Case History EMSLAND

In the seventies magneto tellurics (MT) has given evidence to the existence of electrically good conducting strata in the North German Basin in ca. 5000m depth, underneath a saline formation known as the Zechstein salinar.

The deep borehole Münsterland 1961 came upon black shales of the Lower Carboniferous at a depth of approx. 5500m. These were regarded as the cause for the good conductivity.

A seismic mapping of the extensive distribution of these black shales is not possible since the basis of the Zechstein in the North German Basin is the most distinctive reflector underneath of which there are no reflections that clearly correlate.

As early as the beginning of the nineties under the project “Tiefengas” (=”Deep Gas”) of the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR) the black shales were proven to be potential parent rock for the formation of natural gas.

In the middle of the nineties the BRG originated the project “MT-Norddeutschland” (= ”MT North Germany”) with the intention of demonstrating the distribution of the black shales by means of magnetotellurics.

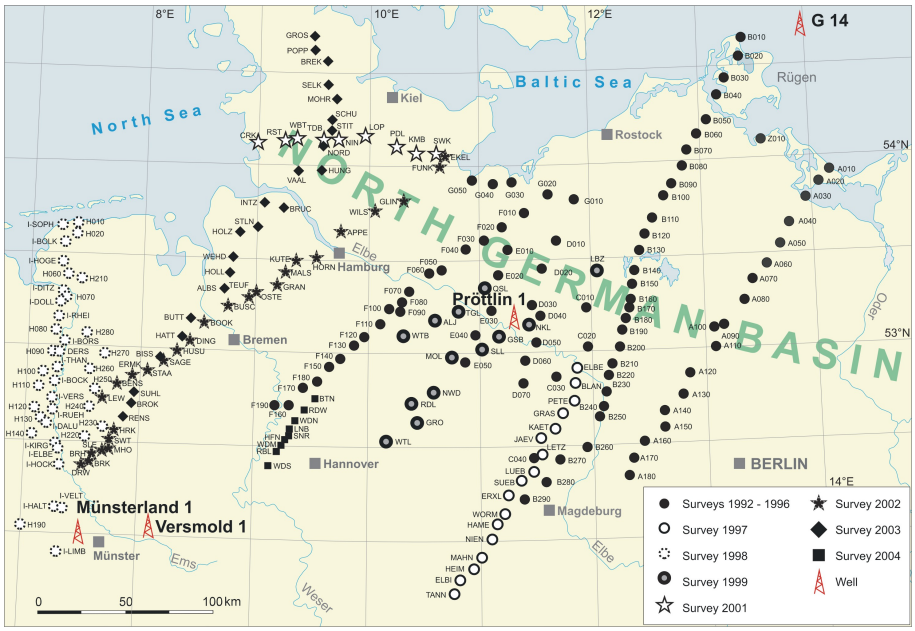

Figure 1 Distribution of MT Sites in the North German Basin

During the years 1993 to 2005 the University of Münster collected over a wide area data from a total of 226 MT soundings.

Instruments of the Metronix Company, i.e. ADU-06 and MFS-06 up to a period of 4096 sec were employed.

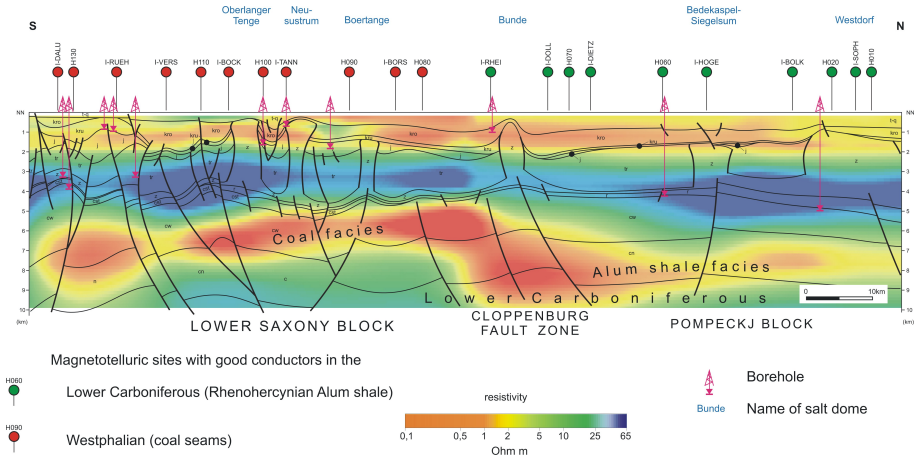

Figure 2 2D EMS-Land Profile, L. Horejschi, 2002

Results

For comparison with the MT a geological profile was projected on the MT profile.

In the southern area the good conductor is explained by the presence of the Upper Carboniferous Coal facies in approx. 6-7 km depth whereas in the northern area the Lower Carboniferous black shales indicate the good conductor in a depth of approx. 8 km depth.

The Cloppenburg-fault zone separates these areas.

The Ems Estuary is situated in the northern area of the profile. For the first time in the North German Basin, in the natural gas deposits of the Ems Estuary so-called mixed gases were evidenced. They derive from high-matured black shales and low matured coal seams.

This project interprets the results of the magnetotellurics together with the results of the petrology and lithofacies research. Consequently, new models of the paleogeographical development of the Lower Carboniferous were deduced.

With this, a new foundation for the exploration of deep gas deposits was created.

Only the possibility of large-scale assessment of the paleogeographical conditions of the parent rocks over a wide area, for economic reasons only enabled by the MT, allows the development of economic geological models for the detection of potential deep gas deposits.

HOFFMANN, N., JÖDICKE, H. & GERLING, P. (2001): The distribution of Pre-Westphalian Source Rocks in the North German Basin - Evidence from Magnetotelluric and Geochemical Data. – Geologie en Mijnbouw, The Netherlands Journal of Geosciences, **80,**1: 71-84, Dordrecht.

HOFFMANN, N., JÖDICKE, H. & HOREJSCHI, L. (2005): Regional Distribution of the Lower Carboniferous Culm and Carboniferous Limestone Facies in the North German Basin. - Derived from Magnetotelluric Soundings. – Z. dt. Ges. Geowiss., **2.**

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