BY PEOPLE FOR PEOPLE

30th July 2014

Ian Blayney MLA
Chairman
Economics and Industry Standing Committee
Parliament of Western Australia
Perth, Western Australia, 6000

Inquiry into Safety-related matters relating to FLNG projects in Australian waters off the Western Australian coast

Dear Chairman,

Thank you for your invitation to make a submission to your inquiry into safety-related matters relating to Floating Liquefied Natural Gas ("FLNG") projects in Australian waters off the Western Australian coast.

GDF SUEZ Bonaparte, as Operator of, and a joint venture partner in, the proposed Bonaparte LNG project, made a submission on 16 October 2013 to the Committee Inquiry into the economic impact of FLNG on Western Australia.

Background on the company can be found in that submission. At that time, and when GDF SUEZ Bonaparte representatives later appeared before the Committee on 21 October 2013, Bonaparte LNG was aiming to develop three natural gas fields – Petrel, Tern and Frigate – in the Joseph Bonaparte Gulf, 250 kilometres west of Darwin – using FLNG technology.

On 19 June 2014, GDF SUEZ Bonaparte and its partner in the project, Santos Ltd, announced that although FLNG was found to be technically robust, the technology did not meet the companies' commercial requirements, and other development options would be pursued.

Despite this decision, GDF SUEZ Bonaparte believes it may be of assistance to the Inquiry to provide to the Committee the position the company reached on the issue of FLNG safety management , and to also describe the systems that GDF SUEZ Bonaparte has in place to manage the safety-related aspects of any development project.

With respect to the terms of reference of your inquiry, this submission is intended to provide information regarding GDF SUEZ Bonaparte's approach to identifying and implementing measures to ensure the safety of workers on an FLNG facility, particularly in relation to extreme weather events and emergency evacuation preparedness. The industry representative body, the Australian Petroleum Production and Exploration Association (APPEA), is addressing the other aspects of the terms of reference and will outline the current industry joint initiatives which are in place and with which GDF SUEZ Bonaparte would actively engage, whichever development concept is ultimately selected.

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Given the development stage that Bonaparte LNG had reached prior to the decision to review other options, this submission will focus on the design of the FLNG facility.

Regulatory Context

Health and safety legislation in Australia has been transitioning from "prescriptive" or "standards-based" to "objective-based" regulation, as is evident in the Model Work Health and Safety Act, 2011 [1]. This approach is not unique to the offshore oil and gas industry, although it has been extensively applied in the offshore oil and gas industry since the Cullen Enquiry into the Piper Alpha disaster in 1987 [4]. As a result of this experience, the objective based approach is well understood by the proponents of projects and the operational workforce.

The proposed development of the Petrel, Tern and Frigate gas fields by means of an FLNG facility in Commonwealth waters was subject to the Commonwealth legislative regime of the Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act [2].

The Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations [3] define the requirements for the management of health and safety of persons at or near an FLNG facility.

The OPGGS Safety Regulations [3] are objective-based and the onus, and hence duty of care, resides with the Operator (GDF SUEZ Bonaparte, in the case of Bonaparte LNG) to ensure that adequate measures are taken to protect the health and safety of persons at or near the Facility. This regulatory context differs from prescriptive or "standards-based" regulation, where the onus rests heavily on the Regulator to ensure that suitable standards are established and that "operators" are in compliance with these standards [5].

The shortcomings of prescriptive-based regulation as applied to major hazard industries were identified in the Cullen Inquiry in 1990 [4] and, prior to that, in the Robens Report in 1972 [5]. These shortcomings remain equally valid today and are particularly relevant in the context of this inquiry into safety matters relating to a new and evolving technology. In particular, the Cullen Inquiry [4] highlighted that the prescriptive regime in place prior to the Piper Alpha incident had resulted in industry and the regulators failing to recognise, understand and control the high consequence, low likelihood hazards which can be unique to every different application.

