meeting, Bureau Veritas will mark-up the ITP with its own surveillance activities and indicate which surveillance is required for each step of the manufacturing process. The Manufacturing Evaluation Plan will be updated accordingly.

5.2.1. Initial audit

Initial audits will be conducted at manufacturers of the support structure to assess the capacity of the manufacturer to perform the production according to the necessary quality requirements. If significant

sub-parts are produced at sub-contractors, initial audits may be performed at the subcontractors' facilities as well. The necessary documentation of manufacturing processes, testing procedures, quality control, plans of the fabrication plants, etc., shall be provided to BV beforehand.

Typically, BV expects to meet the person in charge of:

- The production (e.g. : production director)
- The incoming goods
- The quality (e.g. : quality manager / quality engineer / QSSE Coordinator)

5.2.2. Periodic inspections

The manufacturers involved in the fabrication of the main wind turbine components shall undergo the quality system evaluation described above.

Main Component	Assembly	Sub component
Nacelle	Backend Assembly	Transformer
		Rear End Support Structure
		Bedframe / Mainframe
		Converter
	Generator Assembly	Generator frame / fixed shaft
		Generator
	Hub Assembly	Hub casting
		Pitch System
		Main bearing incl. housings
	Nacelle Assembly	Backend, Generator and Hub Connection
		Electrical Assembly
Blades		Bearings
		Rotor blade
Tower sections (including coating)		Steel plates
		Flanges
		Door frame

Table 3. – Example: List of main WTG components

For CVA verification, additional surveillance activities are included in order to verify that the manufacturing of wind turbines for the specific project is carried out according to the approved design and with the intended quality, in particular with regards to modified components.

The periodicity of the inspection will be established at the beginning of the production based on the selected ITP steps. At the beginning of the production the presence of the inspection will be around 20% of the production time during the first months. During the serial production stage his presence will be reduced to 10% of the time (considering that no critical non conformity has been identified). At the end of the production during delivery stage the inspector will be again increase to cover the final

inspection with an inspection rate of 20%. Overall a minimum of 10% inspection sample rate will be achieved.

As seen in the example above, the three main components are to be covered by surveillance: Nacelle (including Backend assembly, Generator assembly, Hub assembly and Nacelle assembly), Blades and Tower. Some of the sub-components are dependent on WTG manufacturer and model.

The other subcomponents will be covered by the surveillance of the incoming good inspections at the hub and nacelle assembly factory. This is based on the assumption that these inspections are sufficiently thorough to ensure that the required quality level is met.

This list is based on the currently available information and may need to be updated once more information about the wind turbine is provided, in particular the CVA verification documentation.

Secondary subcontractors will normally not be subjected to the manufacturing surveillance. However, Bureau Veritas reserves the right to extend the scope of inspection in case critical components, unusual materials or special processes are involved. If a subcontractor is involved in the production of load carrying parts, initial audit and periodical inspection will be mandatory. For secondary load carrying elements, the inspection will be decided on a case by case basis. This may depending on several parameters such as applicability of the quality procedures of the main contractor to his subcontractor, the availability of the material certificate such as 3.2 for steel component, etc…

The hub and nacelle assembly will also be subjected to inspections based on random sampling. These inspections will cover both the assembly process and the final assembled hub and nacelle. They will focus in particular on the welded and bolted connections and the electrical installations. These inspections will take place at the Hub and Nacelle assembly plant. During these inspections, the incoming good inspections for the other components of the hub and nacelle assembly will be thoroughly verified. The general approach will be as follows:

- Documentation review (for the selected components)
- Initial audit (for the selected components)
- Initial inspections at the beginning of the production
- Regular inspections for the main components during production to reach the planned inspection rate

With regards to the blades, the manufacturing inspection will comprise:

- Verification that workshop drawing and comparison with the final blade dimension, workshop instruction, purchase specification, etc. are in line with the documentation approved as part of the Type certificate
- Verification of fabrication method, procedure and qualification of personnel,
- Review of material certificates,

- Random checks on the effectiveness of acceptance procedures for purchased components,
- Random checks of fabrication processes

It is expected that in particular the following the key process will be surveyed:

- The lay-up
- Infusion
- Closing and bonding

Any NCR or TQ linked to manufacturing scope will be sent to the CVA and dealt with on a case-by-case basis depending on the criticality of each finding. In case of severe non-conformities of the manufacturing process, the number of inspection would have to be increased accordingly.

With regards to the tower, the manufacturers involved in the fabrication of the tower shall undergo the quality system evaluation described above.

For tubular or conical steel towers, Bureau Veritas will perform a manufacturing survey at the manufacturer workshop, including the following activities:

- Review of structure fabrication documents
    - Quality control plans
    - Construction drawings
    - Welding procedures specifications and existing qualifications
    - Existing qualifications of welding operators *
    - Existing qualifications of NDT operators *
    - Fabrication procedures
    - Testing procedures
    - Contractor QA/QC manual
    - Coordination procedure and planning
    - List of sub-contractor and vendors
- Survey of fabrication of structures and sub-assemblies
    - Materials traceability
    - Cuttings and welding preparations
    - Main fit-ups
    - Identification of welders
    - Preheating
    - Welding consumables

- Welding parameters
- Visual random checks
- Identification of NDT operators
- Witnessing of non-destructive testing
- Heat treatment
- Witnessing of dimensional inspection
- Final visual inspection
- Contractor's site queries
- Contractor's non conformity reports

* It is assumed that operators are qualified. The qualifications of welding & NDT operators are not in the scope of work, but only the review of the qualifications. An audit will be performed of the manufacturing site. This will include a review of the quality management system, including their quality program and qualification of personnel.

The CVA will be involved in data book / material test report review for critical bolted connections.

5.3. Task 3 - WTG – Installation & Commissioning

5.3.1. General approach

The evaluation plan will be provided to BOEM at the beginning of the phase for information. The objective of the transport and installation (T&I) surveillance is to make sure that no excessive loading is sustained by the wind turbines, support structure, IAC and export cable during the transportation and the installation, and to prevent any damage on the components.

The surveillance activities will be detailed in a Transportation & Installation Evaluation Plan, as part of the global Evaluation plan. This specific plan will be prepared once more detailed information about the transportation and installation activities will be available, in particular the corresponding ITPs, and before the start of the surveillance activities.

The consistency between the design and the installation operations is verified by:

- the review of the transportation and installation method documentation to verify its conformance with the Design Basis, the reference standards and the assumptions made in the design phase
- the surveillance of the transportation and installation operations
- the review of the installation records

Interface between CVA and Marine Warranty Surveyor is discussed in section 5.6.2 of this document.

5.3.2. Transportation Surveillance

The transportation surveillance covers transport between manufacturing harbor and marshalling harbor as well as the load-out of the WTG on the installation vessel.

Bureau Veritas will verify that the proposed transportation procedures and test plans are documented in sufficient detail and that they comply with the design basis and the requirements of the reference standards.

The description of the transportation process shall include:

- Technical specifications for the transportation
- Limiting environmental conditions
- Safety instructions
- Transportation arrangement including required fixtures, tooling and equipment
- Transportation loads and load conditions

In addition, Bureau Veritas will perform an onshore survey at the harbour with the aim to verify compliance with the design requirements and approved procedures for transportation. The surveillance will cover in particular the following aspects:

- Inspection of stored components at the harbour for damage (transportation damage, corrosion, etc.)
- Inspection of the full tower assembly at the base harbour
- Lifting operations during load-out of the installation vessel
- Follow-up procedure on transportation damages and non-conformities

It should be noted that a 10% inspection rate is only a base case. In case of severe non-conformities of the transportation process, the inspection rate would have to be increased accordingly.

5.3.3. Installation Surveillance

The installation surveillance covers the offshore operations during installation. It covers the installation of the WTG components (tower, nacelle and rotor blades).

Bureau Veritas will verify that the proposed installation process is documented in sufficient detail in the installation documentation and that it complies with the design basis and the requirements of the reference standards. Bureau Veritas shall make periodic onsite inspections while installation is in progress and must, as appropriate, verify, witness, survey, or check, the installation items required by this section. This may include heavy lifts, bolting, level and location checks, flange flatness and gap inspection. It should be noted that a 10% inspection rate is only a base case. In case of severe non-conformities of the installation process, the inspection rate would have to be increased accordingly.

5.3.4. Commissioning Surveillance

Finally, in addition to these inspections, Bureau Veritas will review the installation records, on a spot check basis. Any deviation from the intended procedures shall be justified, and may involve subsequent inspections.

The intended commissioning instructions shall be submitted to Bureau Veritas prior to the commissioning for review and approval. Bureau Veritas will verify that the proposed procedures and test plans are documented in sufficient detail and that they comply with the design basis and IEC 61400 series requirements.

Bureau Veritas will perform inspections to verify that the commissioning is performed according to the commissioning procedures. These inspections will focus on:

- Conformity of the main components with the approved FDR
- General appearance of the WTG
- Witnessing of the safety and function tests and verification of safety related systems
- Visual inspection of the corrosion protection
- Check for potential damage

IEC specifies that at least the commissioning of the first turbine has to be witnessed, plus one additional turbine for every fifty turbines in the project. This sampling rate may require higher number than the minimum sampling rate specified by the IEC, depending on the Turbine Supplier and Installer experience.

Finally, Bureau Veritas will in addition to these inspections review the commissioning records and the final commissioning reports on a spot check basis. Any deviation from the intended procedures shall be justified, and may involve subsequent inspections.

For commissioning of critical safety systems, The CVA will be witnessing of at least 1 out of every 50 installations as expected by BOEM.

Additional tests will be verified as part of commissioning surveillance, this includes:

- Test of the emergency stop buttons
- Triggering of the brakes and witnessing of turbine's behaviour
- Test of the yaw system
- Behaviour at grid loss
- Behaviour at over speed
- Test of automatic operation

5.4. Task 4 – WTG Foundation Design

5.4.1. Design – Primary structure and secondary Steel

Introduction

The evaluation is focussed on the primary steel design (including material designations) and also includes some elements of the secondary steel (including material designations) as described below:

- Primary structure design (steel plates and flanges)
- The secondary structure verification will be limited to its impact on the primary structure and the main structural components. The impact of secondary structure on human safety will be considered in the evaluation. Secondary structure design evaluation will be limited to:
    - External Platform
    - Boat landing
    - Rest Platform
    - Upper Access Ladder
    - Air-tight deck

Document review

A detailed examination of the documentation produced by the WTG Substructure Supplier will be performed. It will include review of design calculations, drawings, specification of materials, manufacturing specification, etc. During this design review, Bureau Veritas will check compliance of calculations notes with the Design Basis, in particular the engineering codes and specifications referenced therein.

The following design calculations notes will be reviewed for the substructure:

- Natural frequencies
- Extreme Events Analysis (ULS)
- Fatigue Analysis (FLS)
- Ship impact
- Geotechnical design
- Driveability and driving-induced fatigue of jacket piles
- Clustering
- Primary structure design (steel plates and flanges)

- The secondary structure verification will be limited to its impact on the primary structure and the main structural components.
- Bolted connection
- Wave run-up
- Vortex-Induced Vibrations
- FE analysis
- Corrosion protection
- Scour protection
- Transportation and Installation

Comparisons between the WTG Substructure Supplier calculations and Bureau Veritas analyses (see next section) will be made for the most significant structural elements. The compliance of drawings between calculations, and applicable standards and project specifications will be checked.

Coherence with the load analysis will be verified. This includes the verification that the correct loads have been used for the design of the substructure and that they have been implemented properly. It will also be verified that the final design complies with the assumptions made in the Integrated Load Analysis, in particular regarding stiffness and damping of the substructure.

The design of the corrosion protection system will be investigated, including the calculation of corrosion allowances and sacrificial anodes.

A review of the seabed stability, scour assessment and scour protection system will be performed.

The installation documentation will be reviewed, including the intended installation procedures, the installation tolerances, the planned measurements and inspections. The driveability study will be reviewed.

The O&M plan will be reviewed to verify the suitability of the intended requirements and to ensure consistency with the assumptions for the design.

Independent analyses for the substructure

Bureau Veritas will perform an independent analysis for one substructure design in order to verify the calculations of the WTG Substructure Supplier. The underlying assumption is that the design of the different substructures is similar and that the external conditions are sufficiently homogeneous over the site (in particular the soil properties).The structural analyses will be performed using Bureau Veritas' in-house structural analysis tool: NSO (New Strudl Offshore). They will cover the primary structure of the support structure and foundation, excluding the tower and the RNA. Secondary structures will be modelled as non-structural elements in order to properly define their participation in global hydrodynamic loadings.

An integrated model (substructure and foundation) will be built in order to analyse the in-place configuration and the fatigue configurations. The dynamic analysis and structural response will be performed for the operating and extreme environmental conditions and fatigue conditions. Independent analyses for accidental conditions, pre-service conditions or earthquake are not considered as a “base case”. Nevertheless, if deemed necessary, such analysis can be performed.

The following analyses are typically performed:

- Natural frequency analysis
- In-place analyses
    - ULS analysis
    - FLS analysis
- Geotechnical independent analyses
    - Holding capacity: axial and lateral bearing capacity
    - Drivability analysis: risk of refusal
- Other structural analyses
    - Pile fatigue during driving (*)
    - Lifting
    - Bolted connections

Sensitivity analyses will be performed to cover the worst conditions of the field.

