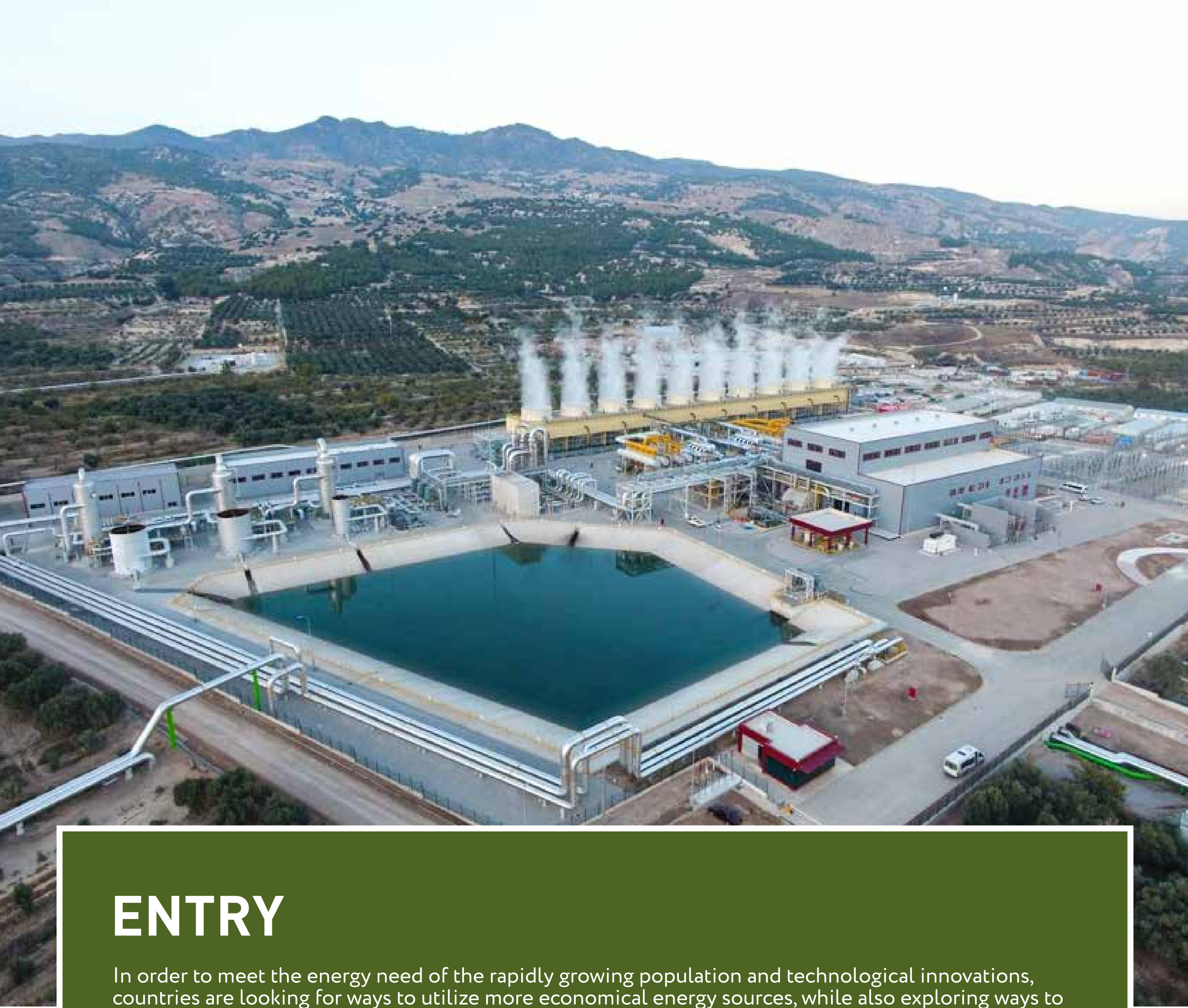
GEOTHERMAL ENERGY
SECTOR REPORT

Nazilli Chamber Of Commerce

CONTENT

Nazilli Chamber Of Commerce



ENTRY

In order to meet the energy need of the rapidly growing population and technological innovations, countries are looking for ways to utilize more economical energy sources, while also exploring ways to exploit renewable energy sources that can replace conventional energy sources in a comprehensive way. This correct business methods are used when geothermal energy as an alternative source of renewable energy one of the resources makes it more important. Geothermal Resources, which have been used for Bath, heating and cooking in the Mediterranean region about 12.000 years ago, now it is used for heating and cooling applications such as electricity generation, central heating, central cooling, greenhouse heating, for industrial purposes, for the production of chemical substances and minerals such as carbon dioxide, fertilizer, lithium, heavy water, hydrogen, thermal tourism, thermal tourism, thermal- it is also used in many areas such as low temperatures (up to 30°c), culture fisheries and drinking water production containing minerals. In addition to creating