P.1917 RELINQUISHMENT REPORT

SERICA ENERGY (UK) LIMITED

Block 110/8b, UK East Irish Sea
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1. Licence Information

<table>
<thead>
<tr>
<th>Licence Number</th>
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<tbody>
<tr>
<td>Licence Type</td>
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</tr>
<tr>
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<tr>
<td>Licence Award Date</td>
<td>Executed 2nd July 2012 (effective from 1st February 2012)</td>
</tr>
<tr>
<td>Block Number</td>
<td>110/8b</td>
</tr>
<tr>
<td>Block Location</td>
<td>East Irish Sea</td>
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<tr>
<td>Licencees</td>
<td>Serica (100%)</td>
</tr>
<tr>
<td>Firm Work Commitment (*)</td>
<td>The Licensee shall reprocess 160km² of 3D seismic data</td>
</tr>
<tr>
<td>Drill or Drop Commitment</td>
<td>The Licensee shall either (a) drill a well to 1230m or 30m below Top Sherwood, whichever is the shallower, or (b) elect to allow the licence to automatically cease</td>
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</tbody>
</table>

(*) The firm work programme was waived by the Oil and Gas Authority.
2. Licence Synopsis

2.1 Pre-Serica Synopsis

Block 110/8 was originally operated under Licence P.70 by Gulf Oil, which drilled the first two wells on the block. Well 110/8-1 was drilled in 1969 on the Deemster Platform in the far SE corner of the block and was P&A dry. However 110/8-2, also drilled in 1969, in the NW corner of the block, was P&A with gas shows in the Triassic Sherwood Sandstone, on what subsequently turned out to be part of the South Morecambe Gas Field.

Block 110/8 was relinquished by Gulf Oil, and awarded to Hydrocarbon Resources Limited (now part of Centrica) in July 1976 under Licence P.251. The exploration well 110/8a-3, drilled in 1982 on the Deemster Platform in the NE part of the block, was P&A dry. However, appraisal and development drilling during the mid-1980s confirmed the southerly extent of the South Morecambe Gas Field into Block 110/8. Following partial relinquishment, the Darwen Gas Discovery was made in the centre of the block by well 110/8a-4 in 1991. This was followed by the nearby 110/8a-5 well which encountered a small, sub-commercial oil accumulation. However, the 110/8c-6,6z well, drilled to appraise the Darwen Gas Field, was P&A dry.

The remainder of Block 110/8 not including the South Morecambe and Darwen gas fields was relinquished and re-awarded under Licence P.1477 to Centrica as Block 110/8b following the 24th UK licensing round in April 2007. Centrica’s work programme, including 3D seismic acquisition was focussed on the Lytham Lead in the north-east corner of the block (see Section 4.3).

2.2 Serica Synopsis

On 2nd July 2012 (effective from 1st February 2012), Serica was awarded Block 110/8b (see Figure 1). The work commitment was (a) reprocess 160km$^2$ of 3D seismic data and (b) drill or drop well to 1230m or 30m below top Sherwood (whichever is the shallower). Note that at the time of application, Serica was not aware that Centrica had already reprocessed the 3D seismic data.

Serica’s work programme was focussed on the Darwen North Prospect in the north-western part of the block (see Section 2.3). In March 2013, Centrica drilled the 110/8a-7 well in Block 110/8a, very close to the boundary with Block 110/8b. The result of this well has had a significant impact on Serica’s subsequent evaluation of the prospectivity of Block 110/8b (see Section 3.2).

Figure 1: Block 110/8b Location Map
2.3 Prospectivity

The Darwen North Prospect is a tilted fault block located between the Darwen and the South Morecambe gas fields (see Figure 2). The prospect exhibits a mixture of strong and modest amplitude anomalies on 3D seismic data at the level of the top Sherwood Sandstone, the principal gas-bearing reservoir within the East Irish Sea Basin, with a partial fit to depth closure. Similar strong amplitude anomalies in nearby fields coincide with high-porosity (predominantly aeolian) gas-bearing Sherwood Sandstone, for example, in the nearby South Morecambe, Calder, Darwen and Hamilton fields. The majority of the Darwen North Prospect was mapped within Centrica-operated Block 110/8a, up-dip to the north. However the extent of the more modest seismic amplitudes, in combination with depth mapping at the time of Serica’s application, suggested that in an upside scenario, significant gas could lie down-dip within Block 110/8b.