Pile fatigue and its impact on design life will be considered in assessing the results of these load combinations, according to the requirements of the applicable codes.

(*) In case that the soil would have a low bearing capacity, a full integrated soil structure analysis would have to be performed in order not to over optimize the structural design of the foundation. As a base case, the design assessment of the foundation will be performed by using a simplified analysis with NSO software (beam analysis). In case the criteria are not satisfied, a detailed analysis is required. In any case, this analysis can be used for screening purposes to identify the critical areas that will be further analysed in the next step.

5.5. Task 5 – Foundation Fabrication

5.5.1. General

MP/TP manufacturing surveillance will focus on metal fabrication audits including quality, material specifications, cutting, bevelling, rolling, welding, blasting and coating, NDT and all other verifications, etc. The GBS manufacturing surveillance will focus on precast concrete quality audits including

concrete specifications (different concrete mix formulations), formwork, concrete pouring, rebar fabrication, rebar placement and dimensional controls (cover, lap length, anchor length…), fresh and hardened concrete tests, curing, steel embedded elements (anchor bolts, anchor plates, pre-stressing anchors...), post tensioning, grouting and all dimensional and material specifications verifications. BV has extensive experience on GBS fabrication having successfully completed the Fécamp Offshore Wind Farm.

The manufacturing surveillance for the supporting structure will cover the:

- Primary structure design (steel plates and flanges)
- Secondary structure limited to the assembly of the following:
    - External Platform
    - Boat landing
    - Rest Platform
    - Upper Access Ladder
    - Air-tight deck

5.5.2. Initial audit

Initial audits will be conducted at manufacturers of the support structure to assess the capacity of the manufacturer to perform the production according to the necessary quality requirements. If significant sub-parts are produced at sub-contractors, initial audits may be performed at the subcontractors' facilities as well. The necessary documentation of manufacturing processes, testing procedures, quality control, plans of the fabrication plants, etc., shall be provided to Bureau Veritas beforehand.

The key aspects of the initial audit will focus on the review of:

- Valid Quality Management (QM) certificate according to ISO 9001: note Revision and Validity
- Project Quality Plan (PQP)
- Inspection and Testing Plans (ITPs)
- For steel production i.e. WPSs, WPQRs, welding sequence schedule, certificates of the supervisory welding staff, welders and NDT personnel, etc.
- For cast components i.e. component specifications, drawing of the raw casting and machining, test drawing, drawing of the surface treatment, post-treatment specifications, etc.

Typically, Bureau Veritas expects to meet the person in charge of:

- The production (eg: production director)
- The incoming goods

- The quality (eg: quality manager / quality engineer / QSSE Coordinator)

5.5.3. Periodic inspections

The manufacturers involved in the fabrication of the support structure shall undergo the quality system evaluation described above.

For steel structures (jacket, flanges), Bureau Veritas will perform an onshore survey at the construction yard(s) covering the primary structures. The following activities are included:

- Review of structure fabrication documents
  - Quality control plans
  - Construction drawings
  - Welding procedures specifications and existing qualifications
  - Existing qualifications of welding operators *
  - Existing qualifications of NDT operators *
  - Fabrication procedures
  - Testing procedures
  - Contractor QA/QC manual
  - Coordination procedure and planning
  - List of sub-contractor and vendors
- Survey of fabrication of structures and sub-assemblies
  - Materials traceability
  - Cuttings and welding preparations
  - Main fit-ups
  - Identification of welders
  - Preheating
  - Welding consumables
  - Welding parameters
  - Visual random checks
  - Identification of NDT operators
  - Witnessing of non-destructive testing
  - Heat treatment
  - Witnessing of dimensional inspection
  - Final visual inspection
  - Contractor's site queries
  - Contractor's non conformity reports

* It is assumed that operators are qualified. The qualifications of welding & NDT operators are not in the scope of work, but only the review of the qualifications.

It should be noted that a 10% sampling rate is only a base case. In case of severe non-conformities of the manufacturing process, the sampling rates would have to be increased accordingly.

5.6. Task 6 – Foundation Installation

5.6.1. Project-specific assumptions

Foundation installation scope of work will vary depending on foundation type (MP vs GBS). The typical MP installations are driving by an impact hammer in soft soils or by drilling and grouting in hard soils. Some hybrid solutions may also be applied based on the geotechnical data. TP will be connected to MP either by grouting or by means of a bolted flange.

The GBS installation is different as the GBS will typically be placed on the seabed. Some sea-bed preparations (bedding layer, filter layer, etc.) are often required to satisfy the overall stability criteria (over-turning and bearing capacity, sliding, stiffness, etc.) as well as installation tolerance criteria. After immersion of the GBS, ballasting is required for the stability. It is noted that a GBS concept is typically very heavier than the MP Concept and the installation topics are more involved. The following assumptions have been made for this Proposal:

- The installation contractors operate a quality management system certified according ISO 9001 by an accredited certification body.

5.6.2. Project-specific approach

The Marine Warranty Surveyor is not part of the CVA scope of work. The interface matrix shown hereafter describing the activity split between the CVA and the Marine Warranty Surveyor (MWS) will be jointly confirmed between Atlantic Shores and the MWS contractor with respect to the responsibilities and surveillance / review for the project.

- As a CVA, Bureau Veritas intends to conduct transportation and installation surveillance with a 10% sample rate for installation verification and will verify the remaining balance of the installations by reviewing MWS records.
- The intention of the split matrix is to define the role of the MWS versus CVA and to avoid duplication of the work. To summarize the principle of the split, Bureau Veritas will carry out the review of the T&I procedures supported by the design documentation and will ensure that all design aspects are correctly defined in the procedures. BV inspector will ensure on site that the T&I procedures are duly implemented so that the T&I operation can be performed on a repetitive manner. Bureau Veritas will have a particular focus on the structural integrity of the asset while the MWS will be more focused on the marine operation itself.
- The boundary between two areas of responsibility is usually defined at the lifting point of the asset. All rigging, lifting tool and cranes are part of the MWS scope.

No.	Task	MWS	CVA
0.	**Audit**		
0.1	Quality management audit of installation provider		X
1.	**Document review**		
1.0	Review and approval of method statement/procedures related to load-out, offshore Transportation & Installation of relevance for the structure.		X
1.1	Verification of all load cases related to load-out, offshore Transportation & Installation relevant for the structure (changes to certified design).		X
1.1.1	Review and approval of calculations in method statements/procedures related to load-out, offshore Transportation & Installation to ensure that utilization rates as verified by the Verification of all load cases related to load-out, offshore Transportation & Installation relevant for the structure are not exceeded taking into account the specific environmental conditions (operational limits) and the duration pertaining to the specific operations, in particular: • Pile drivability analysis (for each location taking into account the location-specific soil condition as well as operational limits • Lifting/upending analysis (rigging, winches, cranes, moorings, etc.) when implication/impact to structure cannot be excluded • Transportation analysis (sea-fastening/grillage, stability, bollard pull) and possible implication/impact to structure • On-bottom stability of component with respect to structure and relevant for the specific foundations. Possible interim activities (e.g. vortex strakes, lifting pad eyes etc.) are within CVA scope. CVA scope is to observe that the structure is transported, loaded-out, lifted, installed in compliance with specification given within design.		X
1.2	Review and approval of method statement/procedures related to load-out, offshore Transportation & Installation in relation to vessel, lifting equipment etc.	X	
1.3	Review and approval of calculations in method statements/procedures related to load-out, offshore Transportation & Installation to ensure that utilization rates as verified by the Verification of all load cases related to load-out, offshore Transportation & Installation are not exceeded considering the specific environmental conditions (operational limits) and the duration (weather window) pertaining to the specific operations, in particular: • Lifting/upending analysis (rigging, winches, cranes, moorings, etc.) • Transportation analysis (sea-fastening/grillage, stability, bollard pull) • On-bottom stability of component • Installation procedures (piling/grouting, lifting, mating) • Vessel positioning, jacking, anchoring during installation operations.	X	

No.	Task	MWS	CVA
	Note for clarification: CVA approves all load-cases related to load-out, offshore Transportation & Installation, which have relevance for the structure while the MWS checks if: • The vessel and equipment specifications are reflected in the calculations • These engineering calculations are conducted according to guidelines resulting in the operational limits for defined durations (weather windows). MWS shall ensure that possible load restrictions (e.g. weather window for installations vessels/equipment, limitations to wave, wind) are followed. CVA will solely focus on same with respect to the structure including possible interim components prescribed within design.		
1.6	Provide technical review report as a result of the review of method statements/procedures.	X	
2.	**Suitability surveys of vessels and equipment**		
2.1	All towing vessels, cargo barges and crane vessels/jack-up´s used for the load- out, offshore Transportation & Installation as well as relevant equipment for marine operations will be audited prior to mobilization to ensure that they are fit for purpose and up to standard (e.g. rigging, crane, remote operated vehicles (ROV), hammer, towing equipment, towline recovery equipment, navigation lights, pumping equipment, mooring ropes, fenders).	X	
2.2	Provide a vessel suitability survey report. The suitability surveys will be carried out according to the MWS checklists.	X	
3.	**Load-out Surveillance**		
3.1	Certificate of Approval	X	
3.2	On-site surveillance of lifting, upending skidding operations during loading and unloading.	X	
3.3	On-site surveillance of lifting, upending skidding operations during loading and unloading with respect to structure.		X
3.4	During on-site attendance, verify the conformity of the operations with the approved method statements/procedures, e.g. in respect with the operational limits (wind speed, wave height, etc.) and the duration of operation (weather Window).	X	
3.5	During on-site attendance, verify the conformity of the operations with the approved method statements/procedures with respect to structure.		X
4.	**Transportation Surveillance**		
4.1	Certificate of Approval	X	
4.2	Surveillance of welding of grillage to transported components	X	

No.	Task	MWS	CVA
	• Spot-check surveillance of preparation for welding including correct use of materials, fit up, weather protection • Spot-check surveillance of welding performance including adherence to welding procedures, preheating, tack welding, welding, post weld heat treatment, weld repairs • Spot-check surveillance of non-destructive testing (NDT) activities including performance of NDT and adherence to NDT procedures, evaluation of results and of the extent of the NDT • Review of NDT reports by level 2 staff.		
4.3	Surveillance of bolted connections (Marine operation tasks should be verified by the MWS . CVA scope will be focus on the structural integrity.) • Surveillance of fit-up • Bolt pre-tensioning.		X
4.4	Surveillance of sea fastening according to approved method statements/procedures for all components to be transported.	X	
4.5	During on-site attendance, verify the conformity of the operations with the approved method statements/procedures, e.g. in respect with the operational limits (wind speed, wave height, etc.) and the duration of operation (weather window).	X	
5.	**Installation Surveillance**		
5.1	Certificate of approval	X	
5.2	On-site surveillance of lifting, piling operations during installation incl. surveillance of the structure for damage during or after the cutting of the sea-fastening.	X	
5.6	On-Site surveillance of bolted connections • Surveillance of fit-up • Bolt pre-tensioning.		X
5.8	During on-site attendance, verify the conformity of the operations with the approved method statements/procedures, e.g. in respect with the operational limits (wind speed, wave height, etc.) and the duration of operation (weather window).	X	
6.	**Completion of the Transportation & Installation Surveillance**		
6.1	As-built documentation with respect to the structure • Pile driving records • General deviations from approved design		X
6.2	Issuing of a Conformity Statement for Transportation & Installation Surveillance.		X

Table 4. - Interface Matrix with MWS

The CVA will review transportation and installation procedures in the FIR during the design phase likely before transportation and installation contractors are selected. As more details become available from the transportation and installation contractors, Bureau Veritas will review detailed transportation and installation procedures to check completeness and plausibility and to get acquainted with the methodology to be implemented as part of the transport and installation. In addition, Bureau Veritas will verify the consistency with the defined loading condition Design Basis.

During the load of the structure at base harbour, Bureau Veritas will witness the operation in order to inspect potential damages which might occur during handling of the structure. MWS will be in charge of the on-site surveillance of the lifting, upending skidding operation in particular MWS shall ensure that possible load restrictions are followed.

Bureau Veritas shall make periodic onsite inspections while installation is in progress and must as appropriate, verify, witness, survey, or check, the installation items required by this section. Bureau Veritas shall ensure they have a proper vantage point for all witnessing activities.

Some of these inspections may have to be followed by Bureau Veritas at distance using connected glasses or any other suitable communication means for supervision purposes.

The reports from the MWS shall be provided for Bureau Veritas to be able to follow the installation process and shall clearly describe the CVA related activities. Also Bureau Veritas shall be able to follow the NCR raised during the transportation and installation process.

The MWS has not been selected for the Project, nor has the scope of work been finalized. The table included was indicative-only, to show the overlap and division of scope between the MWS and CVA.

Once the MWS is selected by ASOW, a clarification meeting will be held to discuss the split in scope of service.

The CVA will conduct T&I surveillance at a 10% sampling rate for each asset. The MWS work will be used to verify T&I scope per the agreed scope of work with insurers. The CVA and MWS shall align on scope of work during a clarification meeting, and shall collaborate and communicate where applicable.

5.6.3. Initial audit

Initial audits will be conducted at the installation contractors to assess the capacity of the contractors to perform the production according to the necessary quality requirements. The necessary documentation of transportation processes, testing procedures, quality control, etc., shall be provided to Bureau Veritas beforehand.

