Assessment findings

Assessment ID	3051
Duty holder:	Woodside Energy Ltd
Facility/Activity:	Northern Endeavour
Facility type:	Floating production storage and offloading facility
Assessment type:	Safety Case

Findings relating to OPGGS(S)

Regulation Clause ID	Regulation Clause	Topic Scope	Comment
2.10	Permit to work system for safe performance of various activities	Dropped Objects	SMS, s.7 describes the PTW (ISSoW) process and states that, "all normal activities within the facility 500m Safety Zone are controlled in accordance with ISSoW". Lifting is not specifically mentioned, but the description is adequate.
		General	SMS, section 7 describes the operator's Integrated Safe System of Work adequately. Section 3.2 describes the operator's Golden Safety Rules - rule 1 mandates the use of the permit to work system. SMS section 4.3.2.3 describes ISSoW Training.
2.11	Involvement of members of the workforce (a) & (b)	Diving System Failure	The safety case revision Part 4 section 3.1.1 states, "As part of the 5-Yearly update of the Safety Case, a workshop review was conducted, attended by relevant Woodside personnel to provide input to the Safety Case update and associated documentation." Please provide further information to demonstrate effective consultation with diving representatives occurred at the 5-year Review Workshop.
		General	SMS, s.5 describes "Communication, Participation and Consultation" processes. Section 5.4 describes workforce involvement FSA, section 7 describes the "ALARP review" process conducted as part of the 5 year revision. Section 7.2.1 states that review workshops were attended by "facility representatives".
2.12	Design, construction, installation, maintenance and modification	General	SMS, s.6 describes "Integrity Management", including management of performance standards, and maintenance and inspection processes, and technical change management. FD, s. 2.7 describes the arrangements for access for servicing and maintenance of equipment and systems on the facility. FD, s. 2.10 describes an annual class verification exercise. FD, s. 2.11 describes the implementation and maintenance of technical controls by means of performance standards. FD, s.5.5 describes "Facility Shutdown Systems". FD, s.5.6 describes "Emergency Relief System".
		Inspection Maintenance and Repair	SMS, s.6 describes "Integrity Management", including management of performance standards, and maintenance and inspection processes, and technical change management. FD, s. 2.7 describes the arrangements for access for servicing and maintenance of equipment and systems on the facility. FD, s. 2.10 describes an annual class verification exercise. FD, s. 2.11 describes the implementation and maintenance of technical controls by means of performance standards. FD, s.5.5 describes "Facility Shutdown Systems". FD, s.5.6 describes "Emergency Relief System".
2.13	Medical and pharmaceutical supplies and services	General	FD, section 5.17 describes "Medical and Pharmaceutical Supplies and Services" adequately. SMS, section 3.4.4 briefly describes provision of medical services. SMS, section 9 (Emergency Management) describes the medivac process. The SC does not specify a performance standard for medivac operations. SCRN

2.14	Machinery and equipment	Dropped Objects	FD, 3.9.19 describes the Material Handling System, including cranes, and other lifting equipment. The FSA, at the bowtie for MAE-05 describes the following technical controls: Load Indication and Monitoring System Overload Protection Limit Stops Certified Lifting Equipment Radios for communicating between the crane operator and other personnel These controls are not described in the FD. This is inadequate. SCRN
		General	
		Loss of Containment	The facility description provides sufficient level of detail to provide reasonable assurance that the specified equipment is fit for it's function both in normal operating conditions and also during emergencies.
2.15	Drugs and intoxicants	General	SMS, s.3.4.2 describes the operator's process for securing, supplying and monitoring the use of therapeutic drugs on the facility. this section also describes the operator's drugs and alcohol testing program.
2.16	Evacuation, escape and rescue analysis	General	FSA, s.4.3 describes the EERA, which was undertaken in 1999. FSA, s.2.2 states that, "as part of the 2014 Safety Case review and update, the existing FSA studies were reviewed against current standards and good practice and assessed against changes that may have occurred to the facility and its activities and operations." Regulation 2.16(h) requires that the EERA identifies the technical and other controls necessary to reduce the risks associated with emergencies to a level that is ALARP. The description of the EERA does not disclose whether float-free EPIRBS were considered as necessary controls. Clarification required - SCRN
2.17	Fire and explosion risk analysis	General	FSA, s.4.2 describes the FERA, which was undertaken in 2001. FSA, s.2.2 states that, "as part of the 2014 Safety Case review and update, the existing FSA studies were reviewed against current standards and good practice and assessed against changes that may have occurred to the facility and its activities and operations." The SCR references the facility Emergency Management Operating Standard, which was revised in 2014, and the facility Emergency Response Plan, also revised in 2014.
