Keynote Address – Process Safety & Performance Standards

Jeremy Dunster – Technical Services Manager

INTRODUCTORY SLIDES

Slide 1 – Introduction

Thank you for the opportunity to address you today regarding process Safety and Performance Standards which from NOPSEMA's perspective are both inextricably linked and form a cornerstone of our regulation of safety in the Australian offshore petroleum industry.

Slide 2 – Agenda

I'd like to cover a number of topics today including:

- providing you with a brief introduction to NOPSEMA, the Australian Offshore Petroleum Regime, and our approach to regulation;
- Safety Cases and the link to Process Safety;
- Performance Standards in our regime;
- Inspection findings regarding performance standards, and;
- Lessons for industry.

Slide 3 – NOPSEMA's background and history

NOPSEMA succeeded NOPSA. NOPSA was formed in 2005 and was responsible for occupational health and safety regulation. In April 2011, in response to significant offshore accidents, namely the PTTEP AA Montara Blowout in the Timor Sea in 2009 and BP Macondo blowout in the Gulf of Mexico in 2010, NOPSA's regulatory coverage was increased to include structural (well) integrity. As of 1 January 2012 NOPSA became NOPSEMA, the National Offshore Petroleum Safety and Environmental Management Authority, responsible for the regulation of safety, well integrity and environmental management of offshore oil and gas activities in Commonwealth waters.

Slide 4 – NOPSEMA's Vision & Mission

Our Vision is:

A safe and environmentally responsible Australian offshore petroleum and greenhouse gas storage industries.

And our Mission is:

To independently and professionally regulate offshore safety, well integrity and environmental management.

Slide 5 – Regulatory functions

NOPSEMA's functions can be considered as addressing three key areas:

Compliance

- To develop and implement effective monitoring and enforcement strategies so that industry complies with the law.

- To investigate accidents and occurrences relating to occupational health and safety (OHS), well integrity and environmental management.

Promotion

- To promote the safety of people working offshore.
- To advise on matters relating to OHS, well integrity and environmental management.

Governance

- To provide reports, including recommendations, to the Commonwealth/state/NT minister.
- To cooperate with other agencies or authorities.

Slide 6 – NOPSEM's Jurisdiction

NOPSEMA Regulates Occupational Health and Safety, Integrity and Environmental Management associated with petroleum activities in Commonwealth waters (the white areas on the map) and, where powers have been conferred, in designated coastal waters (for example in and around the Exmouth Gulf as indicated by the shading). To date only Victoria has conferred powers on NOPMSEA for the regulation of Occupational Health and Safety and Integrity in Victorian designated coastal waters.

Slide 7 – Legislation administered by NOPSEMA

NOPSEMA administers:

- *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGSA);
- 'Schedule 3' of the OPGGSA;
- The *Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009;*
- Part 5 of the *Offshore Petroleum and Greenhouse Gas Storage (Resource Management and Administration) Regulations 2011* (the Wells Regs"), and;
- The *Offshore Petroleum and Greenhouse Gas (Environment) Regulations 2009*

Slide 8 – Legal framework (OHS)

With respect to Occupational Health and Safety NOPSEMA regulates what can be characterised as a 'General Duties' regime that is performance based with some prescriptive elements. The regime features an independent regulator (NOPSEMA) who reports directly to the Commonwealth Minister for Resources and Energy.

The performance based duty (on the operator of a facility) is to take all reasonably practicable steps to ensure the facility and activities conducted at the facility are safe and without risk to the health of any people at or near the facility. Examples of prescriptive elements include contents requirements for a safety case and some OHS exposure standards.

A facility operator's safety case is used as a permissioning document, i.e. must be accepted in order to undertake activities.

Slide 9 – Regulatory Approach

Our approach to regulation cover four key areas:

Assessment – the permission to operate

- Rigorous, independent, sampled evaluation of an operator's submission against the Regulations
- Challenge operators: "Have you done enough?"

Inspection – monitor compliance

- Independent, sampled inspection of the petroleum activity against the accepted permissioning document and Regulations
- Challenge operators: "Are you doing what you said you would do?"

Investigation

- Targeted and depending on severity, to determine what went wrong and whether enforcement/prosecution is required
- Challenge operators: "What wasn't done? What can we learn?"

