

## **IPTC-12461-PP**

# **Reservoir Definition at the Jansz/lo Gas Field, NW Shelf, Australia: A Case Study of an Integrated Project from Exploration to Development**

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This paper was prepared for presentation at the International Petroleum Technology Conference held in Kuala Lumpur, Malaysia, 3–5 December 2008.

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### **Abstract**

The recent discovery of the giant Jansz/lo Gas Field in the Carnarvon Basin, which is considered to be mature from an exploration perspective, has challenged explorers to reconsider exploration strategies in mature basins. The field was discovered in 2000 by the Jansz-1 well and lies 250 km offshore from the north-west coast of Australia, in water depths ranging from 1100 to 1400 m. Jansz/lo is a structural/stratigraphic trap with the gas-bearing reservoir in an Upper Jurassic, mud-rich sandstone, up to 65 m thick, deposited in a shallow-marine depositional setting.

Most shallow-marine hydrocarbon reservoirs produce from the upper- and lower-shoreface depositional facies. However, in Jansz/lo the highest quality reservoir is mainly in distal lower-shoreface to offshore depositional facies. Mud-rich offshore facies are generally considered to be non-prospective by explorers but in the right geological setting at a shallow burial depth, can be highly prospective for gas. At Jansz/lo, reservoir quality is lithofacies-dependent and controlled by a proximal or distal location within the depositional environment, with the highest permeability (greater than 100 md) in proximal sandstones with lowest clay content (less than 20%).

Jansz/lo gas is a key component of the Greater Gorgon deepwater gas assets, and is a focus for development activity to meet an expanding global liquefied natural gas (LNG) market. The reservoir description for Jansz/lo is a key subsurface input to field development planning, requiring the integration of seismic and well data collected during the exploration and appraisal program conducted from 2000 to 2006. The scope of the study included the structural framework, field extent, reservoir architecture, depositional environment, reservoir properties, fluid composition, hydrocarbon contacts and uncertainty analysis.

Geological models were constructed to capture the range of uncertainty in structural framework, reservoir properties and original gas-in-place (OGIP) for the Upper Jurassic reservoir. The model-based uncertainty analysis indicates the OGIP range for Jansz/lo has a low-side of 320 Gm<sup>3</sup> and a high-side of 950 Gm<sup>3</sup> (11 Tcf to 33 Tcf), with a p50 value of 630 Gm<sup>3</sup> (22 Tcf).

The geological setting of the Jansz/lo Gas Field posed a number of technical challenges, including depth conversion, mapping depositional facies and reservoir extent, thickness of seismically tuned reservoir, and prediction of reservoir properties away from well control. The challenges were solved by the subsurface team using a fully integrated multi-disciplinary approach, employing a wide range of geological and geophysical concepts and techniques to characterize the reservoir.

### **Introduction**

The Jansz/lo Gas Field, discovered in 2000 by the Jansz-1 well, lies in the Carnarvon Basin 250 km offshore from the north-west coast of Australia, in water depths ranging from 1100 to 1400 m. The recent discovery of this giant gas field in a basin considered to be mature from an exploration perspective, has challenged explorers to reconsider exploration strategies in mature basins.

Jansz/lo gas is a key component of the Greater Gorgon deepwater gas assets, and a focus for development activity to meet an expanding global LNG market (**Fig. 1**). The field lies within the WA-18-R, WA-25-R and WA-26-R retention leases. The joint