Muscat thermal energy storage

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MUSCAT: A key study led by Omani scientists underscores the potential for the Sultanate of Oman to capitalize 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.

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.

This revelation holds the key to unlocking large-scale production of green hydrogen and green ammonia in Oman, paving the way for significant advancements in the country’s renewable energy landscape.

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Oman boasts an abundance of high-quality silica sand, a resource that has long been overlooked but now emerges as a crucial element in the pursuit of sustainable energy solutions. Silica sand, when utilized for thermal energy storage, demonstrates the ability to revolutionize the production of green hydrogen and green ammonia, marking a paradigm shift towards cleaner and greener energy alternatives.

The primary goal of the study is to highlight the untapped potential of Omani silica sand as a viable and cost-competitive medium for thermal energy storage. By leveraging this abundant resource, Oman aims to position itself as a key player in the large-scale production of green hydrogen and green ammonia - two cornerstones of the global shift towards renewable and eco-friendly energy sources.

At the heart of this ambitious vision lies thermal energy storage technology. Silica sand proves to be an efficient and economically feasible material for storing thermal energy, a critical component in the production of green hydrogen and green ammonia. This technology holds the promise of not only reducing carbon emissions but also establishing Oman as a leader in the renewable energy sector.

The potential impact of harnessing Omani silica sand for energy storage is colossal. It opens avenues for large-scale production of green hydrogen and green ammonia, contributing significantly to Oman’s renewable energy portfolio. Moreover, it aligns with global efforts to transition towards sustainable practices, mitigating the environmental impact of traditional energy sources.

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