GUIDELINES FOR THE DELIVERY OF AN UPSTREAM OIL AND GAS RISK ENGINEERING SURVEY PROGRAMME

ACKNOWLEDGEMENTS:

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If there are any technical queries regarding this document, please contact the LMA (katie.clark@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. The risk engineering survey process and the subsequent market reports have remained essentially the same over a number of years but lacked a consistent and formalised approach. This led to a process initiated first within Onshore Energy to refocus and modernise the approach in line with industry process safety developments and insurance loss experience. This Guideline for Upstream Energy draws heavily on the previous Onshore Energy work and development by the LMA Onshore Energy Business Panel Engineering Sub-Group.

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

- Recognition of the importance of a risk management framework
- The effectiveness of implementation and compliance with facility and industry best practice standards and procedures
- The importance of evidence-based risk engineering opinion
- An awareness of the common causes of losses in the industry
- Reporting of critical measures of process safety and loss prevention performance such as PSPIs
- Develop understanding of the ultimate loss potential for a given risk and insured coverage i.e., the EML and OEE.

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

- Section 1 - Code of Practice for Delivery of an Upstream Oil and Gas 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 – see LMA website)
- Section 2 - Guidelines for the Conduct of Upstream Oil and Gas Risk Engineering Surveys (note that this section follows the Guidelines for the Conduct of Oil, Gas and Petrochemical Risk Engineering Surveys – GPRES 2018-001 – see LMA website)
- Section 3 - Key Information Guidelines for Upstream Oil & Gas Risk Engineering Survey Reports (note that this section follows the Key Information Guidelines for Oil, Gas and Petrochemical Risk Engineering Survey Reports – IGRES 2018-001 – see website).

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

It is recommended that these guidance documents 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 process safety improvement opportunities.

ACRONYMS AND ABBREVIATIONS

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

Term	Meaning
ACV	Actual Cash Value
AFE	Authorisation for Expenditure
API	American Petroleum Institute
ATEX	Atmosphéres Explosibles
BCP	Business Continuity Plan
BOP	Blow Out Preventer
BOSIET	Basic Offshore Induction and Emergency Training
CAPEX	Capital Expenditure
CBI	Contingent Business Insurance
Cl	Chlorine
CLOPI	Contingent Loss of Production Income
CO_2	Carbon Dioxide
CUI	Corrosion Under Insulation
CUF	Corrosion Under Fireproofing
CUTS	Corrosion under Trunnion Support
CUPS	Corrosion under Pipe Supports
DHSV	Downhole Safety Valve
DWOP	Drill Well on Paper
EDG	Emergency Diesel Generator
EML	Estimated Maximum Loss
EOP	Emergency Operating Procedure
ESD	Emergency Shutdown
Ex	Electrical Classification
FHA	Fire Hazard Analysis
FMEA	Failure Modes and Effects Analysis
FPSO	Floating, Production Storage and Offloading Unit
FSO	Floating Storage and Offloading Unit
FUMA	Floating Unit Mooring Assessment
FWP	Firewater Pump
HAZOP	Hazard and Operability Study
H_2S	Hydrogen Sulphide
Hg	Mercury
HSE	Health Safety and Environmental
HSSE	Health Safety Security and Environmental
HUET	Helicopter Underwater Escape Training
IADC	International Association of Drilling Contractors
ICOW	Increased Cost of Working
ICS	Industrial Control System
IOGP	International Oil Gas Producers
IOW	Integrity Operating Window
ISO	International Standards Organisation
IWCF	International Well Control Forum
JV	Joint Ventures
KPI	Key Performance Indicators
LMA	Lloyds Market Agreement
LOPC	Loss of Primary Containment
LOPI	Loss of Production Income
MAC	Main Automation Contractor

Term	Meaning
MAH	Major Accident Hazard
MoC	Management of Change
MoOC	Management of Organisational Change
MTBF	Mean Time between Failure
NDT	Non-Destructive Testing
NPAI	Not Permanently Attended Installation
O&M	Operations and Maintenance
O_2	Oxygen
OEE	Operators Extra Expenditure
OEM	Original Equipment Manufacturer
OIM	Offshore Installation Manager
OPEX	Operating Expenditure
ORA	Operational Risk Assessment
PAI	Permanently Attended Installation
P&A	Plug and abandonment
PD	Property Damage
PHA	Process Hazard Analysis
POB	Personnel on Board
PRD	Pressure Relief Device
PSSR	Pre-Start up Safety Review
PSPI	Process Safety Performance Indicators
PTW	Permit to Work
RBI	Risk Based Inspection
RCM	Reliability Centred Maintenance
RCV	Replacement Cost Value
RESDV	Riser Emergency Shutdown Valves
RRV	Residual Reserve Value
ROEIV	Remote Operated Emergency Isolation Valve
ROW	Removal of Wreck
SCE	Safety Critical Element
SHSE	Site Health Safety Environment
SIF	Safety Instrumented function
SIL	Safety Integrity Level
SIMOP	Simultaneous operations
SIS	Safety Instrumented System
SMART	Specific Measurable Achievable Realistic Timely
SOL	Safe Operating Limit
SOLAS	Safety Of Life at Sea
SOP	Standard Operating Procedures
SSIV	Subsea Isolation Valve
SSSV	Subsurface Safety Valves
TML	Thickness Measurement Location
UPS	Uninterruptible power supply
WORA	Well Operating Risk Assessment
WSE	Written Scheme of Examination

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SECTION 1 – Code of Practice for Delivery of an Upstream Oil and Gas Risk Engineering Survey Programme

1. Purpose

The purpose of this section is to provide a basis for (Re)Insurer(s) to agree the scope of work for a risk engineering survey programme. 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 Code of Practice for Delivery of an Oil, Gas and Petrochemical Risk Engineering Survey Programme – COPRES 2018-001 – on the LMA website. This section will include comments specifically relating to upstream survey programmes, otherwise the above document should be followed.

2. Scope

This document has been developed for upstream oil & gas assets. The term upstream is intended to imply the exploration and production of oil and gas both offshore and onshore.

3. Definition and Types of Surveys

This document uses the word "facility" to describe the oil and gas producing asset. Various terms are used in industry, with "site" being the more common for onshore assets, but also including the word "plant". For the sake of consistency, "facility" is used throughout this document.

Focussed surveys have not traditionally been used to date in the upstream environment but are becoming increasingly common and relevant (see Appendix 3). Examples of such recent focussed surveys include Process Safety Culture, Inspection, Control of Work, Drilling and Asset Life Extension.

During and following the Covid-19 pandemic there has been in increase in the use of "virtual" surveys. The usefulness of these exercises are highly variable and it is preferable as is practical to have a site visit.

SECTION 2 – Guidelines for the Conduct of Upstream Oil and Gas Risk Engineering Surveys

1. Pre-Survey Preparation

Agenda preparation is a key aspect of the survey to ensure the findings are fruitful and handled efficiently. Requests for data are a key component to ensure the asset is prepared for the upcoming survey.

It is recognised that the (Re)Insured may need to modify the agenda depending on the availability of key staff members and their locations. Many of the meetings are likely to be on an onshore location or locations, depending on where the corporate office is located, which will have the added benefit of limiting time on the facility itself and hence pressure on POB numbers. The other factors that need to be considered for offshore facilities are weather and transit method to the asset in question. A suggested agenda is included in Appendix 1.

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. Consideration should be given to the inherent process hazards when developing the agenda. For example, well control is critical for active drilling facilities in hostile environments but may be less so when considering some more developed assets with limited well integrity exposures but where perhaps an increased focus on operating practices and procedures may be warranted.

Of critical importance for upstream (mostly offshore) surveys is the requirement for agreement of prerequisites, such as approved safety training (BOSIET, HUET, etc), medical certification, HSE inductions to carry out the survey. It is also important to note that the requirements can vary according to region and client facility being surveyed. Advice on prerequisites and data collection requirements should be confirmed with the client and or broker in good time before the survey.

2. Conducting the Survey

General good practice will involve a kick off meeting on day one of the survey. It is imperative that senior leadership and asset functional leads attend this meeting. The survey lead will give an overview of the program, define expectations and ensure leadership commitment to the ensuing meetings.

A set of meetings reviewing each of the facility's functions and support teams will then ensure, this is usually centred around offshore logistic arrangements and framed to fit around facility personnel availability. It is imperative that each session is managed well, efficient organisation and allowing of the facility to give a brief overview of operating philosophy followed by an opportunity to delve into the systems and test the execution standards.