Figure 2: Block 110/8b Map showing Prospects and Leads
3. Exploration Activities

3.1 Database

Prior to Serica’s application, Block 110/8b was mapped on three overlapping 3D seismic surveys: British Gas (BG94), Enterprise (ET953F003) and BHP (BHP110/13). Following the 110/8a-7 well, Serica purchased the British Gas “Bains” (BN08) 3D seismic survey. Together with the earlier 3D surveys, this gave almost complete 3D coverage across the block (see Figure 3). Block 110/8b was then fully re-mapped, enabling the Darwen North Prospect to be re-evaluated in the light of the 110/8a-7 well result. In addition, two other leads were identified (Darwen NE and Lytham; see Figure 2) and deeper Permian potential was evaluated.

![Figure 3: Seismic Database Map](image)

3.2 Implications of the 110/8a-7 Well

In March 2013, Centrica drilled the 110/8a-7 well on their Ventnor Prospect in Block 110/8a, which corresponded to the up-dip part of Serica’s Darwen North Prospect in Block 110/8b (for the location of 110/8a-7, see Figure 2). At the time of Serica’s licence application, Serica was un-aware of Centrica’s intention to drill at this location. 110/8a-7 reached TD at 1390mTVDSS and was drilled to evaluate the Sherwood Sandstone reservoir. The well has been plugged and abandoned as a sub-commercial gas discovery. From scout information, it is believed that the well encountered a shorter than expected free gas column, suggesting a possible deeper residual gas zone. Furthermore, it is also believed that reservoir quality was poorer than expected and that consequently, it was not considered worthwhile to drill-stem test the well. Centrica’s 110/8a-7 well has shown beyond reasonable doubt that the Ventnor Discovery (Serica’s Darwen North Prospect) is (a) sub-commercial and (b) lies almost entirely off Serica’s block.
3.3 Depth Mapping

Two depth maps across the Darwen North Prospect are shown in Figure 4(i) Serica’s mapping as presented in the licence application, and Figure 4(ii) Serica’s most recent depth map post-110/8a-7. Two illustrative seismic lines are shown in Figure 5.

Prior to re-mapping, the depth conversion methodology was rigorously checked. Depth conversion anomalies are well known in the area; for example, bona-fide velocity push-down effects in the Calder Field, as a result of localised preservation of pods of low-velocity Upper Mercia Mudstone (R.A. Blow & M. Hardman, 1997; in Meadows, N.S., Trueblood, S.P., Hardman, M. & Cowan, G., Petroleum Geology of the Irish Sea and Adjacent Areas, Geol. Soc. Spec. Publ. 124, pp.387-397). As part of Serica’s licence application, a low-velocity flexure in the velocity grid had been invoked to facilitate a depth conversion fit to the maximum possible extent of the amplitude anomaly. This gave a considerably larger area of depth closure, see Figure 4(i).

Post-110/8a-7, detailed well correlation of halite intervals in the surrounding acreage showed that it was not possible to seismically map the low-velocity Upper Mercia Mudstone into the Darwen North Prospect area and geologically replicate the optimistic depth conversion, Figure 4(ii). The base Upper Mercia Mudstone pick did not honour some of the well ties within the grabens (Wilkesley halite is probably Preesall), which resulted locally in an unrealistically deep pick for the lower velocity Upper Mercia Mudstone. Uniform low velocity had previously been assigned to this unit whereas its velocity is likely to vary according to depth and lithological variations. Furthermore in deeper parts of the grabens the preservation of the youngest (Wilkesley) Halite can result in higher velocity than expected. These aspects, plus the flexing of velocities, had resulted in a prospect size pre-application that was unrealistically large.

Given the results of the 110/8a-7 well and Serica’s subsequent technical analysis, further PreSDM seismic re-processing would not fundamentally change the depth conversion model and would not substantially alter prospect sizes or reduce risk.

Figure 4: Top Sherwood Sandstone Depth Maps across the Darwen North Prospect
(i) pre-licence application, and (ii) post-110/8a-7
3.4 Amplitude Mapping

Confidence in the Darwen North Prospect prior to Serica’s licence application was boosted by Serica’s regional seismic mapping and well interpretation across the whole of the East Irish Sea Basin. This gave evidence in support of significant amplitude brightening of the seismic data at Top Sherwood sandstone reservoir level being coincident with gas-bearing aeolian sandstones with thickness greater than 15m and average porosity greater than 15%. Locally, this could be demonstrated in the Calder and Darwen gas fields in close proximity to the Darwen North Prospect.

