

Hydrogen energy storage malta

"Hydro-pneumatic Energy Storage for Offshore Green Hydrogen Generation ...

Figure 1: Visual representation of the offshore wind energy, FLASC energy storage and Hydrogen production concept.

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The current trend in the EU is to reduce the emissions of Carbon Dioxide into the atmosphere and develop a decarbonised economy. One of the more sustainable ways towards reaching this objective is by investing into renewable energy (RE) technologies. Given that Malta is strategically located in the middle of the Mediterranean Sea, the potential for using wind energy should not be overlooked. The offshore wind industry has been attracting a lot of attention due to the increasing prices of fossil fuels and the need for greater security in energy supply chains. But why look towards the offshore environment?

Due to the small size of the Maltese Islands and the high population density, there is limited space to install renewable energy technologies onshore. Moreover, open marine spaces offer higher wind speeds with better opportunities for power generation. Current and upcoming offshore wind projects are focusing on areas having significant wind resources and shallow sea depths, such as those found in the North Sea. Although wind resources in the Mediterranean region are lower than in the North Sea, a potential for wind generation still exists. Currently, there is only one offshore wind farm in the Mediterranean and this is located near the port of Taranto in Italy.

Recently, the Maltese Government published a Preliminary Market Consultation for the proposal of economic activities within Malta's offshore Exclusive Economic Zone. This offers opportunities for diverse activities including, but not limited to the production of renewable energy from offshore resources and the production and storage of Hydrogen.

Although wind energy generation comes with significant benefits, its intermittency makes it a challenging resource to work with and to predict. Supply and demand mismatches could mean that wind generated electricity might need to be curtailed, or wasted, if the supply exceeds the demand. Likewise, any deficits due to low or no wind would have to be compensated by other means. This is where energy storage comes in. Storage is important for both on and off the grid applications which rely on a RE source for supplying electrical power. Various different storage technologies exist such as pumped hydro storage, chemical energy storage, thermal energy storage and compressed air energy storage, amongst others.

Following the decarbonisation trend is Hydrogen generation (H₂), which is now seen as an important medium

for long duration storage. There are already viable options to use Hydrogen, such as for road transport and aviation, for short-range and heavy-goods vehicles. Hydrogen can be produced by various means and the mode of production is usually assigned a defining colour. For example, Hydrogen produced using fossil fuels has a by-product of Carbon dioxide and is consequently dubbed "Grey" Hydrogen. "Blue" Hydrogen is also produced using fossil fuels but in this case, the Carbon Dioxide emitted is captured and stored.

Integration of the FLASC energy storage system into the offshore wind and hydrogen production system makes it possible to smoothen the variable wind power supplied to the Hydrogen plant thus improving operational hours for the Hydrogen-producing equipment. Power smoothening by means of integrated storage is shown in Figure 2.

Research is underway investigating the behaviour of the FLASC energy storage system and its contributions towards the decarbonisation of an offshore green Hydrogen production process. The HydroGenEration project team is conducting a review of current and emerging technologies" status, looking at local prospective sites in terms of utilisation, constraints and opportunities, identifying stakeholders and conducting numerical modelling on the interactions between the different components and processes as a means of producing green hydrogen in an offshore environment for the further decarbonisation of our environment.

HydroGenEration is an ongoing two-year research project of the University of Malta and its spin out company FLASC B.V., which is based in the Netherlands. Project "Hydro-pneumatic Energy Storage for Offshore Green Hydrogen Generation - HydroGenEration" (Ref.: EWA 64/22) is financed by The Energy and Water Agency under the National Strategy for Research and Innovation in Energy and Water (2021-2030).

This project is utilising coastal wind data collected using a Light Detection and Ranging (LiDAR) system that was purchased through European Regional Development Fund for the setting up of a Solar Laboratory (ERDF 335), part-financed by the European Union.

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