Linking in-situ geotechnical and physical properties to geophysical surveys – a case study from the Dogger Bank

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The Dogger Bank is a large shallow topographic feature in the Central North Sea with water depths of 18 – 63m. As one of the proposed round 3 windfarm licence areas an extensive site-investigation was undertaken during 2010 and 2011 across Tranche A including extensive 2D-ultra high resolution reflection seismic surveys, 70 geotechnical and wireline boreholes and over 120 CPT tests. Analysis of this high resolution dataset was undertaken at the multi-dimensional scale, from 1D borehole petrophysics to seismic facies analysis in 3D.

A number of empirical, and semi-empirical models have been developed to link the geotechnical and physical properties of the Dogger Bank to the seismic data. This has included modifying the concept of rock physics templates (Avseth 2010) for unconsolidated glacial sediments, allowing the quantitative linking of geotechnical-only boreholes to seismic reflection data. Through this method, it has been possible to map geotechnical properties outwards from the borehole with increased confidence. The mapping of these properties has indicated that many high-amplitude seismic reflectors at the Dogger Bank are related to a complex history of multiple quaternary glaciations.

References:

Avseth, P., Mukerji, T. and Mavko, G., 2010. Quantitative seismic interpretation: Applying rock physics tools to reduce interpretation risk. Cambridge university press. The petrophysicist's contribution to maintaining and prolonging the lifetime of the oil and gas fields is to ensure the reservoir's 3D geomodel is accurately initialised with properties that include porosity, permeability, water saturations and net cut-off. This is challenging as there is only limited core and electrical log data available at the well locations.