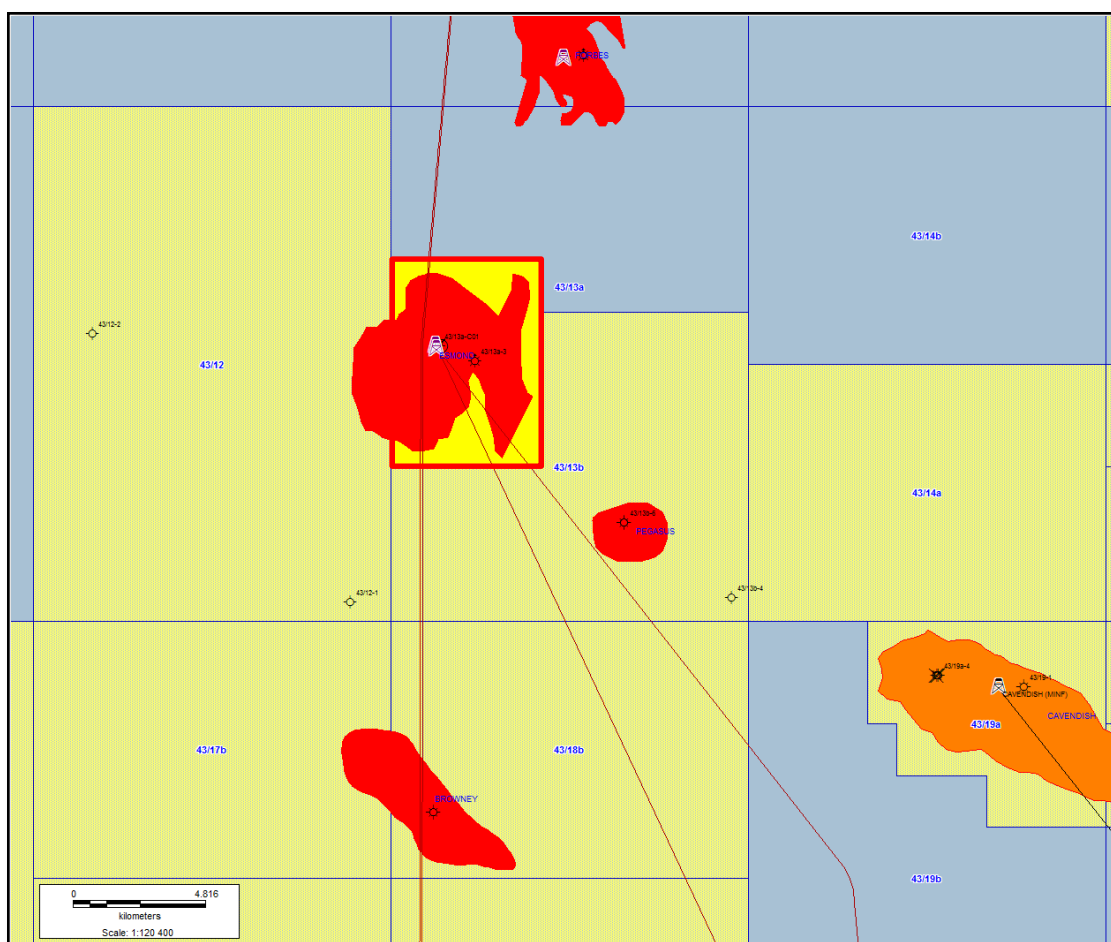




North Sea Business Unit

'Esmond' Licence Relinquishment

P.1335, Block 43/13a  
(Premier Oil 100% Operator)



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## UK P.1335 Block 43/13a 'Esmond' Licence Relinquishment

### 1. Header

Licence Number: P.1335  
Licence Round: 23<sup>rd</sup>  
Block Number: 43/13a  
Operator: Premier Oil  
Work Programme (2<sup>nd</sup> 4-year term): None

### 2. Synopsis

Licence P.1335 is located in the UK Southern North Sea province. It contains the Esmond gas field which was discovered by well 43/13-1 in 1969 by Hamilton Brothers Oil and Gas. The field was developed jointly with Forbes and Gordon via a dedicated 24" gas line to Bacton. Gas production commenced in 1985 and continued until 1995 when the field was decommissioned and the licence released.

The licence was awarded to Virgo Oil & Gas in 23<sup>rd</sup> UK Licence Round as a Promote Seaward Production Licence with a start date of 22<sup>nd</sup> December 2005.

