



## CASE STUDY

# Identifying hydrocarbon pay opportunities across the Norwegian Continental Shelf (NCS)

500+ well hydrocarbon pay study in partnership with the Norwegian Petroleum Directorate

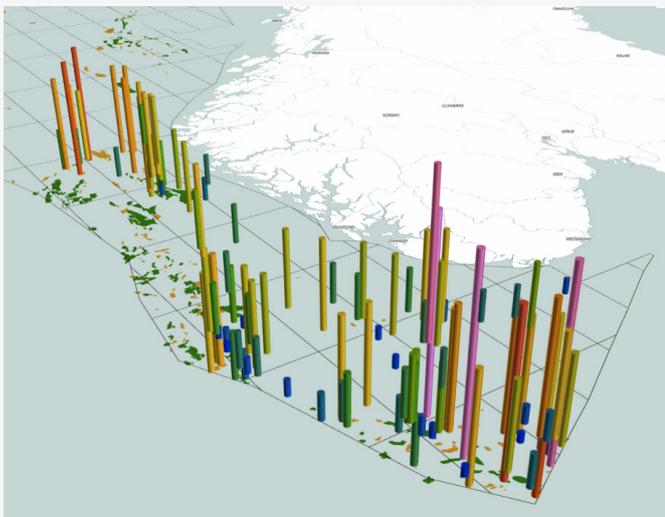
### BACKGROUND

In early 2021, the Norwegian Petroleum Directorate approached Earth Science Analytics to conduct a hydrocarbon pay study on around 500 wells in the Norwegian North Sea.

This followed on from a previous successful collaboration between the two organisations and the OGTC in 2020, during which EarthNET technology was utilised to predict hydrocarbon pay in circa 5000 North Sea wells.

### OBJECTIVES

- Identify, compare and contrast hydrocarbon pay opportunities in 500+ wells in the Norwegian North Sea, previously marked as dry, uneconomical or simply overlooked
- Provide a more detailed picture of potential accessible and cost-efficient reserves located near existing infrastructure – reducing time, environmental impact and costs
- Demonstrate the potential of geoscience and data science workflows to improve accuracy and ultimately outcomes in hydrocarbon exploration and production operations



### SOLUTION

NPD's data, collated from wells in the NCS, was inputted into the machine learning workflow of Earth Science Analytics' EarthNET Software. The software performed 1D and 3D property predictions at wellbore and away from the wellbore using seismic data, to allow targeting of hydrocarbon opportunities in locations close to existing fields and infrastructure.

EarthNET is the ideal software for digesting such substantial data sets because of its cloud native technology. When combined with the platform insights, expert analysis and learned experience extracted from previous data and applied alongside AI, models could be generated to predict hydrocarbon pay across the NCS.

*1D well pay prediction performed by ESA for the Norwegian Petroleum Directorate. Figure illustrates wells in the Norwegian North Sea registered as 'dry' by the operator that have hydrocarbon pay predicted in the wells. The elevation and colour denotes the average depth (m) that the hydrocarbon pay interval is predicted. Note that the 'dry' wells containing hydrocarbon pay are distributed throughout the Norwegian North Sea.*