A walking tour of the facilities is a critical part of the survey, the survey should focus on critical threats where timing is limited. The survey lead may wish to take photographs during the tour however, this should be balanced against time available given the often- lengthy permitting requirements for use of electrical equipment posing an ignition risk, such as a camera.

The areas of the facility visited should be detailed in the Executive Summary of the survey report, as per the requirements in Section 3.

During the closeout meeting, the core feedback to the asset team should provide an overview of the corporate strategic risk management of the organisation and give an overview of the suitability of risk management practices. As part of this, an overall evaluation of process safety culture is a useful feedback discussion point. An overview of process safety culture evaluation and ranking is available through the Energy Institute website.

Feedback to the asset team should comprise of positives and areas for improvement in line with a risk ranking process. Lower level threats should be captured under Observations. For higher level risks these should be captured as Risk Improvement Recommendations.

Observations and Recommendations should be developed and discussed and presented as consensus during the wrap-up meeting. Preference is to only provide the recommendation title and brief outline 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.

3. Report

Within an agreed short time frame a summary of the close out meeting should be presented to the lead underwriters, attending underwriters and the client. Within this report the recommendations should be structured in a fashion with sufficient detail to describe the exposure and the client's current condition / practice, with a recommended solution and expectation for remediation.

Following the survey, the full detailed report should follow on an agreed timeline basis.

SECTION 3 – Key Information Guidelines for Upstream Oil & Gas Risk Engineering Survey Reports

1. Purpose

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

2. Scope

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. Where repeat surveys are undertaken efforts should be made to 'fill-in' any gaps in risk data from previous surveys.

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 more important than the report format itself.

3. General Principles

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

Report length

There is a growing tendency for market reports to exceed 80 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 50-60 pages, excluding appendices. Tables should be used where the data can be provided more succinctly. That said, the amount of detail provided within any market report should be commensurate with the exposures and associated risks.

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:

- 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 including the process should be avoided, unless technology used is considered new or unique
- Avoiding repetition. Data should be presented only once in the report in the most specific section applicable, hyperlinks should be used if this information is considered useful to the reader of another section, e.g., linking a recommendation to the relevant section of the report. Exceptions are made for the Executive Summary
- 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 report does not become obsolete. Consider 'ever-greening' or 'future proofing' reports to aid this, i.e., referencing 'the 202X survey was informed'
- Removing generic text from the main body of the report. Examples of generic text include standardised sections which appear in every report from the same engineering

provider (e.g., the description of the loss estimating methodology). Such generic text could be provided within an appendix or even as a standalone document

4. Evidence-based opinion

The risk engineer's opinion of the quality of individual risk control elements is a critical measurement for (Re)Insurers. Opinion should be based on a review of relevant documentation, records and data and observations in the field. Opinion should be benchmarked against recognised good industry practice based on experience of other risks worldwide, with supporting evidence (e.g., references to industry standards / loss examples / engineering institute practices) to justify the opinion to the (Re)Insured and (Re)Insurers.

5. Implementation and compliance

A description of the features of each risk control element, for example the risk control procedure, is normally provided during surveys. However, commentary and evidence to support the actual implementation of an apparently sound system is often missing. Failures in implementation and non-compliance with established systems of work and procedures are a significant contributor to major losses and therefore this is an important aspect to address during the survey

6. Performance data

Wherever possible, relevant performance data in the form of Business Metrics, Process Safety Performance Indicators (PSPIs) and other Key Performance Indicators (KPIs) should be obtained as evidence to support opinion and effective implementation (as above). Where possible, it is also important to consider any trends and any exceptions to ensure the data is meaningful to the risk engineer. Cumulative risk tracking is a recent addition to the industry, usually in the form of a barrier model, where this exists this should also be included.

7. Audit and third-party technical review

The auditing, third party verification and regulatory compliance regime needs to be considered (e.g., Class for floating structures, Safety Case regime), and the extent and quality of third-party auditing conducted.

The limitations of the survey process are recognised in terms of the time available to carry out any depth of review. A key question, therefore, is what level of process safety auditing is being undertaken internally and externally to the facility, both from within the company (e.g., group process safety audit) and externally by third parties. Details of any process safety auditing or third-party technical review and in particular the key findings are of interest to (Re)Insurers. Should there be significant findings during a survey, then consideration should be given to recommendations to improve process safety auditing and/or conduct a third-party technical review.

8. Risk quality rating

In order for risk engineers and (Re)Insurers (particularly those not present on the survey) to undertake an independent analysis of any risk, it is recommended that risk quality ratings be provided as per principles of process safety (Loss Prevention and Loss Mitigation) element level.

9. Information not provided

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 market report.

10. Electronic format

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

SECTION 4 – Report Elements

The report elements required for the report are covered below:

1. Executive Summary

An abbreviated narrative of the 'Facility Operational Status', 'Loss Prevention' and 'Loss Mitigation' sections (these sections are more fully defined below).

- If deemed necessary, an overall risk quality rating can also be included.
- A list of the areas of the facility visited
- A list of the new and previous recommendations, indicating the current status
- An overview of recent and planned key changes to both hardware, people and processes since the last survey
- A summary of the declared values and loss estimates

2. Basic Facility Details

- Provide structural details of the facility, specifying connections if the facility is a multi-platform unit, including jacket and topsides (if fixed), marine elements (if floating) and subsea developments and associated risers, umbilicals, flowlines, and pipelines. PAI/NPAI status, POB limits, typical manning. Jacket and topsides weights are a useful datapoint if available
- Provide a list of major areas (e.g., accommodation module, well bay, utilities, process etc.) on the facility, the description should cover a chronology of the development of the field. Including decommissioning status where relevant
- Provide a description of the producing reservoir, including temperature and pressure conditions, hazardous fluid contaminants e.g., Hg, H_2S, CO_2, Solids production etc. and a list of all wells on the facility and current status
- Provide a simplified Block Flow Diagram indicating the interdependency between processing areas, utility systems and import/export facilities
- Provide a simplified Block Flow Diagram indicating the interdependency with adjacent facilities
- Include a field schematic. Detailing local third parties facilities and pipelines
- Provide basic details of the electrical power supply systems including the current demand versus supply balance, redundancy and reliability. Provide basic details of any emergency power supply systems. Provide details of any other utilities of relevance to the risk and coverage sought e.g., water injection systems which are of relevance to reservoir souring and material selection and/or LOPI considerations, gas import which might be key to continued operation, any third-party utilities connections, etc.
- Provide a brief overview of the import, storage (if relevant) and export facilities, in particular details of any marine bulk liquid transferring are considered important.
- Provide a legible facility plan and opinion on the layout, spacing and congestion, (if relevant)
- Provide basic details of any recently completed or planned major capital projects (include schedule, cost etc.)

3. Operational Status & Reliability

- Provide an overview of production data for at the last 12 months or since the last survey. Include planned and unplanned losses, capacity utilisation, reliability, planned

and unplanned losses). Comment upon any significant restrictions to capacity utilisation and/or availability.

- For each unplanned shutdown, provide brief details of the direct and root causes along with the remedial actions to prevent reoccurrence. Particular reference should be made to facility investigation, and learnings.
- For any new plant and equipment, provide details of the current status including status of HAZOP actions, any significant problems experienced during testing and commissioning, punch list items. Performance testing should be considered.

4. Exposures

- Identify and comment upon any non-natural peril loss exposures aside from mundane scenarios such as cellulous fire, dropped object etc. This should include specific facility propensity to, or exclusion from, the specific hazards. The following examples are given:
  - Vapour Cloud Explosion, e.g., facility might process LPG streams which provide elevated explosion risk
  - Jet fire, e.g. (re)insurers might be interested that there are only very low gas pressures found on the facility or if there is a connection to a high-pressure large diameter gas pipeline
  - Control of well event, e.g., if all wells are sub-hydrostatic and rely on artificial lift the reduced risk would be of interest to (re)insurers
  - Hydrocarbon spill fire potential
  - Large methanol inventories
  - Toxic release
  - Loss of heading control / buoyancy leading to marine stability event
  - Presence of shallow gas
  - Presence of very high pressures leading to elevated overpressure failure consequences.
  - Any other high risk loss scenario
- Identify and comment upon any technology risks such as novel or unproven processes and pioneering design (e.g., unproven design capacity)
- Identify any relevant third-party operations, in particular marine traffic, any unusual helicopter, shipping or fishing vessel exposures, and comment upon the proximity and possibility of property damage accumulation
- Identify and comment upon any potential cross exposure associated with capital project works (e.g., SIMOPS)
- Identify the key natural peril and met ocean exposures along with the adequacy of associated controls, both physical (e.g., design standards, structural protection etc.) and procedural (e.g., hurricane preparedness procedures).
- Identify exposures from fluid contaminants e.g., H_2S, Hg etc., especially those likely to change over the life of the field.

