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The Chairman
Economics & Industry Standing Committee
Parliament House

INQUIRY INTO SAFETY- RELATED MATTERS RELATING TO FLNG PROJECTS

Please find enclosed Woodside's response to a request for additional information (received 13 November 2014) from the Economics and Industry Standing Committee inquiry into safety-related matters relating to FLNG projects.

Should you require any further information regarding this submission, please do not hesitate to contact Laura Kjellgren, Government Affairs Adviser

Yours Sincerely

Roger Martin
Vice President Corporate Affairs

Attached: Woodside response to request for additional information from the Economics and Industry Standing Committee inquiry into safety-related matters relating to FLNG projects.

ECONOMICS AND INDUSTRY STANDING COMMITTEE

Inquiry into the safety-related matters relating to Floating LNG (FLNG) projects

WOODSIDE RESPONSE TO ADDITIONAL QUESTIONS RECEIVED 13 NOVEMBER 2014

Q.1: In relation to a fixed facility such as Laminaria, when faced with an imminent category 5 cyclone, is the facility de-manned completely? Please also provide further information on the decision-making process for decisions as to whether de-manning should occur, to what level and when? For further context to this request, please refer to page 3 of the hearing transcript

A.1: The Northern Endeavour Facility is a permanently moored FPSO that had, as part of its basis of design, permanent manning maintained on board during cyclonic events. Due to changes in metocean data the facility design was reviewed and a subsequent cyclone response plan was developed.

The plan specifies triggers for staged reduction in manning based on tropical low/tropical cyclone location and forecast intensity. A final de-manning flight is planned for when a tropical cyclone track, including its cone of uncertainty, is forecast to pass within 100 nm of the facility within a 24 hour period.

Q.2: Given that an FLNG facility is permanently moored and, therefore, not a vessel, please advise what regulations and laws (Australian and International) that apply to ships will not apply to an FLNG facility? For further context to this request, please refer to page 5 of the hearing transcript.

A.2: Once an FPSO is disconnected from the riser column, the controlling legislative act transfers from the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth) (OPGGS Act) and related regulations (i.e. Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 (Cth)) to the following:

- Australian Maritime legislation (e.g. Navigation Act 2012 (Cth), Marine Orders); and
- International Maritime Organization (IMO) conventions and codes such as International Convention for the Safety of Life at Sea 1974 (SOLAS).

Disconnected mode related activities are not within the scope of Safety Cases. FPSO's which disconnect are required to maintain Class Certificate issued by Classification Society as administered by the Australian Maritime Safety Authority (AMSA).

FLNG facilities need to be certified to the Classification Society requirements for the initial tow and anytime the facility is required to disconnect and be seaworthy (i.e. dry dock maintenance or decommissioned).

When the FLNG facility is connected, the Australian Maritime legislation and IMO conventions noted above cease to apply.

Q.3: In relation to the state's emergency capacity and preparedness to respond to a major incident on an FLNG facility, please provide Woodside's view as to any gaps in the provision of necessary facilities (for example, medical, search and rescue, emergency response and the like) in areas such as Broome, Exmouth. Karratha, Port Hedland and various points in the north west. For further context to this request, please refer to pages 8, 11 and 12 of the hearing transcript.

A.3: There has not been an immediate need for additional Federal or State government emergency response resources or infrastructure to support FLNG projects.

However it is important for Government and industry to continue to work together to consider necessary response requirements and possible gaps and areas that can be improved.

Woodside recognises the integral role of the State Government in the Western Australian State Government emergency management framework and values the ongoing engagement with the State Government and its agencies.

The proposed Browse Development medical planning is based on the Woodside Medical External Support Guidelines (note these are based on the Oil and Gas Producers - Managing Health for field operations in oil and gas activities). The tiered medical response system would utilise the current Darwin and/or Perth medical facilities as centres of definitive care.

Regional centres may be considered where they can provide the level of care required to meet individual needs and this would be based on professional medical guidance.

The remote medical scenarios are currently planned to be managed by additional aviation support. This is provided by a dedicated search and rescue helicopter and the Western Australia Resources Aero Medical Evacuation Service (WARAME). This is well established practice for the North West Shelf.

Planning for the proposed Browse FLNG Development assumes Woodside will continue WARAME service and will be used to transfer injured personnel to Perth or Darwin hospital.

Q.4: Woodside provided a Z card displaying the design safety case overview for the proposed Browse FLNG development. As this was referred to during a public hearing, the Committee intends to place a copy of this on the web site with the hearing transcript. Please advise if Woodside has any objections to this and, if so, what the basis of those objections?

A.4: No objections.

BROWSE FLNG DEVELOPMENT INHERENTLY SAFER DESIGN

Image courtesy of Shell, FLNG partner

Inherently safer design (ISD) has been incorporated to effectively reduce risk; either consequence or likelihood with the focus on eliminating hazards.

