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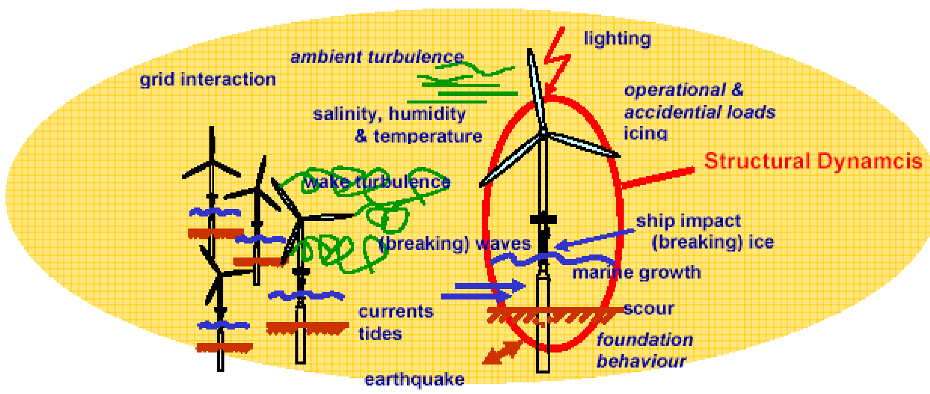
Structure, Equipment and Systems for Offshore Wind Farms on the OCS

Part 1 of 2 Parts - Guideline

Project No. 633, Contract M09PC00015



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Minerals Management Service

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March 2010

MINERALS MANAGEMENT SERVICE CONTRACT

Structure, Equipment and Systems for Offshore Wind on the OCS: Part 1

Front Page Acknowledgement–
Kuhn M. (2001), Dynamics and design optimisation of OWECS, Institute for Wind Energy, Delft Univ. of Technology

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Preface

This Report is in two parts. This part, Part 1 – Guideline, is for guidance only and is primarily intended as assistance in preparation of the Facility Design Report document on which regulatory approval may be focused. It calls for the designer/owner to provide an explanation on the design of systems upon which safety relies. Appendix B provides a summary table of safety concerns for equipment design, suggested applicable codes and/or guidance, and a reference to anticipated Certification and Regulatory compliance activities. Part 2 provides a Commentary giving background to many of the component issues, references, and some insights into issues and references to useful documents for further background on the issues for use in developing or reviewing the Facility Design Report. Appendix A to Part 1 provides a generic list of documents to be supplied as a main part of a submission to a regulator or certified verification agent (CVA) as stipulated in 30 CFR § 285.

This document is part of a project sponsored by MMS to recommend design standards to ensure structural safety/ reliability/ survivability of offshore wind farms on the US Outer Continental Shelf (OCS).

Two other reports are companions to this document and cover the following subjects:

1. Report on Damage and Critical Review of Accidents in relation to Offshore Wind Farm Safety: documentation of significant damages relevant to wind farms for which appropriate information is available together with an analysis of the cause of the casualties, if available.
2. A Safety Management System Template providing guidance on the content and subject matter for the owner's Safety Management System.

As far as can be determined, wind farms in general have had a good safety record in design issues. With the exception of wind turbine towers on land in areas affected by typhoons and tropical revolving storms, and issues that have come from control systems, the structural design record has been excellent.

There have been a number of major maintenance issues:

The industry had a number of serial failures in gearboxes. There have been a substantial number of gearboxes that had to be changed out within a shorter period of time than expected. At least two have been offshore projects.

There have been a substantial number of blades with defects or fatigue issues, which have broken. Many have been recalled and re-engineered. Since there have been recalls it is assumed these are serial faults.

Some foundation designs have had time dependent issues, so as time goes by, diligence is required on inspections.

For application on the OCS one may look to the record of the wind turbine business in the United States on land for insight. Again, so far as the record shows on safety from design issues, the record is good. There are, however, concerns going forward for offshore wind issues, particularly in those areas where the wind characteristics are far different than those experienced offshore in Europe.

The OCS definition of “offshore” is generally more than 3 miles from shore (with the exception of 2 states) whereas the European and International Electrical Commission definition is for where “hydrodynamic forces” are applied. Some of the “offshore” experiences are thus not the same as may be experienced for wind farms on the OCS. Many parts of the OCS are subject to hurricanes, and extremes of weather that are not part of the European experience. If we look to Japan, Taiwan and the Philippines for some of their experiences with wind turbines over the years, there have been several towers knocked down in hurricane conditions: in conditions they were not designed to withstand. The mechanical damage to the turbine itself and the blades is of concern: but the loss of the tower may be more of concern. It is thus of interest to ensure that the conditions being used for design benefit from a perspective of ensuing that the design is adequately pouring in some of the experience from other “offshore” experiences.

Permitting by governments requires ensuring that a framework is provided upon which there is sufficient scrutiny to provide comfort to the government who is responsible for leasing the land, and to ensure that there is a process for technical review of the designs prior to installation. This is normally done by codes developed for that purpose, and these are usually national codes that have been developed over many years. The increased interest in offshore wind power has led in Europe to the development of an “International” Code set (IEC 61400), but mainly supported by other European standards. Loading conditions may be suitable to European conditions but may not be appropriate for other venues. Construction standards may be suitable for Europe and not suitable for a variety of reasons for construction in the United States. Equipment for the installation tasks may be different in the United States.

The IEC has developed the code funded by a tremendous amount of research, and theoretical work which has resulted in an extensive set of code documents which have addressed a lot of issues in detail: thus they are complex to read. The nomenclature is different than that used by the offshore oil & gas community in the US and the techniques used to design the wind farms are much more complex than is customary in very many offshore structures, due to the dynamic nature of the wind turbines.

Since the USA does not have its own code for offshore wind farms, nor has it developed a “country addendum” to the IEC code outlining what might be different in the US, the present task of technical review of these falls to rational consideration. The proposed method of technical review is based on not mandating any particular code that must be used, but to have the designer/owner submit as part of the Facility Design Report, their philosophy of design and then state the codes they have relied upon and why they believe this is “best practice”. When done in a way that requires justification of the design within certain constraints, (this is the approach used in many parts of the oil and gas sector and in many chemical industries) it allows innovation in the design, which is so necessary as the industry progresses toward a more code-prescriptive environment, if indeed that becomes necessary. Since no specific codes exist for offshore wind farms for the OCS the focus, it is assumed, will be centered on both API RP2A Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms and the IEC 61400-3 Offshore Wind Farms code while noting the modifications of European standards to those that are comparable but more appropriate for the US: steel standards, welding qualifications, concrete standards, etc. Reference to Certification documents developed by private organizations e.g. Germanischer Lloyd and DNV as well as European standards as applicable are relevant for “best practice”.