5. Values

State the basis for the declared values (historical book value, ACV, RCV, RRV etc. to allow the adequacy of the declared values to be assessed. Refer to Upstream Property Values & Value Maintenance Guideline (JR2019-003) accessed via the following link -

JNRC Technical Documents

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.

Provide a breakdown of values with separate values for production, processing, utilities, storage areas, wells, subsea, umbilicals, risers, flowlines and pipelines (where applicable/available).

LOPI (Where Covered)

State the type of applicable policy cover – using specific clause and wording reference.

State the basis for the declared values (production schedule and years, insured unit volume, insured unit price, daily value etc.).

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

OEE (Where Covered)

State the basis for the cover and inclusions (Control of Well, Seepage and Pollution, Extended Redrilling, Removal of Debris etc.).

State the combined single limit for any one occurrence.

6. 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.

Property Damage

Consider the possible EML as a loss of the whole facility including third party facilities where applicable. Include listing of any damage assumptions to separately declared assets physically attached to the facility suffering a total loss, e.g., bridges, risers, umbilicals, interconnectors etc.

Provide details of any escalation factors added to the calculated explosion damage (e.g., inflation during policy and/or rebuild period, firefighting, debris removal etc.).

State the basis for the values used (e.g., if declared values or engineering estimates).

For facilities with interconnecting assets, consideration should be given to separation, and details of linkages for example bridges/ pipelines, utilities.

Include relevant allowances for Removal Of Wreck (ROW) and Sue and Labour (S&L) where appropriate.

LOPI (Where Covered)

Provide a qualitative (and wherever possible quantitative) assessment of the potential for LOPI in the following areas of the facility:

- Import, e.g., if a gathering platform from multiple subsea or other surface facilities)
- Well production, e.g., impact of losses of well/s in foreseeable incidents.
- Process, e.g., incident causing unavailability of process equipment.
- Utilities, e.g., loss of utilities.
- Key Machinery, e.g., loss of key machine/machinery in foreseeable incidents.
- Storage (where relevant), e.g., loss of Floating Storage or Offloading facility.
- Export. e.g., critical pipelines and gathering systems.

Consideration should be given to property damage events of a lower severity than the PD EML (but where LOPI consequences could still be significant).

In each area identify business critical elements and consider installed redundancy, flexibility of operation and potential mitigation. Include commentary upon the likely availability and practicality of any mitigation in the event of a loss (consider use of a LOPI scenario worksheet similar to that in Appendix 9).Where applicable, identify other facilities insured on the same policy which could make-up any shortfall in production or take-up any excess in the event of a loss along with a qualitative assessment of the implications.

Develop and quantify the LOPI EML stating any assumptions made (the LOPI EML scenario may or may not be the same as the PD EML, but the largest combined EML should be presented). The LOPI EML should include the impact of any interdependencies and take into account how the insurance policy would actually respond.

Quantified LOPI loss estimates should be based upon the reservoir production projections. Dependency on reservoir production enhancements such as water injection, gas injection, gas lift and steam assisted production should also be considered.

CBI

Consideration should be given to property damage which affects the transfer of third-party fluids. Include commentary on contract Identify any critical process interdependencies with other facilities insured on the same policy. Comment upon the consequences and potential mitigation in the event of a loss at the producing or receiving locations.

Provide details of any facility level BCP covering critical property damage scenarios.

Group (or Corporate) LOPI

The calculation of LOPI EMLs for multi-location accounts requires careful analysis. The LOPI declared values may often not reflect the actual exposure at each location. Rather the figures may be expressed in a more arbitrary way or perhaps reflecting the (Re)Insured's internal accounting practices (internal allocation of revenue/profit). It may therefore be necessary to obtain LOPI interdependency information for multi-location accounts both for the insured locations and any critical 3rd party suppliers and customers (see Appendix 9).

Individual facilities often do not have this account information and therefore LOPI EML calculations conducted and included in survey reports for individual facilities may not reflect the true account exposure.

Where (Re)Insurers agree that further LOPI information is required, the (Re)Insured should be requested to provide the required information based on a corporate level analysis. This may be beyond the scope of a standard single facility survey and may necessitate specific meetings with the (Re)Insured's corporate functions to obtain the required information.

CLOPI

Identify critical third-party suppliers along with any potential mitigation in the event of a loss at a supplier. Consider the likely availability and practicality of any mitigation and quantify the consequences of loss of supply. Note that critical third-party suppliers would not only include key feedstocks, but any other process streams critical to production (e.g., third party supplied

process gas). This could include third party production, gathering systems or pipelines supplying raw materials to the facility in question.

Identify critical third-party customers along with any potential mitigation in the event of a loss at the customer. Consider the likely availability and practicality of any mitigation and quantify the consequences of loss of a customer. This could include downstream FSOs, FPSOs or onshore gathering and/or production facilities.

7. Operator Extra Expense (OEE) (Where Covered)

Comment on well control philosophy. Provide details of the number of relief wells speculated (usually one or two). A good rule of thumb is to take a recent typical well AFE and multiply by three for well control which escalates to relief well drilling. It should also be considered if (in the case that only a single relief well is hydraulically required for well kill) it is likely that the operator will attempt to simultaneously drill two relief wells to minimise duration of well control event; this approach has occurred many times with operators in recent years.

Provide details of the number of wells that would require to be killed based on the compromise of platform based well/s caused by a facility collapse scenario, if applicable. If this number is limited by factors such as free flowing characteristics, artificial lift systems, duration for self-kill, etc. these should be stated.

Provide details of the number that would require plug and abandonment (P&A), this may also include relief well/s drilled.

Provide details of removal of debris for well access arrangements and requirements.

Provide details of redrilling, recompletion and restoration costs and assumptions (repair / replacement of damaged well conductors, directional drilling complications, number of wells in scope, costs per well etc.)

Provide details of seepage and pollution costs (total volume of oil spilt, oil spill removal effectiveness, clean up costing estimates, environmental damage estimates).

I. Loss Prevention

8. Leadership Responsibility and Commitment

Provide a copy of the facility's management level organisation chart indicating the main functional departments and reporting lines. Comment upon the independence of critical functions such as Inspection, Occupational Safety, Process Safety, Audit and the use of Technical Authorities within the organisation.

Provide an overview and opinion of the corporate mind of the organisation. Reference to the robustness of a single vision within long term, medium term and short-term planning and the action orientation to the corporate risk matrix. See Appendix 2.

Provide an overview of the MoOC Philosophy.

Identify any management level vacancies and comment upon the turnover of the management team members.

Provide details of any recent or planned changes of ownership, reorganisation, downsizing or outsourcing initiatives. Where relevant, provide details of the associated risk assessment and the effect the change will have on the organisation and risk profile.

Where the facility is under an O&M contract, provide details on the contractor and their organisation chart, in particular the critical functions identified above.

Provide a copy of the facility's asset risk register, indicating the asset current threats and exposures. Where possible an integrated strategic plan should be included, commentary to include improvement plans and associated high level schedule.

Provide details of the turnaround plan (schedule, frequency etc.), any interim planned shutdowns, any major critical item overhauls (catalyst change etc.) and the procedure for deferral of turnarounds.

Provide details of the performance of the most recent turnaround including items such as personal and process safety, cost and schedule versus plan, key maintenance and inspection findings, achievement of the work list and any deferrals etc.

9. HSE / Security

Provide basic details of the HSE organisation and facility HSE committees and security personnel.

Provide details of any dedicated HSSE committees including the committee make-up, involvement of senior management, scope of activity and frequency of meetings.

Provide details of hazard awareness campaigns, facility observational programs.

Provide details of HSSE KPIs and action trackers.

Provide details of security within the offices, warehouses, heliports and the facility locations.

10. Process Safety Framework

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

Provide details of any dedicated process safety resources at both corporate (if applicable) and facility level.

Provide details of any dedicated process safety committees including the committee make-up, involvement of senior management, scope of activity and frequency of meetings.

Provide details of process safety training.

Provide an overall viewpoint on process safety culture, where possible to include strategic culture improvement programs and associated timescales.

Include details of action tracking of findings resulting from leadership programs, improvement plans, incident investigations and incidents.

PSPIs

Provide the facility's suite of PSPIs including current and historic data. Comment on number of lead and lag indicators, annual reviews, action tracking. Comment on PSPI periodic reviews, any trends and corrective actions (see Appendix 5).

