North Sea rocks could act as large-scale renewable energy stores

January 21 2019

Credit: CC0 Public Domain

Rocks in the seabed off the UK coast could provide long-term storage locations for renewable energy production, new research suggests.

An advanced technique could be used to trap compressed air in porous rock formations found in the North Sea using electricity from renewable technologies.

The pressurised air could later be released to drive a turbine to generate large amounts of electricity.

Using the technique on a large scale could store enough compressed air to meet the UK's electricity needs during winter, when demand is highest, the study found.

The approach could help deliver steady and reliable supplies of energy from renewable sources—such as wind and tidal turbines—and aid efforts to limit global temperature rise as a result of climate change.

However, the amount of energy produced by many renewable technologies varies depending on weather conditions. There is a need for new processes that can store energy cheaply and reliably for months at a time, researchers say.

Engineers and geoscientists from the Universities of Edinburgh and Strathclyde used mathematical models to assess the potential of the process, called compressed air energy storage (CAES).

The team then predicted the UK's storage capacity by combining these estimates with a database of geological formations in the North Sea.

Porous rocks beneath UK waters could store about one and a half times the UK's typical electricity demand for January and February, they found.

Compressed air energy storage would work by using electricity from renewables to power a motor that generates compressed air. This air

would be stored at high pressure in the pores found in sandstone, using a deep well drilled into the rock. During times of energy shortage, the pressurised air would be released from the well, powering a turbine to generate electricity that is fed into the grid.

A similar process storing air in deep salt caverns has been used at sites in Germany and the US.

Locating wells close to sources of renewable energy—such as offshore wind turbines—would make the process more efficient, cheaper and reduce the amount of undersea cables required, the team says.

The study is published in the journal *Nature Energy*.

Dr. Julien Mouli-Castillo, of the University of Edinburgh's School of GeoSciences, who led the study, said: "This method could make it possible to store renewable energy produced in the summer for those chilly winter nights. It can provide a viable, though expensive, option to ensure the UK's renewable electricity supply is resilient between seasons. More research could help to refine the process and bring costs down."

More information: Inter-seasonal compressed-air energy storage using saline aquifers, *Nature Energy* (2019). DOI: 10.1038/s41560-018-0311-0 , www.nature.com/articles/s41560-018-0311-0

Provided by University of Edinburgh