2.18	Emergency communications systems	Diving System Failure	The safety case revision part 2 section 2.6.14 states, 'Additionally, each location is in close proximity to the facility fixed safety and emergency response provisions such as Fire and Gas detection, ESD, general alarm stations and Temporary Refuges.' However the arrangements for the emergency communications (E04 SCE Safety Critical Communications equipment) is not clearly described for each dive location. Please describe the arrangements for emergency communications at each dive location in the event diving personnel are unable to muster due to diver recovery requirements.
		General	FD, section 5.7.2.2 describes "Emergency Communications". Section 3.9.1.4 describes that emergency power systems support the external communications system.
2.19	Control systems	General	FD, s.2.6.8 describes the ballasting operation; s.3.9.4 describes the ballast system. FD, s.3.9.1.3 describes "lighting and small power"; FD, s.3.9.1.4 describes "UPS and Emergency Power" FD, s.5.5 describes "Facility Shutdown Systems"; FD, s.5.7.1 describes "Emergency / Abandon Vessel Alarms"
2.20	Emergency preparedness	Diving System Failure	Emergency preparedness for diving activates. Section 9 and 4.3.2.2 of SMS does not refer to diving related emergencies. However it does include general subcontractor management. SCRN Please describe the emergency management arrangements that will be in place in In the event the divers are unable to return the facility due to an emergency that includes the evacuation of the dive station.
		General	SMS, section 9 describes "Emergency Management" arrangements, including training and exercises. FD, s.3.9.1.4 describes "UPS and Emergency Power". FD, section 5.5 describes "Facility Shutdown Systems". FD, section 5.6 describes "Emergency Relief System". FD, section5.7 describes "Emergency Alarms and Communications".
2.21	Pipes	General	FD s.3.2.1 describes "Reservoir Isolation" and the Surface Controlled Subsurface Safety Valves (SCSSVs) on each well. They are upstream of the wellhead / tree. FD s3.2.5 describes the flexible flowlines, and states that "none of the flowlines (between the subsea manifolds and the FPSO) are equipped with Subsea Isolation Valves (SSIVs). The ESDVs located on the Topsides are used to isolate the subsea facilities." This arrangement appears to satisfy reg.2.21(1)(b). Reg 2.21(3)(b) requires "a frequency of periodic inspection and testing of pipe ESDVs ..." This does not appear to be described in the SC, requires clarification. SCRN

2.22	Vessel and aircraft control	General	SMS, s.8.1 describes "Marine Operations". SMS, s.8.2 describes "Aviation Operations".
