GUIDELINES FOR THE DELIVERY OF AN OPERATIONAL OFFSHORE WIND FARM RISK ENGINEERING SURVEY

ACKNOWLEDGEMENTS:

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If there are any technical queries regarding this document, please contact the LMA (lma@lmalloyds.com).

DISCLAIMER:

Nothing in this Guideline, which is entirely voluntary, shall relieve any party of any legal obligations existing in the absence of this document and nothing contained in this Guideline shall take precedence over any provisions of any policy issued by a party who has chosen to adopt this Guideline.

In the event that the risk engineering service provider is unable to follow one or more of the particulars set out in this document, they should negotiate an acceptable alternative with the (Re)Insurer(s).

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FOREWORD

The primary purpose of insurance risk engineering is to allow (Re)Insurers to understand exposures and loss control features such that the (Re)Insurer can make an informed decision about the transfer of risk. (Re)Insurers would therefore consider themselves the primary (but not the only) customer. In addition, risk improvement is an important aspect of insurance risk engineering which is for the mutual benefit of (Re)Insurers and (Re)Insureds.

A common risk engineering survey process for offshore wind farms and the subsequent market reports does not exist and there is considerable variance in the breadth, depth and overall quality of reports received. Therefore, a review was undertaken in 2022 to agree a protocol for both in line with industry best practice and insurance loss experience.

It is (Re)Insurers' belief that surveys should be planned and conducted in line with the following principles:

- A focus on asset integrity and loss prevention.
- An awareness of the common causes of losses in the industry.
- The importance of evidence-based risk engineering opinion.
- The effectiveness of implementation and compliance with facility and industry best practice standards and procedures.
- Reporting of critical measures of asset integrity, preventative maintenance and loss prevention.
- Develop an understanding of the ultimate loss potential for a given risk and insured coverage i.e. the estimated maximum loss (EML) or probable maximum loss (PML)

To that end, this document was developed to provide guidance on the development of survey programmes, conduct of surveys and key information to be included within market reports:

- Section 1 - Code of Practice for Delivery of an Offshore Wind Farm Risk Engineering Survey Programme (note that this section follows the Code of Practice for Delivery of an Oil, Gas and Petrochemical Risk Engineering Survey Programme, COPRES 2018-001. This can be found on the LMA website as referenced below).
- Section 2 - Guidelines for the Conduct of Offshore Wind Farm Risk Engineering Surveys (note that this section draws from the Guidelines for the Conduct of Oil, Gas & Petrochemical Risk Engineering Surveys, GRES 2018/001. This can be found on the LMA website as referenced below).
- Section 3 - Key Information Guidelines for Offshore Wind Farm Risk Engineering Survey Reports (note that this section draws from the Key Information Guidelines for Oil, Gas and Petrochemical Engineering Survey Reports, IGRES 2018/001 as well as the Key Information Guidelines for Power Generation Risk Engineering Survey Reports, PG IGRES 2015/001. Both are on the LMA website as referenced below).

It is recommended that this document be adopted as far as practicable for the benefit of all involved parties.

Not only will the above approach provide the information requested by (Re)Insurers, it should also result in a more effective process for the (Re)Insured and will provide important risk improvement opportunities.

A link to the relevant part of the LMA website is provided here: Onshore Energy (lmalloyds.com)

ACRONYMS AND ABBREVIATIONS

The following table contains a list of the acronyms and abbreviations used in this document.

Term	Meaning
AC	Alternating Current
CMS	Condition Monitoring System
COD	Commercial Operations Date
CPS	Cable Protection System
CTV	Crew Transfer Vessel
DC	Direct Current
DTS	Distributed Temperature Sensing
EBoP	Electrical Balance of Plant
EML	Estimated Maximum Loss
EPCI	Engineering Procure Construct and Installation
FDSS	Fire Detection and Suppression System
GBS	Gravity Base Structure
GIS	Gas Insulated Switchgear
GWO	Global Wind Organisation
HV	High Voltage
HVDC	High Voltage Direct Current
IAC	Inter Array Cable
KPI	Key Performance Indicator(s)
LAT	Lowest Astronomical Tide
LiDAR	Light Imaging Detection and Ranging
LOTO	Lock Out Tag Out
LV	Low Voltage
MCR	Major Component Replacement
MV	Medium Voltage
NATCAT	Natural Catastrophe
O&M	Operations and Maintenance
OCS	Offshore Converter Station
OEM	Original Equipment Manufacturer
OFTO	Offshore Transmission Owner
ONCS	Onshore Converter Station
ONSS	Onshore Substation
OSS	Offshore Substation

OWF	Offshore Wind Farm
PML	Probable Maximum Loss
PMM	Permanent Met Mast
POB	Person Over Board
PoI	Point of Interconnection
PPE	Personal Protective Equipment
ROV	Remotely Operated Vehicle
SCADA	Supervisory Control and Data Acquisition
SLD	Single Line Diagram
SOLAS	Safety of Life At Sea
SOV	Service Operation Vessel
STATCOM	Static Synchronous Compensator
TLP	Tension Leg Platform
UPS	Uninterruptible Power Supply
WTG	Wind Turbine Generator

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SECTION 1 - Code of Practice for Delivery of an Offshore Wind Farm Risk Engineering Survey.

1. Purposes

The purpose of this section is to provide a set of guidelines to assist (Re)Insurer(s) in agreeing the scope of work for an Offshore Wind Farm risk engineering survey programme. It is equally applicable to both fixed bottom and floating wind farms. It provides guidance for discussions between the Lead (Re)Insurer(s) and the engineering service provider (Broker, (Re)Insurer or Third Party) and sets (Re)Insurers' expectations on programme deliverables. These criteria follow those set out in the LMA Code of Practice for Delivery of an Oil, Gas and Petrochemical Risk Engineering Survey Programme – COPRES 2018-001.

2. Scope

This document has been developed for operational offshore wind farms and their associated offshore and onshore substations and convertor stations plus connecting inter-array and export transmission cables.

3. Definition and Types of Surveys

This document uses the following nomenclature and abbreviations:

- The (Re)Insurance Policy should be referred to in order to confirm exactly which assets are insured. Typically, the words ‘offshore wind farm’ (abbreviated to “OWF”) to describe the insured asset as a whole, comprising:
    - all the wind turbines (WTGs) and their foundations, all undersea cables, all offshore substations (OSS) and the offshore converter stations (OCS) if the export cables are of High Voltage Direct Current (HVDC)type. (Note: on some facilities the OCS is integrated within the OSS).
    - the onshore substation (ONSS) which may or may not also include the point of interconnection (PoI) to the transmission or distribution network and the onshore converter station (ONCS) if the export cables are of HVDC type.
- Various terms are used in industry, with "facility" or “project” being the more common term for the offshore assets. Strictly speaking the latter should only be used during the construction phase of the wind farm. For the sake of consistency, “facility” is used throughout this document.
- The wind farm owner is assumed to be the insured, unless otherwise stated.