Prescriptive regulations and standards tend to be a distillation of past experience and are based upon the best engineering practices at the time of establishing the regulation or standard. The evolution of best engineering practices, especially with new or emerging technology, such as FLNG, occurs at a pace that prescriptive standards can quickly become deficient. This approach, therefore, can "prove at best to be inappropriate and at worst to create unnecessary dangers in industries that are technically innovative. It is the innovator that is best placed to ensure the safety of their design, not the regulator. Clearly prescriptive safety regulations are unable to cope with a diversity of design solutions." [5]. This view was reiterated in the Report of the Montara Commission Inquiry [17] which stated that the Inquiry was of the view that the move to objective-based regulation had been, in general, a desirable development, and the Inquiry did not support a return to a prescriptive approach.

It is important to note that the objective-based regulatory framework in place under the OPGGS Act is not 'self-regulation' as industry is obliged to demonstrate to the Regulator, through a "safety case" submitted for review and acceptance, that they have identified, understood and managed risks appropriately [10].

In general terms "a Safety Case is a structured argument, supported by a body of evidence, that provides a compelling, comprehensible and valid case that a system is safe for a given application in a given environment." [18].

More specifically, in the context of the OPGGS Safety Regulations, NOPSEMA states [19] that the safety case must include a description of the facility, a detailed description of the formal safety assessment and a detailed description of the safety management system for a facility.

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"Overall, a well-structured, coherent safety case will facilitate the operator's ability to demonstrate to others that they have a clear understanding of the factors that influence risk and the controls that are critical to managing risk on their facility." [19].

GDF SUEZ Bonaparte has established robust procedures and systems, as summarised in the following sections, to ensure that the safety case process is applied to any selected development concept, and is implemented as required by the OPGGS Safety Regulations [3], and in accordance with the intent established by Lord Cullen [1].

Workforce Involvement

GDF SUEZ Bonaparte recognises that the operations and maintenance workforce (the workforce) plays a critical role in the risk management and safety case process throughout the lifecycle of a development. The workforce brings a diverse range of experiences and hands on knowledge that is instrumental in effectively identifying hazards, understanding risk and addressing the range of potential operational demands on the Facility. GDF SUEZ Bonaparte established an integrated Project team, including Operations and Maintenance personnel, who were involved from the early design studies in the pre-Front End Engineering and Design (pre-FEED) phase. The plan was to increase workforce involvement as the project progressed into FEED. The workforce was involved in the review of the design, in the formal hazard identification processes, formal design reviews and human factors reviews. This approach ensures the full integration and application of workforce experience throughout the development lifecycle.

Whilst providing these significant benefits during the design development, this integrated team approach also assists in ensuring that the workforce is fully engaged in the safety case process, that its members have a good understanding of the hazards associated with the operation of the Facility and that they understand the nature and criticality of the measures in place to protect their health and safety. This approach is equally valid for any development concept, whether FLNG or any other type of facility.

Management of hazards to ensure the safety of workers

The risk management process established by GDF SUEZ Bonaparte to underpin the safety case development is consistent for all activities, development types and lifecycle phases, and is focussed on ensuring that the risk to the safety of workers is reduced to as low as reasonably practicable. This approach allows, and ensures, that the safety of workers is considered in the manner that is most appropriate for the context, whether that is undertaking routine operations on a conventional facility (e.g. fixed platform, Floating Production Storage Offtake, etc.), a semi-submersible drilling rig, or in the operation of new or emergent technology such as an FLNG facility.

The GDF SUEZ Bonaparte risk management process is based upon the principles described in ISO 31000 'Risk Management' [12], and includes the key steps of establishing the context for risk management as well as identifying hazards, analysing, evaluating, treating, monitoring and communicating risk. The application of the key steps is summarised below.

Identify hazards

The process of hazards identification is ongoing throughout the lifecycle of a development, and commenced for Bonaparte LNG during the early concept development phase. The identification of hazards is initially based upon the results of several formal workshops which involved a range of personnel including managers, technical experts, operations and maintenance personnel. The inclusion of such a broad range of participants was in order to ensure that the greatest possible range of potential hazards were identified at the earliest stages of concept definition. The methodology for hazard identification has become well established in the industry and is conducted in accordance with the guidelines on tools and techniques for hazard identification published by the International Standards Organisation, ISO17776 [15].

