

**GeoNetZero Centre for Doctoral Training (CDT):
Geoscience and its Role in the Low Carbon Energy Transition
(2022 start)**

Project Title: The Critical Geological Evaluation of low carbon energy options in the West Shetlands area of the UK Continental Shelf (UKCS)
Host institution: Institute of GeoEnergy Engineering (IGE), Heriot-Watt University
Supervisor 1: Professor John Underhill
Supervisor 2: Dr Rachel Jamieson

Project description (250 words max.):

There is an increasing need to secure reliable supplies of energy and a drive to decarbonise the UK Continental Shelf (UKCS) during the energy transition. With the increasing maturity and competition for the sea bed (e.g. wind farms) in the North Sea, attention has turned to the West Shetlands Basin (WSB) as a source of indigenous oil and gas supply to reduce the UK's dependence on imports that have a higher carbon footprint. The Clair Field is the largest oil field in UK waters and production therefrom is expected to provide the majority of UK oil production in 2050. Tension has arisen over the sanction of new fields as exemplified by the controversy surrounding the Cambo Discovery. The aim of this project will provide the geological basis for assessing low-carbon options for the WSB. It will examine the case for continued oil and gas exploration and production (compared to imported hydrocarbon needs and the viability of re-purposing platform and pipeline infrastructure to extend the economic life of assets using wind power, (blue and green) hydrogen production and storage of carbon dioxide in the area. This project will draw upon a rich legacy of subsurface (seismic, well and core) data and investigate, describe and interpret the geological factors that determine which sites are the best suited for use in the energy transition. The outcomes will help identify operational synergies and produce a roadmap of opportunities to extend the life of the UKCS, face the net zero emissions challenge and help establish a combined low-carbon energy development in the area.

Stated link to the overarching theme of the CDT i.e. The Role of Geoscience in the Energy Transition and the challenge to meet the net zero emission targets (NOTE: In order to qualify for NEO Energy CDT funding, there must be an explicit link to the Energy Transition with a clear application to the UK's Continental Shelf (UKCS). For projects supported by 100% matched funding from your University, links to the broader Energy Transition remit are sufficient):

The project faces the key stated themes of the CDT: Extending the Life of Mature Basins to address the Energy Transition; Re-purposed exploration to meet the needs of society: Use of Geoscience in the Low Carbon Energy Transition and decarbonisation of industrial clusters; Safe Subsurface Storage (e.g. of Carbon Storage); Geological evaluation of wind farms; Geology for Net Zero; Environmental impacts and dependencies; Critical evaluation of industry's social license to operate; Direct application to the UKCS (West Shetlands area).

PhD Proposal: GeoNetZero CDT (2022 start)

Details of mapping/fieldwork locations/data to be used by the project and confirmation of access to key data being secured (please attach map as an appendix if relevant):

The subsurface (seismic, well and core) data has been secured via public release through the UK Regulator, the Oil & Gas Authority (OGA) and their National Data Repository (NDR) portal. The area of study encompasses the West Shetland Basin of the UKCS and extends from the oil fields lying in Quadrant 204 in the south west to the Tobermory Discovery that lies in Quad 208 in the North. A figure is provided to show the geographical extent of the project.

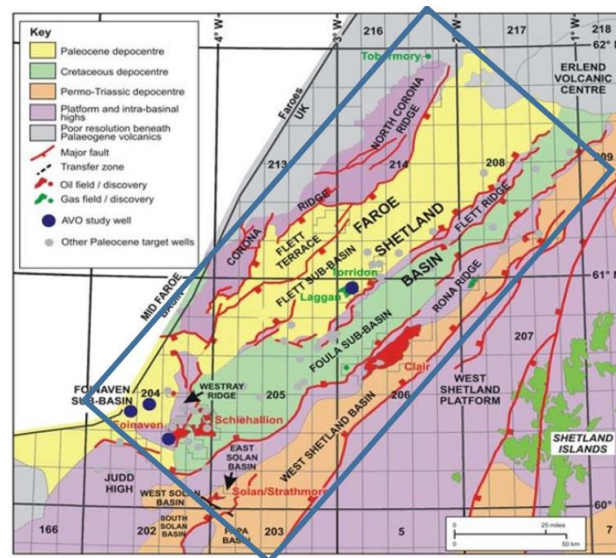


Figure showing the main structural elements in the West Shetland basins, the distribution of the main oil and gas fields therein and the geographical area covered by the PhD project

Outline of planned work schedule for the 4-year research period:

The project will be undertaken in the Centre for Exploration Geoscience in the Institute of GeoEnergy Engineering at Heriot Watt University. The initial stages of the project will involve seismic interpretation and well log analysis to evaluate and characterise the subsurface. The project will develop to evaluate options to decarbonise the basin and will ultimately produce a risk and ranked inventory of low carbon alternative leads and prospects for storage and other uses compatible with net zero aspirations. The work program will enable a student to deepen their geological knowledge using traditional interpretation methods to characterise the subsurface, but importantly, allow them to produce a risk and ranked prospect and lead portfolio facing energy transition choices and options including those with synergies with nascent (CCUS and Hydrogen) and other industries (e.g. geothermal).

Any Additional Research Costs (NOTE: Each CDT studentship includes an individual Research Training and Support Grant (RTSG) budget of £20k for the full 4-year study period):

There are no additional costs expected

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Supervisory arrangements and involvement of external partners (NOTE: Please indicate the area(s) of expertise covered by each supervisor. External collaboration is encouraged, but if proposed partner is not currently providing support to the CDT, please outline the extent of the partner's involvement with the project.):

The two supervisors have vast experience with the handling and analysis of subsurface data, expertise and credibility in the energy transition and have supervised numerous successful PhD projects.

Likely graduate career routes:

The project will be ideal for a candidate seeking future employment in the energy and environmental geoscience sectors as a geologist or geophysicist. The project also lends itself to a career in academia or government departments including carbon storage policy and regulation.