Surveys of operational offshore wind farms have been carried out for over 20 years but considerable variance in scope, detail and format is seen and no universally accepted guidelines exist. During and since the Covid-19 pandemic there has been an increase in the use of "virtual" surveys. The usefulness of these exercises is highly variable. The consensus of market insurance company engineers is that physical surveys are far preferable to virtual ones, and that virtual surveys work best when they are limited in scope and focus on changes made or specific issues evolving since the last physical survey and supported by pre-read documentation.

4. Timeframes

4.1 The following timeframes are considered appropriate for OWF surveys:

- Release of draft report 4 weeks after the survey has taken place, or 2 weeks after the surveyor has received all requested documents and information, whichever is longer
- Final report issued 2 weeks after receipt of comments on the draft report by the (Re)insured.

SECTION 2 - Guidelines for the Conduct of Offshore Wind Farm Risk Engineering Surveys

1. Purpose

1.1. The purpose of this section is to provide guidance to risk engineers in the planning, preparation and execution of OWF risk engineering surveys. The aim is to ensure that surveys are conducted in such a way that the key information required by (Re)Insurers is obtained during the survey.

The survey criteria are informed by the experience by members of the LMA's Joint Natural Resources Committee and while drawing from the aforementioned LMA document "Guidelines for the Conduct of Oil, Gas and Petrochemical Risk Engineering Surveys" (GRES 2018/001), the criteria reflect the unique technological and operational risks posed by OWFs.

2. General Principles

Focus on asset integrity, loss prevention and the causes of major losses

2.1. Loss history in the fixed bottom OWF industry suggests the main focus of the risk engineering surveys should be as follows:

- Export and Inter-Array Cable design, manufacturing quality, installation records, inspections and maintenance (including cable route survey and cable protection systems). Cable failures account for over 70% of OWF insurance claims according to a recent study[1].
- Mechanical and Structural Integrity (including foundations, scour protection, transition pieces, lifting devices such as nacelle and davit cranes)
- WTG preventative maintenance procedures
- Blade leading edge erosion
- WTG transformer and associated switchgear
- Vessel management and associated service contracts covering major component replacement (MCR) works.
- ONSS and OSS equipment, related to transformer protection, transformer/GIS service inspections & analyses & terminations.
- Operational Practices and Procedures

If a floating OWF is being surveyed attention should also be given to the following:

- Station keeping systems, comprising the mooring lines and anchors.
- Systems which allow either the mooring lines and/or cables to be disconnected for tow-to-port maintenance work.
- Active or passive ballast systems

[1] Electrical Cable Failure Trending and Reliability Analysis for Operational Developments, ORE Catapult, 2021 (https://ore.catapult.org.uk/stories/electrode/)

- Any other prototypical systems, meaning those first deployed at the facility in question.

Audit and third-party technical review

2.2. The auditing and compliance regulatory regime need to be considered.

2.3. The findings of any third-party technical reviews, whether relating to assurance (e.g. project certification) or operational phase reviews such as root cause analyses, health, safety environmental and quality audits or repeat fire risk assessments must be summarised and referenced.

3. Pre-Survey Preparation

The success of the survey is driven by good preparation, and this includes the timely provision of key documents to the surveyor prior to their site visit for review. A robust document supply and management process should be agreed up front by the (Re)Insured, broker and (Re)Insurer to focus time on site on gathering new information or seeking clarification on that already provided.

Agenda

3.1. It is recognised that the (Re)Insured may need to modify the agenda depending on the availability of key staff members and their physical locations. Some of the meetings can be held at an onshore location such as: central operational support office; Operations Centre; onshore control centre for the wind farm and transmission systems; supply base etc. This will have the added benefit of limiting time spent offshore and hence pressure on transit infrastructure and person on board (POB) numbers where applicable. The other factors that need to be considered for OWF visits are weather and transit to the asset in question. A suggested set of principles that should inform the survey agenda are included in Appendix 1.

3.2. The relative time spent in each area is intended to be representative of the perceived importance to (Re)Insurers including consideration of the causes of major losses highlighted in section 2.1 of this document. Consideration should be given to the inherent process hazards when developing the agenda and a full Risk Assessment and Method Statement should be prepared by the surveyor and approved by the insured prior to the survey.

3.3. Of critical importance for OWF surveys is the requirement for approved safety training (GWO BST[2], Helicopter Underwater Escape Training) and valid medical certification to carry out the survey. This needs to be confirmed by the (re)insured and completed in good time before the survey and the engineer needs to ensure that the relevant certifications and approvals are retained. Personal Protective Equipment (PPE) requirements for the surveyor must also be confirmed in advance.

[2] Basic Safety Training Standard (Version 16.1), Global Wind Organisation (2022) - https://www.globalwindsafety.org/standards/basic-safety-training-standard

4. Conducting the Survey

Focus Areas

- These should follow the areas outlined in 2.1 above.

Facility Visit

4.1. A facility visit to the ONSS, OSS and OCS & ONCS (if present), plus at least one WTG (including the ability to take photographs) is a critical part of the survey but, as time is limited, certain areas should be targeted. The facility visit should occur as early as possible within the survey and focus upon the high-risk areas where historically major loss incidents and insurance claims have occurred, as well as any areas of concern identified by the surveyor during the document review. However, it is critical that the facility visit does not happen before all documents and responses required by the surveyor beforehand, have been received.

4.2. The parts of the OWF visited should be detailed in the Executive Summary of the survey report, as per the requirements in Section 3. Any limitations on the scope of the survey visit should be stated.

Recommendations

4.3. Recommendations should be developed and discussed by the survey team and presented as consensus survey team recommendations during the wrap-up meeting. Preference is to provide the recommendation title and brief outline only during the wrap-up meeting with the final wording to be developed and agreed by the survey team after the survey (and within agreed timeframes per Section 1).

SECTION 3 - Key Information for Offshore Wind Farm Risk Engineering Survey Reports

1. Purpose

1.1. The purpose of this section is to outline the key information identified as important for inclusion in OWF risk engineering survey reports ('market reports') and to provide guidance to risk engineers responsible for producing such market reports.

2. Scope

2.1. This document identifies the key items of interest to (Re)Insurers rather than providing an exhaustive and definitive list of all possible information. It is recognised that, depending on the type of survey being undertaken, it may not always be possible to obtain all the information requested.

2.2. This document does not stipulate a specific format for market reports (section titles, order etc.). Ensuring that the information (Re)Insurers find most useful is present somewhere within a market report is far more important than the report format itself.