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Analyse and evaluate risks

These hazards were then subject to analysis in order to establish a clear understanding of the range of potential consequences, initiating factors or causes. The outcomes of these analyses have formed the basis for identifying suitable control measures to manage the associated risks.

Treatment of risk

Risk treatment is an iterative process applied to each identified hazard in order to ensure sufficient technical and other control measures are in place. In summary, it involves:

- Identifying the suitable risk treatments i.e. technical and other control measures;
- assessing the effectiveness of those control measures;
- deciding whether residual risk levels are tolerable;
- if not tolerable, identifying an additional or alternative control measure; and
- assessing the effectiveness of that measure.

When formulating risk treatments for each item, the following 'hierarchy of control' is applied:

- Elimination and minimisation of hazards by design
- Prevention – Reduction of likelihood
- Reduction – Limitation of scale, intensity and duration
- Mitigation – Protection from effects

The hierarchy of controls can be represented in a bow tie diagram, where the hierarchy is shown from left to right, as below.

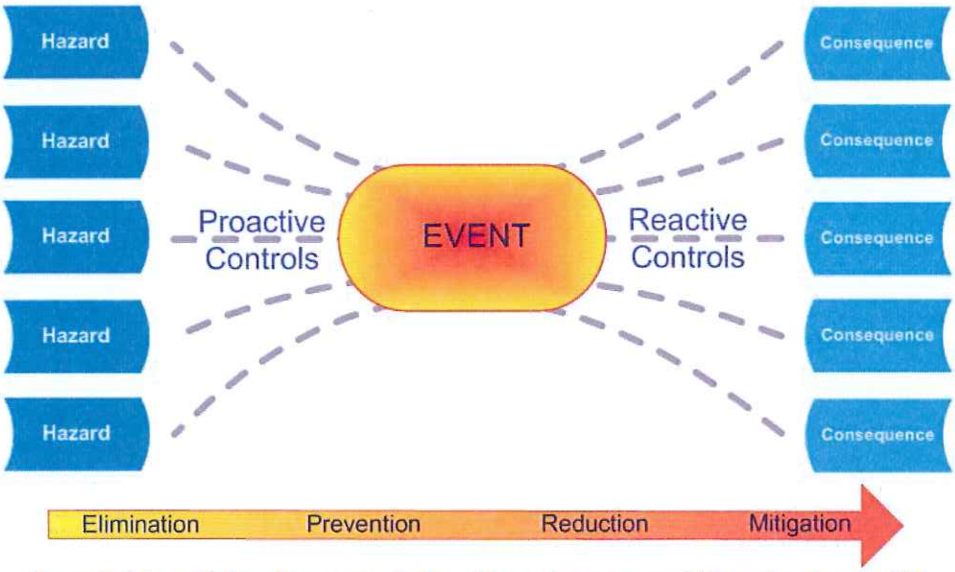

Figure 1: Schematic bow tie representation of hazard management hierarchy of control [9]

This iterative process of identifying and implementing technical and other control measures is continued until such time that the residual risk is reduced to a level where any further risk reduction options are not reasonably practicable. At this point, the risk has been reduced to a level that is as low as reasonably practicable, ALARP [8].

Application of codes and standards

The process of establishing the range of technical and other control measures that are necessary to manage the risk associated with a facility includes the identification of the most suitable codes and standards for the facility and the components, equipment and activities required for its safe operation. The OPGGS Safety Regulations [3] require that the safety case must specify all of the standards that have been applied, or will be applied, in relation to the facility or plant used on or in connection with the facility.

"Operators have the responsibility to consider the available standards, specify the correct one, enforce compliance, and use the system or equipment correctly." [8]

The result is that the facility design complies with both the most appropriate codes and standards currently available (as, for example, may have been required under a prescriptive regulatory regime), whilst also retaining the additional onus on the Operator to identify and manage the risks specific to that application.