The process that the international community has adopted for wind farms is different than that which has existed for verification of fixed oil and gas facilities in the U.S. The system of Component Certification, Type Certification and Project Certification has been a common feature of the international regulatory approval process. Co-dependence between the machinery and electrical control equipment for structural safety lead to a realization that basic certification for suitability of these component parts must be part of any approval process. The Certification can be carried out to a variety of Codes, Standards and Guidelines as stipulated by the owner with the approval of the regulatory authority. The Certification simplifies the process of approval in that it forms the basis of confidence in the facility design basis, and the plans to fabricate and install per existing guidelines while drawing attention to the deviations from those guidelines. Audits can then be carried out on a firm understanding and measure compliance with the approved Facility Design Report and the project plan. Such an approval process can rely upon certification companies, appropriately qualified or accredited by the regulator, to provide assurance in the design in the source country of manufacture, as part of that process.

This Report (Part 1) provides a Guideline to describe the equipment of the wind farm, its design features and the basis upon which the feature has been approved by Type and Project Certification and/or Certified in an equivalent way by a Professional Engineer qualified by the CVA process with experience in the area being certified. In the case of Professional Engineer certification it is appropriate that the Certification basis be existing certification guidelines of the best practice from the most recent published copy of IEC 61400, GL, DNV, or other independent organization offshore windfarm guidelines. Since both Type and Project Certification have different content in different countries/projects it will be necessary for the owner to provide clear detail of what parts of the system are being covered by the Certification process, to what standard, with what deviations, in what depth and with the quantity of surveillance together with the qualifications of those carrying out the reviews and surveillance.

The CVA and Project Certifier may be the same organization, however, because of the potential conflict of interest it has been assumed that these are different organizations in this report as the situation may vary from project to project.

Acknowledgment

This Guideline for demonstration that the Equipment of the offshore wind farm meets reasonable standards was developed using the format and several of the ideas and some of the wording and style from “Health Safety and Environment Case Guideline for Drilling Contractors Issue 3.2, International Association of Drilling Contractors, 2006”. This contribution to safety and to this project by the International Association of Drilling Contractors is gratefully acknowledged.

1. GENERAL INFORMATION

An overview discussion is provided in the Commentary section (Part 2) of this Report.

In addition to the generic information required to be submitted as part of the Facility Design Report as specified by CFR § 285.701, the following additional items should be addressed. All information should be provided pertaining to the wind tower/turbine structures, any offshore transformer platforms, and interconnecting and shore cables.

The information should be submitted in English units and may be accompanied by metric equivalents

1.1 Wind Farm Structures and Details

Provide an overview of the structures including metocean towers, wind tower structures, and major components. As provided in IEC 61400-3 Annex A provide information on location and year built, and the designer/builder, etc.

1.2 Wind Farm Structure Layout

Provide a description of the wind farm structure layout and the relative positions of the primary equipment and the safety equipment e.g. access landings together with details of intended attendant craft for personnel and equipment offloading, lifesaving gear (if any), fire protection arrangements, external ladders, internal ladders indicating side to be climbed and side for lifts, ladder landings, man-riding devices, locations of safety system anchorages, drains, switchgear, transformers, emergency escape equipment, etc.

1.3 Selection of Safety Critical Systems

Provide a summary of the equipment systems that owner/designer has identified as safety critical (many of the systems will be included in this list however, some will not: e.g. the lighting system may not be safety critical, but the emergency lighting system may be). As an example provide details of the anemometer if it controls the yaw direction, design wind speed limitations, and information on what backup systems are relied upon if the anemometer fails.

Description of the arrangements to ensure that safety critical equipment complies with a suitable code (e.g. navigation lights will be required to comply with USCG directives; mooring systems for floating system will have to comply with API RP2SK), or provide a rational criteria for its acceptance and information details on the system that exists to ensure that replacement parts also comply with that code/criteria.

Note: it would be expected that part of the system to be described would demonstrate that replacement parts for safety critical systems are treated with priority in the management system. The Safety Management System Template describes safety critical systems and the process of assurance that the management systems deal with safety critical issues appropriately.

1.4 Certification

Describe in overview each of the major structures and components and on what basis (standard/code/guidance) it is being Type and Project Certified, to including deviations from the standard/code/guidance. The description should identify the proposed certifier, qualifications, and activities that are proposed to be contracted for. For each item certified, provide a description of the component, the code subsections, and information on deviations. Tabulating that information may be helpful in a format similar to Table 1. The table may need modification for the specific situation. The intent is to demonstrate in one document the various aspects of certification and third-party checks that have been carried out for the project. The form of that summary is at the owner's discretion.

Table 1: ITEMS THAT ARE TO BE CERTIFIED, BY WHOM, AND TO WHAT STANDARD

Lightning Protection			•				
De-Icing System							
design basis evaluation							
design evaluation							
type testing							
manufacturing evaluation							
final evaluation							
design basis evaluation							
design evaluation							
type testing							
manufacturing evaluation							
final evaluation.							
site conditions evaluation				N/A			
design basis evaluation				N/A			
load analysis					N/A		
design evaluation							
manufacturing quality evaluation				N/A	N/A		
manufacturing surveillance (report % attendance)				N/A	N/A		
transportation manual evaluation				N/A	N/A	N/A	
transportation surveillance (report % attendance)				N/A	N/A	N/A	
installation manual evaluation							
installation surveillance (report % attendance)							
commissioning surveillance (report % attendance)							
final evaluation							
operation and maintenance surveillance (report attendance requirements).							
basic design evaluation							
prototype test plan evaluation and							
safety and function test							

Table 1 (Continued) : ITEMS THAT ARE TO BE CERTIFIED, BY WHOM, AND TO WHAT STANDARD

Lightning Protection									
De-Icing System									
design basis evaluation									
design evaluation									
type testing									
manufacturing evaluation									
final evaluation									
design basis evaluation									
design evaluation									
type testing									
manufacturing evaluation									
final evaluation.									
site conditions evaluation									
design basis evaluation									
load analysis									
design evaluation									
manufacturing quality evaluation									
manufacturing surveillance (report % attendance)									
transportation manual evaluation									
transportation surveillance (report % attendance)									
installation manual evaluation									
installation surveillance (report % attendance)									
commissioning surveillance (report % attendance)									
final evaluation									
operation and maintenance surveillance (report attendance requirements).									
basic design evaluation									
prototype test plan evaluation and									
safety and function test									

Table 1 (Continued) : ITEMS THAT ARE TO BE CERTIFIED, BY WHOM, AND TO WHAT STANDARD							
Lightning Protection							
De-Icing System							
design basis evaluation							
design evaluation							
type testing							
manufacturing evaluation							
final evaluation							
design basis evaluation							
design evaluation							
type testing							
manufacturing evaluation							
final evaluation.							
site conditions evaluation							
design basis evaluation							
load analysis							
design evaluation							
manufacturing quality evaluation							
manufacturing surveillance (report % attendance)							
transportation manual evaluation							
transportation surveillance (report % attendance)							
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commissioning surveillance (report % attendance)							
final evaluation							
operation and maintenance surveillance (report attendance requirements).							
basic design evaluation							
prototype test plan evaluation and							
safety and function test							