renewable self-resources for the countries lucky for geothermal energy such as our country, it also provides important advantages such as its multi-purpose use, clean, eco-friendly and economical resource to be able to accurately identify the processes that have passed from exploration to operation of geothermal resources, its source protection, development and continuous production are also of special importance.

WHAT IS GEOTHERMAL ENERGY AND APPLICATION AREAS

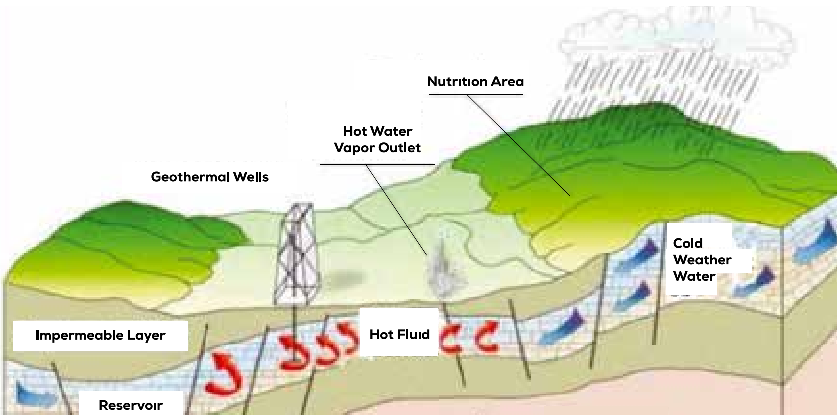
Geothermal heat is the heat of the Earth's crust which is formed by the accumulated heat in various depths of the Earth's crust, containing chemicals, hot water, steam and gases.
Geothermal energy is a new, renewable, sustainable, non-depleted, cheap, reliable, environmentally friendly, indigenous and green energy.

Geothermal Resources:

- The production of electrical energy,
- Central heating, cooling (air-conditioning), greenhouse heating, etc.
- Industrial use, process temperature supply,drying etc.
- Chemical and mineral production, carbondioxide , fertilizer, lithium, heavy water, hydrogen etc.
- Thermal treatment (thermal tourism)
- At low temperatures (30ºC) culture fishing etc.
- Drinking mineral water.