5.6.4. Transportation Surveillance

The transportation surveillance covers the load-out of the support structures on the installation vessel.

Bureau Veritas will verify that the proposed transportation procedures and test plans are documented in sufficient detail and that they comply with the design basis and the requirements of the reference standards.

The description of the transportation process shall include:

- Technical specifications for the transportation
- Limiting environmental conditions
- Safety instructions
- Transportation arrangement including required fixtures, tooling and equipment
- Transportation loads and load conditions

In addition, Bureau Veritas will perform an onshore survey at the harbour with the aim to verify compliance with the design requirements and approved procedures for transportation. The surveillance will cover in particular the following aspects:

- Inspection of stored components at the harbour for damage (transportation damage, corrosion, etc.)
- Lifting operations during load-out of the installation vessel
- Follow-up procedure on transportation damages and non-conformities

5.6.5. Installation Surveillance

The installation surveillance covers the offshore operations during installation. It covers the installation of the support structure.

Bureau Veritas will verify that the proposed installation process is documented in sufficient detail in the installation documentation and that it complies with the design basis and the requirements of the reference standards. Bureau Veritas shall make periodic onsite inspections while installation is in progress and must, as appropriate, verify, witness, survey, or check, the installation items required by this section.

Additionally, Bureau Veritas will, in addition to these inspections, review the installation records, including the pile driving records and the grouting and grout test reports, on a spot check basis. Any deviation from the intended procedures shall be justified, and may involve subsequent inspections

To comply with §585.708(a)(4), the CVA shall make periodic onsite inspections while installation is in progress and must, as appropriate, verify, witness, survey, or check, the installation items required by this section.

- The CVA shall verify, as appropriate, all of the following:
    - Loadout and initial flotation procedures;

- Towing operation procedures to the specified location, and review the towing records;
- Launching and uprighting activities;
- Submergence activities;
- Pile or anchor installations; and associated back calculations for pile driving and associated fatigue calculation
- Installation of mooring and tethering systems;
- Final deck and component installations; and
- Installation at the approved location according to the Facility Design Report and the Fabrication and Installation Report.

- For a fixed facility the CVA shall verify that proper procedures were used during the following:
  - The loadout of the jacket, decks, piles, or structures from each fabrication site; and
  - The actual installation of the facility or major modification and the related installation activities

5.7. Task 7 – Offshore Substation Design

5.7.1. Design of primary design

The following design calculations will be reviewed for the substructure (Jacket):

- Natural frequency assessment
- Ultimate Limit State (ULS) analysis
- Service Limit State (SLS) analysis
- Fatigue Limit State (FLS) analysis
- Accidental Limit State (ALS) analysis (Ship impact, drop object, etc)
- Temporary load conditions
- Wave slam
- Wave run-up
- Vortex shedding analysis (also during fabrication and load-out)
- Finite Element analyses
- Scour protection
- Driveability

For transportation and installation, the following analyses will be reviewed:

- Sea-transport
- Lifting
- Pile driving for the piles connecting the jacket to the seabed
    - Pile driving fatigue
    - Pile upending
    - Pile sway with/without hammer

In addition, the design of the corrosion protection system will be verified, including the calculation of corrosion allowances and sacrificial anodes.

A review of the seabed stability, scour assessment and scour protection system will be performed.

The scope of work includes the review and verification of concept load-out, installation and transportation procedure & methodologies.

An independent analysis will be performed to verify the structural design of the OSS support structure.

The structural analyses will be performed using Bureau Veritas's in-house structural analysis tool: NSO (New Strudl Offshore). They will cover the primary structure of the support structure. Secondary structures will be modelled as non-structural elements in order to properly define their participation in global hydrodynamic loadings.

The jacket (up to the connection with the topside) will be modelled using Isymost and NSO software programs. The soil reaction will be modelled by springs (in accordance with API methodology). The wave loads / current loads will be applied all along the structure on relevant portions: the wave may be of Airy, Stoke and other type and the current may be considered as constant or have a specific profile, depending on the approach chosen. The wind loads will be considered as a single force acting at the top of the model.

The analysis will cover the ULS and FLS configurations. The dynamic analysis and structural response will be performed for the operating and extreme environmental conditions and fatigue conditions. Independent analyses for accidental conditions, pre-service conditions or earthquake are not considered as a "base case". Nevertheless, if deemed necessary, such analysis can be performed.

The following analyses are foreseen:

- Geotechnical independent analyses
    - holding capacity: axial and lateral bearing capacity
    - driveability analysis: risk of refusal
- Structural independent analyses

- driveability fatigue and buckling analysis
- in-place analysis: ULS, FLS, SLS
- grouted connections

Note (1): Accidental load cases such as "Boat impact" and "Dropped object" and temporary load cases such as "Load-out, Lifting, transport, etc." will be verified through documentation review.

Note (2): The structural analysis is performed by considering a single model including the substructure, topsides structures and foundations. The mechanical properties of soil from geotechnical studies are used to represent the boundary conditions of the model.

Note (3): Finite element analyses which are not included as a base case. They can be performed if needed. It may be useful to perform FE analyses for design cases that are close to the design limit. This would have to be defined on a case-by-case basis during the design review.

5.7.2. Design of secondary structure

The secondary structure verification will be limited to its impact on the primary structure and the main structural components. The impact of secondary structure on human safety will be considered in the evaluation. The secondary structure design will be limited to the review of:

- External Platform
- Boat Landing
- Rest Platform
- Upper Access Ladder
- Air-tight deck

5.7.3. Topside Structure Design

The Topside structural design appraisal includes design review and independent analysis. It covers the topside primary structure.

Structural Design Review

- Design Review of following design calculations:
  - In place analysis condition (Operating and storm conditions).
  - Load out, transport and installation phase
  - Dropped object
  - Accidental loads if any
- Review of the corrosion protection system

- Review of topside drawings
- Review of secondary structures

Structural Independent Analysis

Independent structural analyses covering Topside primary structure will be performed using Bureau Veritas own tool, called NSO. An integrated model will be built for in-place analysis (static in-place analysis for operating & extreme environmental conditions).

5.7.4. Fire Protection and Human Safety

Bureau Veritas will review all documents (technical specifications, mechanical & process data sheets, calculation notes, safety cause & effects diagrams, drawings, requisition) issued by the OSS designer(s) for safety systems, pressure vessels & mechanical equipment.

Safety detection, platform layout, control and protection systems

Bureau Veritas will review all documents issued by Engineering relative to the fire and safety concepts and philosophy of the platforms. Design appraisal will be conducted to ascertain that control engineering is adequate to maintain the level of safety on the platform in case of fire, if they occur, to minimise their adverse consequences. The above two objectives are respectively to be reached by the review of plant safety system and emergency support systems.

The review will be conducted to ascertain that abnormal conditions are rapidly detected and that corrective actions are taken in order that the safety of personnel and installations is not impaired.

The verification of the detection and layout will include the review of the following systems:

- Fire and gas detection systems
- Ventilation systems (HVAC)
- Emergency shutdown system
- Classification of hazardous areas
- Equipment and accommodation layout
- Equipment handling
- Passive fire protection.

Fire-fighting equipment / active fire protection

The verification of the firefighting equipment would ascertain the following:

- Check of specifications to ascertain that fire-fighting equipment would be engineered and fabricated according to recognized standards and tested by a competent authority
- Check of layout of protective equipment regarding suitability for use and maintenance

- Check of suitability of extinguishing medium in relation to class of fires liable to be experienced and also to equipment installed in protected area
- Check that design arrangements would permit testing in service
- Check the passive fire protection system and architectural in order to minimize the escalation of a fire on the platform.

Bureau Veritas will review the specifications, drawings, data sheets and calculation notes related to the following systems:

- Fire water system (fire water demand, fire pumps, fire mains, hydrants and hoses)
- Foam systems, Deluge systems
- Fixed gas fire extinguishing systems
- Mobile fire extinguishing systems (fire extinguishers number, location and adequacy)
- Fireman's outfit
- Safety plan
- Passive fire protection & Architectural, including fire integrity of walls and decks; insulation material specification and position; deck and surface coverings material specification and positions; fire doors in different types of walls and specification of doors; penetrations of cables and pipes through fire divisions; details of fire dampers; ventilation system layout including dimensions and penetrations of ducts through fire divisions.

Evacuation systems / Safety systems with respect to access/egress, evacuation and rescue

The verification will centre upon ascertaining Life Saving Appliances adequacy to meet applicable requirements.

Platform lifesaving crafts:

- Review of number of life-boats, life-rafts, rescue boats
- Review of above crafts aggregate capacity
- Review of crafts type, location and launching gears
- Review of embarkation stations in relation to fire possibilities, emergency shutdown panels and escape routes.
- Platform individual life saving appliances:
- Review to ascertain compliance of number, type and location of life jackets, buoys, survival suits, etc.

Safety plan:

- Review will be conducted of safety plan, from operating manual, to ascertain adequacy and compatibility with escape as well as other casualty control equipment (fire and detection and protection, alarm/P.A. Systems etc.)

5.7.5. Electrical Design

The electrical design of the OSS systems will be reviewed and evaluated against compliance with the reference standards. The anticipated scope of the evaluation includes:

- HV transmission and distribution systems
- Local power supplies
- Platform lighting and small power
- Cable schedule and cable routing
- Cable glands / MTC
- UPS
- Lightning protection
- Earthing and bonding
- SCADA
- Communication system

The CVA may review the capacity of the power back-up system. Proper corrective action will be taken once the assessment is performed.

The CVA may review and evaluate design documentation on OSS electrical systems to include as a minimum:

- Charging equipment for batteries
- Emergency generator(s)
- Transformers
- Converters (if applicable)
- Switch and protection equipment
- Switchgear
- Capacitors
- Transmission equipment
- SCADA

Additionally, the CVA will verify that the electrical design documents for the OSS are PE stamped and accompanied by a report(s) from each electric designer(s) demonstrating that compliance with applicable standards. It is assumed that the electrical designer(s) will seek guidance from the published Offshore Wind Electrical Safety Standards Harmonization: Workshop Proceedings.

CVA review will include the lightning protection design of the OSS. Lightning protection of the OSS and any other offshore structures shall be reviewed independently. If deemed insufficient, proper corrective action and reporting will be performed.

The CVA will ensure that fire hazard analysis, short circuit analysis, and overcurrent protective device coordination study were conducted.

5.8. Task 8 - Offshore Substation Fabrication

5.8.1. General

The following activities are included, with a comparable scope as described below:

- Manufacturing Surveillance, Topside Structure
- Manufacturing Surveillance, Topside Equipment (limited to Fire & Safety equipment)
- Manufacturing Surveillance, Support Structure including piles

5.8.2. Initial audit

Initial audits will be conducted at manufacturers of topside and support structure to assess the capacity of the manufacturer to perform the production according to the necessary quality requirements. If significant sub-parts are produced at sub-contractors, initial audits may be performed at the subcontractors' facilities as well. The necessary documentation of manufacturing processes, testing procedures, quality control, plans of the fabrication plants, etc., shall be provided to Bureau Veritas beforehand. Please refer to section 5.5.2 for more details on the content of the initial audit.

5.8.3. Periodical inspections

The manufacturers involved in the fabrication of the topside and support structure shall undergo the quality system evaluation described above. The CVA will perform an onshore survey at the construction yard(s) covering the primary structures. The following activities are included:

- Review of structure fabrication documentation
    - Quality control plans
    - Construction drawings
    - Welding procedures specifications and existing qualifications
    - Existing qualifications of welding operators *
    - Existing qualifications of NDT operators *

- Fabrication procedures
- Testing procedures
- Contractor QA/QC manual
- Coordination procedure and planning
- List of sub-contractor and vendors

- Survey of fabrication of structures and sub-assemblies
  - Materials traceability
  - Cuttings and welding preparations
  - Main fit-ups
  - Identification of welders
  - Preheating
  - Welding consumables
  - Welding parameters
  - Visual random checks
  - Identification of NDT operators
  - Witnessing of non-destructive testing
  - Heat treatment
  - Witnessing of dimensional inspection
  - Final visual inspection
  - Contractor's site queries
  - Contractor's non conformity reports

- For the Fire & Safety equipment:
  - inspection of fire doors and windows
  - review fire certificates

* It is assumed that operators are qualified. The qualifications of welding & NDT operators are not in the scope of work, but only the review of the qualifications. As part of this proposal and as a minimum, the following criticalities have been used to determine the sampling rates during the foreseen construction period:

Component	Criticality	Base inspection rate
Support structure and topside (start of production – first month)	H	20%
Support structure and topside (serial production)	M	10%

Table 5 - Criticality and Frequency rate for Support Structure / Topside inspection

For the manufacturing surveillance of the support structure, the sampling rate should be understood as applying to the construction period rather than to the components themselves:

- 20 % means 1 day of inspection per week or 4 days per month (during the first month to audit manufacturer's quality system)
- 10 % means 0.5 day of inspection per week or 2 days per month (during the rest of the fabrication)

It should be noted that these sampling rates are only a base case. In case of severe non-conformities of the manufacturing process, the sampling rates would have to be increased accordingly.