Table 1 (Continued) : ITEMS THAT ARE TO BE CERTIFIED, BY WHOM, AND TO WHAT STANDARD

Lightning Protection							
De-Icing System							
design basis evaluation		N/A	N/A	N/A	N/A		
design evaluation		N/A	N/A	N/A	N/A		
type testing		N/A	N/A	N/A	N/A		
manufacturing evaluation		N/A	N/A	N/A	N/A		
final evaluation		N/A	N/A	N/A	N/A		
design basis evaluation							
design evaluation							
type testing							
manufacturing evaluation							
final evaluation.							
site conditions evaluation							
design basis evaluation							
load analysis							
design evaluation							
manufacturing quality evaluation							
manufacturing surveillance (report % attendance)							
transportation manual evaluation							
transportation surveillance (report % attendance)							
installation manual evaluation							
installation surveillance (report % attendance)							
commissioning surveillance (report % attendance)							
final evaluation							
operation and maintenance surveillance (report attendance requirements).							
basic design evaluation							
prototype test plan evaluation and							
safety and function test							

Table 1 (Continued) : ITEMS THAT ARE TO BE CERTIFIED, BY WHOM, AND TO WHAT STANDARD

Lightning Protection							
De-Icing System							
design basis evaluation							
design evaluation							
type testing							
manufacturing evaluation							
final evaluation							
design basis evaluation							
design evaluation							
type testing							
manufacturing evaluation							
final evaluation.							
site conditions evaluation							
design basis evaluation							
load analysis							
design evaluation							
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manufacturing surveillance (report % attendance)							
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commissioning surveillance (report % attendance)							
final evaluation							
operation and maintenance surveillance (report attendance requirements).							
basic design evaluation							
prototype test plan evaluation and							
safety and function test							

Table1 (Continued): Other Components

Notes: to Table 1
Provide in each box the basis of representation of Certification upon which regulatory approval is requested. "GL" is used herein as example - however "DNV", Professional Engineers "PE", and others who have Certified are to be indicated by the appropriate initials.
Use "GL" for Germanischer Lloyd Certification - to GL standards
Use "GL-IEC" for Germanischer Lloyd Certification - to IEC standards
Use "GL-IEC/GL"for GL Certification to both
Use "GL-BSH" for GL Certification to BSH standards
If part of the MMS-CVA program - use "CVA"
An explanation sheet should accompany this table to explain deviations/ or other provide other comments
A number in the box related to the notes/comments/ deviations may be helpful.
Place "N/A" for items that are non-applicable

Provide Final Evaluation reports of Project Certification and/or Type Certification to substantiate suitability of the equipment for the site.

Discussion is provided in the Commentary section of this report on the Certification process on the following subjects:

- Bottom Supported Fixed Structures
- Blades
- Certification
- Control Monitoring & Condition Monitoring
- Corrosion Protection & Offshore Suitability Requirements
- Emergency Power/ UPS Battery Back-up
- Fire in Wind Turbines and Transformer Platforms
- Floating Facility
- Gearboxes
- Geotechnical Requirements
- Installation Process
- Lifting Equipment Man Riding and Material Handling
- Lightning
- Load Cases for Tower, Nacelle and Spinner/Rotor etc.
- Navigation Lighting, Sounds and Marking
- Offshore Transformer Platform
- Personal Protection Equipment Design Considerations
- Subsea Cables
- Transportation Process

1.4.1 Surveillance

Provide information on the amount of surveillance which will be contracted for with the Certifier(s) and approved CVA related to the specific activities that they will be carrying out. This should identify any surveillance activities in manufacture that are planned to be for a single prototype or production component and whether partial (state %) or full surveillance.

Where surveillance is proposed to be reduced on the basis of experience with the manufacturer, or installation contractor etc. provide supporting documentation for this proposed decision.

1.5 Location of Records

Provide information on the location of the records used for the design and certification/ verification for the functional life of the wind farm structures including: the as-built drawings; any changes to the Facility Design Report; the design assumptions and analyses; a summary of the fabrication and installation nondestructive examination records; the inspection results from the inspections; and Records of repairs not covered in the inspection reports submitted. The Retained Records should include the original material test results of all primary structural materials during all stages of construction. Primary material is material that, should it fail, would lead to a significant reduction structure safety, structural reliability, or operating capabilities. The location of these records is required to be in the possession of the owner in the United States for auditing purposes by the MMS: if other arrangements are proposed, please explain.

2. ENVIRONMENTAL/METOCEAN DATA

Provide summary of data applicable to the site for turbine installation. This information should include the independent extremes for 1-year, 10-year, 50-year and 100-year returns for wind speed, wave height, crest elevation, wave period, current and distribution, and any other pertinent metocean data. 1000-year values should be provided in order to facilitate reliability calculations. Information to be provided at 10 m height level, and hub height level and include 1-minute wind speeds (as well as the information provided by any manufacturer limitations, with factors to convert to 1-minute wind speeds if information is provided to other criteria). Provide data showing associated values for each of the independent extremes to justify the use of the reduced associated values stipulated in the IEC 61400-3 standard for design.

Provide substantiation for method used or a comparison to NOAA or other published values to provide confidence in results.

This information can be integrated into requirement (5) of the Facility Design Report as outlined in 30 CFR 285.701.

3. ENGINEERING DESIGN DATA

As much as possible, this information can be integrated directly into requirement (6) of the Facility Design Report as outlined in 30 CFR 285.701.

Provide information about the facility design including all requirements, assumptions and methodologies which are essential for the design and the design documentation, including:

> codes and standards complied with, noting any deviations; design parameters; assumptions; methodologies and principles; and other requirements, e.g. for manufacture, transportation, installation and commissioning as well as for operation and maintenance.

Provide a Failure Mode and Effect Analysis (FMEA) backed up where clarity for acceptance is required with a Quantitative Risk Analysis (QRA) to provide basis for extreme load cases. Particularly relevant will be any condition that relies upon power or the control system for tower survival. The QRA should analyze and summarize all conditions that could lead to tower or support structure failure and return period applicable to survival of the tower for each condition. The FMEA should identify all assumptions for which the structural integrity depends e.g. details of braking system if emergency stopping is safety critical: the loads will depend on assumptions made with the deceleration value due to braking, and substantiation that this is a maintainable value may be critical; yaw angles used for calculating the load should be justified if safety critical; battery longevity may also be a safety critical assumption which should be disclosed.

For both the wind towers and any transformer platform(s), provide details of collision criteria, and loads assumed in the derivation of an appropriate criteria: size of vessel appropriate, speed of collision, and other assumptions that determine the load value together with a copy of the HAZID or other rationale for determining the suitable size and speed. Provide details of collision design requirements, and protection requirements from collision e.g. fendering loads to prevent damage from attending vessels.

> Note: DNV, IEC, and GL guidance differ on this, and site specific requirements should govern the determination.