To demonstrate this, five ISD Goals have been applied to the Browse FLNG Development.

This illustration highlights the significant ISD features incorporated into the Browse FLNG Development.

INHERENTLY SAFER DESIGN GOALS

PREVENTION BARRIERS

Goal 1 - Low Plant Occupancy
We strive to minimise manning and increase facility reliability.

Goal 2 - Minimise Facilities
We reduce unnecessary inventory and equipment – 'design to capacity'.

Goal 3 - Leak Minimisation
We eliminate and minimise leak sources.

MITIGATION BARRIERS

Goal 4 - Reduced Escalation Potential
We eliminate critical escalation through design and effective primary risk mitigation.

Goal 5 - Maximise Availability of Primary Muster Area
We design to enhance access to primary muster area and reduce potential MAE impact.

FLNG DESIGN SNAPSHOT

- Shell base case FLNG design has been adopted under Design One Build Many (D1BM) with focus on essential changes for Browse.
- Browse FLNG inherits health and safety in design maturity and lessons learnt through the Shell base case FLNG detailed design and construction experience.
- Substructure includes 8 LNG storage tanks, 6 condensate storage tanks and mono-ethylene glycol (MEG) storage tanks.
- The Browse FLNG facility is approximately 488 metres long, 74 metres wide and has a large freeboard of 20 metres.

SAFETY IN DESIGN - GENERAL

- Field layout optimised to allow simultaneous operations (including drilling).
- Materials selected to minimise corrosion (e.g. corrosion resistant alloys in subsea equipment).
- The facility has been designed for cyclone conditions (Category 5) and will remain on station.
- Human factors engineering applied early in design.

LAYOUT

- Higher risk process and storage areas are located furthest from the living quarters (LQ).
- Blast-rated bulkhead, utilities modules and a safety gap separate the LQ from the process modules.
- LQ on LNG carriers orientated in line with FLNG living quarters during offloading.
- 20 m safety gaps, open process and turret area layouts minimise explosion consequences and fire escalation.
- Flammable material storage areas separated from ignition sources.
- Lifting equipment enhances maintenance access.
- Handling routes avoid lifting over live process areas.
- Dual helidecks increase helicopter operations availability.

SUBSTRUCTURE

- Hazardous inventories are stored in the substructure at or near atmospheric pressure.
- Substructure design includes double skinned cargo tanks arranged in dual rows (enhanced vessel strength and stability).
- Submersible tank pumps eliminate the need for pump rooms.

ESCAPE, TR, EVACUATION AND RESCUE

- Five escape routes run along the full length of the facility.
- Temporary Refuge (TR) and Secondary Refuge (SR) designed to protect personnel for 60 minutes.
- Direct access to free fall lifeboats from TR.
- Continuous standby vessel coverage.

FIRE, EXPLOSION AND COLD SPILL PROTECTION

- Fire and gas detection, emergency shutdown and blowdown systems.
- Robust hull, mooring and topsides designed to withstand severe storm conditions, fires and explosions.
- Passive fire protection and cryogenic spill protection applied to limit consequence escalation and self-draining deck removes cryogenic spills overboard.

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BROWSE FLNG DEVELOPMENT
HEALTH AND SAFETY IN DESIGN

DESIGN SAFETY CASE OVERVIEW

The Browse FLNG Development Design Safety Case (DSC) supports the Joint Venture Participants' concept selection of floating liquefied natural gas (FLNG) to develop the Browse gas reserves located 425 km offshore north of Broome in northern Western Australia.

The DSC has been developed to demonstrate the inherently safer design features in the future FLNG facilities at Browse.

The aim of the Browse FLNG Development DSC is to demonstrate that:

- All identified hazards having the potential to cause multiple fatalities (Major Accident Events) have been understood and assessed.
- The risks to personnel have been eliminated, reduced or otherwise controlled to as low as reasonably practicable (ALARP).
- An effective safety management system is in place to effectively and consistently apply identified controls to manage the hazards and risks.

BROWSE FLNG DEVELOPMENT
CREATING A PROUD LEGACY

#102320 expo design May 2014

BROWSE FLNG DEVELOPMENT DESIGN SAFETY CASE

SAFETY CASE REQUIREMENT

Operators of offshore oil and gas facilities are required to prepare a safety case for assessment and approval by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA), in accordance with requirements detailed in the *Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations 2009 (OPGGS)*.

A key legislative requirement is demonstration of workforce engagement and understanding of the Browse FLNG Development health and safety in design aspects and the safety case.

WHY DO A DESIGN SAFETY CASE?

The development design phases offer the greatest opportunities to incorporate Inherently Safer Design features. The DSC is the vehicle Woodside uses to demonstrate that the health and safety risks are tolerable and as low a reasonably practicable (ALARP). This is communicated to the design team including representatives of the future workforce.

HOW CAN I CONTRIBUTE?

