Relinquishment Report for Licence Number P1435, Block 30/25a
March 2009

Endeavour Energy UK Ltd
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1.0 Header

Licence Number: P.1435
Licence Round: 24
Licence Type: Traditional
Block Number: 30/25a
Operator: Endeavour Energy (UK) Ltd. 100%

Work Programme Summary:

Part I Firm Commitment:
- Re-process and merge 420 km$^2$ to pre-stack time migration
- Carry out rock physics AVO analysis

Part II Drill or drop commitment – either:
- Drill one well 30m into the Rotliegendes (c. 4100m), or
- Elect to allow the licence to automatically cease

2.0 Synopsis

This report marks the end of first part of the four year term of this 24th Round Traditional licence and the decision to allow the licence to lapse. The licence consists of single block 30/25a awarded 100% to Endeavour Energy (UK) Ltd. The licence lies in the southernmost part of the Central Graben. The Ardmore, Dalmore and Innes Fields to the southwest of the block were abandoned in 2007 leaving Block 30/25a stranded in terms of infrastructure.
3.0 Exploration Activities

The work programme has been an integral part of Endeavour’s exploration of the south western Central Graben and has formed part of a regional study in co-operation with our Norwegian office. The 30/25a work programme has focused on integrating:
- the re-processing and interpreting of seismic data
- integration of offset well results (e.g. Block 31/26 and 30/23-4)
- integration of a regional Ichron Jurassic and Rotliegendes reservoir study
- IKON rock physics (to determine AVO responses for lithology and hydrocarbon fill)
- Internal basin modelling

Approximately 500 km$^2$ of data was used with 250km$^2$ output of PSDM and PSTM to cover 30/25a (see Figure 2 below).

Figure 2 Area of re-processed data shown in red with block outline in blue
Regional horizons interpreted on the re-processed 3D seismic data (Figure 3) include:

- Top Carboniferous
- Rotliegendes
- Triassic
- Base Cretaceous
- Tor
- Ekofisk
- Balder
- Permian volcanics picks

Figure 3 N-S line through Block 30/25a showing the re-processed seismic data

**IKON Endeavour Study 2006/7**

Fluid Information from petrophysical analysis on the following wells was used to calibrate the models: 30/16-6, 30/24-24, 31/26-3, 31/26-5, 31/26a-9A. For wells 30/24-33, 30/24-15, 30/23-1, the fluids from 30/24-24 were used. The conclusions of this study are as follows:

- AVO Blocky Modelling shows consistent response of Chalk and Sands
- Fluids have very subtle AVO effect > possibly too small to distinguish between water and oil in seismic
- Inversion of logs shows best separation of fluids in Poissons Ratio and EI plots and LambdaMuRho / MuRho plots
IKON Endeavour Study 2007 on Kimmeridge and Heather Formations

- Depth models used to forward model the appropriate properties for the Heather in 8 wells
- Kimmeridge on Heather:
  o Blocky Modelling displays a class I AVO response. However the seismic shows a class IIp response in X-section.
- Heather on Fulmar:
  o Blocky modelling displays a weak AVO response, whereas the seismic shows a class I AVO response in X-section.
- Kimmeridge on Fulmar:
  o Blocky modelling displays a class I when brine filled. Hydrocarbons cause a reduction in amplitudes in both the nears and fars but no reversals. The seismic in X-section shows the same characteristics, Class I AVO.

The re-processing improved the imaging of the structures but the main risks remain reservoir effectiveness and presence which the geological studies have

In-house basin modeling was carried out on a regional basis with the following implications for prospectivity in Block 30/25a:
- The main source interval is the Upper Jurassic Kimmeridge Clay Formation
- Present day maturation in Block 30/25a shows the northern part of the block to be gas-mature and the central southern part of the block to be oil-mature.
- The hydrocarbons in Ardmore Field are predominantly oil (34-38 deg API) and any hydrocarbons trapped in the 30/25a block are likely to be of a similar nature.

4.0 Prospectivity Analysis

4.1 Reservoir

Potential reservoirs in the area include the Lower Cretaceous ..., Upper Jurassic Fulmar Formation, Permian Rotliegendes and Devonian sandstones. The primary targets in Block 30/25a are the Permian Rotliegend Auk Formation sandstones which are productive in the Auk, Ardmore/Argyll & Innes Fields and were penetrated in the 302/5a-4 well (see below). The other main target on the block are Jurassic Fulmar sandstones.

The 30/25a-4 Discovery is a three way dip closed downthrown fault block to the north of the Ardmore/Argyll Field. The well 30/25a-4 flowed at around 500 bopd to surface from the Permian/Devonian, although there was no flow measured after acidisation. Analysis of the core from this well shows marginal reservoir quality, rendering the discovery uneconomic. At the time of the licence application mapping indicated that the poor reservoir properties seen in the core may have been due to the proximity of the well to faulting. The re-mapping on the re-processed data has not changed this view and reservoir quality still seen as the key risk.
The 30/25a-4 well penetrated a thick succession of Permian/Devonian sandstones and shales at 14,332ft, from which oil was tested at low rates. Reservoir quality is marginal, although the proximity of the well to a number of significant faults may explain the loss of reservoir quality. The 71ft Rotliegend section has 26ft net sand, 37% net to gross and porosity ranging from 1-11%, average 6%. The Devonian section extends from 14,403ft to TD at 14,808 ft. Within the top 403ft there is 206ft net sand, 51% net to gross and porosity ranging from 2-11%, average 6%. RFT pressures obtained from these intervals were not conclusive. Only two pressures were obtained from the Rotliegend interval, and all the Devonian RFTs were tight.

