The Vital Role that Geoscience Will Play in the Energy Transition

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Abstract

Over the past Century, the global population has increased fourfold to over 8.1 Billion today and is projected to rise to >11 Billion by 2100, which places enormous pressure on Earth Systems and its resources as people seek to improve their quality of life, but with negative consequences on biodiversity, the environment and climate. Over the same period, atmospheric carbon dioxide levels have risen from 300ppm to over 420ppm and CO2 emissions have gone from 4 to 35 Gigatons per year, with all the consequences for global warming and sea level rise that has.

In this context, it is an inconvenient reality that fossil fuels currently account for over 80% of primary energy consumption and even countries that have weaned themselves off coal, still rely heavily on oil and gas to power industry, keep the lights on, heat homes and to meet their transportation needs (e.g. 75% dependency in the UK). Given the challenging starting point on our road to decarbonise society and meet net zero emissions targets, a misstep along the way could impose blackouts, power outages, impose fuel poverty and job losses.

There is now an increased appreciation of the balance and trade offs between security of supply, affordability, environmental sustainability and climate compatibility to ensure a smooth transition rather than a cliff edge. While some are intent on shutting down industrial clusters, doing so will come at a cost to jobs, communities, national economics (GDP), energy security, reliability of supply and, given the demand for the products is unlikely to diminish, the (higher) carbon footprint will simply be exported. As society seeks the solutions to save the planet yet continue to meet the energy needs of an increasing world population and geoscientists will be at the forefront of that effort.

Geoscience has a huge role to play as we wrestle with the challenge to transition our energy systems and seek viable solutions to enable the pivot from fossil fuels to renewable sources. There is a need to have forensic data- led, evidence-based research undertaken to characterise the subsurface, seabed, and metocean conditions to enable industry to decarbonise and emissions targets to be met. Use of subsurface data acquired in the pursuit of hydrocarbons will help determine where the best sites are for carbon dioxide, hydrogen, and nuclear waste storage, (low- and high-enthalpy) geothermal energy sources, wind farms and placer deposits containing critical minerals.

Despite the evident need for the expertise to communicate with communities and technically inform policy and decision-making, the career pathway is proving to be less attractive and there are serious recruitment challenges to be addressed. It is imperative that we articulate the message that Advancing Geoscience Education for the Next Generation is crucial if we are going to meet the challenges embodied in the energy trilemma.