EnCore acquired the licence through the acquisition of Virgo in 2006. Star Energy having farmed-in to the licence, assuming operatorship, an appraisal well was drilled on the structure to allow a feasibility study to be carried out and investigate the potential for gas storage. The appraisal well results were disappointing, the lower reservoir being re-pressurised and invaded by water. A gas storage project would require extraction of some 150MMbbls of water. Premier took over EnCore in 2009, acquiring the licence while in its second term. The project not being viable, the licence was determined at the second term expiry, on Dec. 21<sup>st</sup>, 2013.

### 3. Exploration Activity

When re-licensed in 2005 by Virgo Oil & Gas, the Esmond abandoned gas field (decommissioned in 1995) was seen as having gas potential from a combination of a speculative re-charge of the Bunter reservoir via new gas migrating from the Carboniferous below and minor re-aggregation of low gas saturations within the partially drained Bunter reservoir (thus forming a new raised GWC). Some additional gas prospectivity was inferred in the underlying series, with potential leads in the Carboniferous.

The main project consisted of combining gas production and wind power to generate electricity offshore for delivery to the coast, in a joint venture with Eclipse Energy Ltd. The project was seen potentially viable if, and only if, in a synergy with two other stranded (abandoned) gas fields, Forbes (Block 43/8, licensed at that time 100% by Virgo under Licence P.1237) and Gordon (Blocks 43/15a & 43/20a).

Alternatively, should the gas accumulation fail to be significant enough, the Esmond structure was also seen as one of the biggest available offshore gas storage projects in the UK, yet located by a reasonable water depth (35m or 110ft). Since 2005, the UK has become increasingly dependent upon gas imports and is short of storage capacity.

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Although the application had been made jointly for the three blocks, Esmond (Block 43/13a) and Gordon (Blocks 43/15a & 43/20a) were awarded separately under the respective licences P.1335 and P.1337. The latter was relinquished on 21<sup>st</sup> December 2009 at the end of the initial term; the initial project aiming at gas aggregation from the three abandoned fields was not seen viable any longer. The main objective for Licence P.1335 became gas storage capacity in the depleted reservoirs in the Triassic Bunter Fm, no significant lead emerging from the Carboniferous re-interpretation.

P.1335 licence was awarded as a Promote Seaward Production Licence with a 4-year initial term and a firm work commitment which consisted of purchasing 200km of long-offset 2D seismic and carrying out an engineering study of the Esmond Field production history. The contingent part of the work programme consisted of drilling a well to evaluate the Bunter (2-year 'DoD').

EnCore subsequently acquired the licence through the acquisition of Virgo Oil & Gas in 2006; it was held by EGSL, EnCore Gas Storage Limited, a wholly owned subsidiary of EnCore.

Star Energy farmed-in to the licence for 25% equity in 2007. The Joint Venture then went into the second, traditional phase of the first term, Star Energy increasing its equity to 50% and assuming operatorship for a 100% funding of the well cost. After purchasing 450km of 2D seismic and acquiring 175km of new high-density 2D ('pseudo-3D') seismic, the structure was re-mapped and depth and attribute maps were generated to better delineate the gas accumulation. The 43/13a-5 well was drilled between 23<sup>rd</sup> Sept. and 30<sup>th</sup> Nov. 2008 with the aim of appraising the reservoir and delineating the accumulation. The 2008 appraisal well, 43/13a-5, gave negative results as the best, lower reservoir was found re-pressurised in a short time frame (1995-2008) due to unexpected aquifer ingress, leaving the upper reservoir as the unique storage capacity: extraction of some 150MMbbls of water was required to create a gas store of reasonable size, which added complexity, cost and risk to the project.

Following the well results, Star Energy withdrew from the licence. P.1335 then entered the second 4-year term on 22<sup>nd</sup> Dec. 2009, EGSL being the operator with 100% equity. Some 85.4sq.km were relinquished and all commitments were being fulfilled. The remaining area was 40sq.km around the Esmond Field. With the take-over of EnCore in 2009, Premier became in turn the operator of this licence with 100% equity.

## 4. Prospectivity Analysis

The reservoir in the Esmond Field is the Triassic Middle Bunter Sandstone deposited during a period of aeolian conditions, under a predominantly fluviatile environment. The Middle Bunter Sandstone unit has been sub-divided into 7 zones. Zone 1 (the "Upper Reservoir") and Zones 3-7 (the "Lower Reservoir") are comprised of clean sandstones and are separated by Zone 2, a 25 ft thick red-brown mudstone, which forms an effective seal to the underlying reservoir (Figure 1).

