

## **The importance of well barriers – an Australian perspective**

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Australia has recently become one of the world’s largest exporters of liquefied natural gas (LNG), following the start-up of a number of major offshore gas projects. NOPSEMA, the independent regulator for offshore petroleum activities in Australian Commonwealth waters, highlights ‘preventing and managing loss of well control’ as a key element in supporting a safe, environmentally responsible and nationally valuable offshore industry.

In parallel with the growth of gas development, Australian offshore well regulations were updated in 2016 to include more detailed reporting of well incidents where well integrity had been compromised. At that time, the extent and value of this information in identifying and managing well risk could only be assumed. The potential of a significant contribution of this information to safer wells – and reductions of safety and environmental risk – evolved within the first two years.

In early 2018 NOPSEMA commenced a pilot study with the aim of identifying potential patterns and opportunities in this data that could assist with the management of well integrity risks and a longer term view of being used to prevent well control events. An aspirational goal was to contribute to the safety of well integrity in a global context.

The preliminary study was partly inspired by the 2006 study by Petroleum Safety Authority (PSA) Norway (SPE 112535, Viknes and Aadnoy, 2010).

The work developed through 2018, with a focus on the barrier status of production wells including non-operational and suspended wells. This work covered more than 500 wells out of a total inventory of around 900 wells in the Australian offshore regulatory regime. Whilst not exhaustive and not quite at the "80/20" level, it was considered that 500 wells could be representative of the total wells, and that analysis of the remaining wells could follow. In both the NOPSEMA and PSA studies, tubing leaks were identified as the most common well barrier failure. In the NOPSEMA study, the other most common well integrity issues were related to subsurface safety valves, casing and Christmas tree equipment.

It became clear from the progressing study that the data should be shared with industry at an early stage such that the benefits from this work could be quickly accessed and applied. An industry/NOPSEMA workshop was seen as the best approach to engaging a representative cross-section of industry, to show some examples of industry practice, and to encourage discussion with a view to improvements in well integrity management.

In November 2018, NOPSEMA convened a workshop in conjunction with the industry peak body, the Australian Petroleum Production & Exploration Association (APPEA) to share the findings from the well barrier study and initiate proactive discussions on well integrity management. The workshop was attended by 50 industry specialists representing Australian and international oil and gas companies, with three global players presenting an overview of their world-wide well integrity management systems. The workshop highlighted the importance of having robust risk assessment processes in place to manage well integrity problems. An example of a good approach is a well failure model that identifies potential well

failure modes with pre-determined action plans and response periods (as described in ISO 16530).

Workshop participants identified three key areas showing promise for potential improvement in well integrity management. Within these NOPSEMA has identified actions it intends to progress:

- 1) **Increased sharing of lessons learned and near misses between organisations.** This helps industry make informed decisions and more consistent judgements of what is an acceptable level of risk. For additional knowledge-sharing, NOPSEMA is now planning another industry workshop focussing on prevention of well control events during drilling.
- 2) **More consistent terminology for describing wells and well integrity.** The need for standardised definitions for well status (such as shut-in, plugged, suspended, temporarily abandoned, abandoned) was noted in an earlier IRF article by [NOPSEMA \(June 2017\)](#), and an article on the topic can be found in the first 2019 issue of NOPSEMA's online quarterly magazine '*The Regulator*' ([nopsema.gov.au/resources/publications/](http://nopsema.gov.au/resources/publications/)). To address this need, NOPSEMA intends to publish new guidance on this topic, based on existing international guidance and standards, such as the UK Oil and Gas Authority's *Guidance for applications for suspension of inactive wells*.
- 3) **Common reporting categories for wells, to improve industry's ability to measure, monitor and demonstrate performance.** The simple colour-coded well integrity classification system in 117-Norwegian Oil and Gas Recommended Guidelines for Well Integrity is a simple method of communicating well integrity status. NOPSEMA uses the classification charts in 135-Norwegian Oil and Gas Recommended Guidelines for classification and categorisation of well control incidents and well integrity incidents, and is in the process of updating its guidance on this topic. A recent additional resource for process safety reporting is IOGP Report 456 *Process Safety – Recommended Practice on Key Performance Indicators* and the accompanying *Safety Data Reporting User Guide*, which includes a classification system for well control incidents during drilling and completions: a four-level system that includes leading and lagging performance indicators.

NOPSEMA will continue to support measures towards continuous improvement in well integrity management, in collaboration with Australian and international peak industry bodies and promote the use of international well integrity guidance and standards as a benchmark for good oilfield practice.

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