2.23	Arrangements for records	General	SMS, s.6.1 describes the operator's information management system.
2.26/34(1)	Safety Case is appropriate	General	
2.32	Revision after 5 years	General	SMS, s.10.1 describes Safety Case Implementation and Maintenance. SMS, s.10.2 describes the operator's Assurance process SMS, s.10.4 describes the operator's Improvement process SMS, s.6.5 describes Maintenance and Inspection processes FD, s.2.9 describes ongoing classification society commitments FD, s.2.10 describes annual third party verification against performance standards
2.40	Validation - Measures consistent wth FSA	General	
	Validation - Measures to protect health & safety	General	
	Validation - Statement agrees with scope	General	
	Validation - Validator access to data	General	
	Validation - Validator competence & ability	General	
	Validation - Validator independence	General	
2.5(1)	The description of the facility	Diving System Failure	Section 2.6 of the FD contains a brief and inadequate description of diving equipment that is not consistent with internal guidance section 4 Figure 4 – FPSO Diving Locations contains adequate description of the dive locations. SCRN raised: Facility Description – Diving equipment. Please describe the diving launch and recovery systems (LARS), deck decompression chamber (DDC), dive control (DCU) and dive compressors. The description should include details of, primary and secondary power supply sources, (i.e. are they facility supplied services, stand-alone or other?), gas supplies and emergency breathing apparatus (including communications), primary and secondary (independent) lift means and fire protection. Please refer to relevant codes of practice and standards as appropriate, for example, IMCA D014. Nitrox/Diving oxygen – In the case of the nitrox/oxygen being provided for in premixed Quads. Please describe the measures in place to manage the diving gases. In particular, please describe the arrangements for storage, marking, establishing gas quality and transfer. In the case of the production of nitrox diving gases, please describe the system to be used. Note: if nitrox is to be produced on site, the nitrox generator may require validation. For example, IMCA D D014 Section 4.6 and/or BS 8478:2011 for Mixed gas Quality. Part 2 Section 2.6.14 describes subsea activities that "may be conducted by diving from the FPSO, such as near surface duties of hull and riser inspection." Please clarify: • the diving activities to be performed using air/nitrox diving • maximum dive depths for air and nitrox
		Dropped Objects	FD, s.2.6.10 & s.3.9.19.1 describe personnel transfer by crane and FROG. Technical controls are not specifically described in the facility description. Inadequate - SCRN

2.5(1)	The description of the facility	General	Reg 2.5(1)(c) - Intended activities described in FD, s.2.6. FD, s.5.12.2.1 describes "deluge (firewater and AFFF) protection is installed around the methanol tank to provide cooling". It is not clear whether this deluge is automatically started in the event of a fire. SCRN FD, s.5.16.1 describes the TEMPSC, does not describe the passenger weight associated with the TEMPSC capacity of 66 persons. SCRN The Bow Tie diagram for MAE-08 (Accommodation Fires)(Causes) describes the "Smoke Detection and Alarm System"; this system is not described in the Facility Description. SCRN The Bow Tie diagram for MAE-08 (Accommodation Fires)(Outcomes) describes the "Galley Extinguishant System"; this system is not described in the Facility Description. SCRN FD, section 2.8 describes the codes and standards "used as part of the design of the facility" and includes SOLAS. Reg.18 of Ch.11-02 of SOLAS requires that, "a primary and back up thermostat with an alarm to alert the operator in the event of failure of either thermostat"; and, "arrangements for automatically shutting off the electrical power to the deep-fat cooking equipment upon activation of the extinguishing system". This is not described in the safety case. SCRN FD, s.5.8.1 "Safety / Exclusion Zone" describes both 2nm and 5nm "zones". Clarification required. SCRN FD, s.5.16.3.1 states the "aircraft currently used for facility operations is the Eurocopter EC225" (according to the UKOOA "Helideck Guidelines" this aircraft has an MTOW of 10.4T). FD, s.5.16.3.2 states that "the helideck is designed for 9.3T Maximum Take Off Mass helicopters". Drawing M 5000 D F 626 01, included in Part 5, shows a "T" value of 15T. Clarification required - 9.3T or 15T? SCRN
		Loss of Containment	Part 2 of the safety case provides a description of the facility. 2.5(1)(a) In relation to loss of containment, the layout philosophy is described in section 3.4.3. 2.5(1)(b) Section 3.4.3 contains a statement about heat shielding being provided in 'sensitive areas' a SCRN is required for the operator to identify these areas.
2.5(2)(a)	FSA HAZID	Diving System Failure	The SC does not include a HAZARD (diving) register and there is no evidence that at the hazard register was reviewed for the 5 year revision. It is also not clear competent diving representatives were engaged in the review process. The bow ties do not address all the potential MAEs associated with the diving activities. SCRN raised. The safety case revision part 2 section 2.6.14 describes the Subsea work activities. However a Hazard Register is not included in the safety case and there is no evidence to demonstrate all the diving activities were addressed hazard register and reviewed in the 5-Year Review Work shop. Please review and revise the HAZARD register to include all diving activities contained in the proposed diving activities and include all hazards that have a potential to cause a MAE and, The safety case revision Part 4 section 3, table 1 Major Accident Events, does not identifies all major accident events (MAEs) related to the diving activities. However an occupational MAE is described, which includes Hazard ID 13.3 “diving incident” Please identify all diving hazards with MAE potential. This should include consideration of both the hazards posed by the facility on the diving operations, and the hazards posed by the diving operations on the facility, that have the potential to lead to an MAE. Diving hazards associated with diving from a FPSO diving may typically include but not limited to; • Fire/explosion in or in the vicinity of a dive system • Diving gas contamination • Contaminated atmosphere (hydrogen Sulphide) • dropped objects • water intakes • Rotating equipment such as FPSO/turrets. • Pipeline pressurisation and depressurisation Please review and revise the Formal Safety Assessment to include all potential diving MAEs and, The safety case revision does not include a Diving Hazard Register. Consequently it is not clear the Safety Case adequately: • Identify diving hazards with MAE potential – this should include MAE hazards from the facility that could affect diving personnel and those hazards that the diving activity (and associated equipment) may pose to the facility. • Likelihood and consequences (risk assessment) of diving-related MAEs. •Technical and other control measures that are necessary to reduce diving-related MAE risk to ALARP. Please review and revise the Hazard register to identify controls and mitigations for all potential diving hazards.

