**Shining New Light on an Old Basin - Revisiting and revitalizing the regional geology and plays of the NCS and UKCS**

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This contribution will highlight selected results from an integrated 3 year NCS-UKCS research project involving staff from Equinor Exploration, Production and Research in collaboration with external academic and research institutions. The first order aim of the project is to ***critically re-examine*** the tectono-stratigraphic evolution of the North and Norwegian Sea integrating and leveraging new and heritage datasets across scales and disciplines. The project scope is broad, addressing everything from the role of Caledonide basement inheritance and Devonian post orogenic collapse on Late Palaeozoic to Mesozoic pulsed rifting, through to Cretaceous to Cenozoic hyperextension and final rift to drift margin development. Glacial and post glacial erosion, deposition and uplift has also been addressed. Our approach has been to “zoom out” to the plate, seismic megasequence and structural domain scale to set the regional context, and to “zoom in” to understand details at the local/field scale integrating core, biostratigraphic, petrographic and production data. A key project driver has been the availability of super regional high resolution seismic datasets, allowing for the first time a full integrated basin/margin picture to be established, with spectacular imaging of structural style, stratigraphic infill, seismic geomorphology and full margin to basin axis S2S systems now possible. Calibration of well and core data to outcrop data fringing the area of interest (Greenland, Scotland, NE England) has been a key element of the project to establish a robust tectono-stratigraphic template. Compilation of large-scale basin event charts have allowed regional correlation of tectonic and stratigraphic events, and highlight the spatial distribution of play elements (reservoir, source, seal) and prospective intervals. Underexplored plays are thus identified and classified by both structural domain and megsequence. AFTA data are coupled with mantle dynamic processes providing knowledge on the exhumation history and provenance development. Mapping of basement inheritance and structural domains outline multiphase rifting and lithospheric deformation, providing fundamental input for basin understanding and prospectivity evaluation. On the basin scale, focus is placed on the use of seismic sequences, chronostratigraphy, seismic geomorphology, depositional facies and biostratigraphy for play element prediction. Furthermore, structural restoration is key for consistent seismic correlation targeting source and reservoir units. Basin subsidence evaluations result in paleo water depth models with basin geometry modifications, and are subsequently applied as input for source to sink studies, paleogeography mapping, source rock deposition modelling and heatflow history. Digital and “big data” ways of working have also been developed and applied, resulting in a semi-automated integrated workflow for closure mapping, prospect screening, ranking and risking.

New light on an old basin? – hasn’t this all been done before? What’s new? - The number of “established truth’s” this approach has highlighted has been both surprising and enlightening, for example the nature and extent of the “North Sea Dome” event, the role of structural inheritance, the driving mechanisms for Mid to Late Jurassic sequence architecture and play element distribution. ***The project has also highlighted the fundamental importance of integration and leveraging of hard heritage data and knowledge with new datasets and ways of working***. There is much exciting geology still to do and solve in this old basin – be that towards traditional E+P or energy transition geoscience.