3. General Principles

The following points are intended as general principles applicable to market reports.

Focus on asset integrity, loss prevention and causes of major losses

3.1. See comments pertaining to this issue in Section 2, part 2.

Report length

3.2. There is a growing tendency for market reports to exceed 100 pages. Whilst not an absolute target, it is considered that the information outlined in this document can be produced in a market report in the order of 70 pages. That said, the amount of detail provided within any market report should be commensurate with the exposures and associated risks.

3.3. A reduction in report length could be achieved through more succinct report writing, improved format and greater use of bullet points, tables, charts and diagrams. Certain pitfalls should be avoided:

3.3.1. Avoiding lengthy narrative and ensuring that text is relevant to risk quality assessment and the insurance cover being provided. Lengthy descriptions of the physical asset and specific work procedures should be avoided.

3.3.2. Avoiding repetition.

3.3.3. Avoiding report 'creep' by not simply adding more information to an existing market report following each survey, unless that information is considered to materially improve the report content. It is also important to ensure that historical information left in a new version of a report does not become obsolete.

Evidence-based opinion

3.4. See comments pertaining to this issue in Guidelines for the Conduct of Oil, Gas and Petrochemical Risk Engineering Surveys, GRES 2018-001.

Risk quality rating

3.5. Overall risk quality ratings for a site, while providing an easy to benchmark reference point, tend to average out strengths and weaknesses to such an extent that many risk engineers and (Re)Insurers consider them to be of limited value. In order for risk engineers and (Re)Insurers to undertake an independent analysis of any risk, it is therefore recommended that risk quality ratings be provided at individual Loss Prevention and Loss Mitigation element level. A clear explanation for the language used should be provided, for example:

Loss Prevention / Loss Mitigation measure	**Explanation**
Best Practice	The risk in question has been controlled or mitigated using an approach deemed to represent the current industry best practice.
Adequate	The risk in question has been controlled or mitigated to an adequate level and the residual risk is deemed to be acceptable.
Inadequate	The risk in question has not been adequately controlled or mitigated and the residual risk is deemed unacceptably high.

Information not provided.

3.6. Within the constraints of the survey process, it is recognised that not all of the information outlined in this document can be provided or revalidated at every survey. If information was not available or was not assessed, then this should be stated within the report.

Electronic format

3.7. All text, attachments and embedded files (EML output files, appendices, drawings, photos etc.) should be inserted such that they can be extracted and clearly read.

SECTION 4 – Report Elements

The elements required in the report are listed below.

1. **Executive Summary**

- An overview of the key design features of the facility listed in the Plant Design Overview.
- Details of ownership and operator of the facility
- An abbreviated narrative of the 'Facility Operational Status', 'Loss Prevention' and 'Loss Mitigation' sections (these sections are more fully defined below).
- A summary of all past/known claims and significant incidents and the lessons learned from them.
- A summary of all warranties in place and when they expire.
- A qualitative rating of individual 'Loss Prevention' and 'Loss Mitigation' elements.
- A list of the areas of the wind farm visited.
- A list of the new and previous recommendations, indicating the current status.
- A summary of the declared values and loss estimates.

FACILITY OPERATIONAL STATUS

2. Basic Details of the Facility

Provide the following general details:

- The name and general location of the OWF
- The owner/operator and main Operations and Maintenance (O&M) contractor(s)
- Date of First Power and Commercial Operations Date (COD)
- Type and number of WTGs. Unless otherwise stated, "WTG" is taken to include the foundation, transition piece and associated platform and secondary steel, the low voltage/medium (LV/MV) voltage transformer and associated switchgear, tower, rotor and nacelle assembly (RNA), blades and all weather sensors
- Overview of OSS, including transformer ratings, general layout, fire suppression systems and foundation type
- Total length and rating of inter-array cables (IACs)
- Total length, rating and number of export cables
- Owner and operator of the OSS(s), ONSS and any OCS & ONCS (if different from OWF owner and operator)
- Offshore Transmission Owner (OFTO) if different from that of the OWF, and clarity on what is meant by the 'Transmission assets'

- The main Engineering, Procure Construct and Installation (EPCI) contractor for the construction of the facility.
- Provide a map showing all WTGs, IACs, OSS(s), the ONSS, OCS & ONCS (if present), export cable(s), permanent met masts (PMM) and the port of operations.
- Provide a summary of key metocean design criteria, including:
- maximum wind speed at WTG hub height and maximum wave height, and the relevant return periods
- maximum, minimum and average water depth (LAT) across the WTGs, OSS(s) and OCS (if present)
- the level of scour assumed in the design of the foundations, undersea cable protection systems and scour protection systems.

- Provide a summary of the assurance process in place, including:
- The WTG Type certification awarded and the certifying body
- Any other independent verification body's involvement

- Provide details of any recently completed or planned major capital projects (include schedule, cost etc.)
- Provide a list in an appendix of all spares held either locally at the Operations Centre or at an Original Equipment Manufacturer (OEM) facility, including subsea cable lengths, number of joints and accessories. All special tools including lifting frames required for component exchanges should also be listed.
- Provide a brief overview of the onshore and offshore storage facilities for spares and tools.
- If some elements of the wind farm (such as the OSS, OCS and the export cables) are owned by a separate entity and/or covered in a separate insurance policy, provide details of that party, and where the battery limit of responsibility lies with regards to the assets.
- Include a single line diagram (SLD) of the OSS(s), ONSS and OCS & ONCS (if present), stating the level of redundancy in place should a critical element of the electrical system fail.
- Provide details of the main O&M contracts in place and the contractual arrangements in place with regards to vessels and remotely operated vehicles used in the O&M plan.
- Provide basic details of any emergency power supply systems in place, including Auxiliary transformers and portable gensets.
- Provide a brief overview of onshore and offshore storage facilities for spares and tools.
- Provide the Loss Record for both the Construction and Operational Phase, including significant and high potential incidents, along with a summary of the root cause and remedial work undertaken for each, and any lessons learned resulting in changes of operational procedures.
- Provide basic details of any recently completed or planned major component replacements (include schedule, cost etc.)

