GEOTHERMAL ENERGY SECTOR in IZMIR & AEGEAN REGION

NBSO IZMIR

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Overall View
Izmir is a prominent province concerning using and developing energy resources due to its geographical location, ecological structure and development in agriculture and industry. Izmir has geothermal resources, enough agricultural and livestock output to provide the raw material for the biomass sector and high potential for solar and wind energy power.

*Izmir takes 5. place in direct usage of geothermal resources after USA, China, Sweden and Germany in the World.*

Expand your business in Geothermal Energy with the Aegean resources
According to data of the General Directorate of Mineral Research and Exploration, there are 17 sites in Turkey which are convenient for electricity production and all of which are located in the Western Anatolia. Established power performing production in these sites is 91.7 MWe, and this capacity can increase to 630 MWe once the development works of these sites are completed.

*Current geothermal energy production is approximately 2Mtoe.
By 2020 it is expected to be 6,3 Mtoe*

Geothermal Energy Potential of Aegean Region
Even though Turkey is wealthy in geothermal energy resource potential, these resources are not yet employed adequately in terms of energy generation. Geothermal energy remains as a small contributor to the power generation capacity in Turkey. The western part of Turkey is an area of plentiful geothermal activity that undergoing significant exploration and exploitation, but with relatively little volcanism.

Turkey ranks *7th in the world and 1st in Europe* in terms of geothermal energy resources. The overall geothermal energy potential of Turkey is estimated to be 35.000 MW.

*67% of the current geothermal energy resources in Turkey are located in the Aegean Region and in Manisa to a highest degree.*

Main Geothermal Fields in Aegean Region

<table>
<thead>
<tr>
<th>Installed Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manisa-Alaşehir (185 °C)</td>
</tr>
<tr>
<td>Denizli-Kızıldere (200-245 °C)</td>
</tr>
<tr>
<td>Denizli-Geralı (124 °C)</td>
</tr>
<tr>
<td>Aydın-Salavatlı (171 °C)</td>
</tr>
<tr>
<td>Aydın-Germencik (232 °C)</td>
</tr>
<tr>
<td>Aydın-Pamukören (188 °C)</td>
</tr>
<tr>
<td>Aydın-Hidirbeyli (180 °C)</td>
</tr>
<tr>
<td>Aydın-Gümüşköy (180 °C)</td>
</tr>
</tbody>
</table>
Some of the places of use for geothermal energy are;

Vaporization of high concentration solution, cooling with ammonium absorption, obtaining heavy water with hydrogen sulphide, aluminium, salt and clean water through Bayer process, sugar industry, Increasing salinity rate, fermentation, distillation, heating & cooling buildings (either individually or whole towns), raising plants in greenhouses, drying crops, timber, food, organic material and other farm products, heating water at fish farms, and several industrial processes, such as pasteurizing milk, balneological baths (hot spring treatment), swimming pools, physical health and hygiene (modern term: wellness).

16 million local and 10,000 foreign visitors are benefiting from balneological utilities in Turkey. Compared to greenhouse heating applications in Turkey, the thermal tourism and balneology investments have grown in the recent years and reached 1,005 MWt.

**Geothermal resource, which is the hottest in Turkey and the 4th hottest in the World with 287°C, is located in the district of Alaşehir of Manisa.**

**TURKEY TO EXPAND RENEWABLE GEOTHERMAL ENERGY GENERATION WITH WORLD BANK SUPPORT**

The World Bank’s Board of Directors in November 2016 approved an IBRD loan of US$250 million and a Clean Technology Fund Grant of US$39.8 million for a **Geothermal Development Project in Turkey** which will help create renewable energy by tapping heat sources deep in the ground. The Geothermal Development Project aims to encourage private sector investment in geothermal energy development in Turkey by reducing risks for investors through a Risk Sharing Mechanism (RSM) and by providing access to long term financing. The project includes: Establishment of a Risk Sharing Mechanism for Resource Validation, to support the exploration and test drilling stages; and Setting up of a Loan Facility for Resource Development that will support the power plant development phase.

**Thermal Applications**

**Current Status and Chances for Further Development**

<table>
<thead>
<tr>
<th>Use</th>
<th>Installed Capacity (MWt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
</tr>
<tr>
<td>District Heating</td>
<td>805</td>
</tr>
<tr>
<td>Greenhouse Heating</td>
<td>612</td>
</tr>
<tr>
<td>Agricultural Drying</td>
<td>1,5</td>
</tr>
<tr>
<td>Bathing and Swimming</td>
<td>1,005</td>
</tr>
<tr>
<td>Geothermal Heat Pumps</td>
<td>42,8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2.886,3</strong></td>
</tr>
</tbody>
</table>

**2018 Objectives & Targets in Turkish Geothermal Energy, stated in The Tenth Development Plan, approved by Turkish Ministry of Development**

It is aimed to create utilization of 800 MW geothermal electricity, 4.000 MWt district heating (equivalent to 500,000 houses), 1.700 MWt greenhouse heating (equivalent to 6,000 decare), 500.000 ton/annual drying, utilization equivalent to 400 thermal spring in thermal tourism, utilization equivalent to 50.000 houses in cooling.
Opportunities can be summarised as follow;

Dutch companies can benefit from various incentives and support mechanisms of the Turkish government and institutions in utilization of geothermal energy resources. The search for geothermal energy and the development studies have been increased for the last decade in Turkey. Hereby, sustainable energy developments of the country are being supported.

Turkey’s geothermal resources can provide very high thermal tourism capacities. This offers great opportunities for thermal tourism in Turkey. To meet the market and investment criteria, domestic and foreign private sectors should also be encouraged to invest in this energy field.

