

Distribution of the Neogene Utsira Sand and the succeeding deposits in the Viking Graben area, North Sea

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Abstract

The sandy quartzose parts of the Utsira Formation, the Middle Miocene to mid Pliocene Utsira Sand, extends north–south along the Viking Graben near the UK/Norwegian median line for more than 450 km and 75–130 km east–west. The Utsira Sand is located in basin-restricted seismic depocentres, east of and below prograding sandy units from the Shetland Platform area with Hutton Sands. The Utsira Sand reaches thicknesses up to ca. 300 m in the southern depocentre and 200 m in the two northern depocentres with sedimentation rates up to 2–4 cm/ka. Succeeding Plio–Pleistocene is divided into seismic units, including Base Upper Pliocene, Shale Drape, Prograding Complex and Pleistocene. The units mainly consist of clay, but locally minor sands occur, especially at toes of prograding clinoforms (bottom-set sands) and in the Pleistocene parts, and the total thickness covering the Utsira Sand is in most places more than 800 m, but thins towards the margins.

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1. Introduction

This paper presents regional studies of Neogene stratigraphy of the Viking Graben area. The objectives of this paper are, on a regional scale, to describe location, character and the relations of the Neogene sandy units, with focus on the Utsira Sand in the Viking Graben area (Fig. 1), and to contribute to the discussion of the stratigraphy of the Neogene succession of the northern North Sea region.

The paper is based on work mainly performed by the Geological Survey of Denmark and Greenland (GEUS) and the British Geological Survey (BGS) under the Saline Aquifer CO₂ Storage (SACS) project, in which a part of it was to map mainly the sands of the Utsira Formation on regional scale with focus on the southern Viking Graben area. The SACS project had several other sub-projects, and it was a field-scale demonstration project, which aimed to describe, monitor and predict geological and geochemical aspects related to injection of CO₂ at the Norwegian

Sleipner Field. To avoid letting out CO₂ in the atmosphere, the natural content of CO₂ in the Sleipner Field is separated on the Sleipner A platform, and has been treated and injected as fluid into the Utsira Formation sands since 1996 (Baklid et al., 1996; Eiken et al., 2000). The SACS project was carried out by European research and oil/energy companies in cooperation from 1998 to 2002, and included several sub-projects with geological, geophysical, and geochemical investigations (Chadwick et al., 2000, 2004; Gale et al., 2001). The industry partners comprise Statoil (Coordinator), BP, ExxonMobil, Norsk Hydro, Saga Petroleum, TotalFinaElf, Vattenfall. In addition to the partners the following organisations were active involved: GEUS, BGS, SINTEF Petroleum Research, TNO, BRGM, IFP, the Nansen ERS Centre and the IEA Greenhouse Gas R&D Programme (Gale et al., 2001). The demonstration project resulted in scientific results and a best practice manual (Holloway et al., 2003). Parts of its activities were continued in the EU-cofunded CO₂STORE project.

Mapping of the Neogene succession in the present sub-project was based on the interpretation of 2D seismic reflection and well data, including well-logs and well-completion

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