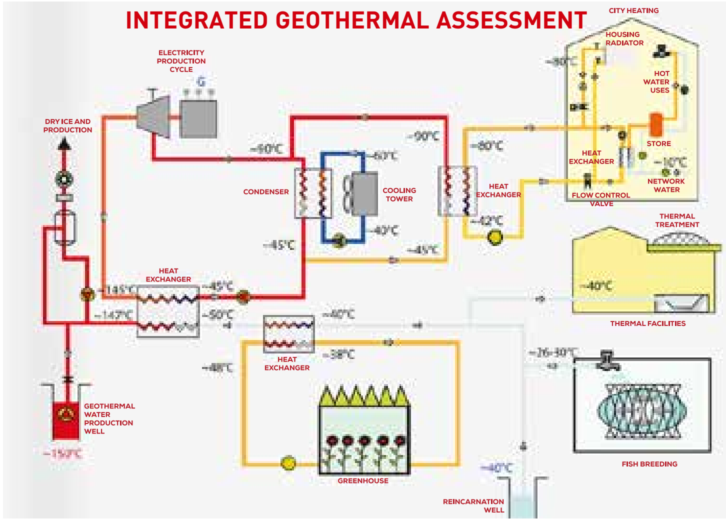
GEOTHERMAL ENERGY IS A NEW, RENEWABLE AND SUSTAINABLE ENERGY SOURCE

Feeding groundwater of rain, snow, sea and magmatic waters by feeding porous and cracked rock masses geothermal reservoirs, underground and steam outputre-growth conditions can be renewed as long as they continue,they protect their sustainable properties. They are not affected by short-term atmospheric conditions.However, geothermal reservoirs made of drilling production of the geothermal fluid to the environment and reservoir feed after completion of the function, it is obligatory to be sent to the underground again (reenjection). Reenjection has been introduced in many countries by law to as an solution mandatory. Geothermal energy has no risk factor in use (explosion, fire, poisoning, etc.)b.) proven to be extremely reliable. Kobe and San Francisco earthquakes occurred in the damage 2670'i natural gas fires.



Since 1904, geothermal electricity has been produced from Geyser site in California for 72 years.
There are central heating systems in Boise Idaho (USA) since 1890 and Reykjavik-Iceland since 1934. In addition, 160,000 homes are heated with geothermal energy in the suburbs of Paris.

WHY GEOTHERMAL ENERGY ?



- Renewable, sustainable, boundless energy
- Natural Resources
- Clean, eco-friendly (no combustion technology used)
- zero emissions)
- Ideal for multi-purpose heating applications,
- agriculture,industry, greenhouse heating, etc.)
- Independent of meteorological conditions (wind, rain, sun, etc. independent)
- Ready-to-use energy is the basic load power plants in electricity generation.
- Much cheaper than fossil and other alternative energy sources
- Exploration wells can be use for production and sometimes for reenjection
- Reliable (no risk of fire, explosion and poisoning)
- Load (production) factor in electricity production over 95%
- Minimum space requirement (unlike hydro, solar etc.)
- Easy and fast , operation and maintenance (6 months-1 year), long life
- Geothermal energy is a local energy, imports and exports does not have an international price so it does not cause wars and international problems.
- Geothermal heating reduces the load of traffic in the city because it will eliminate the transportation of fuel-oil, diesel, coal, wood waste to homes

GEOTHERMAL ENERGY IN THE WORLD

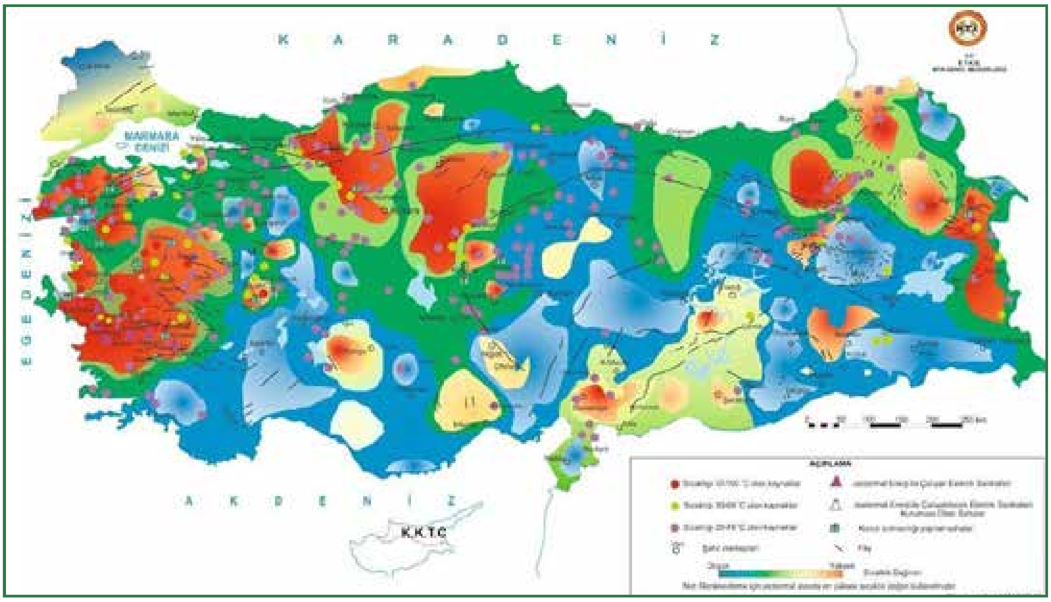
- % 27 of the total electricity generation in the Philippines, % 7 in the state of California.
- 56 MWe capacity geothermal power generation in Papua New Guinea, and it gives % 75 of the energy needs of the Gold Mining Enterprise .
- % 86 of the total heat energy (city heating) requirement in Iceland is from geothermal .
- Top 5 Countries ranking in geothermal power generation in the world: A.B.D. D. The Philippines, Indonesia, Mexico, and Italy
- Top 5 Countries ranking in geothermal heat and Hot Spring applications in the world: A.B.D, China, Sweden, Turkey and Germany
- As of 2010, geothermal power generation in the world is 10715 MW of electricity installed power, producing 87.3 billion kWh/year. The world countries ' target for 2050 is 150,000 MW of installed power electricity generation.
- The non-electric use of geotermal is 50583 MW thermal, equivalent to 6.2 million residential heating.
- 500.000 homes in Turkey (target for 2018