Subject to BOEM approval, Bureau Veritas recommends starting with an initial sampling rate of 20%, in order to properly ascertain that the quality system for manufacturing is in place and functioning. It is then assumed that these initial inspections will provide sufficient confidence in the manufacturer quality control system and procedures to decrease the criticality to Medium and thus reduce the sampling rate down to 10%.

Depending on the manufacturing location, it could be arranged that this decrease in sampling rate does not impact the inspection frequency, but rather the inspection time. This means that instead of performing a full day of inspection every two weeks (for 10% sampling rate), Bureau Veritas would perform one half-day inspection every week. This would reduce the effort required for the inspection while still providing a regular reassurance that the production is under control. Another advantage is that it gives more flexibility to adapt the inspection planning to the production schedule and to focus on the most critical productions steps. This could be implemented if the chosen manufacturing locations are close to Bureau Veritas local offices.

Surveillance is planned to be conducted with a minimum 10% sampling rate and three (3) manufacturing visits (start, mid-production, and end) as a baseline. The baseline surveillance may be adjusted based upon review of findings. CVA surveyors shall conduct manufacturing surveillance in order to verify compliance between the approved design and the product. In general manufacturing surveillance shall involve evaluation of manufacturing, evaluation of quality management system, product related quality and process audits.

5.9. Task 9 – Offshore Substation Installation & Commissioning

5.9.1. Transportation Surveillance

Bureau Veritas will assess the transportation procedures documented in the transportation manual. The description of the transportation process shall include:

- Technical specifications for the transportation

- Limiting environmental conditions
- Safety instructions
- Transportation arrangement including required fixtures, tooling and equipment
- Transportation loads and load conditions

In addition, Bureau Veritas will witness the handling operations of the topside and support structure in order to verify that these procedures are correctly implemented. The surveillance will cover in particular the load-out, sea-fastening and towage.

5.9.2. Installation Surveillance

Bureau Veritas will verify that the installation process is documented with sufficient details in the installation manual and that it is in compliance with the design basis and design assumptions.

In addition, Bureau Veritas will witness the installation of the support structure and topside to verify that these procedures are correctly implemented. Surveillance will cover in particular the following phases:

- Compliance with the requirements for acceptable weather conditions during sea transportation and installation
- Damage inspection before installation
- Witnessing of lifting operations
- Surveillance of the complete installation process on site, and in particular the grouting, welding and bolting processes as well as non-destructive testing.
- Final visual inspection after installation
- Follow-up procedure on transportation or installation damages

Additionally, Bureau Veritas will in addition to these inspections review the installation records, including the pile driving records and the grouting and grout test reports, on a spot check basis. Any deviation from the intended procedures shall be justified, and may involve subsequent inspections.

To comply with §585.708(a)(4), the CVA shall make periodic onsite inspections while installation is in progress and must, as appropriate, verify, witness, survey, or check, the installation items required by this section.

- The CVA shall verify, as appropriate, all of the following:
    - Loadout and initial flotation procedures;
    - Towing operation procedures to the specified location, and review the towing records;
    - Launching and uprighting activities;

- Submergence activities;
- Pile or anchor installations;
- Installation of mooring and tethering systems;
- Final deck and component installations; and
- Installation at the approved location according to the Facility Design Report and the Fabrication and Installation Report.

- (b) For a fixed facility the CVA shall verify that proper procedures were used during the following:
  - The loadout of the jacket, decks, piles, or structures from each fabrication site; and
  - The actual installation of the facility or major modification and the related installation activities

5.9.3. Commissioning surveillance

The commissioning surveillance is limited to the structure and Fire & Safety systems reviewed as part of the design evaluation.

Regarding the structure, the commissioning surveillance consists mostly in visual inspection to check for potential damages, witness remedial work, verify the bolted connections, etc.

Regarding Fire & Safety systems, the commissioning surveillance will include inspection and witnessing of tests relative to:

- fire control equipment installation (fire detection, fire-fighting, personnel safety equipment, escape routes)
- fire alarm system
- fire-fighting, inert gas
- fire-fighting, CAFS

The intended commissioning instructions shall be submitted to BVCF prior to the commissioning for review and approval. Bureau Veritas will verify that the proposed procedures and test plans are documented in sufficient detail and that they comply with the design basis and approved codes / standards hierarchy.

Bureau Veritas will perform inspections to verify that the commissioning is performed according to the commissioning procedures.

Bureau Veritas will in addition to these inspections review the final commissioning reports. Any deviation from the intended procedures shall be justified, and may involve subsequent inspections.

For the project, 7 days of inspections during onshore commissioning and 3 days of inspections during offshore commissioning have been assumed. This number might need to be adjusted up or down at a later stage of the project based on the final design, installation procedures and on the operational conditions during installation and commissioning.

5.10. Task 10 – Export / Inter Array Cables Design

5.10.1. Export / Inter Array Cables, Design

The verification work proposed will cover the design of array cables.

The purpose of the evaluation is to verify that the design is sufficient for a safe design and execution of the project, i.e. that it is coherent, exhaustive, sufficiently documented and that it meets all requirements related to the CVA verification references.

The following documentation is foreseen to be reviewed during the course of the project:

- Design report of array cables including local cross-section design of the cable (mechanical and electrical aspects). In particular, the review of the cable design will cover the following aspects:
- Cable data sheets
- Short circuit and load flow analysis
- Description of cable protection
- FAT test specification
- Interface at substructure and tower
- Burial assessment and trenching analysis

No independent calculations are included in the present scope. It is expected that detailed input / outputs of calculations will be provided by the engineering reports produced by the designer(s). In case of lack of proper justifications from the engineering, additional independent calculations may need to be conducted.

The following aspects will be typically assessed:

- The power cable design report covering detailed cross -section (lay angle of components), the termination drawings, the design in the power cable current length (design criteria for the different parts, load sharing, etc.)
- The material selection report of the power cable and its components , including justification of the long term suitability (effect of ageing, thermal effect, etc.)
- The type approval certificate/ 3.2 certificate for all individual components, armour, cables, etc.

5.11. Task 11 - Inter Array Cables Fabrication

The evaluation plan will be provided to BOEM at the beginning of the phase for information.

5.11.1. Project specific assumptions

The extent of inspection and audits to be carried out for CVA verification shall be evaluated for each single project and wind turbine type. For this project, the following points are taken into account as part of the definition of the surveillance scope:

- It is assumed that manufacturing line is already qualified for the power cable lay-up.
- It is assumed that the quality system of the manufacturer is certified according to ISO 9001 by an accredited certification body that operates according to ISO/IEC 17021.
- The CVA will perform inspections to verify Inter Array Cable fabrication as detailed below. It is also understood that Atlantic Shores will carry out its own additional inspections for surveillance of the manufacturing process and that the associated reports and findings will be made available to the CVA for following of the manufacturing process.

5.11.2. Project-specific approach

Based on the assumptions described below, the following approach is proposed for the project:

- An initial audit of the manufacturer is carried out by Bureau Veritas for the assessment of manufacturer's quality system.
- Review of Inspection and Test Plan with mark-up (fill-in hold and witness points required)/ of testing procedure/ of splicing procedure, as per section Atlantic Shores
- Bureau Veritas inspectors will carry out the following Manufacturing surveillance (inspections & review) on the main following steps for IAC in order to check the repeatability and the quality of the process and foreseen as follows:
    - Attendance to manufacturing of IAC current length (no ancillaries considered) cut of the different length sections and mounting of cable terminations
    - Attendance to FATs for all cables
- Review of final manufacturing dossier.

Assumptions:

- Attendance to manufacturing of current length, cut to length and mounting of termination will be done on a spot basis.
- Attendance to FAT is required.

- Assumptions is made that manufacturing/testing capabilities will allow Bureau Veritas to witness multiple FAT in a day. This may involve carrying out additional inspections if the planning cannot be met.
- The Final Manufacturing dossier is required. .
- To allow an efficient review of this document it will need to be provided compiled with all test/ manufacturing documentation along with the TQ and NCR of the project and sent in one batch to Bureau Veritas. This may involve additional evaluation days if the document is not finalised when submitted to Bureau Veritas.

Apart from the above-mentioned inspections, the manufacturing process will be followed mostly by documentation review of the manufacturing documentation. This includes in particular the findings and inspection reports from Atlantic Shores' own surveillance activities, in addition to the manufacturers' QA/QC documentation. In particular, the non-conformities raised as part of the manufacturing process shall be communicated to Bureau Veritas.

In case the audits, inspections or documentation review indicate quality issues, Bureau Veritas shall be involved in the follow-up and resolution of those issues. This may involve carrying out additional inspections or documentation review as would be necessary to close the corresponding findings.

Any review of NCR or TQ linked to manufacturing scope will be sent to the CVA and dealt with on a case-by-case basis depending on the criticality of each finding.

5.11.3. Initial audit

Initial audits will be conducted at the main manufacturer's premises to assess the capacity of the manufacturer to perform the production according to the necessary quality requirements. If significant sub-parts are produced at sub-contractors, initial audits may be performed at the subcontractors' facilities as well. The necessary documentation of manufacturing processes, testing procedures, quality control, plans of the fabrication plants, etc., shall be provided to Bureau Veritas beforehand.

As a general rule, all requirement referring to quality described in section 5.5.2 also apply to initial audit for cable factories.

5.11.4. Periodical inspections

The manufacturers involved in the fabrication of the support structure shall undergo the quality system evaluation described above.

Manufacturing surveillance (inspections & review) typically covers the main following steps:

- Attendance to manufacturing of IAC current length (no ancillaries considered)
- Cut of the different length sections

- Mounting of cable terminations
- Review of FAT procedures and attendance to FATs
- Review of FAT reports + final manufacturing dossier.

5.12. Task 12 – Inter Array Cables Installation

The objective of the transport and installation (T&I) surveillance is to make sure that no excessive loading is sustained by the IAC during the transportation and the installation, and to prevent any damage on the components.

The consistency between the design and the installation operations is verified by:

- The review of the transportation and installation method documentation to verify its conformance with the Design Basis, the reference standards and the assumptions made in the design phase
- The surveillance of the installation operations (by random sampling)

The review of the installation documentation includes:

- Verification of detailed seabed route engineering
- Verification of construction planning including preparatory construction measures (e.g. pre-lay grapnel run/route clearance operations, seabed preparation and cable burial) and final method statement review
- Review of test and termination procedure
- Review of Project Execution Plan
- Review of installation analysis

Bureau Veritas will perform a technical review of the cable transportation and installation documents including method statements and manuals. This review is designed to identify potential risks associated with the transportation and installation of the cables so that these may be mitigated to minimise material damage and time delays, hence reducing potential financial implications. Bureau Veritas shall make periodic onsite inspections while cable installation is in progress and must, as appropriate, verify, witness, survey, or check, the installation items required by this section including cable burial.

5.13. Task 13 - Export Cables Design

Same scope of work and methodology as for IAC cable. Please refer to Task 10 description. The CVA verification will cover export cables in federal and state waters to cable landing.

5.14. Task 14 - Export Cables Fabrication

Same scope of work and methodology as for IAC cable. Please refer to Task 11 description. The CVA verification will cover export cables in federal and state waters to cable landing.

5.15. Task 15 - Export Cables Installation

Same methodology as for IAC cable. Please refer to Task 12 description. The CVA verification will cover export cables in federal and state waters to cable landing.

Bureau Veritas will review the Transport and Installation documentation and survey the commissioning of the export cables.

5.16. Task 16 - Project Management

Bureau Veritas shall assign a dedicated Project Manager to the Project over the duration of the Project. The Project Manager is the main interface point with the Developer. He is responsible for all aspects of delivery, ensuring that the project delivers the right outputs, to the required level of quality and within the constraints of time, cost, resources and risk. The Project Manager is responsible for day-to-day management of all aspects of project delivery.

The proposed project management activity should include the following:

- Prepare and maintain detailed Evaluation Plans for each phase of the CVA process, detailing how all the activities will be performed, by whom, and how the interfaces will be managed;
- Attend meetings with BOEM and attend regular conference calls and meetings to hold technical discussions on specific design issues, as required;
- Ensure the continuity of the CVA team members. Staff assigned at the beginning of the Project shall remain along the whole Project duration;
- Coordinate the verification and inspection activities with the Bureau Veritas network offices
- Maintain a document register of all documents received from Atlantic Shores and all documents produced by the CVA; and,
- Provide regular tracking of work performed in accordance with CFR requirements.

6. DELIVERABLES

6.1. General

All **deliverables** will respect the following principles:

- The deliverables will be written in English and will be provided in electronic format.
- All other CVA Reports and documents issued under the CVA scope of work shall be delivered directly to BOEM, with a copy to Atlantic Shores.

The handling and exchange of the deliverables will be performed according to the agreed communication rules and documentation quality control requirements.

6.2. CVA Reporting Requirements

In addition to what is included in previous verification task, per CFR 585.708, the CVA must certify in the FDR that the facility is designed to with stand the environmental and functional load conditions appropriate of the intended service life and the proposed location. The CVA must also verify design compliance with the COP, and its terms and conditions.

Per 585.708, the CVA must certify in a report that project components are fabricated and installed in accordance with accepted engineering practices; the approved COP; and the FIR. Also per 588.701(d), the CVA must review the design and as-built plans.