Process Safety Incidents

Provide monthly process safety incident data for the last 12 months or since the last survey. Process safety incident data should be reported as it is defined by the (Re)Insured and including a severity categorisation. Ensure this includes any well or drilling incidents.

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

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.

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

Process Safety Auditing

Describe the main elements of the process safety audit programme (both internal and external) including the involvement of senior management. Consider the auditing of operating philosophies, process, people and hardware.

Provide data and/or KPIs to support compliance with the audit programme and tracking of the follow-up actions resulting from the audits. Provide a summary of the key recommendations resulting from the most recent audits and comment on the adequacy and commitment to the programme based on evidence observed during the survey.

11. Third Party Verification

Describe Class and Flag designation where appropriate.

Provide data on any third-party auditing or independent verification programmes. Details on ISO certifications are typically not thought relevant to the risk.

Describe any regulatory auditing oversight.

Provide details on any JV ownership auditing programmes.

12. Inspection

Organisation

Provide a basic and brief outline of the Inspection organization including reporting lines with regards to independence from production concerns, employee numbers, use of contractors vacancies and turnover of personnel with trends. Include data where possible. This should include location of the inspection workforce (field vs office based), contractors and their organisation, including how they are managed on the facility, and third-party verification bodies used, including their level of oversight.

Describe the qualifications and experience of the Inspection personnel.

Describe the training and competence requirements for Inspection personnel both staff and contract.

Inspection Philosophy

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

Describe the philosophy for pipelines and subsea equipment including but not limited to: umbilicals, risers, mooring systems, structures, piping, pressure vessels and any hazardous utilities.

Describe any reliance on chemical corrosion control including fixed corrosion monitoring (e.g., coupons, probes, etc.), if applicable.

Describe how damage mechanisms have been identified and documented (Corrosion Control Documents, Damage Mechanism Reviews or equivalent).

Provide details of how the type and frequency of inspection is established and documented on an equipment specific basis (e.g., WSE) and how this links to the identified damage mechanisms.

If RBI is implemented (or being implemented), provide details of the software system used, specialists involved, and the data used to justify the RBI study output.

Provide basic details of the systems and processes used to plan inspection work and specifically provide data and/or KPIs on any overdue inspections. Where applicable, state the reasons why inspections have become overdue.

State how end of life criteria have been defined, including arbitrary retirement thickness (or an equivalent minimum thickness definition).

Provide details of how inspection recommendations are issued, prioritized and tracked through to completion and support this with evidence of implementation.

Provide details of the procedure for the installation, interim inspection and removal of temporary repairs. State how many temporary repairs are in place in hydrocarbon service, for how long and when they are due to be removed.

Provide details of the procedure followed should PRDs fail on test and support with data and/or KPIs.

State whether or not IOWs have been defined and, if so, how these are monitored.

Provide Details of Inspection Audit programmes.

Equipment Specific Programmes

Describe the inspection programme for the following:

- Piping systems
- Temporary repairs
- Pressurized vessels
- Pipelines including riser areas
- Flexible risers, if applicable
- Flexible piping in permanent, hydrocarbon service, if applicable
- Mooring components
- PRDs
- Flame arrestors
- Storage tanks, if applicable

Describe the inspection programme for the following specific damage mechanisms (these are often conducted on a separate ‘campaign’ basis):

- CUI
- CUF
- CUPS
- CUTS

Describe how areas subject to enhanced damage are managed (e.g., dead legs and other no/low flow areas, injection points, small-bore piping due to vibration induced fatigue etc.)

Data should be presented succinctly, avoiding wordy paragraphs, see Appendix 7 for further details.

Material Verification

Provide a brief overview of the main materials of construction including any alloy material installed for corrosion resistance and any recently completed or planned material upgrades, including the rationale for those upgrades.

Provide details of the material verification programme for the receipt, warehousing and installation of alloy materials (ensure consideration given to both maintenance and project activities).

Provide details of any retrospective material verification programme for existing alloys installed within the facility.

Records & Analysis

Describe and comment on the quality of the inspection reports, making particular reference to the identification and coverage of TMLs on isometric and/or mechanical drawings (including ordinarily inaccessible locations), the capturing of NDT data and corrective recommendations.

Describe and comment on the effectiveness of the inspection data management system, making particular reference to data population, corrosion rate and remnant life calculations.

Performance Monitoring & Audits

Describe what inspection performance metrics and information is monitored and routinely reported within the organisation. Provide and comment on the data including any targets and trends. Include Overdue, End of Life assessments.

Describe what internal and external audits of the inspection function have been undertaken and summarise the most significant findings.

Deferment Management

Provide details of the procedure used to defer any planned inspection work and make particular reference to risk assessment and management approval. Include data and/or KPIs where possible.

Equipment Deficiency Management

Provide details of any process equipment or piping which is operating beyond end-of-life criteria, is under a special inspection regime and/or has undergone a ‘fitness for service’ assessment.

Operational Changes and Deviations

Provide details of the mechanisms in place to ensure that any process or operational changes that may affect mechanical integrity, for example changes in feedstock, are communicated to the inspection department.

Performance Monitoring & Audits

Describe what inspection performance metrics and information is monitored and routinely reported within the organisation. Provide and comment on the data including any targets and trends. Include Overdue, End of Life assessments.

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

13. Technical & Engineering

Safety Case

Describe the Safety Case regime in place, whether it is voluntary or mandated by the regulator, audit regime (e.g., 'thorough review' process in the UK, verification body review, etc.) and current status.

PHA

Describe the key features of the PHA procedure applied to existing plant including methodology, scope, team make-up etc. Comment and provide opinion on the adequacy of the procedure.

Provide particular commentary on how all operating modes (e.g., start-up) are reviewed and if and how Safety Critical tasks are identified and reviewed.

Provide details of the revalidation frequency, type of revalidation and the current status of PHA reviews including data and/or KPIs where applicable.

Comment and provide opinion on the implementation of the procedure and quality of the PHA reviews. Provide details of any quality assurance and audit activities.

Provide details of how PHA recommendations are prioritised, tracked through to completion and validated as closed. Provide data and/or KPIs indicating the current status of PHA recommendations.

SIL Assessment

State the scope of the last SIL assessment, when it was completed and the status of any necessary follow-up recommendations (testing and/or plant modifications).

If there is no SIL assessment in place, provide details of the alternate process to assure the integrity of safety critical instrumentation.

Alarm Management & SOLs

Provide basic details of the alarm management programme along with any associated data and/or KPIs.

Provide basic details of the SOL programme along with any associated data and/or KPIs.

Management of Major Projects

Describe the key features of major project management including definition of major, related contractors, project assurance activities.

Provide an overview of recent projects and project performance metrics.

Management of Technical Change

Describe the key features of the MoC procedure including definition and types of change (including feedstock changes, change in well fluid composition, temporary changes, emergency changes, deferral management for both inspection and maintenance activities etc).

Describe the key features of the PSSR procedure and comment upon the quality of the procedure and its implementation.

Comment and provide opinion on the implementation of the procedure and quality of the MoC reviews with particular reference to the hazard identification and risk assessment stage.

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.

Provide details on how MOC is used in the well delivery process, documented in a written procedure and signed off by responsible person when applied.

Describe how deviations from normal operating processes are managed, be it related to performance standards, manning requirements or procedures. How is the ORA used to manage these changes?

Comment on learning from process safety incidents at other facilities (within the (Re)Insured group as well as the wider industry).

Safety Critical Instrumentation Override Management

Describe the main elements of the safety critical instrumentation override procedure and highlight any deficiencies versus industry good practice.

Provide evidence of compliance with the override procedure. Discuss any identified current unavailability of Safety Critical instrumentation.

Deferment Management, provide details of the procedure used to defer any planned maintenance or inspection work and make particular reference to risk assessment and management approval. Include data and/or KPIs where possible.

14. Process and Equipment Safeguarding

Basic Process Control, Emergency Shutdown & Isolation

Provide basic details of the Basic Process Control System and any ESD systems including the location and design of control rooms and temporary refuges.

Provide basic details of the approach to ICS cyber security. 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, further guidance on cyber security reviews can be found in the LMA's Cyber Security & Safety Considerations for Oil, Gas & Petrochemical Risk Assessment (LMA OG&P CSSC 2017/001).

Provide basic details of the pressure relief and flare systems (and detail particular any systems venting directly relieving to atmosphere).

Provide details of remote isolation, depressurisation and blowdown systems and in particular the provision and specification of ROEIVs including particular focus on RESDVs and SSIVs.