- Summarise the Recommendations from the previous risk survey (if applicable)

3. Plant Design overview

Wind Turbine foundations (fixed)

- Provide an overview of the WTG foundations, including:
  - Type (monopile, jacket, gravity base, etc)
  - Transition piece (TP) or TP-less design
  - Method of connection between TP/tower and foundation (e.g. grouted, flange)
  - Cathodic protection system
  - Boat landings
  - J-tubes configuration (if present) – external or internal
  - Any unique design features

Wind Turbine foundations (floating)

- As above, plus:
  - Overview of foundation type [Spar/Tension Leg Platform/Semi-Submersible/other] and materials used
  - Passive and active ballast systems
  - Mooring – design criteria, type of mooring, redundancy
  - Anchors, including scour protection if present

Wind Turbine topside

- Provide an overview of the WTGs, including:
  - OEM, model and version of WTG, including rated power.
  - Any known issues with this model or platform and any known retrofits or upgrades available for it
  - OEM and model of gearbox, generator, converter, LV/MV transformer rating and type (e.g. ester or resin filled) and main bearings
  - Any known issues with the above
  - Blade manufacturer and model, any known issues.
  - Leading Edge Protection system
  - Lightning protection system
  - Pitch/Yaw design
  - Mechanical brakes
  - Condition Monitoring Systems
  - Fire Detection and Suppression System (FDSS) (if fitted)
  - Other fire protection systems if fitted (e.g. fire blankets)
  - Cranes (in nacelle and on transition piece) and their safe working limit

Inter Array Cables (IACs)

- Provide an overview of the IAC design, including:
  - Number of WTGs per string and presence of collector cables/loops
  - OEM of cables

- Cable description, including voltage, rating, type (dynamic or static), number of power cores and fibre optic cores, materials used in cores and sheath.
- Any known issues with this design of cable
- Joints (factory and field); these should be marked on a map.
- Details of crossings
- Trenching and burial depth achieved (minimum, average and maximum)
- Cable protection system (CPS) including OEM and product name/type, including bend stiffeners, bend restrictors, and mechanism of restraint/stabilisation if present (e.g. rock bags)
- Scour protection concept (e.g. mattresses, filter beds, rock beds)
- Online condition monitoring systems (CMS) and fault location systems e.g. distributed temperature sensing (DTS)
- For floating wind farms, also include overall design concept (e.g. lazy wave), length of dynamic and static cables, buoyancy units and IAC disconnection system (e.g. I-Tube type) if present.

Offshore substation(s) (OSS)

Provide an overview of the key internal MV/HV design features, including:

- General platform layout (cable deck, main deck, utility deck)
- Fire design and protection, including passive protection such as fire ratings of walls, blast walls and explosion protection, and active protection in the form of the FDSS. Any fire safety standards met by the design should be stated.
- The OEM, model, rating, layout and operating limits for the main transformer(s)
- Auxiliary power systems (normal and emergency/backup)
- Redundancies in the HV and MV equipment, including how much power can be exported by the facility should one transformer fail.
- GIS terminations and layout
- Shunt reactors
- Control room (physical)
- Protection control and metering system
- Battery room – H_2 explosion, ventilation, fire detector, fire protection
- Storage of oil on the platform
- Surge protection
- Spill containment systems such as bunds/tanks
- Ester type used in the transformers, e.g. natural, synthetic, highlighting safety benefits of any less flammable options being used

- **Provide an overview of the key structural and external design features, including:**
  - Design specification of any cranes present, including safe working load
  - Boat landing and J-tubes configuration
  - Scour protection concept (see above)
  - CPS (see above)
  - Overview of foundation design including type (e.g. jacket) and cathodic protection system
  - Any unique design features of the foundation

Offshore Converter Station (OCS)

Provide an overview of the key internal HV design features, including:

- Layout and operating limits for the converter transformer(s)
- Valve design used in the converter transformer (e.g. multi-layer converter)
- Capacitors or alternative systems providing reactive power.
- Filters for harmonic suppression, and
- DC switch gear

Export Cable

- Provide an overview of the export cable or cables, including:
- Number of export cables
- OEM of cables
- Cable description, including voltage, rating, type (dynamic or static), number of power cores and fibre optic cores, materials used in cores and sheath
- Any known issues with this design of cable
- Joints (factory and field); these should be marked on a map
- Details of crossings
- Trenching and burial depth achieved (minimum, average and maximum)
- CPS (See above)
- Scour protection concept (see above)
- Online condition monitoring systems (see above)

Permanent Met Mast(s) (PMM)

- Provide an overview of the PMM(s), whether they use standard cup anemometers or laser imaging detection and ranging (LiDAR) units, their power supply and Supervisory Control and Data Acquisition (SCADA) connection, and who is responsible for the maintenance of the PMM(s).

Onshore substation (ONSS)

Provide an overview of the ONSS, including:

- Site layout
- Fire design and protection, including passive protection such as fire ratings of walls, blast walls and explosion protection, and active FDSS protection such as gas detection, ultra violet/infra red flame detectors, etc. Any fire safety standards met by the design should be stated.
- Redundancies in HV transformer(s) and GIS/AIS
- The OEM, model, rating, layout and operating limits for the main transformer(s)
- Surge protection
- Auxiliary power systems (normal and emergency/backup)
- Capacitors or alternative systems providing reactive power.
- Redundancies in grid connection to the PoI
- ONCS if present
- Distance from fire brigade control station

- Site security & Cyber security
- Natural Catastrophe (NATCAT) perils incorporated in the design, e.g. for flood, windstorm, snow etc.

Onshore Support Facilities

Provide an overview of the key components of the onshore support facilities which are typically located at the port of operations, including the operational control room, spares warehouse, outdoor spares and laydown areas, welfare facilities and vessel berths where crew transfer vessels (CTV) are moored. Comment on the adequacy of housekeeping of spares and the protection afforded to spares stored outdoors.

4. Operational Status & Reliability

- Provide monthly availability data for the facility, for the last 12 months, taken from the monthly operations reports. Define the definition of availability used and explain the main reasons for any months where availability was significantly below target.
- Provide a summary of any unscheduled maintenance currently underway, or due to be undertaken in the next 3 months.
- Provide a summary of any losses incurred to date, including total outage in months, root cause (if identified), and mitigations put in place to reduce risk of a reoccurrence.
- Comment on any programmes of work that appear more urgent than currently scheduled.
- Provide a summary of any claims made to date on the insured's operational all risk (OAR) or construction all risk (CAR) policy.
- If any equipment is still within its Warranty Period, provide details of any significant problems experienced during installation, testing and/or commissioning or still outstanding (e.g. machinery failures, curtailment, warranty repairs etc.)
- For any new plant, provide details of the current status including any significant problems experienced during testing and commissioning or still outstanding (e.g. machinery failures, process capacity restrictions, warranty repairs etc.)
- Provide a summary of any modifications made to the OWF since COD that may affect its asset integrity. For example, stabilisation of CPS and cables through rock dumping.

5. Contractual and warranty arrangements

5.1. Identify the status of the original equipment warranty relating to the WTGs, WTG foundations, IACs, Export Cables and all major electrical balance of plant (LV/MV transformers, main power transformers, HVDC converter, etc).

5.2. For each, provide an overview of the arrangement including the expiration date of the warranty, whether it includes vessel hire costs and any major exclusions (e.g. force majeure or lightning).