Everyone working on the Browse FLNG Development can contribute to the identification and management of hazards to minimise the risk to colleagues who will work and live on the Browse FLNG facilities.

This can be done by:

- Learning and complying with the standards and procedures that apply to health and safety and process safety.
- Challenging yourself and others by asking 'What can go wrong?', 'What is being done about it?', 'Is it safe enough?' and 'What else is being done to make things safer?'.
- Speaking up when you have concerns about any hazards or behaviours that could contribute to future risk on the Browse FLNG facilities.
- Participating in health and safety activities, e.g. Our Safety Culture, hazard identification workshops (HAZIDs), safety moments, design reviews.
- Keeping yourself aware of company and industry experiences and ensuring we apply learnings.

woodside WE KEEP EACH OTHER SAFE

BROWSE FLNG DEVELOPMENT MAJOR ACCIDENT EVENTS (MAE) SUMMARY

PREVENTATIVE BARRIERS HOW DO WE STOP THIS MAE FROM OCCURRING?	MAJOR ACCIDENT EVENTS	MITIGATIVE BARRIERS HOW CAN WE LESSEN THE CONSEQUENCES OF THIS MAE?
Material selection, coatings, pipeline design, cathodic protection, field layout, pressure relief valves and the safety management system (SMS).	 MAE-01 Process Hydrocarbons Loss of Containment – Subsea	Process monitoring, fire and gas (or visual) detection, well/reservoir isolation systems, emergency response, escape routes, refuges, evacuation and rescue provisions.
Riser design, material selection, coatings, pressure relief valves (MEG only) and the SMS.	 MAE-02 Process Hydrocarbons Loss of Containment – Riser	Process monitoring, fire and gas (or visual) detection, ESD and blowdown of topsides, subsea isolation, escape routes, refuges, evacuation and rescue provisions.
Piping and equipment design, material selection, coatings, corrosion monitoring, insulation, emergency shutdown (ESD) system, emergency release couplings, interlocks, equipment trips and the SMS.	 MAE-03 Process Hydrocarbons Loss of Containment – Topsides	Fire and gas detection, facility layout (safety gaps and drainage), ESD/ blowdown, control of ignition sources, passive/active fire protection, cold spill protection, emergency response, escape routes, refuges, evacuation and rescue provisions.
Piping and equipment design, material selection, inert gas system, valve management, tank layout, weathervaning design, load management and the SMS.	 MAE-04 Process Hydrocarbons Loss of Containment – Substructure	Double skinned compartmentalised hull, continuous void sampling, fire and gas detection, drainage systems, ESD and blowdown, control of ignition sources, passive/active fire protection, cold spill protection, emergency response, escape routes, refuges, evacuation and rescue provisions.
Equipment and piping design, material selection, coatings, pressure relief valves, ESD system, safe venting, secondary containment, control of ignition sources, bilge system and alarm, ballast and cargo system and the SMS.	 MAE-05 Non Process Loss of Containment	Substructure design, water tight doors, alarm system fire and gas detection/ alarm, ESD system, emergency response, passive and active fire protection, emergency response, escape routes, refuges, evacuation and rescue provisions.
Design safety factors, fail safe systems, equipment design and specifications, alarms and switches, testing, certification and the SMS.	 MAE-06 Loss of Control of Suspended Load	Dedicated laydown areas, exclusion areas, dropped object protection, barriers and signage, emergency response and escape routes.
Field layout, exclusion zones, weathervaning, thrusters to aid berthing, field support vessels (tugs), communication systems, navaids and the SMS.	 MAE-07 Loss of Marine Vessel Separation	Design for minor impacts, fenders, double skinned hull, emergency response, escape routes, refuges, evacuation and rescue provisions.
Material selection, equipment design, coatings, cathodic protection, weathervaning design and the SMS.	 MAE-08 Loss of Structural Integrity	Damaged stability design, emergency response, escape routes, refuges, evacuation and rescue provisions.
Material selection, equipment design, load management, monitoring, fenders, weathervaning, and the SMS.	 MAE-09 Loss of Stability / Position	Damaged stability design, emergency response, escape routes, refuges, evacuation and rescue provisions.
Helideck lighting, second helideck, equipment design, communications and the SMS.	 MAE-10 Loss of Controlled Flight	Restricted helideck access, helideck drains, fire detection, fire protection, locator beacons, communications, helicopter floatation, emergency response, escape routes, liferafts and rescue provisions.
Equipment design, communications, gas detection and the SMS.	 MAE-11 Occupational Hazards	Personal protective equipment, emergency response and escape routes.
Appropriate design and installation, electrical protection, certified equipment, housekeeping, dedicated chemical storage and the SMS.	 MAE-12 Accommodation Fire	Detection and alarms, fire fighting equipment, emergency response, escape routes, alternative muster locations, fire retardant furnishings.