INTERNAL USE ONLY

Notifiable incident

Incident ID	6119
Duty holder:	Shell Australia Pty Ltd
Facility/Activity:	Prelude FLNG
Facility type:	Floating liquefied natural gas facility

Incident details	
Division	Occupational Health and Safety
Notification type	Incident
Incident date	28/08/2019 12:00 PM (WST)
Notification date	28/08/2019 07:47 PM (WST)
NOPSEMA response date	28/08/2019 07:50 PM (WST)
Received by	[redacted]
Nearest state	WA
Initial category type *(based on notification)*	Dangerous Occurrence
Initial category *(based on notification)*	Other kind needing immediate investigation
3 Day report received	30/08/2019
Final report received	28/10/2019
All required data received	28/10/2019
Final category type *(based on final report)*	Dangerous Occurrence
Final category *(based on final report)*	Other kind needing immediate investigation
Brief description	OHS - OKNI - Hot Spots on Steam Lines
Location	
Subtype/s	Other
Summary *(at notification)*	Theromgraphics identified hot spots that registered temperatures in excess of the auto-ignition temperature of the HC fluids in the module. Hot spots were on steam lines in way of Joins/gaps in the insulation and un-insulated valve stems. An operational risk assessment has been conducted and additional controls identified have been implemented. Controls include situational awareness and Hazard Management through work SIMOPS and reviews. The duty inspector tried to return call twice but contact number rang out with no response.
Details *(from final report)*	Theromgraphics identified hot spots that registered temperatures in excess of the auto-ignition temperature of the HC fluids in the module. Hot spots were on steam lines in way of Joins/gaps in the insulation and un-insulated valve stems. An operational risk assessment has been conducted and additional controls identified have been implemented. Controls include situational awareness and Hazard Management through work SIMOPS and reviews. The duty inspector tried to return call twice but contact number rang out with no response. ** as supplied by duty holder ** 6. Brief description of incident - • Thermography was conducted on the steam system. In the course of the thermography, hot spots in excess of the auto ignition temperature of fluids in the module, have been detected in hazardous areas. • This is contrary to performance standard IC008, miscellaneous ignition sources, which indicates the surface temperature should remain below the lowest auto ignition temperature of the module. • The hot spots are on the high pressure steam lines, and correspond to locations where there are small gaps in insulation, uninsulated valve stems and uninsulated piping supports.

• The primary risk that has been identified is in case a leak starts from a liquid hydrocarbon system, it could be ignited by a hot spot.
• An operational risk assessment has been conducted identifying additional controls which are now in place. In particular additional situational awareness, hazard management through control of work and SIMOPS reviews. We have already eliminated several of the hot spot risks and completed a risk assessment.

7. Work or activity being undertaken at time of incident - Operations

8. What are the internal investigation arrangements? - Internal Investigation has commenced. NOPSEMA notified.

15. Action taken to make the work-site safe -
- Investigation commenced
- Operational risk assessment completed

21. Immediate action taken/intended, if any, to prevent recurrence of incident. -
Action - Operational risk assessment
Responsible party - Technical Safety Engineer
Completion date - Completed

Action - Identification of short term / immediate controls for implementation
Responsible party - OIM
Completion date - Completed

Action - Identification of medium and long term controls
Responsible party - Technical Safety Engineer
Completion date - 30 Sept 2019

22. What were the immediate causes of the incident? - Hot surfaces identified on steam system and equipment

32. Has the investigation been completed? - Yes
Root cause analysis -
Root cause 1 - Piping insulation and valve standards were not aligned with the IC008 performance standard
Full report -
Thermography of the hot piping was conducted as part of project assurance for Prelude. Hot spots (approx. 70) were found on high pressure steam lines, where the temperature was above the auto-ignition temperature (AIT) in the module. This temperature exceeded the IC008 performance standard (PS) criteria to keep the surface temperature below the AIT of the module in hazardous areas. The risk associated with these hot surfaces is that a leak from the process, particularly a liquid hydrocarbon leak, could be ignited by the high temperature.

It has been noted that the hot spots correspond to small gaps in insulation, uninsulated valve stems and uninsulated piping supports. While some of these hot spots are associated with incomplete insulation work, the majority are locations where insulation was not specified on the drawings as having been required. An example is for valve stems that are uninsulated. These are specified to be uninsulated to ensure the valve packing doesn’t overheat (this could potentially lead to a leak).

Further analysis has indicated that the insulation and valve standards are not aligned with the description in IC008 PS, in that the standards specify that some components should not be insulated, however the PS implies total coverage is required.

It was also identified that the performance standard for IC008 does not directly incorporate the results of a technical note that found that topsides temperatures below 450 degC will not ignite a gas cloud.

In order to manage the hot spots on a short to medium term basis, an operational risk assessment identified the controls required to ensure the facility was safe to continue operation, and these controls have be implemented.

Longer term, the hot spots will be managed by either insulating them, or where insulation is not feasible, a barrier (e.g. flange guard) will be used to avoid ignition of any liquid flange leak that could impinge on the hot surface. Initial evaluation of the options to manage each hot spot has been conducted. Evaluation of the options is currently underway.

	33. Actions to prevent recurrence of same or similar incident - Action - Permanent insulation or barriers to be installed to control hot spots Responsible party - Engineering Manager Completion date - 31/12/2020 Action - Update IC008 Performance Standard to more clearly reflect implemented design Responsible party - PS owner (Electrical TA2) Completion date - 31/12/2019 Action - Update Safety Case to more clearly reflect implemented design Responsible party - Technical Safety Completion date - Completed/submitted
Immediate cause/s	TBC
Root cause/s	
Root cause description	Root cause 1 - Piping insulation and valve standards were not aligned with the IC008 performance standard

Duty inspector recommendation	
Date	29/08/2019
Duty inspector	[redacted]
Recommendation	Do not conduct Major Investigation
Reasoning	Does not meet MI threshold based on information received
Supporting considerations	

Major investigation decision	
Date	29/08/2019
Decision	Do not conduct Major Investigation
Reasoning	Does not meet MI threshold based on information received
Supporting considerations	

Non-major investigation review and recommendation	
Date	29/08/2019
Inspector	[redacted]
Risk gap	Substantial
Type of standard	Established
Initial strategy	IInvestigate within 45 days

Recommended follow up strategy	
Recommended strategy	Investigate ASAP
Supporting considerations	Initial strategy is to investigate within 45 days. The operator has indicated continued operations with interim measures. However the interim measures indicated are situational awareness and SIMOPS. No other measures stated to reduce ignition risk which is present due to hot surfaces in excess of AITs. Recommend ASAP investigation to determine if there is any immediate threat.

Non-major investigation decision	
Date	29/08/2019
RoN	[redacted]
RoN review result	Agree with recommendation
Strategy decision	Investigate ASAP
Supporting considerations	

Associated inspection	
Inspection ID	2059