2.5(2)(a)	FSA HAZID	Dropped Objects	FSA references "original" 2009 Dropped Objects Study and states it was subject to the 2014 Safety Case review and hazard register update. "Dropped Objects" MAE renamed as "Loss of Control of Suspended Load". Risk ranking identified as "High". The FSA identifies that there is "potential for fatalities during personnel transfer (personnel transfer baskets)". This is mentioned on the MAE datasheet for "Occupational" MAEs (MAE 07) - s.6.3.7, but is not described on the MAE-07 bow tie diagram. SEE SCRN UNDER 2.5(2)(c)
		General	Part 4 (FSA) s.4.1 "Formal Safety Assessment Summary" Part 4, s.3 describes Hazard and MAE Identification, including "5 year Review Workshop"
		Loss of Containment	The following items require further clarification via the SCRN process: Part 2 Section 3.4.3 contains a statement about heat shielding being provided in 'sensitive areas' a SCRN is required for the operator to describe the study that identified the 'sensitive areas'. Part 2 Section 5.1.4.2 contains a generic statement "may include and not be limited to" regarding identified causal factors for metal failure. A SCRN is required for the operator to confirm that all causal factors have been identified.
2.5(2)(b)	FSA Risk assessment	Diving System Failure	The safety case revision does not include a Diving Hazard Register. Consequently it is not clear the Safety Case adequately: • Identify diving hazards with MAE potential – this should include MAE hazards from the facility that could affect diving personnel and those hazards that the diving activity (and associated equipment) may pose to the facility. • Likelihood and consequences (risk assessment) of diving-related MAEs. •Technical and other control measures that are necessary to reduce diving-related MAE risk to ALARP. Please review and revise the Hazard register to identify controls and mitigations for all potential diving hazards.
		Dropped Objects	FSA, s.4.6.2 - FSA references the "Dropped Object Study" from 1999. Stated to have been reviewed in the 2014 hazard register update. The FSA describes the contribution of this MAE to the IRPA & PLL figures on the facility. The FSA makes the link between a dropped object event and a consequent hydrocarbon loss of containment.
		General	Likelihood and consequence of identified hazards are described in Table 2 in section 3.2 of the FSA. QRA and QRA re-analysis described in section 4.7 of the FSA. Risk assessment results described in section 4.10 of the FSA.
		Loss of Containment	The safety case demonstrates that identified hazards and risks in relation to loss of containment have been systematically assessed for both likelihood and consequence. This is summarised in Table 2 of Part 4 FSA. It is noted from Part 4 section 4.2.2.8 that deluge is required on the debutaniser column to prevent rupture in the event of jet fire impingement before the vessel has blown down. It is also noted within the same section that a debutaniser column fire below the lower process deck would receive insufficient deluge cooling to prevent escalation. The ALARP reasoning appears to be solely based on a low probability of occurrence. A SCRN is required to obtain more information on the consequences of escalation in the event of a debutaniser rupture and the options considered to reduce the risk (e.g. additional deluge below the lower process deck) but rejected on the ALARP basis.