> Note: the design loading case (DLC) conditions are not well enough described in the IEC Document to be sure all points are considered, and that the analyst can interpret what all the potential interpretations of the load cases may result from the information written. The FMEA report should make the conditions that become the critical design cases clear.

3.1 Bottom Supported Fixed Structures

Provide information resulting from each of the load cases in summary form. Provide for each IEC load case the resulting return-period limits for any critical components and assumptions resulting or state why the IEC load case is not applicable. Any additional load cases should be explained as to why they are critical to structural integrity. An example of the table contents is given below:

DLC ID #	Conditions	Details	Assumptions	Results: Return Period, Critical item	Explanation
DLC 1…..			Deceleration values derived from emergency braking		
DLC 1.6a	Provide Detailed values of metocean data and configuration used	Power 6 hr., Yaw ± X degrees etc.		e.g. 20-year, Tower at Transition	
DLC 1.6b	Provide Detailed values of metocean data and configuration used	Power 6 hr., Yaw ± X degrees etc.		e.g. 18 –year, Blades, and Tower at first bolted joint	
…….etc.					
Other					

The table may need adjusting, but the goal of this should be to identify for each load case a complete understanding of the assumptions and the return period, and values of metocean data applicable to the design and to the survivability condition.

Add other load case based on outcome of any load cases determined by the FMEA performed.

Please submit results of 2 further Load Condition if not already covered: Load condition results for an extreme load case for an L-1 structure based on API RP2A. (100-year return period extreme storm, 1–min mean wind with associated waves and currents from site-specific data). The results should include a normal API RP 2A load factor but the results should additionally include the estimated extreme return period with no load factors but including appropriate resistance factors: this case should have no reliance on power to determine the direction of the wind on the turbine nacelle i.e. take the worst case. If the return period cannot be met please provide the appropriate value of return period that the structure will meet from this load condition. Since ASCE 7 provides for a load factor for highest reliability for electrical power stations and installations, provide the value of return period that can be achieved for the API RP2A load condition including the "importance factor" appropriate to the offshore wind farm installation.

Provide information values used for marine growth on the submerged structure and confirm these values used in the calculations to derive forces used in the design together with the drag and mass coefficients used.

3.1.1 Design Conditions- Tower

Provide a table of information on the Design Load Conditions (DLC) used to design the Tower if the critical cases are not noted in the Table in Section 3.1 in a similar format. If Certified to DNV or GL Rules in addition, note any additional or omission of load cases which are provided based on that Certification.

For each load case provide a summary table of the primary structure parts which are critical load locations in the tower. Note the anticipated consequence of exceedance of those load cases.

Provide information on the connection of the tower to the transition pieces, and any tower-tower sections that are bolted or grouted, and the design standards/codes to be used. Bolt information should include torque values and a statement as to how those are assured in the construction/maintenance processes.

From this information provide a table giving locations of critical details in the tower which will be on the Structural Critical Inspection Points (SCIPs) list, in the Inspection document. SCIPs identify areas of particular attention in the on-going structural maintenance and include areas to be inspected after extreme events.

3.1.2 Foundations/Support Structure/Transition Piece

Provide a table of information on the Design Load Conditions (DLC) used to design the Foundations if the critical cases are not noted in the Table in Section 3.1 in a similar format. If Certified to DNV or GL Rules in addition, note any additional load cases which are provided based on that Certification.

For each load case provide a summary table of the primary structure parts which are critical load locations in the foundation. Note the anticipated consequence of exceedance of those load cases.

From this information provide a table giving locations of critical details in the foundation which will be on the Structural Critical Inspection Points (SCIPs) list, in the Inspection document.

3.2 Floating Systems

A summary is provided below, however, based on the historical issues with oil and gas structures the Commentary section of this report gives an anticipated list of issues and codes that may be suitable for applying to the regulatory approval of floating systems.

3.2.1 Stability

Provide the following information:

- details of standards and criteria used in determining the intact and damage

stability characteristics;
- details of damaged stability limits and conditions that could cause those conditions;
- information on watertight closures.

3.2.2 Ballast and Bilge System

Provide description of the Piping and Instrumentation Diagrams (P&IDs), including piping arrangement drawings, of the main and emergency blast and bilge system which includes:

- Layout and capacities of tanks;
- Location and capacities of the pumps with can be used for the ballasting and bilge operations;
- Details of the ballasting and bilge pumps that can be powered from the emergency supply;
- Operation of the primary control valves;
- Description of the environmental operating criteria (e.g. maximum heel and list for pumping);
- Arrangements for monitoring ballast conditions.

3.2.3 Mooring System

Describe the arrangement and equipment for mooring including:

- Arrangements to monitor position in relation to cable limiting requirements;
- Details of limiting operating criteria (e.g. angle limits of cable, cable tension, heave etc.).
- Details of inspection and monitoring arrangements for conditions of cables.

3.2.4 Strength

The strength analysis will vary depending on the floating structure type and shape. In general compliance with the appropriate API or Classification Society standards would be a suitable basis for acceptance.

For each load case provide a summary table of the primary structure parts which are critical load locations.

From this information provide a table giving locations of critical details in the floating structure which will be on the Structural Critical Inspection Points (SCIPs) list, in the Inspection document.

3.3 Design Conditions of the Hub/Nacelle

Provide a table of information on the Design Load Conditions (DLC) used to design the Rotor Nacelle Assembly (RNA) stating the specific wind speeds/ conditions that are used. If Certified to DNV or GL Rules in addition, note any additional load cases which are provided based on that Certification.

Provide a table of information on the Design Load Conditions (DLC) used to design the Foundations if the critical cases are not noted in the Table in Section 3.1 in a similar format. If Certified to DNV or GL Rules in addition, note any additional load cases which are provided based on that Certification.

For each load case provide a summary table of the primary structure parts which are critical load locations in the RNA. Note the anticipated consequence of exceedance of those load cases.

From this information provide a table giving locations of critical details in the RNA which will be on the Structural Critical Inspection Points (SCIPs) list, in the Inspection document.

Provide results of Maximum Blade Deflection Analysis giving clearances to the tower and provide the extreme conditions that might give rise to the tower and blade interacting including 50-year and 100-year extreme values.

Provide information on the braking systems including the mechanical brake and yaw brake and motor, their capabilities so far as the extent that they can hold in extreme wind speeds, and the characteristics of the deceleration that can be applied. The information to be supplied in such a way as to determine how this information is accounted for in the load analysis.

3.4 Blades

Provide information on:

- Design life of the blades;
- Deflection anticipated in extreme loading conditions (to assure that the blade does not impact the tower);
- Tests carried out on the blade design and correlation to site-data to ensure the fatigue and strength requirements match the site-specific data;
- How long blades have been in production: if this is first installation provide information on tests carried out and location/ third parties present during blade tests;
- Temperature limitations of the blades;
- De-Icing methods/equipment details (if appropriate);
- Monitoring strategy to ensure defects are located prior to failure;
- Confirmation that the load case results from FMEA match the blade specification;
- Statement as to control system requirements to assure that blade does not fail.