Provide details of the protection to wells and risers, including DHSV on wells (include mention of surface or subsurface control), and the remote isolation, depressurisation and blowdown systems installed to protect the risers (both surface and sub-surface).

Equipment Safeguarding

Provide basic details of the equipment safeguarding features in the following areas:

- Critical machinery and high hazard pumps and compressors
- Power generators and engines
- Storage tanks (in particular overfill protection), if relevant
- Import and export facilities
- Position Control Systems

Provide basic details of the ballast control, heading control and tank gauging system (where relevant) in the following areas:

- Control system and level of redundancy
- UPS or other backup power
- Audio/visual alarm systems
- Maintenance and calibration

Provide basic details of the dynamic positioning system, if applicable.

Provide basic details of the engines/seawater pumps/other marine equipment including location and whether subject to the same PHA processes as process equipment.

Provide basic details on the gas and water detection of buoyancy relevant structural parts.

Provide details on any protective systems between seawater pumps and the ocean in case of a leak within the pontoon/ballast tanks and any watertight doors between ballast compartments, including controls on these.

Provide details of the mooring system tensioning controls.

15. Operations

Organisation

Provide a basic and brief outline of the Operations organisation including employee numbers, vacancies and turnover of personnel with trends. Include data where possible. Typical operations presence including field and control room operators' numbers. Discuss how any NPAI are managed regards operations.

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

State the criteria for the definition of minimum operator manning levels, including the minimum required and actual manning levels. Discuss systems / practices for managing operator fatigue, including ability of manning levels to cover vacation, absence from work and training.

Comment on the use of additional manning and technical support for start-up.

Shift Handover

Describe the main elements of the shift handover procedure, both between day and night shift and also crew changeover handover. Provide details on any specific extra requirements for personnel returning from extended absences. Comment and provide opinion upon the adequacy of the procedure and provide evidence of its implementation.

Training & Competence Assurance

Describe the main elements of the training and certification process for all front-line operations personnel, both new and refresher training.

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

SOP & EOPs

Comment and provide opinion upon the quality of the SOPs.

Comment and provide opinion upon the quality, availability and usability of the EOPs.

Comment upon the use of signed and itemised checklists for critical operations (such as start-up).

Comment upon the adequacy of the routine review process for SOPs and EOPs and provide data and/or KPIs on compliance with the process.

Provide details of any SOP/EOP improvement initiatives such as Human Factor reviews, Procedural HAZOP, Safety Critical Task Analysis or similar.

Describe the main elements of the critical SOP and EOP refresher training programmes and provide data and/or KPIs on compliance with the programme. In particular, details should be provided of any EOP scenario drills (for instance response to specific utility failures).

PTW

Describe the main elements of the PTW system and highlight any deficiencies versus industry good practice. Control of ignition potential resulting from 'hot work' is of particular interest to (Re)Insurers.

Provide evidence of compliance with the PTW system, include references to safe isolation and reinstatement of plant practices.

Comment upon housekeeping, including, storage of flammable materials, caps and blanks on open ends, flange management practices and junction boxes etc. and sanction to test

Describe the main elements of the PTW audit process and provide data and/or KPIs for PTW compliance.

Equipment Isolation and Reinstatement of Plant

Describe the main elements of the energy isolation procedures (mechanical and electrical) and highlight any deficiencies versus industry good practice. Consideration should be given to control of locks (or seals), lock integrity and lock management, including critical valves normally controlled in the field (e.g., Lock Open / Lock Closed). Training programs should be considered. Describe the process of reinstatement of plant post intrusive maintenance. Where possible provide details of joint management and PSSR.

Provide evidence of compliance with the isolation procedures.

Provide evidence of isolation audit findings.

Marine Operations

Describe collision avoidance systems – exclusion zones control process, met ocean data gathering, monitoring and alarm systems (wave and wind conditions).

Describe any marine operations manual managing vessel proximity, safety zones, permission to enter.

Describe marine cargo transfer (for floating installations) arrangements.

Crane Operations

Describe lifting equipment and certification process including capacity and condition.

Describe any lifting controls (incl. permitted and prohibited areas, requirements during times of poor visibility.

16. Maintenance

Organisation

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

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

Describe the extent of the use of contractor workforce and contractor management and performance management. Discuss major 3rd party support arrangements, e.g., MAC or OEM support available.

Maintenance Philosophy

Provide basic details of the basis for the maintenance programme as per the tables in Appendix 6.

Provide basic details of any equipment criticality assessment and how this relates to the programme definition, work prioritisation and spares holding.

Advise if SCE (or equivalent terminology) has been defined and if so the scope and implications of such a classification.

Provide details on the guidance of certification for completion and handover to operations.

Provide details of the bolted joint procedure for routine and turnaround maintenance.

Planning, Prioritisation & Performance

Provide basic details of the systems and processes used to plan and prioritise maintenance work.

Describe the procedure for deferral of maintenance work on SCE (or equivalent terminology).

Deferment Management, provide details of the procedure used to defer any planned maintenance work and make particular reference to risk assessment and management approval. Include data and/or KPIs where possible.

Comment on the facility's suite of maintenance KPIs (include actual data, trends and details of any corrective actions). Comment on the PSPIs selected from the maintenance KPIs. Core KPIs typically include number of safety critical element overdue tests, number of impairments to safety critical systems.

Reliability

Describe the philosophy utilised for reliability improvement (e.g., bad actor programmes, RCM and FMEA).

Provide details of any significant equipment mechanical failures since the last survey and the processes used to investigate such failures.

Provide data and/or KPIs associated with plant and equipment reliability (e.g., plant mechanical availability, MTBF).

Rotating Equipment Maintenance Programmes

Provide basic details of the rotating equipment preventive and predictive maintenance programmes, including presence of any dedicated Condition Monitoring systems, for the different types of rotating equipment (type and frequency of activity etc.) and comment upon the quality of the programmes and output results.

Provide a tabulated list of all critical rotating machinery including basic design details, replacement cost, impact on production in the event of failure, spares holding and estimated time to repair/replace.

Provide details of the maintenance and testing programmes for critical rotating machinery protective systems (overspeed trips, non-return valves etc.)

Compliance with Vendor Technical advisory notifications, review status with respect to historical advises.

Electrical Equipment Maintenance Programmes

Provide details of the electrical equipment preventive and predictive maintenance programmes for the different types of electrical equipment (type and frequency of activity etc.) and comment upon the quality of the programmes and output results.

Where LOPI is covered, list any critical transformers including basic design details, impact on production in the event of failure, spares holding and estimated time to repair/replace.

Provide details of the maintenance and testing programmes for electrical protective systems (protective relays, circuit breakers etc.).

Provide details of the maintenance and testing programmes for emergency power supply systems (Emergency Diesel Generators (EDGs), Uninterruptible Power Supply (UPS) etc.).

Provide details of checks of field location electrical equipment intended to verify presence of design ignition control measures (e.g., ATEX/Ex/'explosion proof' equipment).

Testing of Safety Critical Instrumentation

Provide details of the programme for testing of safety critical instrumentation (Safety Instrumented System components including sensor and final element - especially RESDVs, Emergency Shutdown Systems, etc.) including the basis, frequency and type of testing.

Testing of temporary refuge protections including overpressure protections, emergency dampers, door closing mechanisms.

Provide details of the test procedures and the reporting and investigation process followed should safety critical instrumentation fail on test.

Provide data and/or KPIs associated with the testing.

Deferment Management

Provide details of the procedure used to defer any planned maintenance work and make particular reference to risk assessment and management approval. Include data and/or KPIs where possible.

Performance Monitoring & Audits

Describe what maintenance performance metrics and information is monitored and routinely reported within the organisation. Provide and comment on the data including any targets and trends. Include Overdue, End of Life assessments.

Describe what internal and external audits of the maintenance function have been undertaken and summarise the most significant findings.

17. Drilling / Well Servicing

Provide details of the well control policy to determine if there is a strong bias towards early shut in, then interpretation, with management practice of reinforcing/praising early shut-in and drillers are expected to act and encouraged to do so.

Provide details on the technical well review process, and whether it follows JNRC guidelines.

Provide details on adequacy of well control manuals.

Provide details on adequacy of emergency response plans.

Provide details of drills as follows:

- Any unannounced drills to test crew reaction time
- Well control drills undertaken and documented.

Personnel competency and training

Provide details on:

- Staffing and adequacy of Drilling and Wells department
- Qualifications, staffing levels and adequacy of drilling crews
- Comment on the role of the drilling representative where present.