5.3. Provide details on any ongoing warranty claims made by the wind farm owner.

EXPOSURE ASSESSMENT

6. Exposures

6.1. Identify and comment upon any *unusual* fire and explosion exposures.

6.2. Include and comment on the NATCAT risk ranking for the OWF

6.3. Identify and comment upon any technology risks such as novel or unproven processes and pioneering design (e.g. dis-connectable subsea cables for floating wind farms), or serial defects associated with a component that are known to the industry.

6.4. Identify any relevant third-party operations, in particular any helicopter, shipping or fishing vessel exposures which have potential to cause damage to the WTGs, OSS, OCS or undersea cables and comment upon the proximity and possibility of property damage accumulation. If vessel traffic has increased over the lifetime of the OWF this should be stated, making reference to the pre-construction navigational risk assessment.

6.5. Identify and comment upon any potential cross exposure associated with capital project works (e.g. simultaneous operations and/or construction at a neighbouring OWF).

7. Values

7.1. **Property Damage (PD)**

7.1.1. State the basis for the declared values (historical book value, Actual Cash Value (ACV), Replacement Cost Value (RCV), Residual Reserve Value etc.) to allow the adequacy of the declared values to be assessed.

7.1.2. Provide details of the last professional valuation including the date and performing company. Also provide details of any subsequent cost indexing applied to the valuation.

7.1.3. Provide a breakdown of values with separate values for WTGs, Foundations, Inter-Array Cables, ONSS, OSS, OCS & ONCS (if present) and Export cable(s).

7.2. **Business Interruption (BI) (Where Covered)**

7.2.1. State the type of applicable policy cover.

7.2.2. State the basis for the declared values and the date at which they were declared (e.g. monthly net energy revenues provided by the insured).

7.2.3. Provide a breakdown of values (where applicable/available).

8. Loss Estimates

The following information is requested in order to allow (Re)Insurers to independently verify and/or re-run the calculations using their own models/systems.

8.1. **Property Damage (PD)**

8.1.1. Consider the possible EML (or equivalent terminology) scenarios and provide a list of potential scenarios. The scenarios should include where applicable:

- Loss of the OSS due to vessel collision, fire or major NATCAT event
- Failure of one export cable due to damage or fault
- IAC cable failure leading to loss of one string of WTGs (select the string with the most WTGs on it)
- Complete loss of one WTG
- For facility with high risk of hurricanes, typhoons or cyclones, the loss of multiple WTGs and the OSS could be considered.

8.1.2. State the basis for the values used (e.g. if declared values or engineering estimates), including assumptions for spares lead times and system redundancy (e.g. on export cables or main power transformers).

8.1.3. Consider the possibilities for vessel collision damaging a WTG or the OSS, OCS by referring to the Navigation Risk Assessment prepared prior to construction and observations of actual shipping movements during operations. This risk is likely to be higher for WTGs on the perimeter of the wind farm array, and for an OSS, OCS which is located near the perimeter rather than in the centre of the array.

8.1.4. For floating OWFs, consider the possibility of vessel collision in the event of a WTG moving off station due to mooring line or anchor failure, by making reference to the OWF's pre-construction risk assessment. Also consider the possibilities for damage occurring when a WTG has been towed to port for repairs, such as damage to mooring lines and failure of IACs due to water ingress.

8.2. **Business Interruption (BI) (Where Covered)**

8.2.1. Provide a qualitative (and wherever possible quantitative) assessment of the potential for BI in each of the EML scenarios listed above. For each scenario identify business critical elements and consider installed redundancy, flexibility of power export options (e.g. back-routing through collector cables in the event of an IAC failure) and potential mitigation. Include commentary upon the likely availability and practicality of any mitigation in the event of a loss (consider use of a Loss of Net income scenario worksheet similar to that in Appendix 4).

8.2.2. The BI EML should include the impact of any interdependencies and consider how the insurance policy would respond.

8.2.3. Provide details of any facility level Business Continuity Plan (BCP) covering critical property damage scenarios.

8.3. **Contingent Business Interruption (CBI) (where applicable)**

8.3.1. Identify CBI risks, for example if the OWF is connected into a shared OSS owned by a 3rd party which suffers a failure. Consider the likely availability and practicality of any mitigation and quantify the consequences of loss of revenue from such an event.

LOSS PREVENTION

9. Design Safeguarding

9.1. Provide a description and opinion of how the following elements of the OWF have been designed to mitigate a loss caused by the exposures presented in Section 6 or other equipment-specific hazards:

9.1.1. Foundations (for example, to mitigate losses caused by storm waves, tsunamis, earthquakes and other NATCAT perils. Controls in place to reduce damage due to scour and the risk of vessel collisions (e.g. AIS)

9.1.2. WTG topsides (for example, to mitigate losses caused by lightning strike, high windspeeds, storm waves, tsunamis and earthquakes). This should include the Type Certification of the WTG (eg Typhoon Class certification if appropriate).

9.1.3. OSS and ONSS (for example, to mitigate losses caused by lightning strike, high windspeeds, storm waves, tsunamis and earthquakes and other NATCAT perils as well as controls in place to safeguard against electrical over-current/over voltage, harmonics and other sources of electrical damage.

9.1.4. ONS and ONCS (as for OSS and ONSS above, as well as physical security measures to reduce the risk of vandalism and theft.

9.1.5. Cables (for example, to mitigate losses caused by scour, anchor drag, and excessive movement in areas of free-span)

10. Process & Equipment Safeguarding

10.1. **Basic Process Control and Emergency Shutdown**

10.1.1. Provide basic details of the Basic Process Control System and any Emergency Shutdown (ESD) systems present in the WTGs, OSS, ONSS OCS and ONCS

10.1.2. Provide basic details of the approach to cyber security for Industrial Control Systems. Given the likely areas of expertise of members of the survey team and plant representatives, it is not recommended that a detailed analysis of cyber security is undertaken. In the event that further information is required, a roadmap for wind farm cyber security can be found at the US Department of Energy's Office of Energy Efficiency and Renewable Energy[3].

10.2. **SCADA, Alarm Management & Safe Operating Limits (SOLs)**

10.2.1. Provide basic details of the SCADA system, including alarm management programme used.

10.2.2. Summarise which WTG, OSS, ONSS, OCS and ONCS faults require a manual reset, therefore having a large potential effect on downtime.

10.2.3. Comment on the SCADA system's safe operating limits (SOL) and alarm log for the last year data and/or Key Performance Indicators (KPI).