Remapping of Block 110/8b confirmed that, using the latest depth conversion model, the brightest amplitudes on Darwen North conform to the gas accumulation proven by Centrica’s 110/8a-7 well (see amplitude map, Figure 6). Although the depth of the gas-water contact is not known, the brightest amplitudes broadly coincide with the re-mapped structural closure. This would be consistent with the presence of porous, gas-bearing reservoir. An area of enigmatic less bright amplitudes exist below mapped structural closure to the east, that does not appear to conform with any known structure.

Focussing on the amplitude response within the reservoir minus overburden ((trough above-trough below)*peak amplitude, Figure 6) confirms that the amplitudes in Darwen North appear to be a genuine reservoir response (porous, gas bearing sandstones) as opposed to overburden effects (for example, hard anhydrite layers above top reservoir). The brightest amplitudes co-incident with the current-day mapped structural depth closure is consistent with gas-bearing reservoir; however, the dimmer amplitude anomaly beyond depth closure is harder to explain. Possibly it is due to residual gas, as a result of tilting of the structure, post-charge. This is a common phenomenon in the East Irish Sea and the interpretation is supported by Serica’s understanding that the free gas column in the 110/8a-7 Ventnor discovery well was shorter than anticipated. Top Sherwood Sandstone amplitudes are also commonly affected by lateral variations in the Quaternary overburden due to glacial scouring.
and channelling. However, even taking the most optimistic extent of the amplitude anomaly, very little gas-bearing reservoir sandstone lies within Serica’s acreage (see also Figure 4.1).

Following depth conversion, amplitude analysis and re-mapping (Section 3.3 & Section 3.4), Serica estimate that the Ventnor (Darwen North) Discovery contains a GIIP range of 13 – 29 – 35 – 64bcf ($P_{90}$ – $P_{50}$ – mean – $P_{10}$). On Serica’s Block 110/8b, the GIIP range is just 0.4 – 1.3 – 1.8 – 3.9bcf ($P_{90}$ – $P_{50}$ – mean – $P_{10}$).

4. Remaining Prospectivity

4.1 Darwen North Prospect (110/8a-7 Ventnor Discovery”)

4.2 Darwen Northeast Lead

Originally part of the greater Darwen North Prospect, there remains to the east a small independent structural closure (see Figure 4). This is now referred to as the “Darwen NE Lead”. It is very small, has no amplitude support, and has a GIIP range of just 0.7 – 1.1 – 1.1 – 1.6bcf ($P_{90}$ – $P_{50}$ – mean – $P_{10}$). Geological chance of success is estimated at 21%. The prospect is much too small to be considered economic.
4.3 Lytham Lead

To the northeast of the Darwen North Prospect (110/8a-7 Ventnor Discovery), the Lytham Lead is a potentially much larger structure (see depth map, Figure 7), with a GIIP range of 54 – 119 – 144 – 265bcf (P_{90} – P_{50} – mean – P_{10}). However, the structure is a hanging-wall anticline without independent four-way dip closure, and relies entirely on cross-fault seal of the Sherwood Sandstone reservoir against older Permian St. Bees Sandstone (see seismic section, Figure 8). It is therefore very high-risk (effective hanging-wall seals are in general high-risk, and have not been proven in the East Irish Sea to date). In addition to fault seal risk, the structure is poorly constrained to the east (on the Bains 3D seismic data) where additional poorly-imaged faults are needed to effectively close the structure. Furthermore, there is no amplitude anomaly that is indicative of gas having been retained in the Sherwood sandstone (see amplitude map, Figure 9). The geological chance of success is probably in the order of 5%.

![Figure 7: Top Sherwood Sandstone Depth Map across northern part of Block 110/8b, showing Lytham Lead and Darwen North Prospect, Post-110/8a-7](image-url)
Figure 8: WNW-ESE Arbitrary seismic Line through Lytham Lead

Figure 9: Amplitude Map across northern part of Block 110/8b, showing Lytham Lead
4.4 110/8a-5 Oil Discovery

In the south-west of Block 110/8b, the 110/8a-5 oil discovery was drilled by British Gas in 1993. It was drilled on a N-S trending tilted fault block and found a 7m oil column at the top of the Sherwood Sandstone. On account of encountering >2000ppm H₂S whilst drilling, the well was not tested. The structure, which is not full to spill and appears to have been tilted and/or breached, was re-mapped by Serica (see depth map, Figure 10), and is estimated to contain STOIIP of just 1.6 – 2.0 – 2.0 – 2.4mmbo (P₉₀ – P₅₀ – mean – P₁₀). This is much too small to be potentially economic.