Geothermal Heating Targets In The World 2010 - 2018 Goals;

- Target of 3 million homes in Europe (2010)
- A.B.D. D.target of 7 million homes (2010)
- is heated by geothermal energy.
- Geothermal energy in the world, direct use of geothermal (non-electricity) geothermal heating % 80,4,
- Thermal-health usage % 13.2,
- Greenhouse heating % 3,1, geothermal fishing % 1,3,
- Industrial use % 1.1,
- Cooling and snow melting % 0.7 and other % 0.1

GEOTHERMAL IN TURKEY

GEOTHERMAL RESOURCES AND MAP APPLICATION



Türkiye is located on an active tectonic belt due to its location and is rich in geothermal resources among the countries of the world. Geothermal resources are available at different temperatures , approximately 1.000 natural outputs spread throughout our country. The geothermal potential of our country is quite high and 78% of the potential forming areas are located in western Anatolia, 9% in Central Anatolia, 7% in the Marmara region, 5% in eastern Anatolia and 1% in other regions. 90% of our geothermal resources are at low and medium temperature and direct applications (heating, thermal tourism, various industrial applications etc.) for, 10% it is suitable for indirect applications (electricity generation). The first electricity generation in geothermal energy applications was started in 1975 with a Kızıldere power plant with a power of 0,5 MWe.

Geothermal energy research studies have been accelerated and drilling geothermal energy exploration has been increased from 2,000 m to 28,000 m. Since 2005, with the support of the Ministry of energy, the heat capacity available to 3,100 MW , end of 2004 has increased to 5.000 MW with an additional 1,900 MW of heat energy increase as of the end of 2018. The number of geothermal sites that have been discovered has also been increased to 239 with the discovery of 10 new sites that are suitable for electricity generation, And up to now 632 sites have been constructed with a total of 410,000 MWe heat energy.

Geothermal resources and natural mineral waters law came into life in 2008 and the private sector's geothermal exploration, development and investment activities together with the total geothermal heat capacity of our country ,(visible heat amount) reached 35.500 MW.

THE CURRENT SITUATION

EVALUATION	CAPACITY
GEOTHERMAL CENTRAL HEATING (CITY, HOUSING)	89443 housing equivalent (805 MWt)
GREENHOUSE HEATING	2832 ACRES (612 MWTJ (FIGURE GIVEN BY MTA EXPERTS IS 516 MWT)
HEATING OF HOT SPRING FACILITIES, THERMAL HOTELS AND CONDOMINIUM FACILITIES	EQUIVALENT TO 42.000 RESIDENCES (380 MWT)
THERMAL ENERGY OF THERMAL WATER USED IN HOTELS, HOT SPRINGS	350 HOT SPRINGS (870 MWT) 16 MILLION PEOPLE A YEAR ARE MWT
GEOTHERMAL HEAT PUMP	38MWT
TOTAL HEAT USE	2705 MWT (260,000 HOUSING EQUIVALENT)
TOTAL ELECTRICITY GENERATION	114 MWE (AYDIN-GERMENCIK, DENIZLI-SARAYKÖY, AYDIN SALAVATLI, AYDIN-HIDIRBEYLI, ÇANAKKALE-TUZLA)
CARBON DIOXIDE PRODUCTION	160 THOUSAND TONS / YEAR