Enforcement

- Improvement & Prohibition Notices, prosecutions
- Transparent, consistent and fair action within NOPSEMA powers under the Act and Regulations to secure compliance

SAFETY CASES & PROCESS SAFETY

Slide 10 – Safety case contents

Similar to offshore safety regimes elsewhere, a safety case in the OPGGS (Safety) Regulations comprises of a facility description (FD), formal safety assessment (FSA) description and a safety management system (SMS) description. Notably a safety case essentially describes a process with the FSA at its heart. A critical output of the FSA is the identification of technical and other control measures necessary to reduce the risk a level that is as low as reasonable practicable.

Slide 11 – Major Accident Events

A key element of the safety regulations is the term Major Accident Event (MAE), which is an event connected with a facility, including a natural event, having the potential to cause multiple fatalities of persons at or near the facility.

Whilst not exclusively related to loss of containment events a significant proportion of MAEs at offshore facilities are related to the loss of hydrocarbon containment events (and associated escalation) either:

- on the facility
- on an adjacent facility
- in a pipeline
- and/or in a reservoir.

It is these two factors that make MAE prevention in the offshore petroleum industry synonymous with process safety.

Slide 12- Performance Standards

In the Australian Offshore Petroleum legislation a ***Performance Standard*** means a standard, established by the operator, of the performance required of a system, item of equipment, person or procedure which is used a basis for managing the risk of a major accident event

(OPGGS(S) Regulation 1)

Slide 13 – Safety Case MAE Focus

Returning to the safety case we can see that in fact at it's heart, the Formal Safety Assessment Description is exclusively focused on the:

- Identification of hazards with **MAE potential**,
- The assessment of **MAE risks** including both a Fire and Explosion Risk Analysis and Evacuation and Escape Risk Analysis,
- The **identification of control measures** needed to reduce the risk to level that is as low as reasonably practicable

with the Safety Management System Description specifying the **performance standards** that apply.

Slide 14 – The Interface

Taking a lifecycle approach, performance standards are the interface between the Formal Safety Assessment, (that establishes the MAE control measures needed to manage risk to a level that is ALARP) and the ongoing operations and risk management (need to sustain the integrity of those MAE control measures over time).

In order to be effective performance standards should address the:

- Functionality
- Availability
- Reliability
- Survivability
- Dependency
- Compatibility

of the control measures.

Performance Standards also need to be **S.M.A.R.T.,** that is they should be

Specific – performance standards should well defined and not open to wide interpretation.

Measurable – whenever possible, performance standards should be based on quantitative measures such as direct counts, percentages, and ratios.

Appropriate – the performance standard should be in alignment with the overall goal of the control measure.

Realistic – performance standards should be achievable, but may be challenging, and attainable using resources available.

Timely – performance standards should be developed and made available in a timely manner. For example operational performance standards should be available prior to start-up of operations.

Slide 15 – Performance Standards Lifecycle

Looking more closely at the lifecycle we can see the entry point starting with processes involved in the formal safety assessment as describe in the FSA description contained in the safety case (HZID, Risk Assessment, control measure identification). At the interface we move from having defined the performance standards to verifying they are being complied with. From here the process to sustain the integrity of the control measures includes:

- **Inspection and testing** of physical controls and **auditing and reviewing** other (procedural) controls against the established performance standards;
- **Investigating performance deviations** identified during the verification activities and taking appropriate corrective action;
- Appropriately **managing changes** need to address both performance deviations and ensure that the performance standards remain up-to-date and aligned with other changes to the facility, standards or requirements;
- **Maintaining and monitoring** the control measures through routine preventative maintenance routines and management oversight of other control measures.

Significant changes to circumstances (outdated technical knowledge, modification to facility, overall levels of risk etc) as defined in the OPGGS(Safety) Regulations trigger a safety case revision leading back into the Formal Safety Assessment process, otherwise the cycle of sustaining the integrity of the MAE controls continues for five years when a safety case revision is required.

Given the central role MAE control measures play in reducing risk it is probably unsurprising they also play a pivotal role in NOPSEMA's inspection activities.

Slide 16 –NOPSEMA Inspections

Whilst our OHS inspections also address follow-up on previous recommendations and meeting with Health and Safety Representatives the core of our inspections is focused on establishing the answers to the following questions, for the MAE(s) that for the inspection scope.