GDF SUEZ Bonaparte conducted an extensive exercise of identifying and reviewing suitable codes and standards for the various aspects of the facility. This was supplemented by independent third- party reviews of the proposed codes and standards by external engineering consultancies, and by the Classification Society. This resulted in a comprehensive list of the most appropriate codes and standards for all aspects of the FLNG facility. This list was documented in the Basis of Design (BOD), which would have formed the basis for proceeding into FEED.

Using Bonaparte LNG as an example of the application of this process, GDF SUEZ Bonaparte identified that the Classification Societies had developed suitable design codes, including Rules for Classification of floating LNG (production, storage and loading) Units, and design standards for mooring systems. GDF SUEZ Bonaparte stipulated in the BOD that these Rules and Standards would be implemented for Bonaparte LNG.

The safety case process also extends beyond the "hardware" or equipment and includes the procedural aspects of managing risk in identifying safety critical tasks, activities and competency requirements, referred to as "other" control measures [9]. The safety case process may determine, for example, that a competency standard may be required for personnel involved in managing a particular hazard such as process operators, or marine watch-keeping. The process would then identify the industry best practices for managing such competencies. In some cases, although not stipulated or mandated in legislation, the most appropriate, or industry best practice approach, may be a maritime standard or a standard developed for an onshore process industry, or may need to include specific requirements in addition to these standards to account for the particular hazards identified for the facility. As Bonaparte LNG did not progress into the FEED phase, this level of detail was not finalised.

In addition, the design, construction and installation of the facility are required, under the OPGGS Safety Regulations [3], to be subject to 'validation' by an independent competent authority. In the case of Bonaparte LNG, the validation would have been undertaken by one of the recognised Classification Societies. The validation process is described in more detail in the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) guideline on Validation [16] and is summarised in APPEA's submission to this inquiry.

Emergency and evacuation preparedness

The safety case process requires that all of the hazards associated with the proposed development activity are addressed, including those hazards arising during an emergency scenario. There are specific requirements in the OPGGS Safety Regulations [3] regarding the assessment of preparedness for, and management of, emergencies. GDF SUEZ Bonaparte had identified the requirements for emergency response and the evacuation of personnel for the range of potential emergency scenarios, from small scale medical events, through to large scale evacuations due to major accident events, and had established preliminary design philosophies to address these requirements. This included the application of industry best practices, and codes and standards such as the application of Classification Society rules and International Maritime Organization (IMO) Conventions [13] for the design of escape and evacuation facilities. The management of personnel following evacuation from the facility and their recovery, and the subsequent medical response and treatment, would have been in a manner consistent with the arrangements currently in place for exploration and production activities in the Commonwealth waters of the north-west and north of Australia. These arrangements are largely consistent regardless of the selected development concept; this issue is not peculiar to an FLNG facility. Industry joint initiatives covering emergency management are described in more detail in the submission from APPEA.

Outcomes of preliminary risk management studies

The studies that had been carried out by GDF SUEZ Bonaparte in relation to the potential hazards to which workers on an FLNG facility may have been exposed had shown that whilst these were similar to other conventional facilities (e.g. FPSO, fixed oil or gas platform), there were some unique issues that needed to be addressed in relation to FLNG. GDF SUEZ Bonaparte had identified the preliminary technical and other control measures for each of these hazards. However, as the Project did not enter the FEED phase, these measures were still subject to further review and design progress. A range of key issues were highlighted for detailed study during the subsequent project phases (FEED and detailed design). These included hazards relating to the cryogenic process plant, the management of extreme weather events, the management of loss of containment of hydrocarbons and the impact of the layout of the facility.

This process of identifying key issues for further assessment is typical for a project of this nature, whether for a new or conventional technology. The requirement to undertake detailed analyses of identified major accident hazards is mandated by the OPGGS Safety Regulations [3] and underpins the decision making process and design evolution as the development progresses through its lifecycle stages.

