Unlocking Green Hydrogen Potential: A Machine Learning-Based Assessment

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Abstract : Green hydrogen is hydrogen produced using renewable energy sources. In the last few years, Oman aimed to reduce its dependency on fossil fuels. Recently, the hydrogen economy has become a global trend, and many countries have started to investigate the feasibility of implementing this sector. Oman created an alliance to establish the policy and rules for this sector. With motivation coming from both global and local interest in green hydrogen, this paper investigates the potential of producing hydrogen from wind and solar energies in three different locations in Oman, namely Duqm, Salalah, and Sohar. By using machine learning-based software "WEKA" and local metrological data, the project was designed to figure out which location has the highest wind and solar energy potential. First, various supervised models were tested to obtain their prediction accuracy, and it was found that the Random Forest (RF) model has the best prediction performance. The RF model was applied to 2021 metrological data for each location, and the results indicated that Duqm has the highest wind and solar energy potential. The system of one wind turbine in Duqm can produce 8335 MWh/year, which could be utilized in the water electrolysis process to produce 88847 kg of hydrogen mass, while a solar system consisting of 2820 solar cells is estimated to produce 1666.223 MWh/ year which is capable of producing 177591 kg of hydrogen mass.

Keywords : green hydrogen, machine learning, wind and solar energies, WEKA, supervised models, random forest

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