Are the control measures implemented?

- do the control measures exist as described in the safety case?

Are the control measures functional?

- do the control measures perform as desired by the performance standards?

Are the control measures maintained?

- Are the control measures inspected, tested and maintained so they continue to meet their performance standard?

Are the control measures audited?

- are the maintenance and inspection results checked and acted upon if the functionality is not as expected?

Is the workforce competent?

- is competency of personnel demonstrated in relation to the selected control measure?

Analysis of some of our inspection results has identified a number of deficiencies which can be clearly related to breakdowns associated with the various stages in the Performance Standards lifecycle which I would like to share with you now. These examples have contributed to performance standards being one on the focus areas for NOPSEMA OHS inspections in 2013-14 as captured in our Annual Operating plan, available on our website.

INSPECTION FINDINGS

Slide 17 – Findings - Definition problems

No Performance Standards:

- For example: *"surface and subsea BOP pressure test and function test sheets did not contain the close time requirements for ram and annular BOP's. The accumulator pump capacity sheet did not specify the required time to return the system to operational pressure……"*
- For example: *"The required performance for some SCEs have not been specified, e.g. for lifeboats and bridge sprinkler curtain. During the test of lifeboats and bridge sprinkler curtain, 3 out of 8 sprinklers on the port side and 1 out of 8 on the starboard side did not work properly. Without defined Performance Standards it cannot be determined whether the sprinkler system is fit for purpose with a number of nozzles partially or fully blocked."*

Performance Criteria Missing:

- For example: *"The purge and gas blanketing system PS P25 does not state any reliability criteria - for example % probability system will operate on demand".*
- For example: *"The following are not identified on the performance standard(s):*
  - *Subsea critical valves,*
  - *Valve test type,*
  - *Valve minimum test frequency,*
  - *Valve maximum accepted leak rates (gas and oil), and*
  - *Valve maximum acceptable valve operating times."*

Function Test Method not identified:

- For example: *"The Assurance Job Plans do not incorporate some of the performance requirements stipulated in these Design Performance Standards. For example, under Damper integrity a worst case damper leakage rate of 30 l/m2/hr is specified in the Design Performance Standard but is not measured in the Assurance Job Plan."*

References to Codes:

- For example: *"the performance standard for 'BOP and Control Systems' simply lists the API 16D specification that applies to the Diverter equipment. The key measurable functionality requirements of the Diverter equipment are not specified. The performance standard has no SAP assurance tasks defined for each functional requirement of the Diverter so that personnel can determine that the Diverter equipment meets its functionality and performs within the required limitations of API 16D".*

Slide 18 – Findings - Linkage Problems

No linkage between the Performance Standard and Specific Safety Control Measures

- For example: *"Performance standards do not have a clear reference to the individual controls committed to in the safety case. The FSA prevention, reduction and mitigation controls do not clearly reference performance standards. For example the ISSOW control of hot work, the cyclone response plan/procedures and qualification and training of personnel controls do not reference performance standards."*

Performance Standards not meeting the Operator Safety Case FSA requirements:-

- For example: *"The performance criteria in the Performance Standard for the Inert Gas System Oxygen Analysers' has higher oxygen level criteria than that required by the FSA".*
- For example: *"The specified procedure does not measure the performance criteria described in the safety case, being:*
  - *Confirmed gas in turret initiates blow-down within twenty seconds of the debutaniser and turret and after ten minutes blow-down of the process, and*
  - *Confirmed gas in process initiates blow-down within twenty seconds of the debutaniser and process and after ten minutes blow-down of the turret."*

Slide 19 – Findings - Function Testing Problems

Incomplete testing

- For example: *"The performance of some of the [control measures] are not monitored against their performance standards, e.g. 99% target availability of Firewater/Foam system".*

Unable to Perform Testing

- For example: *"It was advised that the facility had 283 dampers in total and that approximately 70 of these dampers were automatically controlled. It was also advised that there was limited access to many of the dampers resulting in approximately 50% of the dampers being unable to be observed moving during testing. Due to access limitations, approximately only 40 % of the damper actuators can be accessed to apply lubrication. Many of the damper locations required scaffolding to be erected to gain access with some locations being inaccessible even using scaffolding"*