The present installed power of 3.272.3 MW corresponds to only 20% of current potential. This means that Izmir Region offers to Dutch companies a great market potential.

In Turkey, one of the most common usages of geothermal energy resources is district heating. The initial investment and operating costs of these heating systems are cheap and they are environmentally harmless. They increase the standard of living; additionally, there is no dependence on foreign sources. Although Turkey has affluent geothermal resources, the amount of this type of application and use are not sufficient yet, considering the country’s energy needs and production levels. Therefore, it is essential to increase research and development studies in geothermal energy. There is still a great need to make better and frequent use of existing R&D resources and innovative solutions as well as efficient use of the funds.

The sector needs more specifically;

- Development and manufacturing a technological product and strengthen the commercialization process
- Developing knowledge for innovative entrepreneurship
- Public procurement as a driver to support domestic technological progress
- Improve & increase manufacturing productivity
- Development of supporting technologies for sustainable production
- Increase High-Tech sector share in manufacturing as well as in export

Turkey plans to produce 30% of its electricity need from the renewable energy sources by the year 2023.

The World Energy Commission suggested to the Turkish National Committee the following R&D activities;

- Automation Systems for central heating
- Injection of CO2 into the geothermal reservoir,
- CO2 réinjection and during the process heat production
- Inhibitor for carbonate and silica precipitation
- New search and exploration techniques are needed to discover buried mineral and resources
- Improvement in performance analysis of reservoir outputs
SUPPORTIVE ORGANIZATIONS

Izmir is a centre of R&D for renewable energy in Turkey

Research institutes, scientific laboratories, public and private bodies and cooperation between university and industry makes Izmir favourable for renewable energy R&D activities (e.g. Ege University Solar Energy Institute, IYTE Engineering and Science Institute, Geothermal Energy Research and Development Centres) bring Izmir forward in terms of R&D studies.

There are a number of different organizations that support the renewable energy sector in Izmir;

I. AEGEAN UNIVERSITY SOLAR ENERGY INSTITUTE
The Aegean University Solar Energy Institute, which was established in 1978 to provide applied post graduate courses in renewable energy sources like solar, biomass, wind and geothermal energy and to conduct research studies, is the first and only institute of its kind to be established in our country in this field.
In the Department of Energy Technology applied research and projects are conducted on the subjects of solar heated photochemistry, optoelectronics, new generation photovoltaic cell production and renewable energy resources like solar, biomass, wind and geothermal energy, energy management and energy efficiency.

II. GEDİZ UNIVERSITY RENEWABLE ENERGY LABORATORY
The renewable energy laboratory of Gediz University at their campus in the Izmir Atatürk Organized Industry Zone was established to provide training and do research on wind, solar, geothermal and biomass resources.

III. İEŞOB CONTINUING EDUCATION CENTER
A continuing education center has been established within the structure of the Izmir Chamber of Merchants and Craftsman (İEŞOB). A laboratory has been created in this center to provide training in the field of Renewable Energy Technologies. The project partner Buca Technical and Industrial Vocation High School, where the center is located, has been modernized with equipment to be used in the training on renewable energy at the “Green House” founded with the support of an Agency.

IV. KİRAZ MULTI PROGRAM HIGH SCHOOL
This school trains assembly specialists in the renewable energy laboratory that has been established within its structure.

V. İTO FOUNDATION VOCATIONAL HIGH SCHOOL
Trains students in the Electrical Fixtures and Panel Assembling branches on electricity production from solar energy and prepares them to become solar energy (photovoltaic) technicians.

VI. EBSO ENERGY EFFICIENCY STUDY GROUP
This study group conducts studies in the renewable energy field of Izmir to ensure efficient and productive capacity energy in the scope of the following activities; Conducting work to support the conglomeration of the developing renewable energy sector, Following the current legislation concerning Energy and Energy Efficiency and preparing draft regulations, Informative and training work concerning ISO 50001, Preparing social responsibility projects to increase Energy Efficiency, Preparing informative work about “Clean Production Technologies”, Preparing projects towards the specified needs concerning energy, evaluating relevant appeals and conducting relevant projects.
**Sectoral Events 2017**

- **EXPO GEOTHERMAL**, 4th Geothermal Energy Technologies and Equipment Fair  
  January 12-14 2017 in Istanbul

- **70th GEOLOGICAL CONGRESS OF TURKEY**  
  April 10-14, 2017 in Ankara

- **ICCI** International Energy and Environment Fair & Conference  
  May 3-5, 2017 in Istanbul

- **INTERNATIONAL ENERGY CONGRESS & EXPO - EIF TURKEY 2017**  
  November 8-10, 2017 in Ankara

- **RENSEF** Renewable Energy Systems and Energy Efficiency Exhibition  
  November 16-18, 2017 in Antalya.

**Sectoral Bodies**

- Renewable Energy General Directorate  

- Energy Market Regularty Authority  

- Turkish Geothermal Association  

- Chamber of Turkish Geology Engineers  

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**The Netherlands Business Support Office in Izmir**

The Netherlands Business Support Office located in Izmir offers customized services to Dutch SME’s with their trade and investment activities in Agean Region. We cover the Western Turkey (Izmir, Manisa, Aydin, Denizli, Kutahya and Usak).

Please contact us if you are looking for the opportunities for your business to grow in the Wind Energy sector;

- Up-to-the-minute sectoral developments
- International project notifications, calls for tender and business contacts
- Market and industry reports
- Major Turkish players in the domestic wind energy market
- Potential business partner scan

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