Study of decommissioned onshore gas field highlights hydrogen storage concerns

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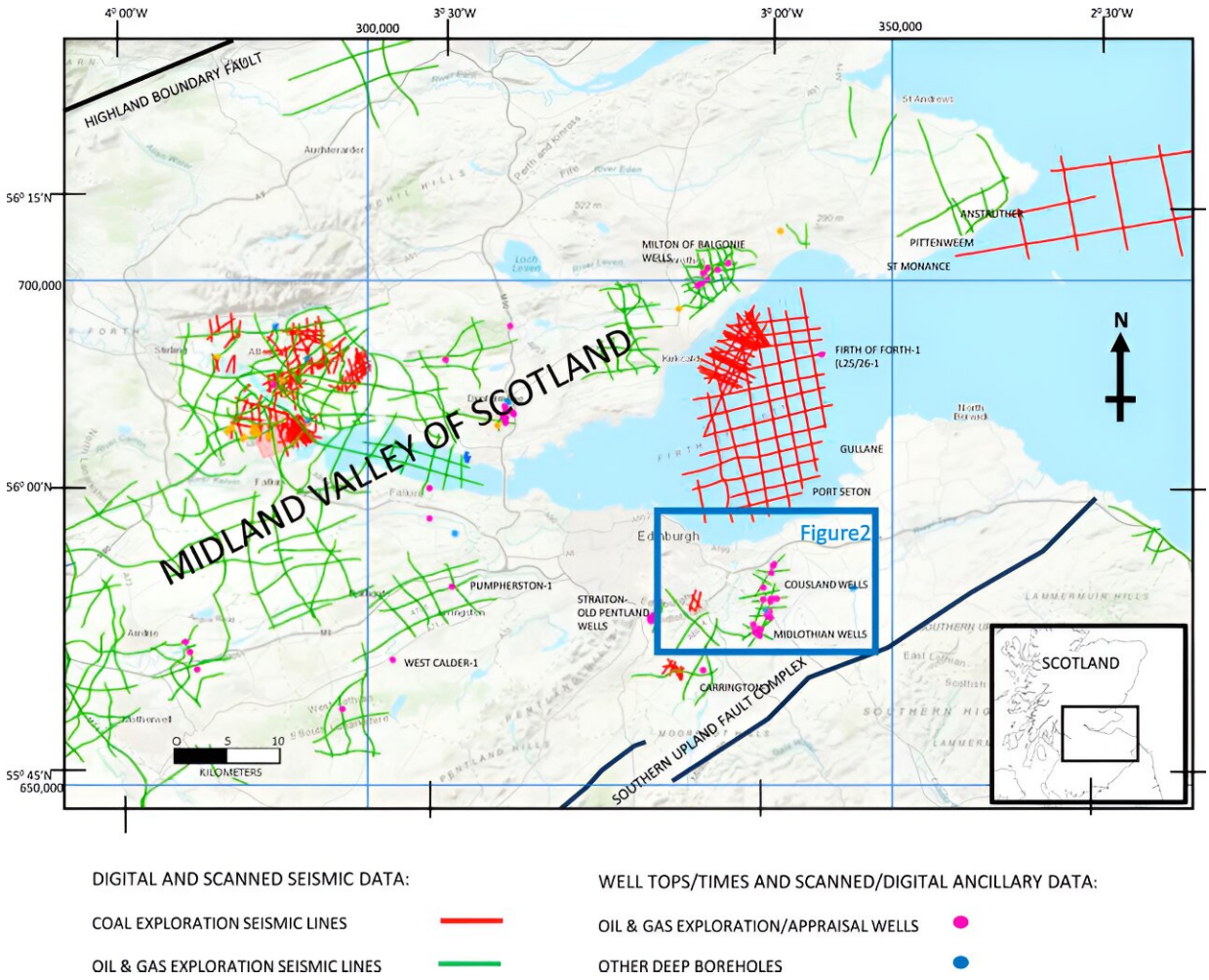

Location map, showing seismic and well data available from UK Onshore Geophysical Library (based on UKOGL website, with permission: https://ukogl.org.uk). Credit: *Earth Science, Systems and Society* (2024). DOI: 10.3389/esss.2023.10076

A study exploring the potential of a decommissioned gas field in Scotland as a major hydrogen store has highlighted concerns over potential leaks and recommended that it shouldn't be used.

Research led by Professor John Underhill at the University of Aberdeen and Malcolm Butler at the UK Onshore Geophysical Library (UKOGL) concluded that the Cousland gas field in Midlothian fails to meet the criteria for safe subsurface storage.

The site near Dalkeith in Midlothian, which was decommissioned in the 1960s, has been highlighted by other academic studies as a potential contender for large-scale hydrogen storage to help meet national net zero ambitions.

However, the study has found numerous barriers to its adoption for this purpose, including a lack of evidence of the nature of the subsurface sedimentary rocks and the structure of the field.

This has led to concerns over the potential for hydrogen to escape and present a risk to the local environment and surrounding communities. The findings have been published in the *Earth Science, Systems and Society* journal.

Professor Underhill, who is Director of the University's Center for Energy Transition, said, "Hydrogen has been proposed as a possible green energy vector in the transition, but it forms a small, nimble molecule and is very difficult to contain.

"It can be stored safely in subsurface geological sites, but so far these have largely been limited to man-made hermetically sealed soluble caverns in halite (rock salt) deposits.

"The absence of salt deposits onshore in Scotland is what has led to the proposal that former and now depleted hydrocarbon fields such as the Cousland gas field, could be used.

"However no natural hydrogen has been discovered in any existing onshore or offshore fields in the UK, which raises the question of whether it was once there and leaked, and crucially if it would stay underground if it was injected into a subsurface site.

"We used geological data available through the UK Onshore Geophysical Library (UKOGL) to critically evaluate the possibility and concluded that the Cousland field fails to meet the criteria for safe subsurface storage, is a poor site for a hydrogen repository and should not be used for this purpose."

Professor Underhill added that the study has made clear the need for independent evaluation of subsurface sites proposed for use in the energy transition.

He said, "In this particular case, it emphasizes the storage challenges associated with porous media in general and in subsurface sites in onshore areas in particular.

"It also underlines the University and Center for Energy Transition's role as an independent technical evaluator of subsurface technologies, and its willingness to identify unforeseen hurdles and seek workable solutions as we steer a pathway to net zero."

Dr. Butler, who is Chair of UKOGL, added, "This study would not have been possible without access to the large volume of well data, seismic records and crucial unpublished historic reports and correspondence archived by UKOGL and now available for free download from its website."

More information: Malcolm Butler et al, A Critical Geological Evaluation of the Hydrogen Storage Potential in the Cousland Gas Field, Midland Valley of Scotland, *Earth Science, Systems and Society* (2024). DOI: 10.3389/esss.2023.10076

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