Relinquishment Report

for

Licence P1185

Block 44/29c

May 2009
1 Licence Number and Block Details

Table 1.1: Licence details.

| Licence Number: | P1185 |
| Licence Round: | 22nd Round |
| Licence Type: | Traditional |
| Block(s): | 44/29c |

Table 1.2: Consortium details:

<table>
<thead>
<tr>
<th>Companies</th>
<th>Equity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDF Britain Ltd (Operator)</td>
<td>40%</td>
</tr>
<tr>
<td>E.ON Ruhrgas UK Exploration &amp; Production Ltd</td>
<td>30%</td>
</tr>
<tr>
<td>RWE Dea UK SNS Ltd</td>
<td>30%</td>
</tr>
</tbody>
</table>

Work programme (Part 1)

Reprocess 135 km$^2$ of 3D seismic data

2 Synopsis

The 44/29c block was awarded to GDF Britain Ltd in February 2005 as the part of the offered 22nd Round 44/29a block north of latitude 54°05’N. It was surrendered in November 2007 following completion of the Initial Term Work Programme. References in this document to the 44/29c block relate to its definition at the time of the 22nd Round award.

No drilling was undertaken in the licence area during the tenure of the licence.
3 Exploration Activities

Although no wells were drilled during the licence period, evaluation of the 44/29c block utilised GDF Britain’s extensive Carboniferous well database across Quadrants 43 and 44 of over 100 wells, which included a comprehensive palynological and chemostratigraphic database in the Silver Pit Basin.

With the exception of its extreme western portion, the P1185 licence area is fully covered by a Fina 3D seismic survey acquired in 1994 and processed by GXT in 2005-2006 as an anisotropic pre-stack depth migration (PreSDM), in conjunction with adjacent surveys in the Orca-Minke area to the east (Fig. 3.1). A depth version of this data set has been used in fault interpretation and horizon mapping after appropriate application of corrections to tie to well formation tops.

Fig. 3.1 Seismic database. The PreSDM output area is outlined in magenta and the Phase 3 output area in blue.

The Fina 1994 3D seismic survey (FH94/44) was acquired with four 3 km streamers and dual 2250 cu in sleeve gun source arrays with a streamer depth of 7 m and source depth of 6 m, recording at 2 msec
sampling to 5.0 sec. The survey was shot along lines oriented NNW-SSE with a shotpoint interval of 18.75 m.

GXT’s anisotropic PreSDM processing in 2005-6 used a hybrid technique involving tomographic inversion in velocity model building down to Top Zechstein, using a four layer model (Upper and Lower Tertiary, Chalk, Base Chalk to Top Zechstein). Below Top Zechstein, a well-based flooding velocity of 4570 m/s was used which closely approximates both the Zechstein and Rotliegendes interval velocities in this area. PreSDM processing resulted in improved imaging and a robust velocity model which was adopted for time-depth conversion in preference to a purely well-based layer-cake $V_{jk}$ approach.

Sub-salt imaging of the Narwhal and Narwhal South prospects, directly below a piercing Zechstein salt wall, remained sub-optimal, and was addressed by further processing tests carried out by GXT in 2007. A wave equation migration (WEM) trial proved unsuccessful in eliminating curved basal Zechstein events, and led to even more severe wavefronting. This led to a radical re-appraisal of the Zechstein salt wall geometry used in velocity model building, involving a slight overhang on the eastern flank of the salt wall. Targeted Kirchhoff pre-stack depth migration was then carried out with this revised initial velocity model over an output area of 54 km² covering the Narwhal and Narwhal South prospects. This reprocessing project, referred to as the "Phase 3" seismic volume, involved three iterations, and was completed in September 2007. Imaging at the objective Carboniferous level showed a significant improvement, hence mapping within the licence area was carried out using the Phase 3 data wherever possible. A representative depth seismic section across the Narwhal South prospect is shown in Fig. 3.2.

![Fig. 3.2 Seismic crossline 1960 (Phase 3) across Narwhal South prospect.](image)

Well ties to nine wells within the area of original PreSDM seismic coverage was provided by synthetic seismograms generated from available calibrated sonic and density logs.
Mapping of the licence area was based primarily on structural interpretation of zero-phase, reflectivity, depth domain seismic data from both the 2005-2006 and 2007 Phase 3 PreSDM reprocessed volumes. Additionally, reference was made to corresponding time, relative acoustic impedance, near- and far-offset and similarity volumes. Key interpreted horizons included Top Chalk, Base Chalk, Top Zechstein, Base Igneous Sill, Base Plattendolomit, Top Rotliegendes, Base Permian Unconformity, Intra Lower Ketch 1, Top Murdoch Sandstone and an Inter Caister horizon.

The Top Chalk and Base Chalk horizons highlight the major Tertiary and Chalk depocentre which occupies the Zechstein depletion zone adjacent to the salt wall that crosses the eastern part of the 44/29c block. Although picked with confidence in relatively undisturbed areas as a high amplitude, positive peak on the 2005-2006 reflectivity data, considerable uncertainty is attached to the precise geometry of the Top Zechstein horizon along the 44/29c salt wall. The improved imaging of the Phase 3 PreSDM data below the Zechstein salt wall is attributed largely to the revised interpretation of the horizon, constrained by reflection terminations on the flanks and the Base Chalk horizon above. This resulted in steeper flanks, a greater degree of piercement and a slight overhang on the eastern flank.

The Top Rotliegendes horizon comprises a prominent regional marker, expressed as a strong positive peak on the zero-phase reflectivity data, originating from the interface between basal Zechstein anhydrite and Silverpit Formation shales. The final map of the horizon, picked on both 2005-2006 and Phase 3 volumes, is a merged version with precedence accorded to the Phase 3 data on account of the greater confidence in its picking. Although the Base Permian unconformity is locally picked as a positive peak, confidence in its picking is generally poor in the 44/29c area, and its mapping has been based on a well-based Rotliegendes isopach below the Top Rotliegendes horizon (Fig. 3.3).