## RESULT

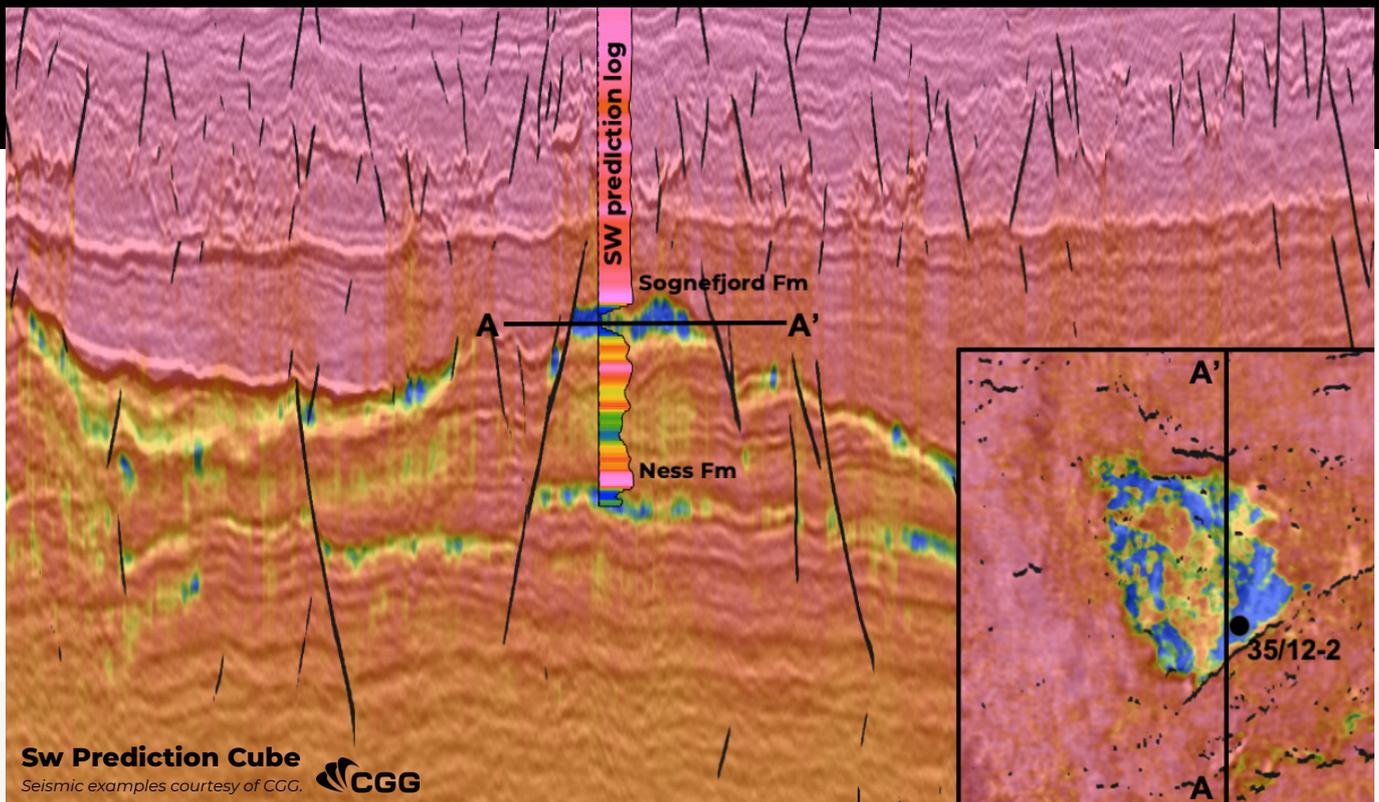
The study resulted in a huge wealth of outputs predicting subsurface properties in an accurate and robust manner, identifying significant missed and potential hydrocarbon pay opportunities. The findings, which were driven by learning data taken from predicted well curves, were supported by real-world 'missed pay' examples including the actual findings from the 2009 Grosbeak discovery.

Predictions generated from the study offer opportunities for operators to extract maximum value from their existing wells and explorationists to target the best value potential hydrocarbon pay, in essence acting as a workflow accelerator. Examples were identified where significant discoveries could be easily accessed from production templates or side-tracked wells.

## FUTURE USE

These studies contribute to a living and dynamic database of highly valuable North Sea well data, which facilitates a continual enhancement of the capabilities and quality of EarthNET's outputs and predictions. With machine learning, the highest quality data, and continued collaborations with major industry operators, EarthNET continues to push the limits of the geoscience and data science fields, providing the keys to unlocking profitable hydrocarbon reserves in an efficient manner.

These machine-learning driven workflows can be easily adopted into existing exploration strategies as a tool for explorationists and domain specialists to maximise potential outcomes.



The study was presented at the 2021 NCS conference by Dr Daniel Stoddart, Earth Science Analytics' Principal Data/Geoscientist.

3D pay prediction away from the wellbore performed by ESA for the Norwegian Petroleum Directorate. Figure shows low Sw values in the Sognefjord Fm and Ness Fm that coincides with the hydrocarbon columns discovered by the 35/12-2 well drilled in 2009. The time slice at A-A' shows the outline of the hydrocarbon discovery.