Provide details of the training as follows:

- Manual BOP operation (should power fail) for the crews
- Drilling personnel trained to IWCF/IADC standards and certified for Well control (at least to supervisor level)
- Contractor's training & competency management through training matrices in place, including competency assurance
- Whether training is scenario-based training (preparing crew for information/decisions faced) rather than routine task-oriented training
- Any DWOP exercises to identify unfamiliar elements in well program, thereby exploring offshore crew competence.

Provide details of the KPIs to determine if:

- They are diverse, with a focus on safety KPIs and drilling progress/efficiency
- Potential conflicts of interests in KPIs are addressed and managed (uptime vs. safety) – no penalties related to underperformance/downtime rate
- Well control KPIs are reported regularly to senior management.

Interface Management

Provide details on the bridging documents with the drilling contractors as follows:

- Check potential conflicts and resolution receive close attention at contract stage and are addressed in the bridging documents/implementation
- Adequate, comprehensive and audited bridging documents, with specific focus on differences in SMS and/or well control philosophy
- 3rd party contractors included in bridging document.

- Training has been addressed.
- Bridging document is readily available (preferably in hard copy), fully controlled and up to date.
- Use of any remote shutdown systems / telemetry between platform and rig, if appropriate.

18. Well Integrity

Number, training and experience of personnel assigned to managing well integrity.

Provide details on the well integrity management system in place as follows:

- Covers all stages of a well life cycle from design to P&A, for all well types.
- Includes process safety requirements, e.g., barrier management including use of any barrier management diagrams.
- Defines monitoring, maintenance and integrity evaluation program/frequencies.
- Includes corrosion monitoring tasks with focus on leading indicators, (e.g., corrosion monitoring, water quality (O2, residual chlorine)), fluid contaminants e.g., H2S, CO2, erosion (sand) and corrosion mechanisms are understood
- Includes document management framework (well handover, data management for inspection, maintenance data)
- Establishes operating windows/safe operating envelope for each well (max. operating pressure) (injection, withdrawal, treatment, stimulation)
- Identifies the status of each well element including cement condition and depths, safety valves casing and tubing and failure modes
- Results of previous inspections and recommendations, including tracking of same to completion
- Sustained casing pressures managed
- Provide details on SCEs of wells, in particular SSSVs installed, and details of the SIL/SIF assigned and related testing regime. Discussion on any replacement of surface controlled SSSVs with sub-surface-controlled variants
- Provide details on adequacy of the well inspection programme (e.g., calliper, corrosion, cement bond) including any backlog
- Provide details on monitoring of annulus pressures and the review process for any trends observed. Provide details on any "problem wells" and mitigation plans for these
- Provide details of Well deviations and use of WORA to track and record.

II. Loss Mitigation

19. Passive Fire Protection

Describe passive fire protection philosophy adopted, e.g., to minimise damage following fire, to facilitate safe evacuation or a minimal ‘burn down’ approach seen with NPAIs.

Provide a description and opinion of the extent and condition of structural fire proofing, Temporary refuge fireproofing, fire and/or blast walls, riser fireproofing, RESDV fireproofing, process vessels / supports fireproofing, cables, radiant heat production on bridge linked platforms, bridge length as a fire protection element, critical equipment fireproofing (e.g., FWP enclosures). Cite specific fireproof ratings, e.g. A-60, J-30, if available. Where possible tabulate data and avoid unnecessary paragraphs, see Appendix 8 as a reference.

20. Active Protection

Fire & Gas Detection

Comment upon the adequacy of the coverage and 'as found' working condition of fire, gas and smoke detection systems and their associated alarms.

Firewater System

Identify the worst-case firewater demand scenario and associated flow rate requirements.

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.

Comment upon the design and availability of the firewater system in terms of its ability to rapidly respond to an incident. Considerations should include the pump start mechanism, firewater main pressurisation, any significant impairments, integrity of the firewater main etc.

Fixed Protection

Comment upon the provision of fixed protection to production, process, storage (if applicable), utility and accommodation/control room areas. In particular for the process areas, state coverage provided for pressure vessels, high hazard pumps and business critical machinery including the associated lube oil skids, and differentiate between fixed, monitor and hydrant coverage.

Fire Protection Improvement

Provide details of any structured programmes, such as FHA, to identify gaps in the provision of fire protection features. State the methodology utilised and the output.

Testing

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

Impairment Management

Verify that a fire protection system impairment procedure is in place and provide evidence of compliance with the stated procedure.

21. Emergency Response

Organisation

Provide basic details of the emergency response organisation (facility, onshore support and contract assistance (e.g., specialist spill response)).

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

Provide opinion on the ability of the emergency response organisation to manage an emergency, including isolation, depressurisation of inventories and an orderly evacuation (manning, training, equipment etc.).

Mobile Firefighting Equipment

Comment on availability of firefighting assistance from field support vessels, including whether they permanently attend or if a transit time would be anticipated and any vessel rating requirements. If a single or small group of vessels is utilised, consider naming the vessels as vessel datasheets are typically publicly available.

Emergency Response Philosophy

Provide basic details and comment upon the adequacy and quality of the Emergency Response Plans.

Pre-arranged contracts with well control/capping service companies/mutuals to enable fast additional well control capabilities.

Provide details about the temporary refuges.

Provide details about the evacuation capability such as SOLAS, lifeboats, fast response evacuation vessels with firefighting capability, etc.

Provide details about the oil spill response capability, including arrangements with third parties.

Emergency Response Exercises

Provide basic details and comment upon the adequacy and quality of the emergency response exercises including follow-up reports and recommendations.

Provide data and/or KPIs on compliance with the stated exercise schedule.

Provide details of the process for handling recommendations with data and/or KPIs on recommendation tracking.

Emergency Response Audit

Provide details of any third-party audits of the emergency response capability.

III. Risk Improvement Recommendations

- Recommendations should be directly relevant to the insurance cover being provided and of sufficient importance to risk quality improvement.
- Recommendations should be written in a clear and succinct manner and follow SMART principles. Consideration should be given when drafting recommendations to ability of future surveys to close recommendation. Guidance to future surveys regards this matter should be considered, if appropriate.
- 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.
- 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.
- Provide a summary 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. With the exception of current survey status updates no changes to past recommendations should be made, they should be kept verbatim.

- The response of the (Re)Insured to any new recommendations should also be provided, including their view of, and intent to, address each recommendation with associated timescale and budget.
- To minimise report length the detailed text of recommendations closed in previous surveys can be excluded with the exception of any 'rejected' recommendations. Data on past recommendation titles should be maintained for posterity.

APPENDIX 1 – Typical Standard Facility Survey Agenda

1. The following Agenda has been produced as an example of the areas to be covered and the time to be allocated to those areas on a first survey of a facility. Subsequent surveys of the same facility might be more focussed on areas of interest. The agenda is for a typical three-day survey, but this is not intended to be prescriptive of the length of a survey, logistical arrangements required for offshore surveys often entails to last up to five days or more. The final agenda for any survey should be agreed by the survey team in discussion with the (Re)Insured.

2. For offshore assets the most common configuration of visit is a single overnight stay, this is mostly driven by offshore working schedules, required content of the survey and helicopter schedules. Offshore logistics, especially for NPAI facilities, may drive a day visit which typically results in a short period spent offshore. In these circumstances the Control Room and Facilities Tour portion of the survey should be prioritised over all else. For complex facilities (e.g., 'super-complexes') or where logistics dictate longer visits may be required.

3. For detailed content relating to each Agenda item, please see the relevant section of Section 3. These are suggestions only as it is recognised that information is often gleaned throughout the survey and not necessarily dedicated to a specific session.