Fig. 3.3 Base Permian Unconformity depth map (ft TVDSS). Contour interval 100 ft
Within the Westphalian section subcropping the Base Permian unconformity, mapping was carried out at three horizons, an intra Lower Ketch 1 horizon, Top Murdoch Sandstone and an Intra Caister horizon. As in the case of the Top Rotliegendes, these horizons were picked with a higher level of confidence on the Phase 3 data, and merged maps were likewise based primarily on Phase 3 maps.

Despite generally poor reflectivity within the objective Lower Ketch Formation, an intra Lower Ketch 1 horizon was tentatively correlated from the Orca field to the east and ultimately tied to near the base of the Lower Ketch in the Minke well 44/24a-5 to the northeast. The horizon, picked as a negative trough on zero-phase reflectivity data, was used in generating a Base Lower Ketch surface in the eastern part of the 44/29c block.

The Top Murdoch Sandstone horizon, picked as a negative trough, was picked with a greater degree of confidence as a fairly continuous marker extending further westwards in block 44/29c. Additional support for Carboniferous character correlation was gained from mapping a deeper Intra Caister horizon, close to the top of the Namurian.

Fault interpretation comprised fault segment picking on vertical sections, aided by inspection of depth slices through the similarity volume of the 2005-2006 data and low-angle illumination of horizon data.

4

Prospectivity Analysis

Reservoir:
The primary reservoir comprises sandstones within the Westphalian C Lower Ketch 1 Formation of the Carboniferous Conybeare Group preserved beneath the Saalian Unconformity in the northeastern part of the licence area. The Lower Ketch 1, the lowermost subdivision of the Ketch Formation, is a known gas producing horizon in the Minke field and contributes to production in the nearby Ketch, Schooner and Boulton fields. Sands of the Ketch Formation were deposited in low-sinuosity braided channels on a low relief alluvial plain with a northern provenance. Their relatively proximal position in the 44/29c block results in sands composed of coarse grained, occasionally conglomeratic, sediments surrounded by overbank deposits which can be silty or shaly in nature.

The basal Westphalian B Murdoch Sandstone in the area is represented as silty mouth-bar deposits overlain by stacked, low-sinuosity fluvial channels deposited in a marginal lacustrine deltaic system. Trapping possibilities for the Murdoch Sandstone reservoir rely on the overlying Westoe Formation for top seal, possibly in combination with the Silverpit Formation.

Source:
The source rock is composed of the coal beds of the Westphalian A Caister Coal Formation and Westphalian B Westoe Coal Formation that are known to be mature for gas generation in this area.

Seal:
The ultimate seal in the 44/29c area is provided by the shales and evaporites of the Rotliegendes Silverpit Formation. Westoe and Cleaver Formations also provide potential seal seals for Ketch reservoirs as well as providing top seals for any Murdoch accumulations.

Trap type:
Structurally, the 44/29c block occupies a position on the southwestern limb of a major, southeasterly plunging synform which preserves Upper Ketch and possibly younger deposits at its core in the southeastern part of the Orca field to the east. Within the block, however, preservation of Westphalian C/D deposits is confined to the Lower Ketch 1 in its northeastern part, where the Narwhal South and Narwhal West prospects are located. Towards the southwest, the Permian subcrop becomes progressively older along a northwest-southeast trending palaeohigh which represents a continuation of the Murdoch Ridge.

Separated from the Narwhal prospect to the north by a saddle at the Base Permian level, the Narwhal South prospect shows a structural spillpoint at 12360 ft TVDSS and a column height of 280 ft over a closed area of 2.1 km², entirely within the 44/29c block. Its western closure is defined by a poorly imaged, west-hading fault, while a pre-Permian graben may influence its southern closure.

A major east-hading fault defines the eastern closure of the Narwhal West prospect, which has a spillpoint at 12150 ft TVDSS, a column height of 450 ft and an area of 8.2 km² (3.2 km² within 44/29c). The prospect, referred to in the application document as Lead A, shows dip closure to the north and west and probable fault closure from a southwest-northeast trending crossfault to the south.

Risking:
An overall Probability of Success of 64% and 48% was assigned to the Narwhal South and Narwhal West prospects respectively. The primary contribution to the risk is related to risks to effective reservoir and closure, both risked at 80% for Narwhal South and 75% for Narwhal West. The higher reservoir risk in Narwhal West reflects the greater potential for Westphalian B non-reservoir within the Base Permian closure, while the greater closure risk is linked to seismic data quality concerns in an area not covered by the Phase 3 reprocessing.

Additionally, an 85% seal/retention risk was assigned to Narwhal West on account of the depleted nature of the Zechstein section in the overburden.

5 Reserve Summary
P50 Gas Initially in Place figures of 13 bcf and 92 bcf were derived for the Narwhal South and Narwhal West prospects respectively. Narwhal South lies entirely within the 44/29c block, while approximately 40% of the Narwhal West GIP lies within 44/29c.

6 Figures
Fig 3.1: Seismic database
Fig 3.2: Seismic crossline 1960 (Phase 3) across Narwhal South prospect
Fig 3.3: Base Permian Unconformity depth map (ft TVDSS)
Publication Clearance

Both GDF Britain Ltd, as operator for the P1185 licence, and EON Ruhrgas UK Exploration & Production Ltd and RWE Dea UK SNS Ltd partners confirm that DECC is free to publish this report and that third party ownership rights have been appropriately cleared for publication purposes.