Desalination and Water Treatment
www.deswater.com
1944-3994/1944-3986 © 2012 Desalination Publications. All rights reserved
doi: 10.1080/19443994.2012.696409

47 (2012) 279–294
September

Taylor & Francis
Taylor & Francis Group

Desalting seawater in Qatar by renewable energy: a feasibility study

Mohamed Darwish*, Rabi Mohtar, Youssef Elgendy, Mokhtar Chmeissani

Qatar Environment Energy Research Institute, QEERI, Qatar Foundation, Doha, Qatar
Email: madarwish@qf.org.qa

Received 26 July 2011; Accepted 12 March 2012

ABSTRACT

Qatar is an arid country and suffers severe lack of natural water resources. Groundwater is overexploited and has become seriously depleted with deteriorating quality. Non-conventional alternative water resources, mainly desalted seawater (DW) and treated wastewater are used and are slowly being expanded to serve potable agricultural, and industrial needs. Qatar's population growth, almost doubled in less than 10 years, has increased the demand for potable water and is exerting pressure on the government to build additional desalting plants. The multi-stage flash (MSF) desalting is the predominant method that is used in Qatar. Its energy consumption is high—an average 270 kJ/kg thermal energy and 14.4 kJ/kg pumping energy. In the present paper, several different types of desalting sweater methods of less consumed energy than the MSF are reviewed. Burning fossil fuel, mainly natural gas, to supply the energy needed for DW units increases the emission of air polluting gases as well as greenhouse gases such as CO_2 and NO_x. Moreover, concentrated brine that is discharged from the MSF plants pollutes the marine and terrestrial environment. This brine is at higher temperature than the seawater temperature and is mixed with chemicals such as chlorine. The present paper also examines the feasibility of using renewable energy resources, such as solar and wind energies, to run the SWRO desalting plants, as well as selecting the suitably driven renewable energy operating the SW. To protect the environment and to make the DW more sustainable as a potable water source, renewable energy and more energy-efficient desalting methods should be used.

Keywords: Desalination system; Multi-effect; Multi-stage flash; Reverse osmosis; Electrodialysis; Solar energy; Concentrating solar power; Parabolic trough solar collectors

*Corresponding author.