Muscat hydrogen energy storage

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Muscat: Hydrom, the Sultanate"s green hydrogen orchestrator, announced ...

We are the singular, central entity orchestrating Oman"s interest in green ...

Al-Khuwair, Ministry Streets, Opposite Sultan Qaboos Street Muscat - Sultanate of Oman View in Map

MUSCAT: A key study led by Omani scientists underscores the potential for the Sultanate of Oman to capitalise on the abundance of high-quality silica sand for cost-competitive thermal energy storage - a prerequisite for the large-scale production of green hydrogen and green ammonia in the country.

Publication of the study, titled "Silica Sand as Thermal Energy Storage for Renewable-based Hydrogen and Ammonia Production Plants", comes as Oman prepares to embark on a landmark transition to clean energy production and export. A portfolio of clean energy projects lined up for implementation in the coming decade envisage around $50 billion worth of investment inflows to achieve a production of 1 million tonnes per annum of green hydrogen by 2030.

Muscat-based researchers Nasser al Rezeiqi (PhD candidate at Malaysia-Japan International Institute of Technology) and Mariam Jedda participated in the study, supported by Peng Yen Liew, Associate Professor of Malaysia-Japan International Institute of Technology. It delved into the potential for silica sand - an abundant, thermally stable and low-cost and low-cost method for storing thermal energy at temperatures as high as 1,200 deg C.

The technology is particularly effective in addressing intermittency challenges associated with renewable energy. Thus, after sundown for example, when solar power is no longer available to harness, heat stored in silica sand can be discharged and converted into electricity by driving an electric power system, the paper points out.

Silica sand-based thermal energy storage can be particularly advantageous for Oman, according to the researchers. "The silica sand in fthe Sultanate of Oman was found to be ultra-pure; a composition National Renewable Energy Laboratory (NREL) [part of the US Department of Energy] has proven to have ideal thermal properties for its use as a Thermal Energy Storage system. NREL has also proposed a standalone sand-TES concept, which offers ample storage capacities, longer discharging hours and meagre cost compared to other commercial energy storage technologies," they noted in their paper.

Simulations conducted by the researchers found that the silica sand-based thermal energy storage system offers far greater economic benefits in comparison with commercial lithium batteries in maintaining the full-day operation of a 500 MW solar-based green ammonia production plant in Duqm.

"The result shows that using silica sand as a TES system significantly reduced the unit production cost of green hydrogen and green ammonia by 59% and 48%, compared to the use of lithium-ion batteries, where the green hydrogen and green ammonia lifetime normalized costs fell to 0.60 US$/kgH2 and 0.16 US$/kgNH3.

"The sand TES system is thus a promising solution for intermittent renewable energy storage. The low cost and abundance offered through a sand TES system will contribute to ramping up renewable energy projects, thus driving down the costs of clean energy and renewable energy-based products," the paper added in conclusion.