Brackish water RO plant as a variable load for renewables based hybrid power system for increased power output

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ABSTRACT

Water and energy are the two needs that control human lives and propagate civilization. The scarcity of water can be addressed easily if energy is abundant. But we can see that most of the places that are water-stressed are also energy-stressed. Making the normal electricity grid supply available may not be a cost-effective option. Rural/remote locations such as hills and islands often have the problem of both water and energy. Hence there is a need to identify energy sources such solar, wind and biomass that are available locally to cater to water and energy needs. These sources are of intermittent nature and hence there is a need to store the energy when available. Also, combination of two or more of these renewable sources is also required to meet the demands. These are known as hybrid power system. This paper carries out an analysis of various sizing combinations of systems with solar photovoltaic, wind energy and stored energy in batteries for production of drinking water from a brackish water source. When the power produced is less than that required by the load, the generated power has to be stored in a battery and again discharged when required. We propose a BWRO plant that can take reduced power input also and reduced water output under such conditions and thus reduce the need of higher capacity of storage batteries. The system can operate the RO plant whenever the power is available, produce drinking water and store in a tank. This paper analyses the model of the entire hybrid power system in MATLAB to simulate the performance of the hybrid power system for different combinations of capacities. The analysis under various input conditions and analyzed the results.

Keywords: Renewable energy; Hybrid power system; Desalination; RO; Solar; Wind; Battery; Storage

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