Papua New Guinea – exploration trends, discoveries and production

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Over the last few years, commercial, geological and technological factors have coalesced to refocus exploration and production in Papua New Guinea (PNG). Foremost of these has been the signing in May 2008 of the gas agreement between the state of PNG and developers, enabling the decision to move immediately into Front End Engineering and Design (FEED) for the PNG LNG Project. This stroke of the pen has invigorated exploration for gas, which had previously been relatively uneconomic, and has opened new and deeper play fairways. Hitherto, exploration has been focussed on oil trapped within the frontal structures of the Papuan Fold Belt, with considerable success. Since 1986, over 500 MMstb of recoverable oil have been discovered in the Kutubu, Moran, Agogo, SE Mananda, Usano, Gobe and SE Gobe structures. This phase of exploration involved drilling most of the obvious surface anticlines. Whilst we have high hopes for the as yet undrilled Wasuma and Tami anticlines, we are now investigating new play types. Advances in technology make this possible, particularly seismic processing, 87/86Sr isotope mapping, 3D earthquake seismic modelling, high resolution aeromagnetic data modelling and acquisition of three component seismic data. These technologies enable us to image much deeper in the fold belt and map folds and thrusts in basement.

So, what are the new play fairways? Exploring for gas allows us to go below the traditional depth limit of ~3 km and look for large basement-cored anticlines in sub-thrust plays at depths of up to 5 km. In addition to these deeper conventional structures, we have recently had success in our first true sub-thrust play where indications of oil demonstrates hydrocarbon charge and the presence of an effective trap in this underexplored high-potential play type. Exploring for gas also opens up the distal part of the fold belt where reservoirs are thought to be poorer but, particularly where fractured, may be perfect for gas. Offshore, gas has already been discovered in Neogene reefs, but there is also potential for clastic basin-floor fan reservoir targets within both low-relief drape and high-relief offshore fold-belt structures.

Exploration in fold belts is notoriously difficult and expensive, especially when they are mountainous, covered in jungle and with limited access. Typical wells cost US$30–80 MM. This cost and the far greater funds required for the PNG LNG Project make it imperative to have successful and efficient oil production from existing fields and nearby step-outs. Oil Search took over as operator of the oil fields in 2002 and since this time a new trapping model has been developed showing that the PNG oilfields are dominated by compartmentalisation rather than hydrodynamics. To date, the new model has been very successful, extending the life of the Kutubu field to 2025+ rather than the previously predicted shutdown in 2007-8. However, the production team now faces the new challenge of planning the transition to production from the gas-cap of the fields whilst maximising the total recoverable oil.

The planned transition from oil to gas production is resulting in major changes in exploration trends and will have an increasing impact in future. The long term outcome is likely to be excellent for the people of PNG and the companies involved.

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