



Joint PESA-ASEG Luncheon



Megan Smith

**Quantitative 4D interpretation
Relating the seismic to
production changes at Enfield,
North West Shelf, Australia**

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Tuesday 26th October 2010 at 12.00pm

**Glenroy Room, Mercure Grosvenor Hotel
125 North Terrace, Adelaide**

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Registrations close 5.00pm Friday 22nd October 2010

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Megan Smith



Abstract

The Enfield oil field, on the Australia's Greater North-West Shelf, started production in July 2006, and has already seen significant benefit from 4D seismic monitoring. The technique is particularly applicable in Enfield due to faulting and baffles within the reservoir, the need for multiple water injection wells, and the presence of a gas cap. Full-field monitor surveys in February 2007 and December 2008 have made major contributions to reservoir management and identification of infill drilling opportunities.

Production data together with 4D seismic attributes has been used to calibrate the initial rock physics model that relates rock properties to production effects. It was found that the initial model under-predicted the seismic response to reservoir pressure changes in the field. The updated rock physics model has been used in an extensive modelling exercise to determine the best seismic attribute to quantify changes in reservoir pressure and saturation. Results show that 4D AvO attributes are crucial in discriminating areas of increased reservoir pressure from free and depletion gas effects. The most accurate method is utilising seismic inversion attributes, followed by AvO intercept and gradient, with the least quantitative being seismic amplitude from partial stacks.

During the 2009 development drilling in the field's Sliver Block, 4D not only supported the business case for a new production and water injection well, but also provided important information to enhance safe and efficient drilling. A clear 4D AVO signal on the early monitor showed the drilling target area to be pressured up by a distant injector, contrary to pre-4D expectations. The later monitor confirmed this, and also showed the oil target intact – with no significant water sweep. Using 4D, significant overpressure in the target was predicted. Accordingly, casing schemes for the wells were redesigned to enable safe reservoir entry; the distant water injector was shut in prior to drilling; and appropriate heavy brine was ordered for completion operations. Actual pressures fell within the predicted range, and a safe and successful drilling campaign was achieved.

Biography

Megan Smith is a Senior Reservoir Geophysicist at Woodside Energy Ltd. Megan specialises in quantitative seismic interpretation including 4D seismic, rock physics, AVO studies, seismic inversions, reservoir modelling and amplitude interpretation. In particular, she has managed 4D seismic interpretation projects and is the main focal point for 4D studies at Woodside. Megan currently has 14 years experience in the oil and gas industry and has also worked for Shell in the Netherlands, Santos and Exxon-Mobil.