

## ***1.2 Technical Progress and Main Results (1 July to 31 December 2001).***

### **WP 1 – Geology led by BGS and supported by GEUS and SINTEF**

#### ***Summary***

In the reporting period work has continued on the following tasks:

- Task 1.4 Characterise caprock
- Task 1.7 Iterative development of full regional geological model

#### **Task 1.4. Characterise caprock**

##### **Work carried out during the reporting period**

Caprock cuttings from the shales of the Nordland Group in both the Norwegian and UK sectors have been analysed by SEM and XRD, as well as determinations of grain size, quartz content, total organic carbon and cation exchange capacity. Results have been interpreted in terms of the Krushin sealing capacity. Results indicate that the samples in general have a high clay content and good sealing capacity.

A small amount of core material from a Pliocene clay was obtained from well 2/4-C-11, in the Ekofisk area. This material may provide a reasonable analogue for the clay-rich units in the caprock succession at Sleipner. XRD, N<sub>2</sub>BET (gas absorption/specific surface area) and grain size analyses were carried out. Results indicate properties similar to those of the caprock at Sleipner, with the likelihood of satisfactory sealing capacity.

Two Technical Reports describing this work are available on the SACS website. A third Technical report is in draft form and will shortly be available.

Analytical work for Task 1.4 is now complete.

##### **Problems and difficulties encountered**

Ekofisk core samples suitable for analysis of physical properties were not obtainable from NPD, this restricted the scope of the analysis.

#### **Task 1.7 Iterative development of full regional geological model**

##### **Work carried out during the reporting period**

Regional interpretation of the Utsira Sand has been completed, incorporating additional well data in the north, infill seismic data to the NW of Sleipner and detailed interpretations from the Sleipner 3D survey. Regional velocity models have been constructed and the seismic data have been depth converted. Final depth maps of Top Utsira Sand, Base Utsira Sand and Utsira Sand thickness were produced. Regional well log analysis was carried out to characterise the properties of the Utsira reservoir. Maps of reservoir porosity and shale volume were produced. Digital grids of reservoir depths and reservoir properties are also available. A Technical Report describing the work is on the SACS website.

Regional well correlation and seismo-stratigraphical interpretation of the Utsira Sand and the caprock has been completed, and a series of regional cross-sections produced. A depositional model of the Utsira Sand was developed. In an effort to identify possible areas of gas flux in the caprock a regional study of seismic amplitude anomalies has been undertaken. A Technical Report describing the work is on the SACS website.

The seismic coherency cube has been interpreted to map lineaments in and above the Utsira Sand that potentially could be faults. Most lineaments strike NE-SW and are likely to be artefacts, mirroring velocity anomalies in the shallower overburden. So far, none of the lineaments has been clearly identified as a fault.

Interpretive work on Task 1.7 is almost complete. A little additional work on the regional amplitude anomaly mapping is still required.

### **Problems and difficulties encountered**

The depth conversion took longer than anticipated due to the fact that many wells (particularly those in between the seismic lines) were discovered to have slightly incorrect picks for top and base Utsira Sand. Correction required considerable well-to-well log correlation and was quite time consuming.

### **References – Work Area 1**

Boe, R. & Zweigel, P. 2001. Characterisation of the Nordland Shale in the Sleipner area by XRD analysis. Sintef Report 33.0764.00/01/01.

Kemp, S.J. Bouch, J. & Murphy, H.A. 2001. Mineralogical characterisation of the Nordland Shale, UK Quadrant 16, northern North Sea. BGS Commissioned Report CR/01/136.

Lindgren, H., Fries, K. & Springer, N. 2002. Clay Mineralogical Investigation of core and cuttings from the Ekofisk and Sleipner areas. GEUS Technical Report (draft).

Kirby, G.A., Chadwick, R.A. & Holloway, S. 2001. Depth mapping and characterisation of the Utsira Sand saline aquifer, central and northern North Sea. BGS Commissioned Report CR/01/218.

Gregersen, U. & Johannessen, P.N. 2001. The Neogene Utsira Sand and its seal in the Viking Graben area, North Sea. GEUS Report 2001/100.

## **Brief forecast of next three months' activities (to March 31)**

Task 1.7

Complete regional amplitude anomaly mapping.

Incorporate key results from all Work Area Task into Final Work Area Technical Report.