3.5 Gearboxes

Provide information on the design of gearboxes. Provide the standard used. If AGMA 6006 is used, provide information and the site which justifies the assumptions made in the load analyses. If another standard is used, provide detailed justification and summary of deviations from AGMA 6006.

Provide list of analyses carried out on gearbox, computational verification of the load capacities and lifetimes of the individual components of the gearbox, and practical demonstration of tests carried out to confirm analytical figures. Provide summary information on prototype trials, field tests and series tests completed or anticipated, as appropriate. If the prototype trial was performed on a gearbox test bench provide information on the assumptions, boundary conditions that were applied in the design phase. Provide summary results which indicate to the owner confirmation of the anticipated reliability of the gearbox e.g. years prior to major overhaul needed.

3.6 Control and Condition Monitoring Systems

Provide a full description of the Control and Condition Monitoring systems.

Provide details of any systems that have to be active to achieve “fail safe” status in case of a power failure. If the power failure is backed up by battery power or other emergency power indicate length of time for the backup to function and details of the consequences if the back-up system were to fail at the same time as the electrical fault.

Provide details of the marine standards used for cabling, connections, and appropriate quality control in the manufacturing and installation for the control and condition monitoring system.

Provide information and proposed method of assuring the verification of the software used in the process of control and also in the process of condition monitoring if it is proposed to be used for setting the machinery and other inspection limits (recommended).

Please provide a table similar to that below with the anticipated extent of the Control and Condition Monitoring system being submitted for approval. This table is not considered complete but will give an indication of the anticipated information to be provided. Where the proposed system is outside the regulatory recommended items, please provide an explanation.

Control Monitoring System		
● Regulatory Recommended (●) Optional		
Measured Information – Examples		**Comments**
Meteorological Information		
Wind Speed	●	
Wind Shear		*Recommended for prototype testing IEC 61400-13*
Wind Direction	●	
Wave Height	●	
Wave Direction	●	

Current Speed	●	
Current Direction	●	
Ambient Temperature	●	
Temperature Gradient		*Recommended for prototype testing IEC 61400-13*
Power Information		
Condition of Power Generated	●	
Amount of Power Generated	●	*Required for prototype testing IEC 61400-13*
Control Mechanisms – Examples		**Comments**
Blades Angle	●	
Yaw Position	●	
Hydraulic System	●	
Brakes	●	
Shutdowns	●	
Condition Monitoring System		
(may be Monitoring: over 100++ values per turbine)		
Alarm Information		**Comments**
Fire Detection	●	
Fire Protection Equipment Health	(●)	
Electrical System Health incl. Transformer, switchgear, converter	(●)	
Power Management System Health	(●)	
Equipment Information		**Comments**
Tower Information	●	Determine fatigue deviations from design to identify potential for failure.
Rotor Information	●	Monitor and record wind, direction, blade speed, vibration, lightning hits, etc. for fatigue determination; If 2 rotor bearings are provided state if both are to be monitored.
Blades	●	Measured data may pick up blade defects, unbalances or yaw misalignment Icing information may prevent ice-throw Out of balance information may prevent blade throw
Yaw Brake Status	●	
Mechanical Brake Status		
Nacelle Information	(●)	Nacelle temperature, vibrations, Main bed frame
Generator Information	●	Temperature of windings, differential in rotation angle
Transmission Information	●	Gearboxes: number and location of sensors
	●	Gearbox bearings: number and location of

		sensors
	●	Planet-helical gears potential location of sensors may include: at the ring gear, at the level of the sun pinion shaft, at output gear level
Temperature of Equipment	(●)	Differential temperatures (input and output) to indicate wear
Vibration of Equipment	(●)	Indicate location of vibration sensors and whether screwed or glued on by means of ceramic glue
Lubrication Oil Quality	(●)	
Wear Debris content of oil	(●)	Indicate how size of metallic particles are monitored
Transmission Equipment		
	(●)	Monitoring the Monitoring and Transmission equipment sending signals to condition monitoring center
Software Information		
Event Recorder	●	
Backup Discs if Power failure	●	
Alarm message logic	●	Explain philosophy of clearing multiple alarms without on-site inspection since it may lead to issues
● Regulatory Recommended (●) Optional		

Explain for each measured value, where appropriate, how the analytical system is used to determine unacceptable deviations.

3.7 Lightning Protection

Lightning protection should be mandatory for offshore wind farms. Consideration will be given to deviations if the area can be shown to have minimum risk from lightning strikes.

Provide details of the lighting protection proposed as follows:

- Definition of protection levels;
- Definition of protection zones;
- Execution of measures;
- Foundation earth electrode for the tower;
- Junction at the yaw bearing;
- Connection of the machine foundation to the earthing system;
- Connection of other components in the nacelle;
- Metallic housing of the nacelle;
- Non metallic housings of the nacelle;
- Lightning protection for the rotor blades;
- Protection of Control and Protection system if structural survival is based on an operational Control system.

3.8 Hazardous Area Classification

Provide details of the definition used to define any hazardous areas.

Provide details of:

- Rating of hazardous areas in relation to use of explosion-proof and intrinsically safe equipment;
- Procedures for assessing the suitability and use of temporary (third party) equipment;
- Drawing of the designated hazardous areas;
- Demonstration that the hazardous area arrangements/equipment has been approved by an independent qualified third party and that verification at site is completed.

3.9 Fire Detection and Protection

Provide details of the Fire Detection and Protection Systems. Both are proposed as mandatory for offshore wind farms. The rationale for the selection of method should be subject to a risk evaluation, however brief. Please supply information on the philosophy related to the results of this risk evaluation.

3.9.1 Detection Systems

Provide a description of the fire detection system including details of:

- Detection thresholds;
- Sensors types and locations;
- Indicator panel locations;
- Actions automatically initiated on detection;
- Frangible head sprinkler systems;
- Maintenance testing and calibration.

Description of any fixed or portable Hydrogen Sulfide (H_2S) detection systems/instruments including details:

- Location;
- Maintenance, testing and calibration.

3.9.2 Active Fire Protection

Provide description and drawings of the active fire fighting systems including:

- Suppression systems (e.g. CO_2);
- Mist systems;
- Foam systems.

Provide details of protection arrangement to ensure suppression systems do not activate while personnel cannot escape.

Provide details of any portable system and whether permanently installed or brought on board with personnel access including whether USCG approved appliances.

3.9.3 Passive Fire Protection

Provide a description of the passive fire protection systems including:

- Drawing showing materials of housings, coatings which are fire resistant;
- Drawing showing location and rating of any fire resistant walls, decks, escape equipment;
- Details of any structural fire protection for load bearing structures;
- Details of any structures that have a role in controlling fires;
- The use of any non-flammable and non-smoke producing materials in potentially occupied areas.

3.10 Temporary Refuge

Describe any areas which are planned for temporary refuge (if any) and any permanent or temporary supplies/equipment for such contingencies e.g. if caught on-board in lightning storm, location of the best place to shelter.