[3] https://www.energy.gov/sites/prod/files/2020/07/f76/wind-energy-cybersecurity-roadmap-2020v2.pdf

11. Management & Organisation

11.1. Organisation and competency

11.1.1. Provide a summary of the general operational philosophy adopted by the wind farm owner, including which elements are performed by the asset owner (the 'self-perform' model)

11.1.2. and which are handled by contractors under service agreements. Outline whether the maintenance carried out is generally preventative or reactive and what systems are employed to minimise WTG downtime (e.g. spares management, long-lead time spares agreements, vessel agreements).

11.1.3. Provide a basic and brief outline of the Operations organisation including employee numbers, vacancies and turnover of personnel with trends. Include data where possible.

11.1.4. Provide the average experience levels and age profile of the staff.

11.1.5. Describe the main elements of the training and certification process for new in-house operations staff.

11.1.6. Describe the main elements of the operator competence definition and assessment process.

11.2. Permit To Work (PTW) and Lock Out Tag Out (LOTO)

11.2.1. Describe the main elements of the PTW system and highlight any deficiencies versus industry good practice.

11.2.2. Provide evidence of compliance with the PTW system.

11.2.3. Provide detail of the LOTO process followed for accessing WTGs and HV areas of the substations and use of HV electrical safety rules.

11.3. High Voltage equipment Isolation

11.3.1. Describe the main elements of the equipment isolation procedures (mechanical and electrical) employed in the OSS, ONSS, OCS and ONCS and highlight any deficiencies versus industry good practice.

11.3.2. Provide evidence of compliance with the equipment isolation procedures.

11.4. Performance Monitoring & Audits

11.4.1. Describe what inspection performance metrics and information is monitored and routinely reported to management. Provide and comment on the data including any targets and trends.

11.4.2. Describe what internal and external audits of the Inspection function have been undertaken and summarize the most significant findings.

11.5. Management of Change (MoC)

11.5.1. Describe the key features of the MoC procedure including definition and types of change stepwise process flow, hazard identification and risk assessment, training, documentation etc. Comment and provide opinion on the adequacy of the procedure.

11.5.2. Provide details of how the status of MoCs is tracked from initiation to close-out and include data and/or KPIs associated with MoC close-out.

12. Operations and Maintenance

12.1. Organisation

12.1.1. Provide an overview of all the operations and maintenance or 'service' agreements in place for the WTGs, electrical Balance of Plant (cables, substation equipment) and civil Balance of Plant (foundations, substation buildings, related infrastructure).

12.1.2. For each, provide a basic overview of the contractor involved including their level of experience in the field, the contract expiration date and any major exclusions in the contract, such as provision of vessels or cranes.

12.1.3. Comment on any major omissions or carve-outs in the scope of these service agreements and the potential impact this could have on asset integrity and/or excessively long periods of downtime. This could include force majeure events (e.g. repairing damage from lightning strikes on WTGs may not be covered), or unscheduled maintenance which relies upon the OWF owner to organise the vessel or spare parts required.

12.1.4. Provide a basic and brief outline of the Asset Management practice used to manage the service agreements, the extent of the use of contractor workforce and the level of in-house supervision.

12.2. Basis of the Maintenance Programme

12.2.1. Provide basic details of the basis for the maintenance programme (Original Equipment Manufacturer (OEM) guidelines, industry standards etc.)

12.2.2. Provide basic details of the scope and frequency of scheduled maintenance carried out on:

- WTGs, including blades, the drivetrain, transformer, converter, switchgear, yaw assembly, etc.
- WTG foundations, including secondary steelwork, davit cranes, boat landings, fall arrest systems topsides (type and frequency of activity etc.) and comment upon the upon the adequacy of the scope.
- IACs, including terminations.
- Export cables.
- OSS, including cable terminations & hang off, transformers & GIS, HV/MV and LV systems, plus a review of the signed O&M agreement for the OSS.
- ONSS, as above for OSS.
- OCS and ONCS (if present).

12.2.3. Provide an overview of all vessels under contract to the wind farm for operations and maintenance purposes and their type e.g. CTV, Service Operation Vessel (SOV), ROV

12.3. Planning, Prioritisation & Performance

12.3.1. Provide basic details of the systems and processes used to plan and prioritise maintenance work, including an overview of the condition monitoring systems in place on the WTGs, cables and in the OSS, ONSS, OCS & ONCS.

12.3.2. Highlight and areas not covered by the CMS.

12.3.3. Describe the procedure for deferral of maintenance work on Safety Critical Equipment (or equivalent terminology).

12.3.4. Provide the site's suite of maintenance KPIs (include actual data, trends and details of any corrective actions). Particular focus should be on completion of Safety Critical maintenance activities (planned and corrective).

12.4. Reliability

12.4.1. Describe the processes utilised for reliability improvement (e.g. Failure Mode and Effects Analysis).

12.4.2. Provide data and/or KPIs associated with plant and equipment reliability (e.g. system availability whether time or energy based, Mean Time Between Failures).

13. Inspections

13.1. Inspection programme

Describe the inspection philosophy (e.g., time based, risk based etc.) and the standards used to develop the programme (e.g., government regulation, corporate standards).

13.2. Inspection details

Provide details of the contractor responsible, scope and frequency of scheduled inspections on the following, including results of the latest inspections where stated:

- WTGs, including:
    - Blades, listing how many were found to have damage requiring repair within 6 months or less (typically these would be classified as damage category 3 or higher in accordance with industry best practice[4].
    - Main bearing, gearbox, generator, converter and blade bearings
    - Gearbox oil sample reports
    - Yaw system including brakes and motors.
    - Blade pitching systems including statutory inspections of hydraulic accumulators.
    - Low and medium voltage cables and switchgear within the nacelle and down-tower. Any joints or replacements in these cables should be flagged.

[4] Cortir, 2019, Wind Turbine Blade Handbook

- Lightning protection systems, including an overview of how these were conducted.

- WTG and OSS/OCS foundations, including secondary steelwork, davit cranes, J-tubes and cathodic protection systems.
- OSS(s), ONSS and OCS & ONCSs (if present), including:
  - Frequency and details of the dissolved gas analysis (DGA) carried out on the insulation oil of the transformers and shunt reactors.
  - It is essential that the last set of insulation oil analysis results are reviewed to ensure that the results are satisfactory, and preferably the last 3 results.
  - Screen tests (physical and chemical properties) and which laboratory carries out the analysis.
  - Furans, analysis and inferred Degree of Polymerisation (DP)/life expectancy
  - Corrosive sulphur analysis
  - Electrical testing, scope of testing (IR/PI/Tan Delta/ SFRA) and frequency. The last electrical testing report should be reviewed.
  - Engineering analysis of the overall health of the transformers (including bushings).
  - Frequency and details of the thermographic surveys carried out, including a review of the last report.
  - HVDC converter valve inspections if applicable.