Session (onshore day)	Format	Duration
Kick-off Meeting/Facility Overview • Review of agenda • Facility overview presentation • Organisation overview • MoOC overview • Corporate audit program and recent findings • Status of existing recommendations • Overview of recent changes • Major changes since last survey • Long term plan • Overview of high level KPIs and trends	Presentation by facility management team followed by Q&A Location: Meeting Room	1hr
HSE /Security • HSE KPIs • Safety observational program • Hazard awareness campaigns • Security Arrangements • Overview of KPIs	Q&A and review of sample documentation/data	30 mins
Process Safety • Process safety framework • PSPIs • Process safety incidents • Process safety auditing • PSPIs Action tracker • PS improvement plans	Q&A and review of sample documentation/data Location: Process Safety Department	1hr

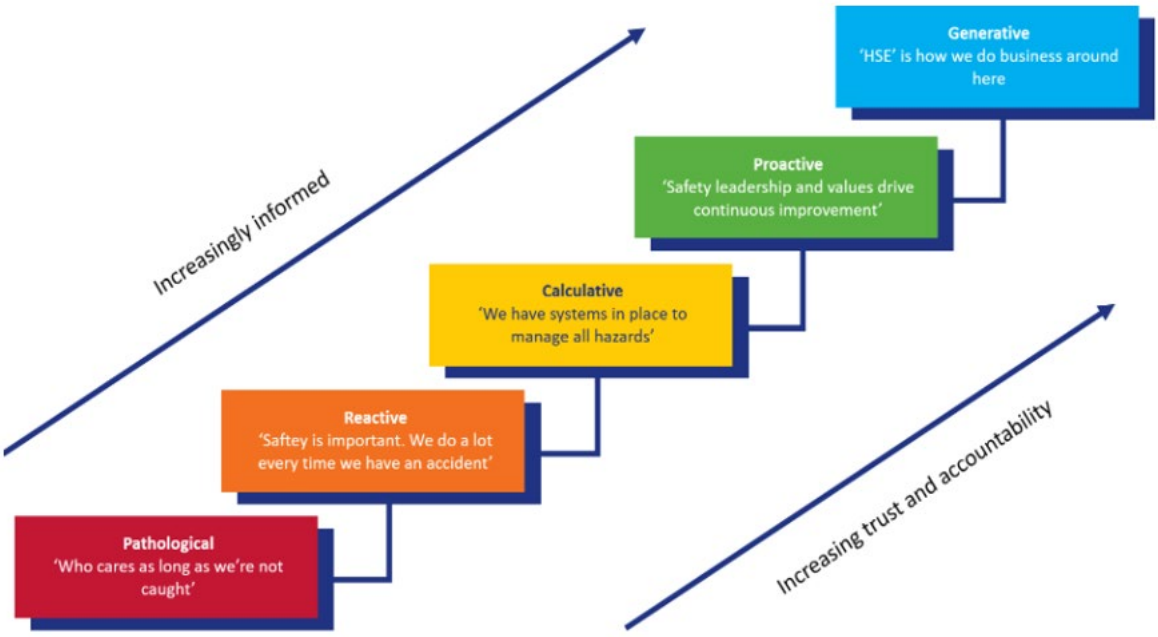
• PS Training		
Operations Overview • Organisation • Shift and trip handovers • SOPs/EOPs • Training & competence assurance • Control of work • Safety critical instrumentation override management • Alarm management & Safe Operating Limits (SOLs)	Q&A and review of sample documentation/data Location: Operations Department	1hr
Well Control and Well Integrity • Organisation • Basis of philosophy • Planning, prioritization & performance • Drilling barriers & standards • Procedures • Reliability • Validate assumptions around well redrill times and costs, plus relief well requirements	Q&A and review of sample documentation/data Location: Drilling/ Well Integrity Department	1hr
Maintenance Planning & Rotating • Organisation • Basis of philosophy • Planning, prioritization & performance • Reliability • Rotating programmes • Joint integrity management	Q&A and review of sample documentation/data Location: Maintenance Department	1hr
Maintenance Electrical & Instrumentation • Testing of safety critical instrumentation • Electrical programmes	Q&A and review of sample documentation/data Location: Maintenance Department	1hr
Insurance/Losses/Values	Q&A and review of previous losses, insurance values, EML/MPL scenarios	0.5hr
Production Planning BI Scenarios	Q&A Location: Production Planning Department	0.5hr
Survey Review Meeting	Review of Day 1	15mins

Session (offshore survey)	Format	Duration
Introduction meeting • Begins with meeting with OIM to discuss main issues on asset integrity, operations, manning, PSM, etc.	Discussion with OIM	1 hour
Control Room • SOPs/EOPs • Training & competence assurance • Permit To Work (PTW) • Equipment isolation • Safety critical instrumentation override management • Well integrity management systems	Validation of operations and asset integrity documentation Location: Meeting room near Control room	1-2hrs
Facility Tour • Tour outside facility including key elements such as riser valves, well bay, process trains and firewater pumps	Walking tour accompanied by experienced operations personnel.	½ day minimum
Maintenance supervisor • Review maintenance practices and records.	Discussion	1 hour
Offshore Inspection Engineer • Review inspection practices and records	Discussion	1 hour
Permit/SIMOPS meeting, if possible	Passive attendance.	1 hour
OIM wrap up meeting	Discussion with OIM, asset integrity lead and operations lead to review any critical areas and findings. Any nascent recommendations arising from offshore portion of tour should be mentioned.	40 minutes

Session (onshore day)	Format	Duration
Fire Fighting & Emergency Response • Active protection • Emergency response	Q&A and review of sample documentation/data Location: Emergency Response Building	1hr
Inspection (Mechanical Integrity) • Organisation • Basis of philosophy • Equipment specific philosophy • Planning & deferment management • Equipment deficiency management • Operational changes & deviations • Material verification • Records & analysis • IOWs • Performance monitoring • Audits	Q&A and review of sample documentation/data Location: Inspection Department	2hrs
Technical/Engineering • Basic process control, emergency shutdown & isolation • Equipment safeguarding • Process Hazard Analysis (PHA) • Management of technical change (MoC) • Safety Integrity Level (SIL) Assessment • PSSR	Q&A and review of sample documentation/data Location: Engineering Department	2hrs
Wrap-Up Meeting preparation	Survey team preparation time Location: Data Room	1hr
Wrap-Up Meeting	PowerPoint (or similar) presentation by the survey team to the facility management team Location: Meeting Room	1hr

APPENDIX 2 – Corporate Mind

Process Safety Culture



Key Responsibilities

Corporate Board

Strategic vision

- Production – Cost – Safety – Protection of Asset
- Reputation Management
- Stakeholder Management
- Corporate Risk Management
- Long Term Planning
- Resource Strategy
- Philosophies
- Assurance Practices
- Organisational Culture
- Business Continuity Planning

Site Leadership Team

Transform vision into action

People

- Ongoing fit for purpose organisation
- Contractor Management Corporate Risk Management

Plant

- Execution of Operational Practices
- Execution of Maintenance Process
- Execution of Inspection activities

Process

- Integration of short term plans
- Medium Term Planning
- Alignment to long term plan.
- Emerging change risk evaluation
- Philosophies and procedure alignment
- Manage Continuous Improvement
- Key Performance indicator Trends
- Learn from Experience
- Adoption of Best practice

Functional Support

Execute effectively

- Short Term planning
- Work As Intended
- Follow procedures & work task instructions
- Execute to achieve Key Performance Indicators
- Individual capability
- Reporting of Anomalies
- Engineer to standards and codes

APPENDIX 3 – Focussed Facility Survey and Group/Corporate Process Safety Management Assessment Guidelines

1. As indicated in Section 1, a Focussed Facility Survey could be conducted in place of (or part of) a Standard Facility Survey or as part of a Recommendation Update with the intention to spend more time focussing on specific areas of concern. Focus areas to be addressed could be based on any of the following:

1.1 Where significant risk recommendations have been made to address process safety management deficiencies e.g. Well integrity, Inspection, Maintenance, PHAs, etc.

1.2 (Re)Insurers' and industry loss experience specific to the occupancy e.g., FUMA, etc.

2. Reference is also made to JR2018-012 Well Review Guideline, Tier 4. This provides a Scope of Work for a focussed Corporate Well Risk Engineering Survey.

APPENDIX 4 – Pre-Survey Information Request List

1. The following additional information for upstream surveys should be provided **before** the facility survey commences preferably in electronic format. This information is in addition to that suggested in Guidelines for the Conduct of Oil, Gas and Petrochemical Risk Engineering Surveys – GPRES 2018-001 – on the LMA website Appendix 4.