Describe any situations where temporary refuge may be used other than an emergency i.e. if there are planned activities that can leave personnel at the structure overnight and what equipment is provided.

(Note IEC Code 61400-22 *"provision for emergency stay on an offshore wind turbine for one week"* – which may require significant design changes from those that are customary in Europe – and thus a deviation may be noted in this regard).

3.11 Accommodation

This is expected to apply only to the transformer platform unless there are plans for other manning.

Provide information on the number of bed spaces, beds per cabin and maximum permitted persons on board (POB) by day, or overnight, and compliance requirements of coastal state:

- Description of the accommodation facilities;

- Description of safety equipment in accommodation facilities e.g. life jackets, smoke hoods, fire extinguishers, etc.);

- Details of the potable water system arrangements including methods used to ensure quality of potable water.

3.12 Emergency Shutdown Systems

Provide a description of the Emergency Shutdown philosophy including information on shutdown from icing, storm, blade failure, power failure, fire etc.

Provide details of maintaining shutdown while turbine structure is manned.

Provide hierarchy arrangements and definitions of different levels of shut down and equipment effected at each level.

3.13 Evacuation and Escape Systems

Describe the Evacuation and Escape systems that are provided in the event of a major incident while personnel are on the structures (wind turbine, and transformer platform).

Provide drawing and describe the main routes of access egress to the evacuation/escape points and the conditions under which they can be used. For example: the Safety Management System will describe the action in case of a fire, however the tower door may need to remain closed to prevent an fire from escalating in the nacelle if manned – thus the design of the physical system needs to be thought out and the contingencies provided for and signage to be able to ensure that the right action is taken.

Provide information on the lighting/ emergency lighting for these routes.

Provide description of any lifesaving gear, permanent, or temporary when the facility is manned.

Provide description of any escape methods from the nacelle other than back down the ladder/elevator. If an elevator is proposed, provide system survivability details in the event of an emergency.

Provide for a statement on the compliance of any emergency equipment with applicable codes.

Describe the provision for emergency communications if not noted elsewhere in the information submitted.

3.14 Lifting Equipment, Man-Riding and Material Handling

Provide description and details of:

- Lifting devices on board any of the wind farm structures and standards to which they are designed/maintained;
- Safety related and ergonomic devices;
- Confirmation that the equipment is subject to regular inspection and testing.

3.15 Plant and Utilities

3.15.1 Communications

Provide details of main and backup system of communications:

- Within personnel at the turbine tower structure and nacelle;
- Between the turbine tower structure and servicing boat/helicopter;
- Between turbine service personnel and shore supervisors/technical support;
- To call for emergency services.

3.15.2 Drain and Waste Systems

Provide details of:

- Drainage system for accumulation of fluids in machinery space;
- Description of toilet facilities for personnel working at the location. Note temporary arrangements if these are not designed into the system.

3.15.3 Heating Ventilation and Cooling System

Provide description of Heating Ventilation and Cooling System including details of the

- Ventilation of enclosed work places;
- Location of smoke and gas detection system in relation to this system;
- Automatic shut down arrangements.

3.15.4 Emergency Power/ UPS System

Note: Depending on the design, the tower/turbine structure may include an emergency power location at the structure and/or at the transformer platform which will require emergency power and/or battery backup.

Provide details of the emergency generator (s) including:

- Rating and endurance at rated and anticipated emergency load;
- Start up arrangements;
- Equipment powered from the emergency system;
- Information on Uninterruptible Power Supply (UPS).

Provide details of emergency generator fuel oil storage tanks including:

- transfer arrangements;
- description of arrangements for fuel sampling and retention;
- details of safety, alarm and shut-off devices fitted to the system;
- details of fire detection and protection in these areas;
- identification of components preventing loss of containment/ spillage (valve lockout/tagout, hose storage areas, hose inspection, metering, etc).

3.16 Coating and Corrosion Protection

Provide information on heating/ dehumidification system for nacelle (if appropriate).

Provide information on the coatings and other corrosion protection system.

For steel surfaces provide details of amount of corrosion allowance in the structure and the anticipated corrosion rate for any areas where there is a particularly corrosive environment.

4. GEOTECHNICAL DATA

Provide summary data applicable to the site for turbine installation. The summary data should cover the points noted in the 30 CFR §285. Note: these are the minimum requirements and particular sites may require more investigation points. Include copies of soil survey reports.

Provide information of seabed variability throughout the site, and how this variability is addressed in the design considerations.

Provide information on anticipated changes in seabed topography due to the presence of the structure (e.g. scour), and mitigation method.

It may be helpful to note compliance with a referenced state-of-the-art understanding of the soil such as the BSH document noting deviations from that requirement.

(Ref: Ground Investigations for Offshore Wind Farms, Bundesamt Fur Seeschifffahrt uhd Hydrographie (BSH), February 25, 2008).

5. PERSONAL PROTECTION DESIGN CONSIDERATIONS

5.1 Access to the Wind Turbine

Provide details of access to the wind turbine tower, security at the tower, weather limitations, and any portable equipment carried on board for safety.

Provide details of collision design requirements, and protection requirements from collision e.g. fendering loads, for the offshore wind tower to prevent damage from attending vessels.

5.2 Access and Safety within the Tower

Provide copy of the HAZID conducted to decide the design issues with access inside the tower.

The HAZID should contain information about the risks of health and safety for the type of access system being used e.g.

- Ladders (with fall arrest systems and intermediate platforms)
- Elevators
- Climb Assists
- Helicopters

Provide decision basis statement for solution provided for access in the tower, and for the Offshore Transformer Platform.

It is anticipated that personal protection equipment (PPE) and Portable items are described in the Safety Management System.

Provide design information on features for safety and codes to which the item or components of the item are designed. This includes:

- Watertight and weathertight doors
- climbing facilities;
- access ways and passages;
- standing places, platforms and floors;
- hand rails and fixing points;
- fire resistance and fight fighting equipment (if so equipped)
- electrical and earthing systems;
- provision of alternative escape routes;
- offshore specific safety equipment such as lifesaving equipment (personal flotation devices (PFDs), ring buoys, etc)..

Provide information on emergency lighting arrangements including diagrams, including how they are powered, their area of coverage, and duration.

As guidance on vertical ladder requirements consider the USCG's proposed revisions to 33 CFR Subchapter N, and specifically proposed regulation 33 CFR 143.1341. This proposed rule was published in the Federal Register on December 7, 1999 (Vol. 64, No. 234), but as of 2009 it has not yet been finalized.

6. NAVIGATIONAL WARNING DEVICES (LIGHTS & SOUND SIGNALS) & MARKING

Provide information on navigational warning lights, sound signals (foghorn) and markings, radar reflectors etc. including any flashing characteristics of the lights.

Provide information on size, color and location on tower and platform structures of numbering/ marking system for offshore wind farm.

Provide information on permitted colors for offshore wind turbine and associated structures.

Provide information on notices for cable locations, depth, warning to potential blade failure, and any other safety information signage.

