Prospective pumped hydro sites in South Australia

June 16 2017

Researchers at The Australian National University (ANU) have identified 185 sites in South Australia potentially suitable for pumped hydro storage, which may help secure Australia's electricity grid.

The ANU team has considered the possible benefits of using hydro power energy storage, where water is pumped uphill and stored to generate electricity on demand.

In light of Chief Scientist Dr Alan Finkel's final report on the review of the electricity market's security, Professor Andrew Blakers said the new findings provided a valuable contribution to the national discussion on energy security.

"Our work shows that there are many sites in South Australia that may be suitable for establishing pumped hydro storage, to help build a sustainable, secure and affordable electricity grid," said Professor Blakers, the study's lead researcher from the ANU Research School of Engineering.

"This assessment is based on very appealing physical characteristics, but the 185 potential upper reservoir sites identified would require detailed due diligence involving land ownership, engineering, hydrological, environmental and other considerations."

Professor Blakers said pumped hydro energy storage - which accounts for 97 per cent of energy storage worldwide - can be increased across the

country to support high levels of renewable energy, primarily solar photovoltaics and wind.

The Australian Renewable Energy Agency (ARENA) is providing $449,000 support for an ANU-led feasibility study, aiming to develop a nation-wide atlas of potential off-river pumped hydro storage sites.

Off-river pumped hydro storage requires pairs of reservoirs, typically ranging from nine to 100 hectares, in hilly terrain and joined by a pipe with a pump and turbine. Water is circulated between the upper and lower reservoirs to store and generate power.

"All the potential sites in South Australia are outside national parks and urban areas, and like all hydro power can go from zero to full power very quickly," Professor Blakers said.

The water would be stored in an upper reservoir and run through a turbine to a lower reservoir when electricity is needed - such as when the sun is not shining or the wind is not blowing. The water can then be pumped back uphill when electricity from renewables and other sources is abundant and cheaper.

Co-researcher Dr Matthew Stocks said pumped hydro storage, depending on the size of the reservoirs, would be capable of delivering maximum power from hours to more than a day.

"Our earlier work demonstrated the feasibility of 100 per cent renewable electricity for Australia supported by pumped hydro storage," said Dr Stocks from the ANU Research School of Engineering.

"About 400 hectares of reservoir is required to support a 100 per cent renewable energy grid for South Australia, which is four parts per million of the state's land mass. Annual water requirement would be less

than one per cent of South Australia's annual extraction from the Murray River."

Co-researcher Mr Bin Lu said South Australia obtained about half of its electricity from renewable wind and rooftop solar photovoltaic (PV) generators.

"As the proportion of wind and PV increases towards 100 per cent over coming years, a combination of additional interstate high-voltage transmission, demand management and local storage may be required to stabilise the South Australian grid," Mr Lu said. "Pumped hydro and batteries are both likely to have prominent storage roles."

ARENA CEO Ivor Frischknecht said the project was part of ARENA's focus on supporting flexible capacity solutions to ensure a smooth transition to a renewable energy future.

"Storage is becoming more important and valuable as we move towards higher levels of renewable energy in our grids," Mr Frischknecht said.

"Pumped hydro is the most mature form of energy storage, and studies like these are helping to determine whether it could play an even greater role in increasing grid stability."

More information: South Australian PHES atlas: re100.eng.anu.edu.au/research/re/site/sa.php

Provided by Australian National University