

Control Water Pumping in a Hybrid System Used in Agriculture

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Abstract : This work investigates the performances of a photovoltaic and wind-for-water pumping system designed to improve water accessibility in rural and agricultural areas, particularly within the Mediterranean region. By combining solar and wind energy, the system maximizes energy capture across diverse environmental conditions, addressing the intermittency challenges typically associated with standalone renewable energy sources. Through detailed simulations, the study evaluates the system's energy efficiency, water output, and operational reliability. The integration of advanced energy storage solutions and a fuzzy logic control strategy (FLC) further enhances the optimization of PV and wind power, ensuring consistent and efficient performance. This hybrid configuration not only stabilizes the system but also exemplifies the importance of renewable energy production and water management using techniques used to the unique climatic and geographical characteristics of the Mediterranean region. The results demonstrate that the hybrid system offers a sustainable and resilient solution for agricultural irrigation and potable water supply. It represents a reliable alternative for off-grid applications, contributing to the sustainable development of energy and water resources in remote and rural areas while addressing critical environmental and resource challenges in the Mediterranean context.

Keywords : photovoltaic system, wind turbine, water management, pumping water, agriculture areas

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