In order to better define the Top Middle Bunter Sandstone horizon 785 kms of high density 2D seismic data, covering an area of 175 sq kms, were acquired by Fugro in 2008. This enhanced dataset allowed separating the picks for Zones 1 and 3. Subsequent mapping has confirmed the field as a simple anticlinal structure at the Middle Bunter Sandstone level, which has been induced over time by movement of the underlying Zechstein salt (Figure 2). The structure is unfaulted, as demonstrated

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by the excellent lateral communication within the reservoir with the overlying shales and evaporites of the Haisborough group cap-rock providing the seal.

The depth to the top of the Middle Bunter Sandstone reservoir at the crest of the Esmond Field is approximately 4,450 ft TVDSS with a closing contour of the structure at a depth of 4,900 ft TVDSS. The original GWC is interpreted at 4,770 ft TVDSS (Figure 3).

The design of the gas storage facility has been based on a dual reservoir model (i.e. two separate storage reservoirs). The Upper Reservoir was seen as a medium range storage facility with a smaller volume and higher deliverability rates than the larger Lower Reservoir, which would act as a seasonal storage facility.

The reservoir appraisal well drilled in 2008 confirmed the suitability of the Upper Reservoir for gas storage purposes. However, it also showed that the Lower Reservoir had been re-pressurised and was water bearing. The extensive feasibility study that was carried out subsequently concluded that the redevelopment of the field for gas storage purposes would have involved the drilling of 18 new wells, 6 in the Upper Reservoir and 12 in the Lower Reservoir. The 12 wells in the Lower Reservoir would initially have been completed with Electrical Submersible Pumps ("ESPs") to facilitate dewatering of the Lower Reservoir prior to gas injection., The dewatering process was to remove approximately 150 MMbbls of water.

The Esmond Gas Storage Facility was designed as a new wellhead platform bridge-linked to a Processing, Utilities and Quarters platform ("PUQ"), a new onshore terminal, offshore and onshore process equipment and a new pipeline to the onshore terminal.

Being a very highly capital intensive project, the Esmond gas storage project turned out not viable.

## 5. Reserves / Resources Summary

Working gas volumes and cushion gas requirements are shown below. The Upside Case assumes a higher working pressure which would allow the storage volume to be increased from approximately 120 bcf to 160 bcf. The same number of wells was modelled in each case.

Reservoir	Working Gas Volume (bcf)		Cushion Gas Requirement (bcf)	
	Base Case	Upside Case	Base Case	Upside Case
Upper	34	39	4	4
Lower	88	123	70	81
<b>Total</b>	<b>122</b>	<b>162</b>	<b>74</b>	<b>85</b>

