Text-to-Iamge Synthesis

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Abstract

The electrical energy from renewables in Algeria contributed about 3.4% (280 MW) in 2008 of a total power of 8.1 GWe and will reach 5% by the year 2017 according to the Algerian Electricity and Gas Regulation Commission (CREG). The countrys target is reaching 40% by 2030. The geothermal resources in Algeria are of low-enthalpy type. Most of these geothermal resources are located in the north of the country and generate a heat discharge of 240 MWt.

Introduction

Algeria is situated in northern Africa, bordering the Mediterranean Sea, between Morocco and Tunisia. Algeria has the 9th-largest reserves of natural gas in the world. It ranks 16th in proved oil reserves. Currently, more than 98 % of Algeria's electricity generation comes from fossil-fuel resources.

- Geothermal exploration program started in 1967 by National Oil Comapny SONATRACH.
- From 1983 onwards the geothermal research has been continued by the Renewable Energies Center of Algeria (CDER).

Geology

The geology of Algeria (Figure 1) is divided into two main structural units: the folded Tellian Domain in the North, and the Saharian Platform in the South, separated by the South Atlasic Flexure (Fabre, 1976).

Figure 1: Major geotectonics units of West Africa modified from Fabre (1976). 1: Tertiary and Quaternary; 2: Alpine molasses; 3: Tertiary thrust sheet; 4: Secondary tabular; 5: Secondary plicative; 6: Primary plicative; 7: Primary tabular; 8: Precambrian and Precorce Cambrian of Sahara; 9: Cenozoic magma; 10: Megafault.

Geothermal Data

Heat Flow

- Average heat flow values are 82 ± 19 mW/m^2
- Very high heat flow values (90-130 mW/m^2) in South Algeria (Hoggar Precambrian basement).

Figure 2: (A) Temp. vs. depth for different regions (Takherist and Lesquer, 1989). (B) Heat flow map of Algeria (Takherist and Lesquer, 1989). Unit: mW/m^2. 230 oil wells are presented, with depths ranging from 500 to 5500 m.

Geothermal Reservoirs

1. The Tlemcenian dolomites in the NW-Algeria: thermal waters are related to the Plio-Quaternary volcanic rocks; bicarbonate water type.
2. Carbonate formations in the NE-Algeria: area is 15,000 km^2; high flow rates (>100 L/s); highest temperature in Algeria (98 °C).
3. Albian sandstone reservoir in the South of Algeria: area is 600,000 km^2; depth of aquifer is 2.6 km; highly mineralized waters.

Figure 3: Main Algerian geothermal areas (Fekraoui and Abouriche, 1995)

Hot Springs

Figure 4: Temperatures of the main hot springs of the northern part of Algeria (Kedaid, 2002)

Figure 5: Total Dissolved Solid (TDS) of the main hot springs of the northern part of Algeria (Kedaid, 2002)

Figure 6: (A) Mixing model to illustrate the relative contribution of magmatic, meteoric and crustal sources of gases in NE Algerian geothermal discharges. (B) Photo of the concretions of Hammam Meskhoutine (NE Algeria). The height of the concretions on successive conduits reaches 30 m.

Geothermal Energy and its uses

- Utilizations of the hot water in Algeria are balneology, space and greenhouse heating.
- Heat-pump in a primary school (NW Algeria) for heating and cooling purposes.
- Tilapia fish farming in south of Algeria (Ghardaia and Ouargla).
- Greenhouses for melon and tomato cultivation in South of Algeria (Ouargla and Touggourt).
- Future projects: binary-cycle geothermal power plant in Guelma (NE-Algeria); heat-pump in Khenchla (NE Algeria).

The total energy use for geothermal is about 1,778.65 TJ/yr.

Figure 7: Location of Algerian geothermal uses sites (Fekraoui and Kedaid, 2005)

Geothermal Conceptual Models

Conclusions

Despite being a petroleum- and gas-rich country, Algeria is making efforts to exploit its renewable energies. The Algerian government has adopted new renewable energy laws and financial support for the investors to facilitate the exploitation of the renewable energies for electricity production and direct utilizations. Algeria has relatively abundant geothermal resources especially in the northeastern parts but not totally used.

Forthcoming Research

Simulation of thermodynamic properties of the thermal fluid and power output with longevity using geological, hydrogeological, and geothermal data from NE-Algerian geothermal reservoirs.

References

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