

## Photovoltaic system for brackish water desalination by electro dialysis and electricity generation

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Received 30 September 2008; Accepted in revised form 24 April 2009

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### ABSTRACT

Desalination typically requires significant amounts of energy. Although renewable energy (RE) sources can be indirectly connected to a desalination plant through the electrical grid, the direct connection of RE to low or medium capacity desalination plants is more convenient, especially in remote regions. Photovoltaic (PV) energy can be used to power a desalination system by electro dialysis (ED) in a reliable and autonomous way. In this paper, a new configuration for dual desalination and electricity production is presented. Photovoltaic modules are connected in series (strings), and a number of strings are connected in parallel according to the electrical power of the system. The ED reactor is directly connected in parallel with a small number of the photovoltaic modules. The PV arrays can be connected to batteries (stand-alone system) or to the grid (grid connected system). The ED system is modelled as a time-varying resistance that draws a time-dependent intensity of current from the solar modules. The surplus of energy generated in the solar panel (a function of the incident solar irradiance) is injected into the electrical system (batteries or inverter) in a very efficient way, without changes in the configuration.

*Keywords:* Photovoltaics; Desalination; Distributed generation; Dual systems

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