CURRENT STATUS OF CENTRAL HEATING SYSTEMS

Place Name	Heated Housing Count	Date	Water Tempe-rature	Investor
Balçova+Narlıdere district heating	35000	1983	125-140	Provincial Special Administration and Munici-pal Joint Stock Company
Gönen	2500	1987	80	Municipal Joint Stock Company
Simav	7500	1991	137	Municipal
Kırşehir	1800	1994	57	Provincial Special administration mainly municipal Joint Stock Company
Kızılcahamam	2500	1995	70	Municipal Joint Stock Company
Afyon	8000	1996	95	Provincial Special administration mainly municipal Joint Stock Company
Kozaklı	3000	1996	90	Municipal Joint Stock Company
Sandıklı	6000	1998	75	Municipal Joint Stock Company
Diyadin	570	1999	70	Provincial Special administration mainly municipal Joint Stock Company
Salihli	7292	2002	94	Municipal
Sarayköy	2200	2002	95	Municipal Joint Stock Company
Edremit	4881	2003	60	Municipality+private sector Joint Stock Company
Dikili	2500	2010	125	Municipal Corporation
Bergama	450	2008	65	Municipal Corporation limited
Güre	650	2009	65	Municipal
Sorgun	1500	2008	80	Municipal

Note: There is also total of 3100 house heating capacity but currently not in use .

TOTAL GEOTHERMAL POTENTIAL OF TURKEY

- 60000 mwt
- Over 1 million hot spring beds capacity
- 7.5 million residential heating , equivalent 300.000 acres of greenhouse
- 60 billion m3/year natural gas equivalent heating

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→ Dr. Servet Sılmazer, WEC (11. Energy Congress izmir, 2009) 55000-60000 MWT Dr. Abdurrahman Satman, GTV Karlsruhe. Turkey Geothermal Association study October 2012 (62000 mwt). However, the 31500 MWT value announced by the MTA General Directorate is still the official value and continues to be updated with new studies.

- Turkey's total geothermal electricity potential(hydrothermal resources) (0-3 km)
- 2000 mwe (16 billion kwh/year), assisted hal (15 cents/kwh per purchase)
- Turkey's 2018 geothermal electricity generation is target 750 MWe(6 billion kwh/year) (10.5 US cents/kWh per state)

Turkey, which ranks seventh in the world with its geothermal wealth, has the potential to meet up to 5% of the total electric energy needs with its geothermal potential and up to 30% of the heat energy needs in heating. However, when the average weight of these is taken, Turkey aspires to meet 14% of the energy (electricity + heat energy). Total geothermal potential (2,000 MWe hydrothermal, 60,000 MWe) electricity generation, City heating, cooling, greenhouse heating, thermal heating, hot spring use, chemical substances production, industry use, etc.applications will be provided with the full evaluation facility. The target annual net domestic value added is around 80 billion USD.

According to the study conducted by Geothermal Association in Turkey;

Geothermal energy in Turkey can be heated with potential settlements (geothermal field potential and market-by-market technical and economic global approach):

IZMIR (+Cooling)	240.000	House
DENİZLİ AND VICINITY (+Cooling)	120.000	House
AYDIN AND VICINITY (+Cooling)	120.000	House
BURSA AND VICINITY(+Cooling)	75.000	House
BALIKESİR AND VICINITY	25.000	House
AFYON AND VICINITY	50.000	House
MANİSA+TURGUTLU	40.000	House
KÜTAHYA AND VICINITY	25.000	House
ÇANAKKALE AND VICINITY	15.000	House
SAKARYA-AKYAZI-KUZULUK	30.000	House
SALİHLİ (+Cooling)	30.000	House
BOLU AND VICINITY	10.000	House
YOZGAT AND VICINITY	25.000	House
NAZİLLİ	25.000	House
ERZURUM	10.000	House
ŞANLIURFA	20.000	House
KIRŞEHİR	20.000	House
DİKİLİ-BERGAMA(İZMİR)	25.000	House
ALAŞEHİR(MANİSA)	15.000	House
ALİAĞA(İZMİR)	15.000	House
SİVAS	20.000	House
BİNGÖL	20.000	House
OTHER SETTLEMENTS	25.000	House

GEOTHERMAL GREENHOUSE

There are 12 thousand acres in the world and about 3,000 acres of geothermal greenhouse in Turkey. The 424 acre geothermal greenhouse in Sanliurfa is exporting products to Europe. Turkey has been the world leader in geothermal greenhouse heating by 2010.