Figure 9 CPI showing Petrophysical analysis of well 30/25a-4

The Fulmar sandstones vary significantly in thickness across the area. To the west the Fulmar Field has sands up to 1200ft thick with porosities of 17-28% and permeabilities of 100-4000mD (average 500mD). The Dalmore/Angus Field has sandstone thicknesses up to 174ft. Reservoir porosities range from 9-25% with permeabilities of 3mD-10D (Hall, 1992, Geological Society Special Publication No. 67). This Field was used as a direct analogue for the Fulmar resource potential for prospects identified on Block 30/25a. None of the wells in block 30/25a has penetrated Fulmar sands, so a significant risk is associated with leads targeting this formation.
4.2 Source

The expected source for the hydrocarbons in the area is the Kimmeridge Clay Formation (see Section 3.0 for a summary of the in-house basin modeling work).

4.3 Seal

The Kimmeridge Clay Formation generally acts as a seal for the Fulmar Formation, though it is not present everywhere. In the Fife, Angus and Fergus Fields the Cromer Knoll Group Valhall Formation marls act as the seal to the Fulmar Formation. This same interval also acts as a seal to the Carboniferous reservoirs of the Flora Field and the Zechstein dolomites of the Auk Fields. These marls are very thin however, and the ultimate seal is probably within the Chalk Group.

4.4 Trap Type and Chance of Success

Block 30/25a lies on the boundary between the Argyll Ridge and the Central Graben. A dip slope is developed at most stratigraphic levels from the Argyll Ridge towards the graben from south to north. At Base Zechstein/Top Rotliegend level, depths vary from around 3000m in the south to around 5500m or more in the north of the block, where significant overpressure is expected.

Trapping mechanisms at this level are largely tilted fault blocks in the footwalls of faults antithetic to this dip slope. These provide the necessary counter-regional dip. At the target Jurassic Fulmar (or intra Kimmeridge Clay) and Permian Rotliegend levels, Base Zechstein faulting is extensive and consistent with regional trends, and results in compartmentalisation, and small trap sizes over a large part of the block. Larger structures are developed in the hanging-wall low of the Ardmore/Argyll Field as a series of downthrown fault blocks, some with back-rotation. A large tilted fault block is also mapped in the north of the block at Base Zechstein/Top Rotliegend level. This also has some structural expression at Base Cretaceous.

4.5 Remaining prospectivity

Regional mapping of southern Quad 30 has focused on delineating prospectivity in the Upper Jurassic and Rotliegendes intervals. The Base Cretaceous and Top Rotliegendes TWT maps (Figures 6 and 7) show a similar structural pattern as that recognized at the time of the licence application with 30/25a-4 discovery lying on a small fault terrace on the northern flank of the Ardmore structure. The 2007-2008 mapping has confirmed the size and configuration of the various leads previously mapped on the block (Figure xx).
Figure xx Block 30/25a Base Zechstein Depth Map

Figure vv Geoseismic sections through 30/25a-4 and Gullane lead
Several leads were also identified on the block in addition to the structure drilled by the 30/25a-4 well:

- The Baberton and Carluke leads are a series of downthrown fault blocks in the hanging-wall low of the Ardmore/Argyll high. The primary reservoir targets are the same Permian/Devonian horizons which produced in the Ardmore Field to the southwest and were drilled in 30/25a-4 well on an adjacent terrace.
  - Baberton most likely reserves are approx. 3 MMBO on block
  - Carluke most likely reserves are in the region of 10 MMBO assuming a 25% recovery factor
- The Drumpellier lead is located in the block centre, and is a simple tilted fault block structure at top Rotliegend. Potential reservoir targets are at Permian/Devonian and Jurassic.
  - Crest at 4700m
  - Chance of success approx 10% with reservoir main risk
- The Gullane lead is a tilted fault block structure situated to the north of the block. Reservoir targets are seen at Permian/Devonian and Jurassic levels.
  - Crest at 5400m
  - Chance of success <20% with reservoir main risk
  - Gas-prone with reserves of approx 10 MMBOE
- The Fireneze lead is a potential high risk stratigraphic trap within the Lower Cretaceous identified in the north of the block.
- This has most likely reserves of approximately 21 MMBO with a Chance of Success of around 5%.

The imaging of these structures has improved following re-mapping using the re-processed data but the main concern remains reservoir presence and effectiveness. The risk on this is seen as too high relative to the size of these leads.

### 5.0 Conclusions

The technical work carried out on Block 30/25a confirms the presence of several leads in the block as well as the 30/5a-4 discovery. However, the work has highlighted the significant risk attached to the likelihood of the presence of effective reservoirs in this area. This issue has contributed to the recent abandonment of infrastructure in the area.

For these reasons, Endeavour considers that there is not a viable prospect to drill on block 30/25a and therefore elects to drop the block.

### 6.0 Clearance

Endeavour confirms that BERR is free to publish and that all third party ownership rights (on any enclosed data/interpretation) have been considered and appropriately cleared for publication purposes.