One such issue which underwent detailed analysis related to the risk associated with extreme weather events. This was subject to significant analysis during the early stages of the concept development and was identified as one of the key design drivers for the FLNG facility. The industry has accumulated many years of experience regarding the effective management of risks associated with cyclonic and extreme weather events. This experience pertains to all types of facilities including fixed platforms and permanently-moored floating facilities in the Timor region and around the world. This analysis of these historical data provides a sound basis for risk assessment. An extensive program of capturing and analysing metocean data was underway at the Bonaparte LNG project site to assist GDF SUEZ Bonaparte identify and quantify the parameters of weather events. These data were used, in conjunction with the recognised design codes established by the Classification Societies, to undertake analyses of a range of different mooring system options. At the time of the project's hiatus, a definitive decision had not been taken on the mooring system design. However, the preliminary analysis had shown that a mooring system with sufficient redundancy to account for concurrent failure of a mooring line, coincident with the extreme weather event, would have been achievable. The design of the hull and associated facilities was also underway and subject to similar analyses in accordance with the relevant Rules for Classification. The parameters for managing the serviceability and survivability of the FLNG facility had been established to account for weather events of extreme severity, with the details of the design to have been progressed during FEED.

GDF SUEZ Bonaparte had identified the range of hazards (including extreme weather events), and was conducting an ongoing process of analysing, evaluating and developing suitable controls to treat the risk associated with these hazards. The satisfactory conclusions of the preliminary studies and assessments were supported by the Classification Society's independent analysis that the facility design would have complied with the requirements of their Rules for Classification.

Conclusion

GDF SUEZ Bonaparte is of the view that the objective-based regulation in force through the OPGGS Act provides the most appropriate and effective framework for managing the health and safety of workers on offshore

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facilities, particularly in relation to the range of diverse development concepts and evolving technologies in the industry, such as FLNG. This view is supported by the findings of previous industry inquiries in other regions including the Cullen Enquiry [4], Robens Report [5], and more recently and specific to the Australian context, the Montara Inquiry [17].

Further, GDF SUEZ Bonaparte is of the view that the safety case processes that have been established to support the development of offshore fields in Commonwealth waters, in conjunction with the integrated approach to workforce involvement, will result in the development and operation of an FLNG facility, or any other facility type, with suitable measures in place to protect the health and safety of the workers.

Yours Sincerely,

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References

[1] Model Work Health and Safety Act, 2011
[2] Offshore Petroleum and Greenhouse Gas Storage (OPGGS) Act, 2006
[3] Offshore Petroleum and Greenhouse Gas Storage (Safety) Regulations, 2009
[4] The Hon. Lord Cullen, The Public Inquiry into the Piper Alpha Disaster, Vols. 1 and 2 (Report to Parliament by the Secretary of State for Energy by Command of Her Majesty, November 1990).
[5] Lord Robens. Safety and Health at Work. Report of the Committee 1970 - 72. 1972
[6] The Practicalities of Goal-Based Safety Regulation, J Penny, A Eaton CAA (SRG); PG Bishop, RE Bloomfield (Adelard)
[7] Charles Haddon-Cave, The Nimrod Review, HC 1025, London: The Stationery Office Limited, Oct. 28, 2009.
[8] NOPSEMA Guidance Note, ALARP, N-04300-GN0166
[9] NOPSEMA Guidance Note, Control Measures and Performance Standards, N04300-GN0271
[10] NOPSEMA Newsletter "The Regulator" Issue 6: December 2012
[11] Inquiry into the Economic Implications of Floating LNG Operations
[12] International Standards Organisation ISO 31000:2009 'Risk Management'
[13] International Convention for the Safety of Life at Sea (SOLAS), International Maritime Organization
[14] GDF Suez Bonaparte Pty Ltd Submission to the Inquiry into the Economic Implications of Floating LNG Operations, 16th October 2013
[15] ISO 17776:2000 Petroleum and natural gas industries -- Offshore production installations -- Guidelines on tools and techniques for hazard identification and risk assessment
[16] NOPSEMA Guideline, Validation, N-04200-GL0525
[17] Report of the Montara Commission of Inquiry, June 2010
[18] UK Defence Standard 00-56 Issue 4 http://www.dstan.mod.uk/standards/defstans/00/056/02000400.pdf
[19] NOPSEMA Guidance Note "The Safety Case in Context: An Overview of the Safety Case Regime" N04300-GN0060 Revision 6, June 2013

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