Note: The information provided should be documented as acceptable to US Coast Guard.

7. HELICOPTER FACILITIES

Provide description of helideck (if present – e.g. at the offshore transformer platform), or personnel landing structure (for servicing personnel drop-off), standards to which designed, built and maintained

If there is no specific standard for the helicopter drop-off area for the turbine structure, please provide a report of a HAZID held to determine the safety requirements. Such a HAZID should be attended by a suitably qualified mix of personnel qualified to make a judgment on such matters and the attendance and decision rationale made available.

Provide the following where appropriate:

- Details of lighting and markings;
- Confirmation that the helideck has been assessed to relevant regulatory standards including a list of helicopters that can utilize the helideck;
- Details of emergency equipment provided to mitigate and recover from helicopter incidents;
- Details of operational conditions that limit the use of the helideck, including structural loading limits, or limit the use of the personnel landing structure (for servicing personnel drop-off).

8. OFFSHORE TRANSFORMER PLATFORM

Offshore transformer platforms should be subject to the normal regulations, submissions and approval for fixed offshore oil and gas platforms as found in 30 CFR § 250.900-921 and it is anticipated that API RP2A provisions for an L-1 structure will apply.

Considerations for the electrical equipment on board would generally be expected to follow API RP 14 FZ: Recommended Practice for Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class 1, Zone 0, Zone 1 and Zone 2 Locations.

9. SUBSEA CABLES

Provide information on specification of cables and design basis taking account of the soil conditions for the cable routes within the field and from field to shore.

It may be helpful to note compliance with a referenced state-of-the-art understanding of the soil such as BSH document noting deviations from that requirement.

(Ref: Ground Investigations for Offshore Wind Farms, Bundesamt Fur Seeschifffahrt uhd Hydrographie, February 25, 2008).

10. TRANSPORTATION MANUAL

Provide summary information on weather, motion and other limitations on transportation of components to the installation site and return periods of storms that are anticipated to cause the limiting situation for each stage in the transportation.

Provide the arrangements and details of contents for the submission of a summary of the log book of transportation to the CVA prior to installation, with sufficient information to confirm that loads were not exceeded nor damage done during transportation.

11. INSTALLATION MANUAL

Provide summary information on weather, motion and other limitations on installation of components return periods of storms that are anticipated to cause the limiting situation for each stage in the installation.

Provide information on:

- quality control check points, measurements and inspections, required by the design;
- installation manual;
- commissioning procedures and check-list; and
- Quality recording and record keeping processes.

Provide information on installation prior to operations, with sufficient information to confirm that loads were not exceeded, nor damage done during installation.

12. QUALITY CONTROL

Provide a description of the quality control system during procurement, tests, inspection and documentation relied upon to design, fabricate, transport, install and commission the structure and equipment.

Provide a description of the audits carried out on the system. This is to be included in support of the design basis.

13. MAINTENANCE

Provide sufficient description to verify the adequacy of the turbine design, taking into account specified maintenance processes. This description of the maintenance process shall, if applicable, include:

- scheduled maintenance actions including inspection intervals and routine actions;
- identification of all safety related operational procedures or maintenance activities;
- description of planned environmental protection measures;
- outline of operating instructions and maintenance manual;
- description of quality recording and record keeping processes; and
- a list of Structural Critical Inspection Points (SCIPs) identifying areas of particular attention in the on-going structural maintenance and include areas to be inspected after extreme events.

APPENDIX A

DATA TO BE SUBMITTED AS REQUIRED BY 30 CFR § 285

(Items related to matters in this Report only)

§ 285.610	The SAP must include the following, as applicable:
Project information:	**For all activities you propose to conduct under your SAP you must provide the following information:**
(1) Contact information.	The name, address, e-mail address, and phone number of an authorized representative.
(2) The site assessment or technology testing concept.	A discussion of the objectives; description of the proposed activities, including the technology you will use; and proposed schedule from start to completion.
(5) A location plat.	The surface location and water depth for all proposed and existing structures, facilities, and appurtenances located both offshore and onshore
(6) General structural and project design, fabrication, and installation.	Information for each type of facility associated with your project.
(7) Deployment activities.	A description of the safety, prevention, and environmental protection features or measures that you will use.
(10) Reference information.	A list of any document or published source that you cite as part of your plan. You may reference information and data discussed in other plans you previously submitted or that are otherwise readily available to MMS.
(11) Decommissioning and site clearance	A discussion of methodologies.

Information.	Report contents.	Including:
(1) Geotechnical	The results from the geotechnical survey with supporting data.	A description of all relevant seabed and engineering data and information to allow for the design of the foundation for that facility. You must provide data and information to depths below which the underlying conditions will not influence the integrity or performance of the structure. This could include a series of sampling locations (borings and in situ tests) as well as laboratory testing of soil samples, but may consist of a minimum of one deep boring with samples.
(2) Shallow Hazards	The results from the shallow hazards survey with supporting data	Description of information sufficient to determine the presence of the following: features and their likely effects on your proposed facility, including: (i) Shallow Faults, (ii) Gas Seeps or Shallow gas; (iii) Slump blocks or slump sediments; (iv) Hydrates; and (v) Ice Scour of seabed sediments

Information.	Report contents.	Including:
(4) Geotechnical survey.	The results from the geological survey with supporting data	A report that describes the results of geological survey that includes descriptions of: (i) Seismic activity at your proposed site; (ii) Fault zones; (iii) The possibility and effects of seabed subsidence; and (iv) The extent and geometry of faulting attenuation effects of geologic conditions near your site.

§ 285.626 (b)	
Project information:	**Your COP must include the following project specific information as applicable:**
(1) Contact information.	The name, address, e-mail address, and phone number of an authorized representative.
(2) Designation of operator, if applicable.	As provided in § 285.405.
(3) The construction and operation concept.	A discussion of the objectives, description of the proposed activities, tentative schedule from start to completion, and plans for phased development, as provided in § 28 5.629.
(5) A location plat.	The surface location and water depth for all proposed and existing structures, facilities, and appurtenances located both offshore and onshore, including all anchor/mooring data.
(6) General structural and project design, fabrication, and installation.	Information for each type of structure associated with your project and, unless MMS provides otherwise, how you will use a CVA to review and verify each stage of the project.
(7) All cables and pipelines, including cables on project easements.	Location, design and installation methods, testing, maintenance, repair, safety devices, exterior corrosion protection, inspections, and decommissioning.
(8) A description of the deployment activities.	Safety, prevention, and environmental protection features or measures that you will use.
(9) A list of solid and liquid wastes generated.	Disposal methods and locations.
(10) A listing of chemical products used (if stored volume exceeds Environmental Protection Agency (EPA) Reportable Quantities).	A list of chemical products used; the volume stored on location; their treatment, discharge, or disposal methods used; and the name and location of the onshore waste receiving, treatment, and/or disposal facility. A description of how these products would be brought onsite, the number of transfers that may take place, and the quantity that that will be transferred each time.
(12) A general description of the operating procedures and systems.	(i) In normal conditions (ii) In the case of accidents or emergencies, including those that are natural or manmade.
(13) Decommissioning and site clearance procedures.	A discussion of general concepts and methodologies.