Ineffective function testing against performance criteria

- For example: *"Checking condition of sprinkler nozzles and replacing blocked/defective nozzles prior to function testing. Defeats purpose of Function testing to determine if the Control Measure would have functioned satisfactorily on-demand."*

Slide 20 – Findings - Follow-up Problems

Function Testing identifies valves not meeting performance criteria

- For example: *"A sample of the 30 day monthly Ballast valve timing WO Report showed that some of the valves did not meet the required opening/closing times. For example it was noted that the slowest closing time recorded for a 14" valve was 30 seconds whilst the standard closing time for these type of valves detailed on the WO report is between 15-20 seconds. A recorded closing time of 30 seconds represents a (50 -100) % deviation. The rig personnel advised that no follow up action was taken to investigate the reasons for the slower times as the additional time taken for the valve/s to close was not identified as being critical."*

Slide 21 – Findings - Change management Problems

Change to Operations which require modified Active Fire Protection

- For example: *"Additional Sprinkler systems added to facility for well testing resulting in increased Fire water flow requirements which were not addressed."*

Amended Standards and Codes

- For example: *"The Performance Standard for the Control Measure 'HVAC System' refers to 'Class/SOLAS' requirements rather than providing specific performance criteria. The Codes and Standards were amended with updated Performance Standards not captured by Facility."*

Slide 22 – Findings - Facility Personnel Knowledge Problems

Performance standard definition

- For example: *"The Performance Standard for the Control Measure 'Vessel Crane' referred to 'Class' requirements rather than specific performance criteria. Facility Personnel unaware of details of 'Class' requirements."*

Linkage of PS with Control Measure

- For example: *"Senior management on the facility at the time of the inspection showed a limited understanding of Performance Standards, their importance and linkages to SCEs and corresponding MAEs".*

Linkage of Performance Standard with FSA

- For example: *"From a sample of three weekly tests of subsea BOP and related equipment function tests reviewed, it was found that all failed to meet the closure time requirements. The time to close the rams or unlatch the LMRP is required not to exceed 45 seconds (paragraph 3, part 4, section 5.2.16 of the safety case). All three tests were signed as successfully complete in contrary to the findings."*

Investigate deviations

- For example: *"(as noted earlier) "A recorded closing time of 30 seconds represents a (50 -100) % deviation. The rig personnel advised that no follow up action was taken to investigate the reasons for the slower times as the additional time taken for the valve/s to close was not identified as being critical."*

Slide 23 – Preventing Major Accident Events

As we continue to see in this industry, a lack of understanding, attention or awareness of the MAE control measures can have disastrous consequences. A fundamental understanding by all facility personnel of the inter-relationship of hazards, risks, associated control measures and their performances standards in relation to their facility remains at the heart of preventing major accident events.

Slide 24 – Lessons for Industry

In terms of lessons for industry I would challenge operators to ensure that:

- MAE controls and their performance standards are clearly visible to facility personnel and not hidden in plain sight. I.e. maintenance management systems and safety management systems clearly identify those elements that are MAE controls, and their associated performance stands so personnel appreciate the importance of ongoing verification and maintenance.
- Performance standards are well defined so that the MAE control measures can be effectively verified and relied upon to function as intended when needed and are:
  - **S**pecific – performance standards should well defined and not open to wide interpretation.
  - **M**easurable – whenever possible, performance standards should be based on quantitative measures such as direct counts, percentages, and ratios.

- **A**ppropriate – the performance standard should be in alignment with the overall goal of the control measure.
- **R**ealistic – performance standards should be achievable, but may be challenging, and attainable using resources available.
- **T**imely – performance standards should be developed and made available in a timely manner. For example operational performance standards should be available prior to start-up of operations.

- Facility personnel are provided with the information, instruction training and supervision need to ensure they are knowledgeable and understand the MAE control measures on their facility, the standards they are expected to perform to and the action that must be taken when such control measures are found wanting.

Slide 25 – Resources

NOPSEMA publishes a range of guidance material including several in our safety case guidance note suite specifically focused on risk assessment, performance standards and control measures, all freely available from our website www.nopsema.gov.au

Slide 26 – Thank you