Warning issued over the unintended consequences of wind for achieving net zero targets

26 October 2021, by John Underhill

Professor John Underhill. Credit: Heriot-Watt University

In the run-up to the COP26 global climate summit in Glasgow, John Underhill, Professor of Geoscience & Energy Transition at Heriot-Watt University, highlights the need for joined up thinking if society is going to find the optimal use of the North Sea to achieve Net Zero targets.

The UK has been highly effective in decarbonising our electricity system through the use of renewables in general and wind power in particular. The contribution made by wind power has risen four-fold in a decade—from 5.4 GW in 2010 to 24 GW in 2019—and it contributed 24.8% of UK electricity supplied in 2020, having surpassed coal in 2016 and nuclear in 2018. Although initially dominated by onshore sources, the contribution made by offshore wind installations has rapidly caught up to be roughly equal now and will provide the majority of electricity in the future.

The appetite for offshore wind remains high and there have been demands for more wind farm licenses to be awarded. The next round (Phase 4) of awards promises to be the largest yet with substantive areas of the continental shelf becoming hubs for wind energy. It is also providing a tidy income stream green energy windfall too.

Despite the undoubted positive contribution that wind has made to decarbonise the electricity system, there are unintended consequences that impact our ambition to decarbonise other sectors. In particular, since most wind farms are fixed to the sea bed, it is much harder to visualize, characterize, monitor and hence, utilize the subsurface below them, something that is required if we are to locate and evaluate safe storage sites and monitor the carbon dioxide injection needed to decarbonise the UK's industrial hubs.

Subsurface imaging is primarily through the acquisition of seismic reflection data that produces an accurate 3D "body scan" of the buried geology. The data is usually obtained by towing a long streamer of sound wave receivers. Unfortunately, wind farm installations preclude this method since it's akin to the boat and its recorders having to navigate a large "ski slalom".

The competition for offshore sea bed and subsurface "real estate" has come into sharp focus with the publication of the Net Zero Strategy and the green light for two carbon storage licenses. One of the prime sites (Endurance) that underpins the East Coast Cluster carbon store will be covered by the Hornsea-4 wind farm. As a result, it may prove necessary to use sea-bottom sound recorders, something that adds an order of magnitude of cost to the project (from £5m to £50M) meaning it and other projects may no longer be viable.

Wind farms are undoubtedly a valuable technology for the energy transition and a crucial part of our efforts to decarbonise. However, holistic, joined-up thinking is needed to ensure the best and most

appropriate use is made of the sea bed and subsurface geology. A collective failure to understand the dependencies and the impacts that their blanket coverage has may rule out other promising technologies and hold back the UK's pathway to net zero.

The occurrence of wind farms and significant monitoring issue will affect our ability to build a blue hydrogen capacity because of the spatial association needed between a producing gas field, carbon store and hydrogen export route to shore (and storage), any one of which might be precluded by the competition for space.

Judicious management of the offshore areas is urgently required that involves collaboration between the regulatory bodies (Crown Estate and the Oil & Gas Authority) and the various wind farm, gas and carbon storage operators to avoid unhelpful competition. Only by doing so will the UK have choices for the low carbon technologies and re-purposing of the North Sea for the low-carbon energy transition. It is essential to get the optimal use of our offshore subsurface resources if we have any chance of achieving our net zero targets.

Provided by Heriot-Watt University

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