- All IACs and export cable inspections, including:
  - Surveys of their location and burial depth,
  - Remotely operated vehicle (ROV) inspections of their CPS and scour protection.
  - Any cables which are in free-span or suffering from partial or complete disintegration of the CPS should be highlighted. Particular attention should be paid to any findings and remedial action planned.

13.2.1. Highlight any areas in which the above does not meet recommended best practice.

13.2.2. For floating OWFs, provide details of the inspection programme for non-fixed marine elements such as mooring systems, dynamic cables, underwater connection ‘hubs’.

13.3. Independent Inspections

13.3.1. Provide a basic and brief outline of any inspections which are undertaken by parties other than those contracted under the service agreements. This may include regulatory and fire safety inspections by appropriate independent bodies.

14. Third Party Verification

14.1. Describe the certification achieved by the OWF, including all certifying bodies and the type of certification conducted.

14.2. If project certification was applied, provide details on what components of the asset are covered (WTGs, OSS, ONSS, OCS, ONCS, cables, floating structure, etc) and for what phases (design, fabrication, installation, operation).

14.3. Provide details of any third-party lifetime extension verification or re-certification that has been conducted and by whom. Include the proposed operational lifetime of the wind farm and the key areas in which additional inspections or maintenance will be carried out to achieve this.

14.4. Describe any regulatory auditing that is conducted.

14.5. Describe any vessel regulatory auditing that is conducted.

15. Process Safety

15.1. Process Safety Framework

15.1.1. Provide basic details of the process safety management framework including the status of the development and implementation of process safety standards.

15.1.2. Provide a summary of the crew transfer process used for WTGs and the OSS, OCS and provide commentary on the suitability thereof. For example, is it solely by CTV or are helicopters used in emergency situations.

15.2. Process Safety Incidents

15.2.1. Provide monthly process safety incident data for the last 12 months. Process safety incident data should be reported as it is defined by the (Re)Insured and including a severity categorisation.

15.2.2. Ensure this includes any incidents aboard vessels in transit to or from the wind farm.

15.2.3. For any significant incidents, provide brief and relevant details of the incident, consequences, root causes and corrective actions.

15.2.4. Describe the main elements of the procedure used for incident investigation and comment on the quality of incident investigation reports and root cause identification process.

15.2.5. Provide data and/or KPIs on the implementation of recommendations resulting from incident investigations.

LOSS MITIGATION

16. Passive Protection

16.1. Provide a description and opinion of the extent and condition of structural support fireproofing in the OSS, ONSS, OCS and ONCS (if present).

17. Active Protection

17.1. **Fire Detection and Suppression**

17.1.1. For the OSS, ONSS, OCS and ONCS, comment upon the adequacy of the FDSS and its 'as found' working condition.

17.1.2. As above for the WTGs

17.2. **Fire Suppression System**

17.2.1. For the OSS, ONSS, OCS and ONCS (if present), provide basic details of the installed firewater system and comment upon its ability to meet the worst-case firewater demand. Considerations should include capacity redundancy, backup diesel for electric pumps, security of power supply to electric pumps etc.

17.2.2. As above for the WTGs

17.3. **Testing**

17.3.1. Provide basic details of testing and maintenance procedures for firewater pumps and other fire protection equipment, identify any deficiencies with the test procedures and include evidence of compliance with the stated procedures.

17.4. **Auxiliary Power**

17.4.1. Auxiliary power is used to power critical safety systems on the WTGs, including yaw, pitch and braking systems in the event of loss of grid power. Comment upon the auxiliary power feed to WTGs and what systems are covered. If multiple layers of redundancy are used (e.g. PS, followed by portable gensets, provide detail on their capacity).

17.4.2. Comment on the Uninterruptible Power Supply (UPS) in the WTGs, what systems are covered, and its capacity in days. Provide an overview of the criticality of the safety systems powered in terms of avoiding a complete WTG loss.

17.4.3. Provide details of portable diesel generators available for providing back up power to WTGs and the OSS and OCS, in the event of loss of grid connection, including how many days' worth of power can be provided.

18. Emergency Response

18.1. Organisation

18.1.1. Provide basic details of the emergency response organisation for both onshore and offshore assets.

18.1.2. Provide basic details of the emergency response training programme with data and/or KPIs on compliance with the stated training programme.

18.1.3. Provide opinion on the ability of the emergency response organisation to fight a major fire at the OSS, OCS or ONSS, ONCS (manning, training, equipment etc.)

18.1.4. Comment upon the adequacy and condition of the mobile firefighting equipment present in the WTGs, substations and at the Operations Centre.

18.2. Emergency Response Planning (Offshore)

18.2.1. Provide basic details and comment upon the adequacy and quality of the Emergency Response Plan, including what scenarios it considers.

18.2.2. Provide basic details and comment upon the adequacy and quality of the fire pre-plans for both WTGs and the OSS.

18.2.3. Provide details about the temporary refuges and escape plans for both WTGs and the OSS, including fire rating of safe areas.

18.2.4. Provide details on evacuation procedure for WTGs and the OSS/OCS including helicopter and CTV/SOV transfers.

18.2.5. Provide details about the evacuation capability such as Safety of Life at Sea (SOLAS), lifeboats, fast response evacuation vessels with firefighting capability, etc

18.2.6. Summarise how often drills are carried out and with whom.

18.3. Emergency Response Planning (Onshore)

18.3.1. Provide basic details and comment upon the adequacy and quality of the Emergency Response Plan for the ONSS, ONCS and Operations Centre, including what scenarios it considers.

18.3.2. Summarise how often drills are carried out with the local fire department.

RISK IMPROVEMENT RECOMMENDATIONS

19. Risk Improvement Recommendations

19.1. Recommendations should be directly relevant to the insurance cover being provided and of sufficient importance to risk quality improvement.

19.2. Recommendations should be prioritised according to the potential impact (in PD or BI terms) of the loss they are designed to mitigate.

19.3. Recommendations should be written in a clear and succinct manner and follow Specific, Measurable, Achievable, Relevant, Time-related (SMART) principles.

19.4. Recommendations should be presented in two parts. The first part should outline the background to the identified issue and include references to standards or established best practice. The second part should be the recommendation itself.

19.5. Where recommendations are in multiple parts, each sub-recommendation should be individually identified with a separate letter (e.g. a, b, c etc.) or number (e.g. i, ii, iii, etc.). Bulleted lists should be avoided as they cannot be easily referenced.

19.6. Provide a summary in tabular format and the current status of any previous recommendations (continual addition of status updates year on year should be avoided). Status flags should either be: In Progress; No Progress; Under Review; Completed; Superseded; Rejected; or Withdrawn. These status flags are not sufficient without additional explanation and justification.

19.7. The response of the (Re)Insured to any new recommendations should also be provided, including their view of, and intent to, address each recommendation.