2.5(2)(c)	FSA controls to achieve ALARP	Diving System Failure	Section 7 FSA ALARP Demonstration does not adequately describe how the risks associated to diving hazards are ALARP. 7.2.1 RRM, ALARP & Bowtie Workshop states "The Bowtie diagrams were subject to a workshop-based review. This review was attended by key Woodside personnel including facility representatives." however there is not evidence to indicate diving personal attended. Inconsistencies in the MAE 07 bow tie (that includes diving) were not identified in the Bow tie review. SCRN MAE 07 Occupational (causes 6-8) Bow Ties 5. Diving Activates refers to a 'dive management plan'. Is this meant to be a dive project plan? If it is not the DPP please describe the "dive management plan" Similarly, MAE 07 Occupational (out comes 4-7) Bow Ties 5. References Diving safety management schemes. (DSMS) Should this be dive safety management system? Please review and revise accordingly. and, The safety case revision Part 4 section 3.1.1 states, "As part of the 5-Yearly update of the Safety Case, a workshop review was conducted, attended by relevant Woodside personnel to provide input to the Safety Case update and associated documentation." Please provide further information to demonstrate effective consultation with diving representatives occurred at the 5-year Review Workshop.
		Dropped Objects	FSA, s.5.2.1 - Technical Controls related to this MAE listed, with performance standards, in Table 7. FSA, s.5.3.1 - "Management System Based Controls" listed - competency, procedures, maintenance, PTW, change management. FSA, s.6.3.5 is the MAE Datasheet for this MAE. FD, s.5.2 describes "Dropped Object Protection" FD, s.2.6.10 & s.3.9.19.1 describe personnel transfer by crane and FROG. FSA, s.4.3.3 makes a brief reference to personnel transfer operations and procedural controls, but they are not described in detail. The FSA identifies that there is "potential for fatalities during personnel transfer (personnel transfer baskets)". This is mentioned on the MAE datasheet for "Occupational" MAEs (MAE 07) - s.6.3.7, but is not described on the MAE-07 bow tie diagram. SCRN
		General	FSA, section 5 describes technical controls and related performance standards. Section 5.3 describes "Other Control Measures", including "Management System Based Controls" and "Engineering Processes". Reference to the Facility Description and SMS made. FSA, section 6 contains MAE datasheets and bowties, describing the MAEs and controls.
		Loss of Containment	It is noted from sections 7 and 8 of the FSA that a periodic Hazard and Operability Study was conducted in March 2014 and, in general, the FSA identifies technical and other control measures to reduce risks to ALARP. The fire & gas system (Part 2 section 5.4) and the facility shutdown system (Part 2 section 5.5) descriptions describes CCR alarms and ESD executive actions, it does not however identify that a general platform alarm will be initiated on fire or gas detection. A SCRN is required for the operator to confirm the levels of fire and gas detection that will cause a general platform alarm. It is noted from Part 4 section 4.2.2.9, that PFP is provided on vessels that are vulnerable to failure within 15 minutes of a jet fire. A SCRN is required for the operator to provide a list of vessels provided with PFP. It is noted from Part 4 section 4.2.2.8 that deluge is required on the debutaniser column to prevent rupture in the event of jet fire impingement before the vessel has blown down. It is also noted within the same section that a debutaniser column fire below the lower process deck would receive insufficient deluge cooling to prevent escalation. The ALARP reasoning appears to be solely based on a low probability of occurrence. A SCRN is required to obtain more information on the consequences of escalation in the event of a debutaniser rupture and the options considered to reduce the risk (e.g. additional deluge below the lower process deck) but rejected on the ALARP basis.
2.5.(3)(a)	SMS comprehensiveness and integration	Dropped Objects	FD, s.3.9.19.2 makes reference to the SMS & Lifting Procedures. SMS, s.6.4, table 6.3 states that lifting operating procedures are included in a category of Operating Procedures, which are a "Safety Critical Management System Category". There is no further description of the facility lifting procedures. This is inadequate. SCRN FD, s.2.6.10 & s.3.9.19.1 describe personnel transfer by crane and FROG. This activity and procedural controls are not specifically mentioned in the SMS. Inadequate - SCRN
		General	

2.5.(3)(a)	SMS comprehensiveness and integration	Loss of Containment	The SMS controls in relation to loss of containment have been identified in the Part 4 Section 6.3.2. of the safety case. The identified controls are described in Part 3 of the safety case.
2.5.(3)(b)	SMS scope	General	FD, section 1.3 describes the scope of the safety case. FD, section 2.6 summarises the operations and activities conducted at the facility. SMS, section 1.1 describes the SMS applicability to all activities that will or are likely to take place at, or in connection with facility.