Figure 10: Top Sherwood Sandstone Depth Map, 110/8a-5 Oil Discovery

4.5 Permian Upside

Across the Deemster Platform in the south-east part of Block 110/8b, the Triassic Sherwood Sandstone lies close to surface, either sub-cropping the sea-bed or the Quaternary. However, the 110/8-1 well penetrated thick Permian Collyhurst Sandstone, demonstrating the potential for a secondary Permian play.

Figure 11 shows a WNW-E seismic line through the Darwen Gas Discovery, Deemster Platform and the 110/8-1 well. This shows a footwall high immediately east of the 110/8c-6z, which was drilled in the hangingwall of the Deemster Fault to appraise the Darwen Discovery, but unfortunately did not drill deep enough to penetrate the footwall section. However, the well did demonstrate the presence of Triassic Sherwood sandstone in the hangingwall, which is mapped in juxtaposition against older Permian and Carboniferous strata in the footwall. Therefore, there is a very high risk of seal failure across the Deemster Fault. The Top Permian TWT Map (Figure 12) does show a clear north-south
Permian footwall high, although most of this is located outside of Serica’s acreage, in Block 110/8c. Furthermore, the seismic line (Figure 11) shows that the Collyhurst Sandstone penetrated by 110/8-1 thins onto the footwall high, which is under-pinned by a large Carboniferous inversion anticline. Therefore there must, in addition to very high risk of cross-fault seal, be very high risk on Permian reservoir presence over the footwall high. On this basis, the Permian play is not considered to be prospective on Block 110/8b.

Figure 11: WNW-E Seismic Line across the Deemster Platform, Block 110/8b

Figure 12: Block 110/8b Top Permian TWT Map
5. Resource & Risk Summary

A summary table of Block 110/8b resources and risks is shown in below:

<table>
<thead>
<tr>
<th>Reserves (bcf), Block 110/8b (Serica)</th>
<th>P_10</th>
<th>P_50</th>
<th>Mean</th>
<th>P_10</th>
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<td>110/8a-7 Ventnor Discovery (Darwen North Prospect)</td>
<td>0.3</td>
<td>0.8</td>
<td>1</td>
<td>3</td>
<td>100%</td>
</tr>
<tr>
<td>Darwen NE Lead</td>
<td>0.47</td>
<td>0.74</td>
<td>0.78</td>
<td>1.14</td>
<td>21%</td>
</tr>
<tr>
<td>Lytham Lead</td>
<td>37</td>
<td>83</td>
<td>101</td>
<td>186</td>
<td>5%</td>
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<th>Reserves (mmbo), Block 110/8b (Serica)</th>
<th>P_10</th>
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<th>Mean</th>
<th>P_10</th>
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<tr>
<td>110/8a-5 Oil Discovery</td>
<td>0.54</td>
<td>0.78</td>
<td>0.80</td>
<td>1.07</td>
<td>100%</td>
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</tbody>
</table>

Table 1: Block 110/8b Resource & Risk Summary

6. Conclusions

Serica’s re-mapping of Block 110/8b has shown that:

- The Ventnor Discovery (Serica’s Darwen North Prospect), drilled by Centrica (110/8a-7), is sub-commercial and lies almost entirely off Serica’s acreage,
- Further seismic processing would not materially alter the depth conversion methodology or the mapping of the Darwen North Prospect
- Remaining leads are either very small (Darwen NE) or very high risk (Lytham),
- The 110/8a-5 oil discovery is very small and sub-commercial, and
- There is no deeper Permian upside on-block.

Therefore, the technical recommendation is to relinquish Block 110/8b.

Given the results of the 110/8a-7 well, and Serica’s subsequent technical analysis, Serica sought and was granted from the OGA waivers on the firm work programme commitment for the 3D seismic reprocessing (see Section 2.2 and 3.3).

7. Clearance

Serica’s evaluation of Block 110/8b has utilised 3D seismic data from the British Gas (BG94), Enterprise (ET953F003), BHP (BHP110/13) and British Gas “Bains” 3D seismic surveys. These data sets, acquired as proprietary surveys, are now publically released.