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Article in *Arabian Journal of Geosciences* · February 2021

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A review of geothermal energy status and potentials in Middle-East countries

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Received: 19 October 2020 / Accepted: 23 January 2021
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Abstract

Geothermal energy production and consumption is one of the world's top priorities as it ensures sustainable developments via steady yield of renewable energy and helps to reduce atmospheric carbon dioxide (CO₂) emissions and air pollution levels. The objective of this study is to critically assess geothermal energy prospects in terms of number of proven geothermal reservoirs, thermal energy capacities, and potential areas of utilization across thirteen Middle East countries (MECs). The findings from this study show that most oil-rich MECs have not adequately explored/exploited their geothermal resources as evidenced by lack of research and exploration activities. It was found that the current geothermal reservoirs/resources across all the MECs are mostly medium (100–150 °C) and low (< 100 °C) enthalpy reservoirs, except Turkey, Iran, and Yemen which have exhibited some high (>150 °C) enthalpy geothermal fields. For low/depleted oil and gas reserves countries, full exploitation of geothermal energy is deemed as one of the options to meet their energy demands. In order to fully optimize the geothermal energy productions, it is imperative for these countries to employ advanced geothermal energy production technologies (GEPTs). MECs could learn the experiences of Europe and US to develop their own GEPTs including national and regional strategies and policy frameworks to help fully harness these valuable geothermal resources. These targets are possible through research, trainings, and international collaborations.

Keywords Geothermal energy, · Renewable energy, · Sustainable development, · Middle-East countries

Nomenclature Abbreviations

CO ₂	Carbon dioxide
EGS	Enhanced geothermal system
GHG	Greenhouse gas
GDP	Gross domestic product
IRENA	International Renewable Energy Agency
KSA	Kingdom of Saudi Arabia
ORC	Organic rankine cycle

RO	Reverse osmosis
UAE	United Arab Emirates
US\$	United States Dollars

Units

GWh	Giga watt hours
J	Joule
kWe	Kilowatt electrical
kWh	Kilowatt hours
kW	Kilowatt
kg/s	Kilogram per seconds
km	Kilometer
km ²	Kilosquare meter
kJ	Kilojoule
kg	Kilogram
ME	Middle East
MECs	Middle East countries
MJ/m ³	Mega Joule per cubic meter
Mt	Metric ton
MW	Megawatt
MWe	Megawatt electrical
MWt	Megawatt thermal

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