Design and testing of an isolated commercial EDR plant driven by solar photovoltaic energy

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ABSTRACT

The production of potable water from brackish water, tertiary treatments of treated wastewaters for irrigation and other allowed uses, and several industrial processes which use recycled water are the most important applications of electrodialysis (ED). During the last years, the number of pilot initiatives focused on renewable energy powered desalination has grown, being one of the most promising combinations of the ED powered by photovoltaic (PV) systems. ED combined with renewable energies becomes attractive for being a mature technology, which requires direct current (DC) power and is easily adapted for variable energy conditions. The present paper shows the design, installation, testing, and monitoring of a 100% isolated PV–ED system which is feasible for a commercial scale. The testing tasks have been performed in a 4 m³/h commercial-one stack electrodialysis reversal plant powered by two solar PV fields in parallel. For the DC energy required in the stack, a solar PV field has been designed and tested. It permits modulation by different solar panels connections, and thus makes possible to maintain the output current according to the real solar radiation and different raw water salinity.

Keywords: Desalination; Renewable energy; Commercial-scale EDR plant; Solar PV; Off-grid

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