§ 285.626 (b)	
Project information:	**Your COP must include the following project specific information as applicable:**
(18) Reference.	A list of any document or published source that you cite as part of your plan. You may reference information and data discussed in other plans you previously submitted or that are otherwise readily available to MMS.
(21) Construction schedule.	A reasonable schedule of construction activity showing significant milestones leading to the commencement of commercial operations.

§ 285.626 (a)	COP Information	Your COP must include the following
Information:	**Report contents:**	**Information:**
(1) Shallow hazards.	The results of the shallow hazards survey with supporting data.	Information sufficient to determine the presence of the following features and their likely effects on your proposed facility, including: (i) Shallow faults; (ii) Gas seeps or shallow gas; (iii) Slump blocks or slump sediments; (iv) Hydrates; or (v) Ice scour of seabed sediments.
(2) Geological survey relevant to the design and	The results of the geological survey with supporting data.	Assessment of: (i) Seismic activity at your proposed site; (ii) Fault zones; (iii) The possibility and effects of seabed subsidence; and (iv) The extent and geometry of faulting attenuation effects of geologic conditions near your site.
(3) Biological.	The results of the biological survey with supporting data.	A description of the results of biological surveys used to determine the presence of live bottoms, hard bottoms, and topographic features, and surveys of other marine resources such as fish populations (including migratory populations), marine mammals, sea turtles, and sea birds.

§ 285.626 (a) Information:	COP Information Report contents:	Your COP must include the following Information:
(4) Geotechnical survey.	The results of your sediment testing program with supporting data, the various field and laboratory test methods employed, and the applicability of these methods as they pertain to the quality of the samples, the type of sediment, and the anticipated design application. You must explain how the engineering properties of each sediment stratum affect the design of your facility. In your explanation, you must describe the uncertainties inherent in your overall testing program, and the reliability and applicability of each test h d	(i) The results of a testing program used to investigate the stratigraphic and engineering properties of the sediment that may affect the foundations or anchoring systems for your facility. (ii) The results of adequate in situ testing, boring, and sampling at each foundation location, to examine all important sediment and rock strata to determine its strength classification, deformation properties, and dynamic characteristics. (iii) The results of a minimum of one deep boring (with soil sampling and testing) at each edge of the project area and within the project area as needed to determine the vertical and lateral variation in seabed conditions and to provide the relevant geotechnical data required for design.
(5) Overall site investigation.	An overall site investigation report for your facility that integrates the findings of your shallow hazards surveys and geologic surveys, and, if required, your subsurface surveys with supporting data.	An analysis of the potential for: (i) Scouring of the seabed; (ii) Hydraulic instability; (iii) The occurrence of sand waves; (iv) Instability of slopes at the facility location; (v) Liquefaction, or possible reduction of sediment strength due to increased pore pressures; (vi) Degradation of subsea permafrost layers;(vii) Cyclic loading;(viii) Lateral loading; (ix) Dynamic loading; (x) Settlements and displacements; (xi) Plastic deformation and formation collapse mechanisms; and (xii) Sediment reactions on the facility foundations or anchoring systems.

§ 285.627 Type of information:	Including:
(1) Hazard information.	Meteorology, oceanography, sediment transport, geology, and shallow geological or manmade hazards.

§ 285.632 (b)	
(b) You must submit your Safety Management System, as required by § 285.810 of this part.	

Required	Required contents:	Other requirements:
(1) Cover letter.	(i) Proposed facility designations; (ii) Lease, ROW grant or RUE grant number; (iii) Area; name and block numbers; and (iv) The type of facility.	You must submit 1 paper copy and 1 electronic copy.
(2) Location plat.	(i) Latitude and longitude coordinates, Universal Mercator grid-system coordinates, state plane coordinates in the Lambert or Transverse Mercator Projection System; (ii) Distances in feet from the nearest block lines. These coordinates must be based on the NAD (North American Datum) 83 datum plane coordinate system; and (iii) The location of any proposed project easement.	Your plat must be drawn to a scale of 1 inch equals 100 feet and include the coordinates of the lease, ROW grant, or RUE grant block boundary lines. You must submit 1 paper copy and 1 electronic copy
(3) Front, Side, and Plan View drawings.	(i) Facility dimensions and orientation; (ii) Elevations relative to Mean Lower Low Water; and (iii) Pile sizes and penetration.	Your drawing sizes must not exceed 11" x 17". You must submit 1 paper copy and 1 electronic copy.
(4) Complete set of structural drawings.	The approved for construction fabrication drawings should be submitted including, e.g., (i) Cathodic protection systems; (ii) Jacket design; (iii) Pile foundations; (iv) Mooring and tethering systems; (v) Foundations and anchoring systems; and (vi) Associated cable and pipeline designs.	Your drawing sizes must not exceed 11" x 17". You must submit 1 paper copy and 1 electronic copy.
(5) Summary of environmental data used for design.	A summary of the environmental data used in the design or analysis of the facility. Examples of relevant data include information on: (i) Extreme weather; (ii) Seafloor conditions; and (iii) Waves, wind, current, tides, temperature, snow and ice effects, marine growth, and water depth.	You must submit 1 paper copy and 1 electronic copy. If you submitted these data as part of your SAP, COP, or GAP, you may reference the plan.
(6) Summary of the engineering design data.	(i) Loading information (e.g., live, dead, environmental); (ii) Structural information (e.g., design-life; material types; cathodic protection systems; design criteria; fatigue life; jacket design; deck design; production component design; foundation pilings and templates, and mooring or tethering systems; fabrication and installation guidelines); (iii) Location of foundation boreholes and foundation piles; and (iv) Foundation information (e.g., soil stability, design criteria).	You must submit 1 paper copy and 1 electronic copy.
(7) A complete set of design calculations.	Self-explanatory	You must submit 1 paper copy and 1 electronic copy.

Required	Required contents:	Other requirements:
(8) Project-specific studies used in the facility design or installation.	All studies pertinent to facility design or installation, e.g., oceanographic and soil reports including the results of the surveys required in § 285.610(b), §285.627(a), or §285.645(a).	You must submit 1 paper copy and 1 electronic copy.
(9) Description of the loads imposed on the facility.	(i) Loads imposed by jacket; (ii) Decks; (iii) Production components; (iv) Foundations, foundation pilings and templates, and anchoring systems; and (v) Mooring or tethering systems.	You must submit 1 paper copy and 1 electronic copy.
(10) Geotechnical Report.	A list of all data from borings and recommended design parameters.	You must submit 1 paper copy and 1 electronic copy.

APPENDIX B

EQUIPMENT DESIGN AND APPLICABLE CODES

Offshore: Risk & Technology Consulting Inc.

CORPORATE HEADQUARTERS

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