**Table 1.** Esmond Gas Storage Working Gas Volume and Cushion Gas Requirement

## 6. Maps and Figures

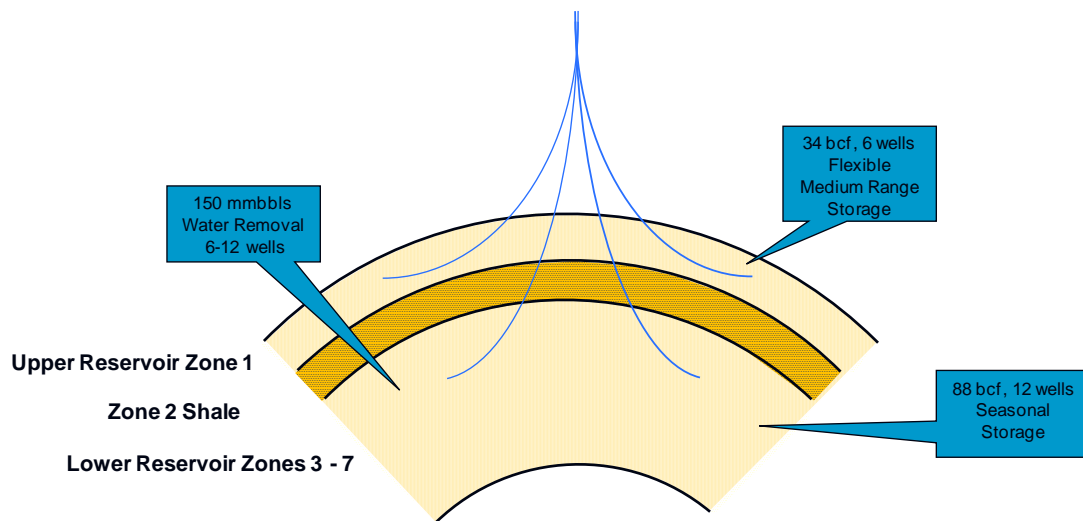


Figure 1. Esmond Gas Storage Facility Dual Reservoir Model Design

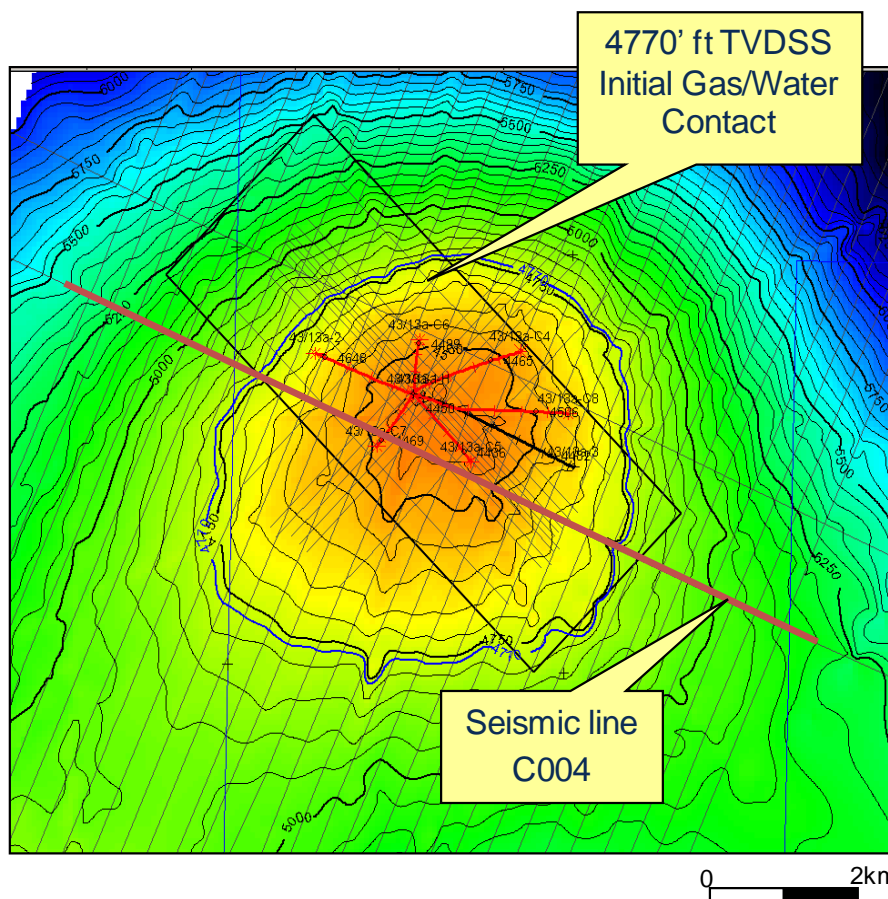
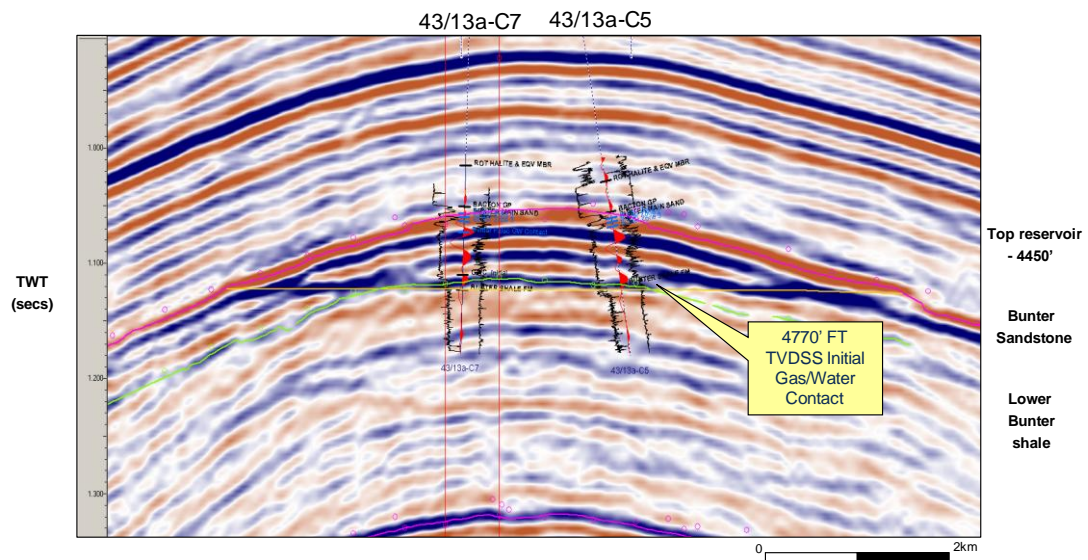


Figure 2. Esmond Field Depth Structure Map at Top Middle Bunter Sandstone Level

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Esmond Field Seismic Line 2008-C004

### 7. Clearance

It is hereby confirmed that DECC is free to publish the results contained in this relinquishment report