The CVA reports pertaining to Fabrication, Transportation, Installation and commissioning phases, shall identify all significant non-conformities and corresponding corrective actions

The planned CVA reporting structure is framed to satisfy the requirements set forth in the CFR and to provide documentation of the review process at relevant points in the design timeline. According to 30 CFR § 585.712 interim reporting of the CVA towards BOEM is required. According to § 585.712 (b) the reporting must:

- Give details of how, by whom, and when the CVA or project engineer activities were conducted;
- Describe the CVA's or project engineer's activities during the verification process;
- Summarize the CVA's or project engineer's findings; and
- Provide any additional comments that the CVA or project engineer deems necessary.

The deliverable reports include up to four BOEM-facing CVA Reports at conclusion of each project phase and regular monthly status updates. These BOEM facing reports are described in the following sections.

Several assumptions were in the CVA SOW. If the assumptions end up not being true, the CVA shall notify BOEM and mitigations should be presented.

6.3. CVA Report - Facility Design Report

Bureau Veritas will issue a CVA report accompanying Atlantic Shores' Facility Design Report ("FDR") submittals certifying that the entire project design employed good engineering judgment and practices. It will include a summary of all detailed design review findings, a copy of the Design Basis Review, and all the technical verification reports and approval statements for the completed technical review topics. Review topics mutually agreed to be pushed into the subsequent Fabrication Review process will be identified and excluded from approval in the FDR.

Bureau Veritas will provide an interim CVA report that covers, at a minimum, review of the Design Basis of all the assets along with a timeline of when the final CVA evaluation report of the FDR would be submitted.

It is possible to split the FDR submittal into separate reports each focused on a specific asset(s). In this case, the corresponding CVA reports will be provided in separate submittals. It is always desirable for reports to be issued as they become available. They can be submitted as preliminary. In the event changes are necessary revisions must be submitted.

6.4. CVA Report - Fabrication and Installation Report

The CVA will review the Fabrication and Installation Report (FIR) that covers Project's planned fabrication and installation procedures during the design phase. Bureau Veritas will issue a CVA report certifying that the Project's planned fabrication and installation procedures, summarized in Atlantic Shores' FIR, employ good engineering judgment and practices. It will include a summary of all detailed design review findings related to the Project's planned activities for manufacturing, transportation, installation, commissioning plans. Review topics mutually agreed to be pushed into the subsequent Fabrication and Installation process will be identified and excluded from approval in the FIR.

If the FIR is not ready for review prior to start of fabrication, the CVA may provide interim CVA reports to report on a summary of current findings and a timeline to final CVA evaluation report for the FIR.

6.5. CVA Report - Fabrication

At the conclusion of the fabrication phase, Bureau Veritas will issue a CVA report certifying that the Project's components are fabricated accordance with accepted fabrication practices; your approved FDR, COP, SAP and the Fabrication and Installation Report (as applicable); and the Submission of this report concludes the Fabrication Phase of the CVA scope. This report will also include detailed reporting on fabrication activities. Non-conformities and deviations that are accepted by ASOW will be communicated to BOEM in the monthly reports.

6.6. CVA Report - Installation

At the conclusion of the commissioning phase, Bureau Veritas will issue a CVA report certifying that the Project's components are installed in accordance with accepted installation practices; the approved FDR, COP, SAP and the Fabrication and Installation Report (as applicable); and the submission of this report concludes the Installation Phase of the CVA scope. This report will also include detailed reporting on commissioning activities. Non-conformities and deviations that are accepted by ASOW will be communicated to BOEM in the monthly reports.

6.7. CVA Monthly Reports

The basic reporting document will be a summary memorandum issued to BOEM and Atlantic Shores monthly for the duration of the CVA activities. In addition to covering the CFR-mandated status update for each month, the Monthly Report will update administrative topics (e.g. schedule updates), and provide a high-level written statements for each of the completed reviews over the reporting period.

END OF CVA VERIFICATION PLAN

Appendix I-F2

Project 1 CVA Statement of Qualifications

BUREAU
VERITAS

CVA Statement of Qualifications

For Atlantic Shores Wind Project

Bureau Veritas North America

INTRODUCTION

Atlantic Shores Offshore Wind, LLC (the “Customer”) has invited Bureau Veritas (BV) to present this Statement of Qualifications (SOQ) for Certified Verification Agent (CVA) services for the Atlantic Shores Wind Project (the “Project”).

To gain approval for an offshore wind farm, United States (U.S.) regulations require that an independent third party is appointed to certify the design, fabrication, and installation to BOEM. BV’s Renewables Certification (RC) division has been active as a certification agency from the very beginning of the European offshore wind industry.

The CVA is nominated by the offshore wind facility’s developer for approval by BOEM, on behalf of which the CVA performs its activities. The CVA duties outlined in the U.S. Code of Federal Regulations (CFR) match very well with the systems and schemes applied for in the approval and certification of offshore wind farms in Europe. This is not a coincidence as the CFR and European regulations on offshore wind both evolved from the offshore oil and gas industry.

BV’s proposed approach will focus on verification of design, fabrication, and installation phases in accordance with 30 CFR 585 and applicable codes and standards to be defined in the Design Basis."

BV has a strong presence across the U.S. with offices on the east and west coasts as well as a Houston office with U.S.-based offshore experience and trained offshore surveyors. These U.S. personnel are supported by BV’s Project Certification team in Europe, which provides experience from certification activities performed for most offshore wind farms under design, fabrication, installation, operation, and at various stages of development.

The Bureau Veritas team is staffed with many technical experts working on certification of offshore wind farms and normally engages in more than 10 offshore wind farms simultaneously. Hence, BV can run multiple CVA projects simultaneously.

With reference to 30 CFR 585 Subpart G § 585.706 (b) (1 – 7), as well as (c) and (d), below is the required information for the CVA nomination of Bureau Veritas (BV) towards the Bureau of Ocean Energy Management (BOEM) for the Atlantic Shores Offshore Wind, LLC. This information is complimented by the CVA Verification Plan submitted in the COP application as in separate document, {Ref. CVA Verification Plan - Atlantic Shores Offshore Wind}

As a pre-requisite for the understanding of the project team set-up and organization, a description of BV's structure including its affiliates relevant for the CVA work is included in Appendix 1.

This qualification statement demonstrates that BV has a formal structure in place to conduct CVA activities as shown in Appendix 3. Certificates referenced in Appendix 2 are shown in Appendices 4.1 to 4.3, namely BV's accreditation according to ISO/IEC 17065 and the ISO 9001 certificate as well as the Certificate of Acceptance to participate in the IECRE - IEC System for Certification to Standards relating to Equipment for use In Renewable Energy Applications.

Finally, BV's corporate Environmental, Health and Safety Policy is provided in Appendix 4.4.

CVA QUALIFICATIONS:

Bureau Veritas' compliance with CVA qualification requirement according to 30 CFR 585 Subpart G § 585.706 (b) (1 – 7), as well as (c) and (d), is demonstrated as following:

Previous experience in third-party verification or experience in the design, fabrication, installation, or major modification of offshore energy facilities:

BV and its subsidiaries have more than 190 years of experience in the Marine industry, 40 years in the Offshore Oil & Gas industry, and 20 years in the wind industry which includes certification of offshore wind projects installed or under construction in Europe. A summarized overview about our project certification experience can be found in Appendix 2 and 2.1.

Technical capabilities of the individual or the primary staff for the specific project:

BV plans to draw from our deep bench of highly qualified engineers to provide a team of technical experts with extensive experience in offshore wind, wind turbine technology, structural engineering, offshore oil & gas engineering, maritime surveying, and other relevant disciplines. The proposed CVA team will include personnel and project managers who have been actively involved in CVA Projects for offshore wind. BV intends to manage the Project with U.S.-based staff and the technical work will be conducted by a team consisting of staff from France and the U.S., providing local service while ensuring BV's work is informed by our extensive experience from Europe.

The proposed CVA Team includes staff qualified in the range of disciplines that will be required for completing the proposed scope of work. The following technical areas are covered by the CVA team:

A. Wind conditions and site assessment
B. Metocean conditions and hydrodynamic loads and scour
C. Wind turbine wind loads and load cases, assessment and load validation, power performance testing, noise measurements
D. Control and protection system
E. Fiber reinforced plastic (FRP) structures (blades and hub and nacelle covers) incl. testing
F. Main gear
G. Mechanical systems
H. Mechanical structural components
I. Geotechnical assessment and foundation/soil interaction
J. Electrical system including testing of power quality, electromagnetic compatibility (EMC)
K. Grid code compliance including testing
L. Steel support structures including corrosion protection
M. Concrete support structure
N. Manufacturing evaluation / manufacturing surveillance
O. Transportation & Installation surveillance
P. Commissioning surveillance incl. safety and function test
Q. Inspection of wind turbines
R. Offshore substation risk assessment, HAZID, fire protection and safety
S. Project management level and manuals
T. Condition monitoring systems, fire protection (wind turbine), training systems, service providers

Size and type of organization or corporation:
A description of BV's structure relevant for the CVA work is included in Appendix 1. Some information about the BV Power & Utilities division as well as its standing within the corporate structure of BV can be found in Appendix 5.

In-house availability of, or access to, appropriate technology (including computer programs, hardware, and testing materials and equipment):
BV has access to several computer programs for undertaking any complex independent analysis. Software validation and documentation information are provided below.

A. MS Office
B. SAMCEF
    a. Equivalent to HAWC and Bladed. Software validation papers previously submitted to BOEM.
C. Isymost NSO
    a. Equivalent to SESAM
D. ANSYS Classic/Workbench
E. VeriSTAR (in-house software for Document control)

Further tools and equipment required for the fabrication and installation review are available. These are mainly:

A. Personnel Protective Equipment such as safety shoes, glasses and gloves, high visibility vests, helmets, fall protection, ear protection as well as survival suits and life vests for offshore activities (typically rented for the specific activity).
B. Smaller equipment and measuring tools such as cameras, construction survey equipment, measuring tapes, weld gauges, pocket lamps, etc.

Ability to perform the CVA functions for the specific project considering current commitments:

The Bureau Veritas team is staffed with many technical experts working on certification of offshore wind farms and normally engages in more than 10 offshore wind farms simultaneously. Hence, BV can run multiple CVA projects simultaneously. Sufficient resources are allocated for the project. For each of the key positions a back-up engineer is planned. A system to manage technical resources is in place with great flexibility to add resources as needed.

The proposed project team has been chosen under due consideration of the proposed project timeline as well as other project commitments and the ongoing business. Therefore, we have accounted for redundancy for the different required skills and can reinforce the team with additional technical resources as needed to cover potential busy project times such as the facility design review. As also shown, the senior management is fully supporting the CVA work and can prioritize tasks towards project review activities if required. Finally, we are prepared to include further resources, especially local inspectors for the fabrication and installation review in due course.

Previous experience with BOEM requirements and procedures:

BV's US based team is well connected to BOEM. The project management team is headed by Mr. Ahmed Phuly who successfully managed DNV GL's North American Certified Verification Agent (CVA) activities from 2011 to 2018. As part of his work experience, he was the project manager for the Cape Wind CVA project and the VOWTAP CVA project (Revived as CVOW), the Icebreaker CVA project and the early phase of Vineyard Wind CVA project. He also managed the technical verification of similar scope for Atlantic City Offshore Wind Project and supported the CVA for the Met-buoy for the GSOE offshore wind site. The scope of work for those CVA Projects included the verification of the design, fabrication and installation of offshore wind turbine foundations and support structures. The CVA verification activities of the aforementioned projects were performed in accordance with 30 CFR 585.707 and is closely aligned with Project Certification System DNVGL-SE-0073 and IEC.

Furthermore, BV has met with BOEM representatives over the last calendar year to present our capabilities and to understand requirements for CVA nomination. We further aligned on the basic expectations of BOEM for the scope of work and CVA deliverables.

Finally, specific senior team members have participated in the U.S. Offshore Wind Standards Initiative. The goal of this initiative is to establish a set of U.S. National standards/guidelines for offshore wind that BOEM/BSEE could use to help provide more guidance and transparency to the regulatory process.

The level of work to be performed by the CVA:

Detailed descriptions of the level of work to be performed to fulfil the duties of the CVA as outlined in 30 CFR 585 Subpart G §§ 585.707 – 708 are given in the CVA Scope of Work as defined in the CVA Verification Plan {CVA Verification Plan - Atlantic Shores Offshore Wind}.

Conflict of Interest

Regarding "***Rule c) CFR §585.706: Individuals or organizations acting as CVAs must not function in any capacity that will create a conflict of interest, or the appearance of a conflict of interest",*** it is noted that:

A. Outside of the contract to provide CVA services for the Atlantic Shores Wind Project, BV or any of its employees and or family members is not affiliated with Atlantic Shores Offshore Wind, LLC in any capacity. Atlantic Shores Offshore Wind, LLC is not aware of any function performed by BV that would create a conflict of interest or the appearance of a conflict of interest. BV has successfully met this requirement on all the past independent engineering and certification projects.