2.5.(3)(c)	SMS HAZID	General	SMS, s.2 describes the risk management process adequately.
2.5.(3)(d)	SMS assessment of OHS hazards & risks:	General	SMS, s.2 describes the risk management process adequately.
2.5.(3)(e)	SMS risk reduction (ALARP)	Dropped Objects	SMS, s.3.2 describes the "Golden Safety Rules", including Lifting Operations. SEE COMMENTS UNDER 2.5(3)(a)
		General	
		Loss of Containment	If implemented as described in the safety case, the described SMS will provide reasonable assurance that risks would be managed to ALARP.
2.5.(3)(f)	SMS provides for inspection, testing and maintenance	General	SMS, s.6.5 describes "Maintenance and Inspection".
		Inspection Maintenance and Repair	SMS, s.6.5 describes maintenance and inspection adequately
		Loss of Containment	Section 6.5 describes the SMS process for the management of inspection, testing and maintenance for safety critical equipment in relation to loss of containment.
2.5.(3)(g)	SMS provisions for adequate communications	General	SMS, section 5 describes internal and external communications processes. FD, s.5.7.2.1 describes operational communications equipment, FD s.5.7.2.2 describes emergency communications equipment including GMDSS equipment. SEE SCRN FOR REG 2.16
2.5.(3)(i)	SMS performance standards.	General	FSA, s.5.2.2 and Table 7 describe performance standards for technical controls FSA, s.5.3.1 describes "Management System Based Controls". The SC does not fully describe performance standards for these controls. FSA, s.5.3.2 describes "Engineering Processes" as MAE "controls". The SC does not fully describe performance standards for these controls.
		Loss of Containment	Table 6.6 of the SMS description identifies the performance standards applicable to the facility. Table 7 of the FSA identifies which of the performance standards are applicable to the loss of containment MAE.
2.6	SMS Implementation and improvement	General	SMS section 10 describes "Monitoring and Improvement". Section 10.1 states that: "Reviews - A Safety Case validation shall be conducted at least every year, at the request of the regulator, on significant technical or organisational change and when required as part of an audit action item." Clarification required - what does "at the request of the regulator" mean in this context? SCRN Section 10.2.1 describes the "review" process, but does not describe the planned frequency of 'review-level" or "independent review level" assurance activities. SCRN Section 10.4 describes "Improvement", including the process of management of changes to the SMS
		Inspection Maintenance and Repair	SMS section 10 describes "Monitoring and Improvement". Section 10.1 states that: "Reviews - A Safety Case validation shall be conducted at least every year, at the request of the regulator, on significant technical or organisational change and when required as part of an audit action item." Clarification required - what does "at the request of the regulator" mean in this context? SCRN Section 10.2.1 describes the "review" process, but does not describe the planned frequency of 'review-level" or "independent review level" assurance activities. SCRN Section 10.4 describes "Improvement", including the process of management of changes to the SMS
2.7	Standards to be applied	Diving System Failure	Part 2, section 2.8 table 1 “Codes and Standards,” does not adequately describe Australian and International Design and operations codes and standards relating to diving operations and diving systems. Please amend and revise to include Australian and International Design and operations codes and standards relating to diving operations and diving systems.
		General	FD, s.2.8 describes the "Codes and Standards" used as part of the facility design - most of the listed codes and standards do not indicate which year and revision is being described. SCRN

2.7	Standards to be applied	Loss of Containment	The list of Australian and International Codes and Standards in the Faclity description section 2.8 does not appear to reference codes and standards in relation to the design and specification of the flare, relief and blowdown systems. A SCRN is required for the operator to provide a list of applicable codes and standards used in the design and specification of the flare relief and blow down system.
2.8	Command structure (Refer to N-4300-PL0052 with respect to FPSOs)	General	SMS, section 4.1 describes responsibilities, authorities and accountabilities onshore and offshore for the facility. section 4.2 describes the Organisational Structure. This is a non-disconnectable FPSO, so no change of command arrangements are necessary.
2.9	Members of the workforce must be competent	Dropped Objects	SMS, s.4.3.1 - Competency Assurance Process describes crane operators as a License to Operate role. States that the required competency and training for each LTO role has been defined. LTO Roles Report for ensuring availability of competent crane operators is described.
		General	SMS, section 4.3 describes "Competence and Training" adequately.