

Project Number	4
Name/title of the PhD course	Geology and Geophysics (PhD)
Name/Title of the PhD project	<i>Assess the durability and integrity of well cements and casing under hydrogen storage at the casing-cement-rock interface.</i>
Recruiting organisation and Department/Faculty of reference	<i>The University of Edinburgh, School of Geosciences. As one of the largest and most successful groupings of geographers, Earth and environmental scientists in the UK, we tackle the most environmental and social challenges of our times. You will join the Earth and Planetary Institute (EPI), a grouping of over 100 researchers united by a desire to understand the physical processes, properties and history of the planet on a fundamental level, which continue to shape the world in which we live. You will become an integral part of the hydrogen research team, comprising 10 academics, 5 post-doctoral researchers and over 15 PhD students researching various aspects of the hydrogen economy across hydrogen production, storage, transport, use and atmospheric impacts working across a range of EU, UKRI and industrial funded hydrogen projects. You will join the <i>Applied Geoscience and Hydrogen Laboratory</i>, which is a member of the European Carbon Dioxide Capture and Storage Laboratory Infrastructure (ECCSEL), (https://www.ed.ac.uk/geosciences/about/facilities/all/applied-geoscience). The facilities combine state of the art experimental multiphase flow rigs and X-ray Microtomography pore scale imaging to study multiphase flow and reactive transport during hydrogen storage. Pre and post rock analysis is achieved using a suite of analysis techniques including SEM, XRD, XRF, ICP-MS, the electron probe, and any of three ion microprobes all hosted within the School of Geosciences at The University of Edinburgh (https://www.ed.ac.uk/geosciences/about/facilities).</i>
Scientific context and Objectives	Assess and understand the integrity of active and abandoned wells during hydrogen injection and storage using experimental techniques and numerical modelling investigations on the full range of well cement types and casing materials to evaluate the well leakage risks associated with hydrogen storage activities.
Expected Results	Assessment of production well integrity under hydrogen injection and production and leakage potential of abandoned wells during hydrogen storage.
Secondment opportunities	UGA, F Donze (M27-30, 3 months) to join the ISTerre team to simulate hydrogen migration through a wellbore cement. You will be mentored by Schlumberger.
Brief CV of main Supervisor	Dr Katriona Edlmann (main supervisor) is the Chancellors Fellow in Energy and a Senior Lecturer in the School of Geosciences at The University of Edinburgh. Katriona is a reservoir geologist, advancing and transforming understanding of subsurface characterisation and multiphase reactive transport through porous media for the secure and sustainable utilisation of subsurface water resources, energy storage and low-carbon energy generation through state of the art experiments and benchmarking of numerical modelling. Katriona has an impressive portfolio of delivered research and leadership in the field of geological hydrogen storage. Katriona currently serves as the Specialist Adviser to the House of Commons Scottish Affairs Committee inquiry into Hydrogen and Carbon Capture in Scotland. She is a member of the UK Government Department for Energy Security and Net Zero (DESNZ) Hydrogen Advisory Council Transportation and Storage Infrastructure Working Group and of the Scottish Enterprise SHINE (Scottish Hydrogen Innovation Network) program, supporting business development within the hydrogen economy in Scotland. Katriona is currently supervising 3 PhD students whose research focuses on the geological storage of hydrogen, atmospheric impacts of hydrogen emissions and risk-based analysis.
Publications	1-Craig Allsop, Georgios Yfantis, Evan Passaris and Katriona Edlmann (2022). Utilising publicly available datasets for identifying offshore salt strata and developing salt caverns for hydrogen storage Geological Society, London, Special Publications Volume 528. https://doi.org/10.1144/SP528-2022-82 2-Richard A Schultz, Niklas Heinemann, Birgit Horváth, John Wickens, Johannes M Miocic, Oladipupo Oluwatoyin Babarinde, Wenzhuo Cao, Paolo Capuano, Thomas A Dewers, Maurice Dusseault, Katriona Edlmann ... (2022) An overview of underground energy-related product storage and sequestration. Geological Society, London, Special Publications, Volume 528 https://doi.org/10.1144/SP528-2022-160 3-Johannes Miocic, Niklas Heinemann, Katriona Edlmann , Jonathan Scafidi, Fatemeh Molaei, Juan Alcalde (2022) Underground hydrogen storage: A review. Geological Society, London, Special Publications Volume 528. https://doi.org/10.1144/SP528-2022-88
Projects participation	1- H20202 HyUsPRE: (Oct 2021-Dec 2023) Grant agreement ID: 101006632. Edlmann is a project Co-I and work package lead. 2- UK EPSRC HyStorPor: (Sept 2019- August 2023) Grant Agreement ID: EP/S027815/1 Co-I and work package lead. 3-US National Science Foundation, Partnership for International Research and Education (PIRE): Four networks for Geologic Hydrogen Storage (Jan 2023-Dec 2026), Co-Investigator.