Qualification Matrix and Professional Engineer Supervision:

Regarding "***Rule d) CFR §585.706: verification must be conducted by or under the direct supervision of registered professional engineers***", it is noted that:

A. The proposed CVA team includes several BV employees who are registered professional engineers in the Civil, Structural, Mechanical, Electrical and Safety disciplines.
B. BV has its own quality system with strict requirement to assign only people with required competence to oversee and/or execute the project activities.
C. Verification work will be performed analogous to an accredited service with staff qualified through a qualification matrix. The requirement per §585.706 (d) for the verification to be conducted by or under direct supervision of a registered PE, will be executed in addition to the requirement by the accreditation.
D. Design reports, construction / fabrication drawings and corresponding evaluation reports will be reviewed by PE's. Evaluation reports will be included in the BOEM-facing CVA Reports.

E. The organization has numerous professional engineers. A listing (non-comprehensive) is provided below:

1. Cristian Rosca, Mechanical (NV)
2. Bikash Ghosh, Marine (TX)
3. Richard Daoud, Civil and Structural (CA, AZ, NV, AL, HI, FL, OR)
4. Richard Henrikson, Mechanical (CA, AZ)
5. Steven Hooper, Electrical (CA)
6. Josh Miller, Mechanical (CA)
7. Saman Halabian, Mechanical (CA)
8. Nader Namdar, Structural (CA, AZ)
9. Hung-I Wu, Structural (CA)
10. Hussein Boudiab, Electrical (CA, AZ, WA)
11. Michael Chegini, Structural (AZ)
12. Cristian Son, Electrical (CA)
13. Michael Hill, Structural (CA)
14. Daniel Lee, Structural, Civil (CA, HI)
15. Hassan Hadidi, Structural (CA)
16. Ryan Guerrero, Structural, Civil (CA)
17. Joe Chao, Electrical (CA)
18. Sam Sampat, Mechanical (CA)
19. David Menzies, Civil (TX)
20. Terry Potter (TX)
21. Mohammad Heivand, Civil (GA)
22. Hassan Hadidi, Structural (CA)
23. Doug Evans, Fire Protection (CA)
24. Sunai Kim, Structural (CA)
25. Lisa Beaver, Fire Protection (CA)
26. Mohammad Hariri, Structural (CA)
27. Saman Parsi, Electrical (CA)
28. Jeff Comparato, Mechanical (PA, TX, FL)

F. The organization also has numerous local technical resources for the fabrication phase:

1. Albert Carr, CWI, NDT Level III
2. Dale Cheek, CWI, NDT Level III
3. Jeff Ciezki, CWI, NDT Level II
4. Luis Cordero, CWI, NDT Level III
5. Matthew Dagget, CWI
6. John Delk, CWI, NDT Level II
7. Jeffery Eckwright, CWI, NDT Level II, NACE Level II
8. Kerry Hahn, CWI, NDT Level II
9. Don Heiter, CWI, NDT Level II, NACE Level III
10. Timothy Hinman, CWI, NDT Level II, NACE Level II
11. Michael Hotaling, CWI, NDT Level II
12. Mark Irwin, CWI, NDT Level III

13. Jack Ivey, CWI, NDT Level II
14. Darrel Jones, CWI, NDT Level II
15. Scott Kennedy, CWI, NDT Level II
16. Thomas Koepl, CWI, NDT Level II
17. Duane Kothlow, CWI, NDT Level II
18. Timber Loveland, CWI, NDT Level II
19. Paul Mafla, CWI, NDT Level II
20. Chris Odom, CWI
21. Kevin Prestude, CWI, NDT Level II
22. Brian Treveer, CWI, NDT Level II
23. Eric Thompson, CWI, NDT Level II
24. Jordan Wind, CWI, NDT Level II
25. Dean Urbanek, CWI, NDT Level II

G. The following additional local technical resources holding MSOMWS certification in either Renewables or Cargo and Projects. These resources are for transportation and installation phases of the CVA project:
    1. Chris Bintcliffe, MSOMWS certified in Renewables
    2. James Vavasour, MSOMWS certified in Renewables
    3. Danny Biancato, MSOMWS certified in Renewables
    4. Christopher Bowman, MSOMWS certified in Project Cargo and Projects
    5. Miguel Hernandez, MSOMWS certified in Project Cargo and Projects
    6. Duane Mendoza, MSOMWS certified in Project Cargo and Projects
    7. Leonard Nguyen, MSOMWS certified in Project Cargo and Projects
    8. Don Whelan, MSOMWS certified in Project Cargo and Projects
    9. David Menzies, MSOMWS certified in Project Cargo and Projects
    10. David Cisneros, MSOMWS certified in Project Cargo and Projects
    11. Mauricio Saenz, MSOMWS certified in Project Cargo and Projects

H. The following safety professionals will also be on the project:
    1. Bikash Ghosh
    2. Vitaliy M. Greenberg
    3. Scott Sibillia
    4. Henry Smahlik
    5. Doug Alvey

PROJECT ORGANIZATION

An overview of the proposed project team is included in Appendix 3. Executive summaries of the team member's professional backgrounds are listed in Appendix 3.1.

BV's project organization is shown in the organograms in Appendix 3. BV's organizational structure follows the structure of the project phases (Design, fabrication and Installation) with a project organization for the Design phase and the Execution phases. In each of these phases there will be project teams for each of the four assets (WTG's, Foundations, OSS, and Submarine Cables); where possible the same team members are involved in more than one asset to ensure information transfer between the assets.

There is a single project manager for the entire project to ensure coordination; further the U.S. based project manager is the primary contact to the authorities.

PROJECT MANAGEMENT

Main project management tasks during the execution of the scope of work shall include:

A. Preparation and follow up on project management plans. Particularly, a communication plan coordinated with the developer specifying communication lines between BOEM, BV project team and the counterpart project team of Atlantic Shores Offshore Wind, LLC.
B. Keep BOEM informed of CVA work progress using monthly reports.
C. Furthermore, BV will provide Atlantic Shores Offshore Wind, LLC with an overview of the design verification and surveyor teams and key contact information. This facilitates efficient contact between Atlantic Shores Offshore Wind, LLC's office-based and site teams and BV's office-based engineers and site surveyors.
D. To set up of internal agreements with BV units.
E. Facilitate lessons learned workshop with team members in connection with project kick-off, based on previous learnings. This can ideally be organized such that interaction and team spirit is established at the beginning.
F. Ensure transfer of knowledge across the interfaces between the design and execution phases. A meeting between PM and Coordinators of the Design Phase and the Execution phases (manufacturing and installation) including relevant project personnel will be held.
G. Participate in critical meetings where Designer and Atlantic Shores Offshore Wind, LLC are deciding corrective measures, if the as-built documentation is found to deviate from the certified design.

MANAGEMENT SYSTEM

The BV management system is an integrated quality health, safety and environment, and business administration management system.

Bureau Veritas Certification France is accredited by COFRAC for certification of management systems according to ISO 17021. As a consequence, Bureau Veritas Certification France's quality management system cannot be certified, as stated by the accreditation: "A certification body shall not certify another certification body".

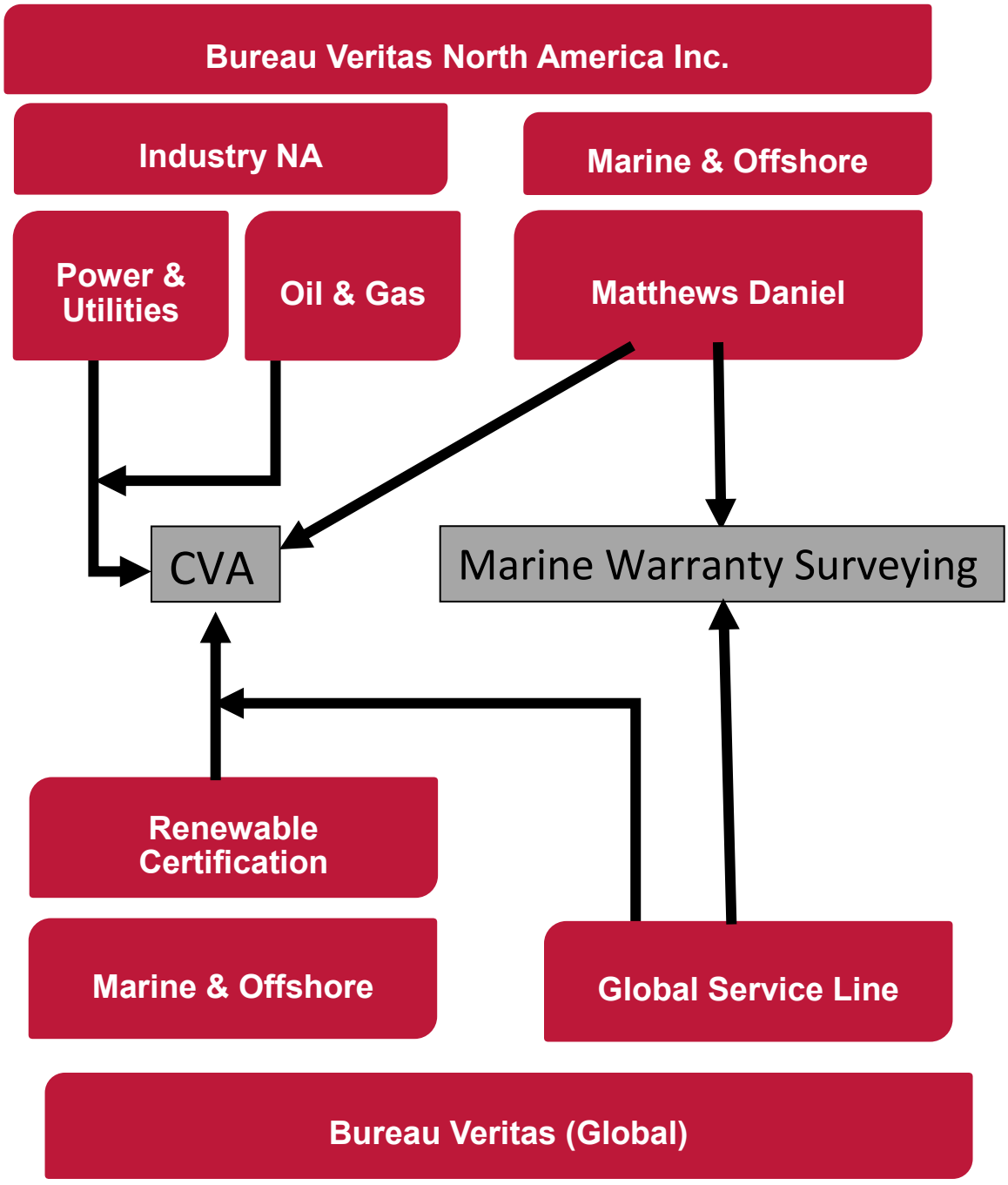
However, the requirements of the accreditation standard ISO 17065 for project certification are more stringent than the ISO 9001 requirements. The Bureau Veritas Certification France quality management system is therefore regularly audited by COFRAC. A description of BV's quality, health, safety and environment policy and management system is provided in Appendix 4.4.

APPENDICES:

Appendix 1: BV's Structure relevant to the CVA work

Appendix 1: BV's Structure relevant to the CVA work

Bureau Veritas is a global leading testing, inspection, certification and advisory company. With over 70,000 employees worldwide Bureau Veritas expertise and history in renewables is longstanding. Bureau Veritas North America is the leading entity for all CVA projects within the North American Region. Our industry business is the key operating group driving all activity throughout the CVA process. In order to handle CVA projects in the US; the industry team coordinates with 2 other groups throughout the project. They are, Marine and Offshore (local and global) and Renewables Certification (global). Throughout the CVA process, the global service line is integrated to ensure continuity, executive sponsorship and overall project success.



