

Current and future opportunities for renewable integrated desalination systems in the Brazilian semiarid region

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ABSTRACT

Renewable energy sources for desalination purposes are becoming a reliable and technically mature solution over conventional methods powered by fossil fuels, especially for small-size applications in isolated regions such as the Brazilian semiarid. In this paper, an overview of desalination systems is provided with their respective energy consumption, costs, social needs, environmental assessments, and potential integration with renewable energy sources. The opportunities and challenges for the application of small-scale renewable integrated brackish water reverse osmosis desalination systems in the Brazilian semiarid are provided. In addition, a spatial analysis is conducted for a prior assessment of potential areas for the implementation of photovoltaic-RO-wind (PV-wind-RO) units in the region. Among various hybridization possibilities, PV-RO grid-connected systems are a reliable and cost-effective solution for rural communities due to the high availability of wind and solar resources and previous experience with the technology. The spatial analysis demonstrates that Ceará and Rio Grande do Norte states, as well as the central part of Bahia state, are the regions with highest potential for the implementation of PV-wind-RO systems. Further studies and experimental projects are required to aid decision making and expand small-scale desalination projects in the Brazilian semiarid.

Keywords: Desalination; Brackish water; Reverse osmosis; Renewable energy integration; Brazilian semiarid

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