

USE OF FUEL CELLS FOR ENERGY STORAGE IN DESALINATION PLANTS

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In the Northeast Region of Brazil a great volume of water exists in the underground, enough to alleviate the water supply crisis of this area. However, due to the fact that 51% of the total area of Northeast (about 788,358 km²) is located on crystalline rocks, water from deep wells often has high salt concentration (brackish water) preventing direct usage as drinking water. But, due to the lack of options, some rural populations in this area are forced to consume this water, which has a salt content greater than the limit recommended by the World Health Organisation (WHO). The water supply crisis is a world problem. In recent years the process of reverse osmosis (RO) has become a significant technical option to solve this problem through the desalination of brackish and seawater. A small PV-RO (photovoltaic powered reverse osmosis) brackish desalination plant with batteries storage was installed in the community of Coité – Pedreiras, in the state of Ceará, Northeast Region of Brazil, where one finds yearly average temperature of 28 °C and a solar potential of about 2,000 kWh/m²year.

The PV plant can not supply the high pressure pump with constant power; so, the RO system needs a storage system to operate the RO membrane with constant pressure.

The goal of this paper is to analyse the use of fuel cells for energy storage in a PV-RO unit and compare it with a conventional battery storage system. The main motivation is the fuel cell advantages, which can be useful for operation with a PV-RO plant. In this way, an energy flow rationalization is found, making the system more efficient.

In principle, a fuel cell operates like a battery. It generates electricity combining hydrogen and oxygen chemically without any combustion. Unlike the batteries, a fuel cell is not run down neither it requires recharge. It will produce energy as electricity and heat as long as fuel is supplied. The only by-products that are generated are water 100% pure.

This storage system uses the following one method to store energy:

- Reversible fuel cells: this fuel cell can revert their process producing hydrogen (H₂) and oxygen (O₂) directly, if a current flows in reverse way through them.