Appendix 2: Summarized Overview about BV's Current Project Certification Activities

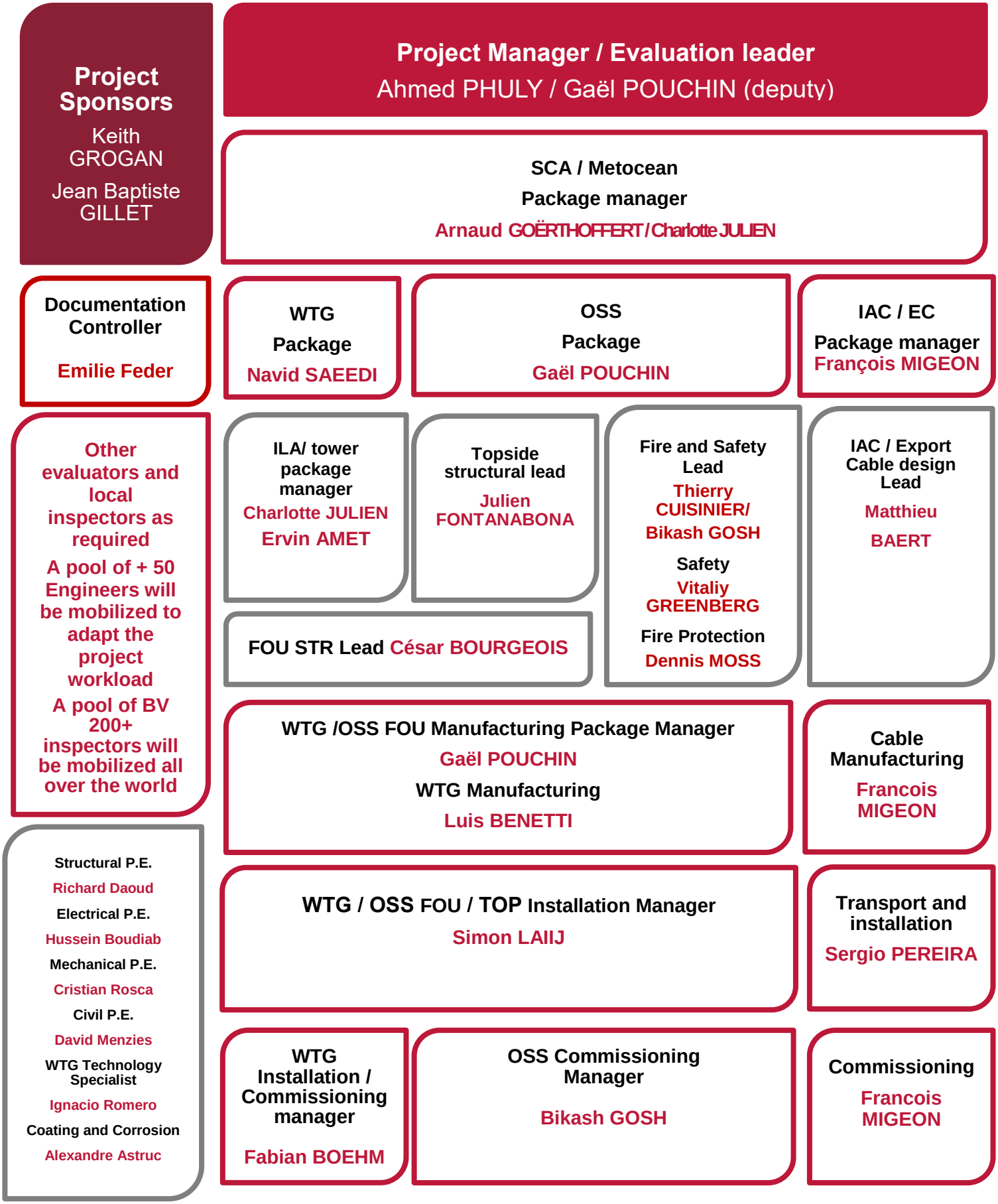
Client	Year	Client Country	Projects	Services
Ørsted	2017-2021	Netherlands	Borssele 1 & 2 OWF WTG : Siemens Gamesa 8.0-167	Project certification according to IEC 61400-22 • Site Conditions Assessment • **WTG Manufacturing surveillance** • **Transport and Installation surveillance** • **Commissioning surveillance** • **Final Evaluation and Project Certificate**
MORAY East Offshore Windfarm	2017 - 2021	United Kingdom	Moray Offshore Windfarm (East) Limited WTG : MHI Vestas V164 –8.0	• **Project Certification including Site Conditions, Design Basis, Integrated Load Analysis and Design Evaluation.** • Certification of Offshore Substation including Design Basis and Design
Iberdrola	2016 – 2019	Spain	East Anglia One Offshore Wind Farm	• **Certification of Offshore Substation** including Design, Manufacturing, Installation and Commissioning • **Jacket substructure**
Orsted	2015 - 2018	Germany	Borkum Riffgrund 2 OWF WTG: MHI Vestas V164 –8.0	Project certification acc. BSH and IEC 61400-22 • Design Evaluation of Offshore substation • Wind turbine manufacturing surveillance • Manufacturing surveillance of 20 Suction Bucket Jackets in Poland • Suction Bucket Jacket substructure Transport & Installation surveillance • Offshore substation Commissioning surveillance • Final Evaluation and Project certificate
EDF Energies nouvelles	2016 – On going	France	Fécamp, Courseulles and Saint-Nazaire OWF WTG SNA: GE Haliade 150 6MW COU / FEC: SIEMENS SWT-7.0-154	• **Complete Project Certification** according to IEC 61400-22 • Includes RNA, site-specific tower and WTG foundations
EDF Energies nouvelles	2017	France	Faraman Provence Grand Large	• Complete Project certification according to IEC 61400-22
STX France	2016-2019	Belgium	Rentel Offshore Wind Farm	• Complete certification of Offshore Substation including Design, Manufacturing, Installation and Commissioning • Stress-skin topside and monopile substructure
E-On Climates Renewables	2013-2016	UK	Rampion OWF WTG : Vestas V112-3.45 MW	• Project Certification according to IEC 61400-22 • Evaluation of the modules Site assessment, Design Basis, Integrated Load Analysis, Design Evaluation • All structure & substructure including RNA, WTG tower, monopile foundations, OSS topside & jacket substructure
WindMW	2013-2014	Germany	Meerwind Südost OWF (WTGs & OSS)	• Offshore supervision of WTG erection • 24/7 QC • Commissioning control of WTGs

Appendix 2.1: Experience with ILA with top Turbine Suppliers

Bureau Veritas has already had experience with most of the contractors of the wind industry:

- In collaboration with SGRE the following activities:
    - For Provence Grand Large offshore wind farm (floating wind turbine), BV has performed site conditions assessment, design basis evaluation, integrated load analysis and design evaluation. BV is currently performing WTG and tower manufacturing surveillance with SGRE for Provence Grand Large
    - For Borssele 01&02 offshore wind farms, BV is currently carrying WTG and tower manufacturing surveillance.
    - For Fécamp offshore wind farm (gravity base structure), BV has performed integrated load analysis and design evaluation.
    - For Courseulles offshore wind farm (monopile), Independent load Analysis is on-going.
- In collaboration with MHI Vestas the following activities:
    - For Moray offshore wind farm (jacket), BVhas performed Design basis Integrated load analysis and Design of the foundation and tower.
    - For Borkum Riffgrund II, BV has performed manufacturing surveillance of the Wind Turbine.
    - For the Rampion (monopile), BV was in charge of the project and performed design basis evaluation and Integrated load Analysis.
- In collaboration with GE the following activities:
    - For Fécamp and Saint Nazaire offshore wind farm (gravity base structure), BV has performed integrated load analysis and design evaluation. SGRE has taken over GE.
    - For Courseulles offshore wind farm (monopile), BV has performed integrated load analysis.

Appendix 3: Proposed Project Team



Appendix 3.1: Summaries of Team Member's Professional Backgrounds

Role Description:

Project Sponsor

A designated company executive with overall responsibility for the project on behalf of Bureau Veritas management.

Project Manager

The Project Manager is the main interface point with the Client. The PM is responsible for all aspects of delivery, ensuring that the project delivers the right outputs, to the required level of quality and within the constraints of time, cost, resources and risk. The Project Manager is responsible for day-to-day management of all aspects of project delivery.

Evaluation Leader

The Evaluation Leader evaluates, regarding global coherence, the structural and functional aspects of the project, the interfaces between these aspects in one hand, and the interfaces between the project and its environment in the other hand.

Package Manager

The Package Manager is the main interface point with the Project manager. He is responsible for all aspects of delivery, ensuring that the package delivers the right outputs, to the required level of quality and within the constraints of time, cost, resources and risk. The Package manager is responsible for day-to-day management of all aspects of package delivery. He is a senior expert in the field of the package.

Technical Support

The Technical support is a technical expert with strong experience in a similar project scope. He supports the project to ensure smooth and efficient delivery.

Experienced Key People

Bureau Veritas understands that offshore wind projects are complex and time pressured.

For this reason, the "key people" are offshore wind experienced and are in charge of ensuring that each inspector/engineer is properly briefed internally at the start of any assignment so that all the expectations are met.

Personnel	Project Role	Responsibilities/Key Experience
Key personnel from the organigram		
Keith Grogan	Project Sponsor	Vice President Industrial Inspection Division, Overall responsibility for the project on behalf of Bureau Veritas management.
Jean Baptiste Gillet	Project Sponsor	Director, Power & Utilities, Overall responsibility for the project on behalf of Bureau Veritas management.
Ahmed Phuly	Project Manager	A quality focused engineer 25+ years of experience in structural engineering and design for power plants, wind turbine structures, process facilities, offshore structures, oil & gas facilities, industrial site planning and forensic analysis including 17 years in renewable energy design and engineering due diligence. Mr. Phuly was the CVA Lead for all DNV GL US based offshore wind projects from 2011 to 2018. In-depth knowledge of structural engineering principles and the ability to apply such principals in industrial engineering projects, from conceptual design through detailed engineering, construction and commissioning phases of the project, while maintaining focus on quality and complying with scope, schedule and budget according to project management plans. **Mr. Phuly was selected as a PM due to his previous CVA Lead & PM experience, which included project management of the Cape Wind CVA project, the VOWTAP CVA Project, the Icebreaker CVA project, the CVOW CVA and Vineyard 1 Pre-CVA.**
Emilie Feder	Documentation controller	Emilie has a degree in documentation management. She is currently managing the documentation of wind farm project certification. She knows the major documentation management systems such as Acconx, Thinkproject and VeriSTAR.

Personnel	Project Role	Responsibilities/Key Experience
Gaël Pouchin	OSS Package Manager / Evaluation Leader / WTG / OSS foundation manufacturing package manager	Gaël has more than 15 years of experience at Bureau Veritas as lead structural engineer mostly working on many various marine and offshore structures, with particular focus on finite elements. He has been involved over the last four years with the Saint-Nazaire, Fécamp, Courseules Borkum Riffgrund 2 and Moray offshore wind farms as evaluation leader **Gaël has been chosen as evaluation Leader, OSS Package Manager and Manufacturing package manager based on his experience of WTG / OSS offshore substation, in major European offshore wind projects**
Arnaud Gerthoffert	SCA / Geotechnical Package Manager	Arnaud has accumulated 10 years' experience in the offshore sector, with focus on geotechnics, offshore structures and hydrodynamics. He has acquired a deep experience on a wide range of soil conditions and foundation types, be it anchors, suction buckets, monopiles or jack-ups. Regarding offshore wind specific experience, he has been involved in the certification of the Rampion Offshore Wind Farm for E.ON. **Arnaud has been chosen as SCA / Geotechnical Package Manager based on his deep understanding of offshore foundations including various aspects in addition to his experience in offshore wind.**
Charlotte Julien	Site Condition evaluator (Marine condition) / Integrated Load analysis	Charlotte was previously working for the Bureau Veritas Offshore department as hydrodynamic and structural engineer for about 5 years She is currently working as structural engineer and load engineer in the Bureau Veritas Wind team. She is also involved in the evaluation of the metocean condition in various project **She has a strong experience in structural, hydrodynamic calculation and load calculation.**

Personnel	Project Role	Responsibilities/Key Experience
Navid Saeedi	WTG Package Manager	Naveed has over 15 years' experience in wind and structural roles. From his roots at EDEF R&D to the project director at Bureau Veritas, he has established strong expertise not only in turbine design in fixed bottom but also floating. He is a specialist engineer in the realm of structural modeling, feasibility and conceptual designs of wind turbines. He has established engineering credentials with a PhD in mechanics of materials and structures. **Naveed has been selected as the WTG package manager given his vast expertise in wind turbines in offshore wind projects.**
Ervin Amet	WTG package Manager / Integrated load analysis lead evaluator	Ervin has 15 years of experience in aerodynamic and numerical modelling. He is involved in the Integrated Load Analyses for the Fécamp, Courseulles and Saint-Nazaire offshore wind farms. **Ervin has been selected as Lead evaluator for ILA based on his experience of Integrated Load Analysis on many offshore wind farms: Saint Nazaire, Fécamp, Courseulles, Provence Grand Large, Moray.**
François Migeon	Array./ Export Cable package Manager & Cable Manufacturing / commissionning	François has been involved in the design review and certification of Umbilicals, Power Cables and SURF projects for 20 years. He has a significant experience in design appraisal, independent calculations and manufacturer's qualification, both for static and dynamic cables all over the world. **Francois has been selected as cable Package manager and Lead evaluator based on his overall experience on the Cables.**
Julien Fontanabona	Topside structural Lead	Julien has more than 15 years of experience at Bureau Veritas as lead structural engineer mostly working on many various marine offshore structures, with particular focus on nonlinear finite elements. He has been involved over the last two years with the OSS Tennet, Fécamp, Courseules and Moray offshore wind farms as structural lead **Julien has been selected as structural Lead for the topside based on his experience of OSS offshore substation, in major offshore renewable based projects**

Personnel	Project Role	Responsibilities/Key Experience
César Bourgeois	Lead Evaluator Structure foundation	César is an offshore engineer with experience on both offshore projects and wind engineering. He has more than 10 years in structural design. **He will be in charge of the substructure for the topside and the WTG considering is overall experience in structural assessment**
Thierry Cuisinier	Fire & safety lead evaluator	Thierry has a deep experience on Fire & Safety systems for offshore units, both in the O&G business and in the wind industry. He was involved in the certification of the Fire & Safety aspects for various offshore substations such as Rampion, Borkum Riffgrund 2, Rentel and East Anglia ONE. **Thierry has been selected considering his overall experience in the evaluation of fire and safety topic for OSS.**
Vitaliy Greenberg	Safety	Vitaliy is a strategic and result focused safety leader specializing in high risk, large projects, accident/fatality prevention, and safety program development. From project safety management to risk management and planning, he has vast experience navigate complex projects with rigid requirements and expectations.
Dennis Moss	Fire Protection	Dennis has over 30 years of experience in quality assurance inspection and plan review of industrial and power plants. He is a registered fire prevention specialist I & II and fire plans examiner. **Dennis has been chosen for fire protection role given his vast experience in various applications and well tenured but diversified background.**
Mathieu Baert	Inter Array cable / Export cable lead Evaluator	Mathieu Baert has been involved in the design review and certification of Umbilicals, Power Cables and SURF projects. He has a significant experience in design appraisal, independent calculations and manufacturers. **Mathieu has been selected as IAC / Export Cable Lead evaluator based on his overall experience on Umbilicals.**

