



Geothermal electricity generation and desalination: an integrated process design to conserve latent heat with operational improvements

Thomas M. Missimer^{a,b,*}, Kim Choon Ng^{b,c}, Kyaw Thuw^{b,c},
Muhammad Wakil Shahzad^{b,c}

^aU. A. Whitaker College of Engineering, Florida Gulf Coast University, 10501 FGCU Boulevard South, Fort Myers, FL 33965-6565, USA, Tel. +1 966 012 808 4964; email: tmissimer@fgcu.edu (T.M. Missimer)

^bWater Desalination and Reuse Center, King Abdullah University of Science and Technology, Thuwal 23955-6900, Saudi Arabia

^cDepartment of Mechanical Engineering, National University of Singapore, Singapore

Received 28 January 2015; Accepted 14 January 2016

ABSTRACT

A new process combination is proposed to link geothermal electricity generation with desalination. The concept involves maximizing the utilization of harvested latent heat by passing the turbine exhaust steam into a multiple effect distillation system and then into an adsorption desalination system. Processes are fully integrated to produce electricity, desalted water for consumer consumption, and make-up water for the geothermal extraction system. Further improvements in operational efficiency are achieved by adding a seawater reverse osmosis system to the site to utilize some of the generated electricity and using on-site aquifer storage and recovery to maximize water production with tailoring of seasonal capacity requirements and to meet facility maintenance requirements. The concept proposed conserves geothermally harvested latent heat and maximizes the economics of geothermal energy development. Development of a fully renewable energy electric generation-desalination-aquifer storage campus is introduced within the framework of geothermal energy development.

Keywords: Geothermal energy electricity generation; Multiple effect distillation; Adsorption desalination; Seawater reverse osmosis desalination; Aquifer storage and recovery

*Corresponding author.

Presented at EuroMed 2015: Desalination for Clean Water and Energy Palermo, Italy, 10–14 May 2015. Organized by the European Desalination Society.

1944-3994/1944-3986 © 2016 The Author(s). Published by Taylor & Francis.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.