APPENDIX 1 – OWF Survey Agenda Principles

A detailed survey agenda is considered essential to communicate the intent of a survey, its content, and expected outcomes. This acknowledges the significant time investment by the Re(Insured), Re (Insurer), Broker and Surveyor in the survey. Further this provides assurance that the intent of the survey, and how this is communicated in the form of a Risk Engineering Survey report will be met.

It is recognised that an agenda needs to be flexible to address the specific point in time of the facility life that a survey is being undertaken, and would be expected to have different emphasis whether a: first operational survey after commissioning; resurvey during the design operational life of the facility; survey after a large loss or incident; survey addressing specific areas of risk control concern; survey prior to and after asset life extension; or survey prior to decommissioning.

In constructing a suitable survey agenda, attention is also drawn to Section 2, and more general guidance offered in LMA OG&P GRES 2018/001, Section B.

The following provides some guidance on how to set up the agenda for the survey so that it meets the requirements listed in Section 3. It contains the principles for each day of the survey, typical timings, suggested interviewees and locations:

1. The survey agenda should be drawn up by the Lead Surveyor, and shared for comment from other survey parties, prior to issuing to the Re(Insured).

2. The survey agenda should ideally be issued to the Re(insured) 6-8 weeks in advance of the survey, together with a list of requested Pre-Survey Information (see Appendix 2).

3. The Re(Insured) should identify a survey focal point & co-ordinator.

4. A typical survey length is 3 days (ideally consecutive) and in general terms the following day structure is suggested:

    a. Day 1 should be scheduled as a full working day and is typically and preferably held at the OWF Operations Centre. After introductions and stating of aims of the survey, this day should focus on interviews and data collection to support the requirements of Section 3 of this document. It should be constructed around department and discipline specialist, and take the form of discussion, with access to documentation to support the discussion. Clarity should also be sought over arrangements for Day 2, and confirmation of who will accompany the survey party.

    b. Day 2 is the facility visit and should include the OSS/OCS and at least one WTG. What can be achieved on Day 2 is highly dependent on the mode of transport (vessel or helicopter transfer). Day 2 should focus on evidence

gathering in support of Day 1 discussions, and to ascertain an 'as presented' visual physical integrity of the asset. It is recognised that some regions and States in the USA consider the WTG hub as confined space which would require a specific Global Wind Organisation (GWO) course in confined space training as well as approval on site. Ideally at the end of the day, as is practical the surveyor will communicate to the (Re)Insured the initial key findings and recommendations from the survey.

c. Day 3 presents an opportunity to remind the (Re)Insured what documents requested prior to the visit have still not been received, and what additional documents or information are required based on what was seen on the survey. Key findings and recommendations are discussed with the insured prior to issue of the draft survey report for comment by the (Re)Inured including initial response to recommendations, and timeline for issue of a final survey report. It is recognized that it may be impractical for Day 3 to run consecutively with Day 2 and may instead need to be conducted remotely. Regardless urgency should be placed on scheduling the concluding day to ensure outcome certainty for all parties.

d. Each interim day of a survey should conclude with a short debrief with at least the survey focal point & co-ordinator.

APPENDIX 2 - Pre-Survey Information Request List

1. The following information as a minimum should be provided **before** the facility survey commences, preferably in electronic format. It is not intended to be an exhaustive list.

2. All information should be legible and reproducible:

- An overview of the document management system
- As-built drawings of as a minimum:
    - WTG topside (from platform level up)
    - WTG foundations, including all cables, cable protection systems and scour protection from exit to point of burial
    - OSS topside (from platform level up)
    - OSS foundation, including all cables, cable protection systems and scour protection from exit to point of burial
- Facility-wide Electrical Balance of Plant (EBoP) single line diagram (SLD)
- WTG Type Certificate and Turbine Suitability Report, also known as a Mechanical Loads Assessment
- Final, approved electrical inspection by the Authority Having Jurisdiction (AHJ)
- Detail on all cable, WTG, electrical balance of plant and foundation warranties, containing at least the tenure and any exclusions
- Service Agreement, containing at least a list of scheduled and unscheduled maintenance activities, tenure and limits of liability
- Asset Management Policy
- Spares list
- Latest inspection and maintenance reports
- List of residual punch list items from the Construction Phase (if applicable)
- Latest annual operations report or last three months of operational monitoring reports.
- Maintenance and Inspection Plans (above and below water) for all assets
- Sample work and inspection procedures for WTGs, OSS, ONSS EBoP, OCS and ONCS (if present), all platforms, foundations, IACs and Export Cables
- Emergency Response Plan
- Sample HSE procedures / processes
- Facility team organogram
- List of strategic spare part costs for loss scenarios
- KPIs relating to Asset Integrity and OWF performance

APPENDIX 3 – Asset Integrity Key Performance Indicators

1.1. It is recognised that the (Re)Insured may have their own Key Performance Indicators (KPIs) to capture asset integrity and general performance of the OWF. Where that is the case these should be presented in the market report in each section as appropriate.

1.2. However, the (Re)Insured's own list of KPIs should be compared with and could be supplemented by a selection of KPIs from the following list whenever the necessary information can be obtained during the survey.

Section/Subsection	Metric
Operations and Maintenance	
OWF Performance	Availability (proportion of time available to export power) (%) Note: this must be defined, e.g. Run Time Availability, System Availability, etc.
OWF Performance	MTBF for key WTG and substation components (including main bearings, gearboxes, generators, blade bearings, blade leading edge protection systems)
Planning	Proportional split of reactive (corrective) and proactive (planned) maintenance by manhours (%)
Organisation	Average operator experience (yrs)
Organisation	Annual operator turnover (%)
Training	Training completed as per plan (%)
Permit To Work	Permit audits completed as per plan (%)
Permit To Work	Permit compliance as per audits (%)
Technical & Engineering	
Management of Change (MoC)	MoC procedure compliance as per audit (%)
Root Cause Analysis (RCA)	Number of Root Cause Analyses carried out to date (#)
Root Cause Analysis (RCA)	Number of Root Cause Analyses still open after 6 months (#)
Emergency Response	
Testing	Number and proportion of overdue fire protection equipment testing (# and %)
Training	Training completed as per plan (%)
Emergency Exercises	Exercises completed as per plan (%)
Emergency Exercises	Number and proportion of overdue actions from emergency response exercises (# and %)

APPENDIX 4 – Statement of Values and Loss of Net Income Worksheet

Plant Area	Critical Loss Scenario(s)	Unmitigated Loss	Mitigations	Mitigated Loss
WTGs				
OSS				
ONSS				
Inter-Array Cables				
Export Cables				
Onshore Control Facilities				
OCS (if present and not contained on the OSS)				
ONCS (if present and not contained in the ONSS)				