Personnel	Project Role	Responsibilities/Key Experience
Sergio Pereira	Transport and installation Cable	Sergio expertise includes working in verification of offshore pipeline systems; offshore units, ship drawings, documents of machinery, and safety and process systems. He also has extensive knowledge of working on technical of equipment certification. Mr. Pereira is very knowledgeable of all Bureau Veritas (BV) rules, industry standards and international regulations such as: SOLAS, DNV Rules & Standards, Modu Code, MARPOL, API, ASME, TEMA, NFPA. **Sergio is based in USA and has been involved in the AWEA Work Group for Cables on the development of US standards for offshore wind turbines.**
Luis Benetti	WTG Manufacturing coordinator	Luis is currently involved in the component certification for Bureau Veritas. He has a great experience in the blade design / manufacturing process. In addition is he currently handling the manufacturing surveillance for the Saint Nazaire Fécamp and Courseulles Offshore project. **Luis has been selected as WTG manufacturing package manager considering his overall experience in manufacturing and component certification**
Simon Laaij	Onshore and offshore Inspector / Installation package manager	Inspector of welded constructions Level III, BOSIET certified, expert in Transport and installation phase. He is currently involved the HKW-1 HKW-B Tennet offshore substation platform and for the French offshore projects as installation package manager but also working as lead inspector. **Simon has been selected as Installation manager considering his overall experience in installation of offshore structures**
Fabian Böhm	Onshore and offshore inspector / Commissioning package manager	Fabian is an offshore-qualified specialist, working on surveillance of manufacturing, transportation, installation, commissioning and operation of offshore wind farms. He was in particular involved in Meerwind Süd/Ost and Nordsee Ost, in addition to the Orsted wind farms Borkum Riffgrund 1 and 2 and Gode Wind. **Considering his experience, he is nominated as Commissioning package manager**

Personnel	Project Role	Responsibilities/Key Experience
Bikash Gosh P.E.	ESP Fire & Safety Lead Evaluator / Commissionning manager	Bikash has 44 years of experience in the marine industry and offshore engineering. He is a senior professional engineer and quality and safety professional who specializes in compliance with OSHA and USCG safety requirements. **Bikash has been selected to support the safety aspect / commissioning of the OSS considering his overall experience**
Key Technical evaluators		
Ignacio Romero-	Turbine Technology Engineer	Ignacio is a veteran wind turbine technology expert. He has more than 17 years of experience directly in wind turbine product development, engineering aerodynamics and R&D with Siemens Gamesa Renewable Energy.
David Menzies	Civil P.E.	David is equipped with over 30 years of experience in the marine and geotechnical project basis. He is the lead of our geotechnical group and supports analysis of marine projects inclusive of soil evaluation and geophysical data.
Richard Daoud	Structural P.E.	With over 13 years of experience as a structural engineer, Richard has extensive experience with power projects and high voltage power generating facilities. In addition to his engineering experience he has reviewed and inspected projects to monitor compliance with building and safety regulations. He is a registered professional engineer in 7 states within the USA.
Cristian Rosca P.E.	Mechanical P.E.	Cristian has more than 23 years of experience in various roles in offshore industry. He is a well experience professional engineer and a quality professional. He has been involved in CVAs (ex. Leviathan) and independent reviews of equipment according to American and international standards. **Cristian is based in USA and was chosen to support this project in the role of P.E. which is required by the CFR.**

Personnel	Project Role	Responsibilities/Key Experience
Hussein Boudiab	Electrical P.E.	Hussein been managing electrical engineering, design and construction projects for over 32 years. He has designed and supervised numerous projects in power distribution. He is experience in large/medium voltage design, energy calculations and short circuit analysis and coordination studies. He is a professional engineer licensed in 3 states within the USA. With an MS and BS in electrical engineering.
Alexandre Astruc	Expert Corrosion Protection	Alexandre has 8 years of experience as a Coating and Corrosion specialist at Bureau Veritas. He has been involved in the certification of the Rampion and Borkum RIffgrund 2 offshore wind farms.
Auditors and inspectors		
Matthias Rehm	Inspector - IAC	Matthias is a very experienced inspector with more than 40 years of experience focussed on quality control of electrical equipment. In particular, he has already carried out FAT inspections for Power Cables for NSW Norddeutsche Seekabelwerke. He has already worked on the Borkum Riffgrund 2 project for manufacturing surveillance of electrical equipment.
Edwin Bodros	Inspector – Rotor blades	Edwin is an Engineer qualified with a European Master degree specialized in composites processing and design and 10 years' experience in composite material research, testing and, manufacturing.
Thomas Rahaus	Inspector - Tower	NDT and Frosio Level II inspector, specialized in Towers.
Herman Ten Broek	Auditor	Experience in technical quality & risk and HSE management. VCA (SCC)-Vol certified. Experienced professional in the work field of inspections, heavy duty cranes, heavy and light steel structures, pressure equipment, welding, NDT, coating, quality and auditing.
Bernd Braatz	Onshore and offshore Inspector	Frosio Level III inspector, specialized in offshore structures, BOSIET certified
Bartosz Owczarzak	Onshore inspector	International Welding Engineer and Inspector + SOLAS approved Coating inspector, specialized in offshore structures
Carsten Görnhoff	Onshore and offshore inspector	Carsten is Technical manager in Bureau Veritas. He gained a large experience on the manufacturing surveillance of wind turbines and supporting structures since 2007 working on various offshore wind projects.

Appendix 4: Project Certification Qualifications

Appendix 4.1: Accreditation Certificate according to ISO/IEC 17065

Bureau Veritas Certification France is accredited by COFRAC according to ISO/IEC 17065 for type certification of wind turbines, component certification, prototype certification and project certification. The corresponding certificate is available on the COFRAC site at the following address:
http://www.cofrac.fr/annexes/sect5/5-0051.pdf

The accreditation is delivered on a flexible scope basis, meaning that Bureau Veritas Certification France is responsible for managing itself its list of standards under accreditation and is allowed to include additional activities in their scope of accreditation. The rationale behind is that competence has been evaluated by COFRAC not only to carry out activities in accordance with previously evaluated procedures, but also for the development and validation of their procedures in accordance with a pre-established system. The flexible scope accreditation principles and requirements are defined in EA 2-15 document which is available at the following address:
http://www.european-accreditation.org/publication/ea-2-15-m

The list of standards for which Bureau Veritas Certification France can deliver accredited certificates (among which IEC 61400-22 certification scheme) is available on the Bureau Veritas website at the following address:
https://www.bureauveritas.fr/accreditation

Appendix 4.2: ISO 9001 Certificate

TÜV NORD

CERTIFICATE

Management system as per
EN ISO 9001 : 2015

In accordance with TÜV NORD CERT procedures, it is hereby certified that

Bureau Veritas
8, cours du Triangle
92800 Puteaux
France

with the locations / sites according to the annex 2

applies a management system in line with the above standard for the following scope

Please see scope annex 1

Certificate Registration No. 44 100 160145
Audit Report No. 3521 8827

Valid from 2019-02-01
Valid until 2022-01-31
Initial certification 1996

Certification Body
at TÜV NORD CERT GmbH

Essen, 2019-01-25

This certification was conducted in accordance with the TÜV NORD CERT auditing and certification procedures and is subject to regular surveillance audits.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

DAkkS
Deutsche
Akkreditierungsstelle
D-ZM-12007-01-01

Appendix 4.3: Certificate of Acceptance to participate in the IECRE - IEC System for Certification to Standards relating to Equipment for use In Renewable Energy Applications

Certificate of Acceptance

To participate
in the IECRE – IEC System for Certification to Standards relating to Equipment for use In Renewable Energy Applications

Bureau Veritas Certification France
Immeuble "Le Guillaumet, 60 avenue du Général de Gaulle, 92046 Paris La Défense, France

has been assessed and determined to fully comply with the requirements of ISO/IEC 17065: 2012, The Rules and Procedures of the IECRE System.

Bureau Veritas Certification France

is therefore entitled to operate as a French Certification Body within the IECRE the Scope and Standard(s) as listed in the relevant part of the IECRE Web Site at www.iecre.org, and is subject to all other terms as set forth in the IECRE Basic Rules and Rules of Procedure.

This certificate remains valid until December 1st 2021, at which time it will be reissued by the IECRE Executive Secretary upon successful completion of the normally scheduled 5-year Reassessment Programme administered by the IECRE.

Geneva, Switzerland, November 2017

Kerry McManama
IECRE Executive Secretary

Appendix 4.4: BV's Corporate Environmental, Health and Safety Policy

Health, Safety & Environmental Statement

Bureau Veritas' HSE vision is an accident free workplace, that causes no harm to people and that minimizes the environmental impacts of business activities.

Bureau Veritas is specialized in testing, inspection and certification services in the fields of quality, health & safety, environment and social responsibility. Present in 140 countries, with a strong acquisition policy, an increasing number of test laboratories and of sub-contractors, we face significant challenges to ensure a consistent level of HSE throughout the Group.

The following elements constitute the heart of our commitment to continuously enhance our HSE performance and to add value for our clients.

OUR PRINCIPLES

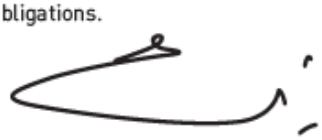
- Safety is an absolute;
- Health and Safety at work is our responsibility:
  - Line management demonstrates leadership and is accountable for compliance
  - Each employee, sub-contractor and visitor must comply and be alert

OUR MANAGEMENT SYSTEM

- Risks and opportunities are identified and managed especially where they have the potential to cause an accident, injury to people, or unacceptable impacts on the environment or the community
- Employees and sub-contractors are empowered to address unsafe or hazardous situations
- Sub-contractors are required to comply with this Statement

OUR COMMITMENTS

- Provide a safe workplace and systems of work to prevent accident and injury to people.
- Prevent pollution, minimize energies consumption and waste generation.
- Increase employees HSE awareness and safe behaviour;
- Comply with relevant HSE legislation, Group, clients and other applicable obligations.



Didier Michaud-Daniel - Chief Executive Officer
April 2017

Appendix 5: Information on BV's Power & Utilities Division

Bureau Veritas has been in the power industry for over 100 years. We are a business to business to society organization. Focused on quality, health and safety, environmental protection and social responsibility. Testing inspection, certification and technical services are the cornerstone of our services. As business transition into the renewable industry we are there to provide impartial independent expertise throughout the lifecycle of an asset.

Your trusted partner
in the energy transition

140 countries

78,000+ employees

1,400 offices & laboratories

400,000 clients

3,500 accreditations & agreements

CERTIFICATION
Demonstrate compliance and secure viability

DESIGN & PERMITTING
Reduce development risk

PROCUREMENT
Access a global, reliable supply chain

CONSTRUCTION
Run projects safely and to schedule

ASSET OPERATION
Increase availability and reduce downtime

CONDITION MONITORING
Understand the state of your asset

ASSET MANAGEMENT
Extending operating life and improve performance

LATE-LIFE SERVICES
Optimize management of aging assets

GENERATION

Low carbon

- Offshore & onshore wind
- PV & CSP solar
- Storage
- Nuclear
- Hydro
- Conventional thermal

TRANSMISSION

Power grids

- UHV DC power lines
- HV power lines
- HV sub stations
- Interconnectors

DISTRIBUTION

Utilities

- MV/LV overhead and underground lines
- MV/LV sub stations
- Gas & water distribution
- District heating & cooling

Track record
Our customers

DELIVERING INNOVATION OFFSHORE WIND

Dedicated solutions for **blades, gearboxes, generators, towers** and **foundations**

CERTIFICATION

Demonstrate compliance & secure viability

- Approvals in Principle
- Prototype certification
- Component certification
- Type certification
- Project certification

DESIGN & PERMITTING

Reduce development risk

- Wind measurement & site assessment
- Marine Warranty Services
- Grid connection assessment
- Design review
- Environmental impact assessment
- Permitting support
- Risk assessment
- Due diligence
- Investor / lender services

PROCUREMENT

Access a global, reliable supply chain

- Supply chain technical assessment
- Technical procurement support
- Shop inspections (QA/QC)
- Expediting
- Factory acceptance tests
- Transport, loading & unloading supervision

CONSTRUCTION

Run projects safely & to schedule

- Project & construction management support
- On site QA/QC
- On site HSE
- Turbine foundation supervision
- Commissioning and test run supervision
- Take over and end-of-warranty inspections

ASSET OPERATION

Ensure availability & shorten outage time

- Periodic inspections of blades & main components
- Non-destructive testing
- Load measurements
- Vibration monitoring
- Thermographic inspections
- Oil analysis
- Endoscopic inspections
- Rotor balance inspections
- Earth termination measurements
- Training
- Failure & damage analysis

ASSET MANAGEMENT

Extend operating life & increase performance

- O&M management
- Maintenance strategies
- Condition monitoring & assessment
- Asset integrity management
- Reliability engineering
- Performance optimization
- Turbine digital twin
- Remaining life assessment & lifetime extension