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On the Use of EM Technology in the Exploration Decision Making Process

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Abstract

Seabed logging (SBL) has been used extensively as part of the decision making process in Aker Exploration AS in 2007 to scan mature areas on the Norwegian Continental Shelf (NOCS) in the 2007 “Award of Pre-defined Areas” offshore Norway.

Conceptual modeling has been used, based on petroleum play analysis, to optimize the acquisition design for an optimal Electromagnetic (EM) response. A typical grid size of 3 X 3 km enables the operator to scan a larger area, obtaining results quickly, and making exploration decisions accordingly. Whereas grid sizes of 3 X 3 km can only identify the potential presence of resistive anomaly a more detailed infill survey is required to perform more advanced geophysical processing, such as CMP inversion, depth migration and 3D inversion. With a grid size of 1 X 1 km the operator can investigate anomalies in more detail and hence identify potential prospects with respect to depth and strength.

Although a resistive anomaly may have been obtained from both the scanning survey and the infill survey it is critical in the exploration decision making process to challenge the initial model which was used for the basis of the survey design. The initial model is derived from knowledge of the regional geology and data from available offset wells. Challenging the initial model should include testing against depositional models, presence of certain minerals locally and regionally, and comparison with possible well logs in the area. If the anomaly model survives being tested against possible alternative models it may represent a good basis for the next exploration phase of the prospect, which might include acquisition of additional seismic data for better prospect definition, or potentially drilling the prospect.

Ultimately, time from data acquisition to first oil can potentially be reduced compared to a more conventional exploration approach. This approach allows an early ranking for resource focus.

Introduction

The annual “Award of Pre-defined Areas” (APA) offshore Norway is intended to stimulate the exploration of near field / near infrastructure prospectivity and is an important process for all the new energy companies attempting to acquire exploration acreage. Mature areas around existing infrastructure have however been explored quite extensively previously in terms of seismic acquisition and reprocessing of older vintage surveys to improve the overall imaging of these areas. As a consequence of these areas being “mature” new ways of reviewing the subsurface is regarded as of vitally important. The reprocessing of older seismic vintages may only improve the overall picture of the subsurface to a certain degree. Hence additional tools and processes are needed to assess the subsurface from a different perspective. With this in mind more than 3000 km² of SBL data were acquired prior to the application deadline end of September 2007 (Figure 1). The data were acquired as a supplement to existing geophysical and geological data and used in the internal ranking of blocks for the application prioritization.