All information should be legible and reproducible:

2. Asset Details

2.1. Field layout drawing

2.2. Facility plots plans and elevations

2.3. List of wells, including status and type.

2.4. Recent Well AFE history.

2.5. Safety case (if available)

2.6. Description of the field status and current processing capabilities of the facility, if not included in above.

2.7. PHA / SIL latest studies

3. Business Management System

3.1. Corporate long-term plan

3.2. Current year performance contract

3.3. Assurance KPIs – HSSE, PSPIS, Inspection KPIs, Audit

3.4. Organisation Chart

3.5. Corporate Asset Risk Register

3.6. MAH barrier model

3.7. Human resource statistics

3.8. Corporate audit plan

4. Philosophy Documents

4.1. MoC, including technical change / ORA/ Safety overrides)

4.2. Control of work

4.3. Isolation and reinstatement of plant

4.4. Project management

4.5. Inspection

4.6. Maintenance and reliability

4.7. Incident investigation

5. **Functional KPIs and registers related to:**

- Organisation
- Process Safety
- HSE
- Audits
- Inspection
- Operations
- MoC
- Control of work
- Production Chemistry
- Maintenance and reliability
- Inspection
- Integrity Operating Windows
- Pigging operations
- Training and Competency
- Document Control
- Emergency Response

APPENDIX 5 – PSPIs

1.1. It is recognised that the (Re)Insured may have their own PSPIs and 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 PSPIs should be compared with and could be supplemented by a selection of PSPIs from the following list whenever the necessary information can be obtained during the survey. It should be emphasised that the (Re)Insured is not necessarily requested to measure or report the PSPIs listed below, merely that the inclusion of some of these within the market report will aid the risk engineer to assess process safety performance.

1.3. The list has been compiled based upon commonly agreed important PSPIs amongst the London energy risk engineering community and also from the following publications:

1.3.1. *Energy Institute. Research Report Human Factors Performance Indicators for the Energy and Related Process Industries. 1st Edition. December 2010.*

1.3.2. *HSG254. Developing Process Safety Indicators. HSE. 2006.*

1.3.3. *API 754. Process Safety Performance Indicators for the Refining & Petrochemical Industries. April 2010.*

1.3.4. *Marsh Risk Engineering Position Paper - 04. Process Safety Performance Indicators – PSPIs.*

1.3.5. *CCPS. Process Safety Leading & Lagging Metrics. 2011.*

1.3.6. *IChemE Safety Centre Guidance – Lead Process Safety Metrics – Selecting, Tracking and Learning. 2015*

1.3.7. *OGP Process Safety – Recommended Practice on Key Performance Indicators, Report 456. November 2011.*

Functional Key Performance Indicators

Function	Metric
Business Performance Metrics	
Facility Performance	Facility availability (proportion of time available to produce) (%)
Facility Performance	Number of unplanned shutdowns (#)
Facility Performance	Capacity utilisation (actual versus design capacity) (%)
Budget Spend	CAPEX/ OPEX Spend as % of budget
Process Safety Culture	Facility evaluation
Organisational Capability	
Turnover	Annual Staff Turnover
Vacancies	Number of vacancies, As an organisation and by team
Training and competency	Overall staff training as a percentage and / or by function
Incidents	Number and proportion of overdue actions from incident investigations (# and %)
HSSE	
Hazard recognition	Number of safety observations
Incident Investigation	Number of open investigations
Incident Investigations	Number of overdue investigations
Incident Investigations	Number of Open Actions
Incidents	Number and proportion of overdue actions from incident investigations (# and %)
Audits	Number(s) of audits, at Tier 1,2, and 3
Audit Actions	Number of high priority audit actions
Hydrocarbon containment	
Incidents	Number of process safety incidents classified by severity (#)
Incidents	Number of LOPC incidents classified by severity (#)
Incidents	Number and proportion of overdue actions from incident investigations (# and %)
Incidents	Number of Leaks Weeps and Seeps
Document Management	
Document control	Number of overdue procedures / philosophies.
Operations	
Organisation	Average overtime worked per operator (hrs)
Organisation	Average operator experience (yrs)

Impairment management	Number of ORAS
Operating Procedures	Number of overdue procedures
Training	Training completed as per plan (%)
Permit To Work	Permit audits completed as per plan (%)
Permit To Work	Permit compliance as per audits (%)
Isolation	Failure of isolation control identified at PTW audit (%)
Override Management	Number of safety critical instrument overrides and by duration (>1 day, >1 mth, > 3 mths) (#)
Alarm Management	Average alarm rate per operator (# per hr)
Alarm Management	Number of standing alarms per console (#)
SOL	Number of SOL exceedances (#)
SOL	Number of activations of safety systems (SIS, PRDs etc.) (#)

Maintenance	
Organisation	Average overtime worked per technician (hrs)
Planning	Amount of overdue planned maintenance work (i.e., backlog) (weeks)
Planning	Proportional split of maintenance work orders by priority (%)
Planning	Proportional split of reactive (corrective) and proactive (planned) maintenance by manhours (%)
Planning	Safety Critical planned maintenance compliance (%)
Planning	Safety Critical corrective maintenance compliance (%)
Reliability	MTBF for different equipment types (months)
Reliability	Plant mechanical availability (%)
Safety Critical Instruments	Number and proportion of overdue safety critical instrument testing (# and %)
Safety Critical Instruments	Number and proportion of safety critical instrument failures on test (# and %)
Safety Critical Instruments	Proportion of corrective maintenance on safety critical instruments overdue (%)
Inspection	
Planning	Proportion of hydrocarbon piping systems on the inspection schedule (%)
Planning	Number and proportion of overdue inspections as per plan by equipment type (# and %)
Planning	Number and proportion of overdue PRD testing per plan (# and %)
Planning	Number of inspection deferrals in place by equipment type (#)
Equipment/Structural Deficiency	Number of inspection results outside acceptable limits (#)
Equipment Deficiency	Number and proportion of PRD failures on test (# and %)
Equipment Deficiency	Number of temporary / defined life repairs in hydrocarbon service (#)
IOW	Number of IOW exceedances (#)
Technical & Engineering	
PHA	PHA reviews completed as per plan (%)
PHA	Number and proportion of overdue PHA actions and by risk category (High, Medium, Low) (# and %)
PHA	PHA procedure compliance as per audit (%)
MoC	
MoC	Number of MoCs beyond predefined close-out period after start-up (i.e., overdue) (#)
MoC	Number of temporary changes beyond original reinstatement date (i.e., overdue) (#)
MoC	MoC procedure compliance as per audit (%)
MoC	Proportion of audited changes subject to MoC (%)
MoC	Current number of live ORAS
MoOC	

Vacancies	Number of Vacancies
Risk Assessments	Number of overdue MoOC
Temporary Assignment	Number of temporary assignments
Wells and Drilling	
Well Control	Well control incidents and/or unexpected upsets/kicks, with no LOPC
Well Integrity Management	Well barrier failures according to criticality
Well Integrity Management	Wells with annulus pressure issues
Well Integrity Management	Number of storm chokes

Emergency Response	
Testing	Number and proportion of overdue fire protection equipment testing (# and %)
Testing	Number and proportion of fire protection equipment failures on test (# and %)
Impairment	Number of fire protection systems under impairment and by duration (>1mth, >3mths) (#)
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 6 – Maintenance Tables

Electrical

Component	Frequency	Type of inspection	Comment
UPS			
Motors			
Switchgear			
Emergency Diesel Generators			
Transformers			
Cathodic Protection			
Cables			
Earthing			
Relay			
ATEX/Ex integrity			

Mechanical

Component	Frequency	Type of inspection	Comment
Compressors			
Gas turbine Generators			
Seals			
Seal oil / Lube oil			
Valves			
Subsea equipment			
Bolting			
Lifting			

Instrumentation and Control

Component	Frequency	Type of inspection	Comment
ESD system actuation			
SIS sensors			
SIS final elements (ESDVs, RESDVS, BDVs,			

SSIVs, SSSVs)
Smoke Detectors
Flame Detectors
Heat tracing

APPENDIX 7 – Inspection Summary Tables

Component	Frequency	Type of inspection	Comment
Process Piping			
Pressure Vessels			
Atmospheric Storage Tanks			
Pipelines / Risers			
Subsea Production Systems			
Relief Valves			
Flame arrestors			
Jacket /Substructures			

APPENDIX 8 – Emergency Response Summary tables

Firewater System

Description	Drive	Capacity	Pressure	Comment
Fire pump A				
Fire pump B				
etc				

Firefighting System Testing

Equipment	Test Frequency	Comment	NFPA Requirement*
Firewater Pumps	Weekly	Start Test	10-minute run test per pump. Weekly
Firewater pumps	Annually	Pump curve	0-150 % Annually
Firewater System flow capacity test	3 yearly	System wet test	Worst case Design scenario
Flammable gas detectors			
Flame Detectors			
Deluge Test			
Sprinkler Systems			
Inert gas system test			
Foam Concentrate quality test			

APPENDIX 9 – LOPI Scenario Worksheet

Facility Area	Critical Loss Scenario(s)	Unmitigated Loss	Mitigations	Mitigated Loss
Production/Import Facilities				
Process Units				
Utilities				
Storage				
Export Facilities				
Pipelines				
Cables & Umbilicals				
Wells, Reservoir support (e.g. water injection)				