Geothermal heating of greenhouses has very important advantages.

These;

- Geothermal heating increases the yield by 50-60%.
- Giving geothermal carbon dioxide to the greenhouse atmosphere increases the efficiency by 40% (photosynthesis support by CO_2 fertilization)
- The temperature inside the greenhouse is above the temperature required for fertilization, which increases the yield. In this way, necessary ventilation can be done and the humidity in the greenhouse does not rise . This is a condition that the European Union and international food/health organizations want.
- Hormone-free production is possible due to the Ideal internal temperature.
- Greenhouses technical, economic, commercial operation for the size of at least 25,000 square meters, heating calculations are based on the outside design temperature of 15 degrees colder than the average temperature of winter months outside air +5 degrees lower than not have a value such as a recommendation.
- The current greenhouse heating of about 3000 acres , target is to 15000 acres by the end of 10 years.

Geothermal Greenhouses	
Izmir-Dikili	880.000 SQUARE FEET
Manisa-Salihli,Urganli	250.000 SQUARE FEET
Kutahya-Simav	310.000 SQUARE FEET
Denizli-Kizildere	152.740 SQUARE FEET
Sanliurfa-Karaali	424.000 SQUARE FEET
Others	885.000 SQUARE FEET

Agrobay Greenhouse– BERGAMA

Sultan Greenhouse– Sultanhisar

MINERAL PRODUCTION FROM GEOTHERMAL FLUIDS

It is possible to produce minerals which has commercial value from geothermal fluid.
(CO_2, KCIL LiCI, Silica, Zinc, Lithium, Magnesium Manganese,- Boron, Tungsten, Cesium, Rabidium, Potassium, Lead, Copper, Silver, Barium, Strontium etc.). Since 1986, liquid carbon dioxide and dry ice have been produced in Denizli Sarayköy as a waste of geothermal power plant in our country. In addition, liquid CO2 integrated into the geothermal power plant is obtained in Salavatlı, producing around 160,000 tons per year, the factory meets 50% of Turkey's liquid carbodioxide needs.

GEOTHERMAL and HYDROGEN

The production of hydrogen, known as the fuel of the future, it is possible to get this through geothermal resources. With the use of geothermal electricity in the reactor and geothermal fluid as water, hydrogen production pilot studies have started in Iceland.
Because of its geothermal wealth, Iceland has been the ideal place to start this business. On 24 April 2003, the world's first hydrogen gas station was opened in Reykjavik - Iceland in cooperation with the private sector (Shell) Municipality.
Hydrogen produced from geothermal, a natural and cheap source, will replace oil, preventing air pollution in the city and providing the economy. Shell has opened a filling station in Tokyo with municipal cooperation, followed by America California and Luxembourg.

PRODUCTION OF FISH BY GEOTHERMAL WATER

Culture fishing is carried out at low temperatures (30 °C)
(Shrimp, perch-yellow perch, Chupra, Tilapia (species of chupra), carp, catfish, oysters, etc.)
Land or sea fishing can be done in the summer months, geothermal heating is done for 12 months and higher amounts of product is obtained.
Geothermal fisheries provide a 50% -100% increase in the growth rates of seafood with suitable temperature environment.
Example: Catfish: 17-24°C (4-6 months),
Trout:12-18°C (4-6 months)),
Shrimp:26-30°C (6-9 months)Eel:27-30°C (6 months), Tilapia (Çupra):22-30°C (6 months))
Where the geochemistry of geothermal water is appropriate, direct geothermal fluid can be used for geothermal fishing. Some limits on water chemistry for fishing are:pH:6-8, Hydrogen Sulfide: 0, AmmoniaNitrogen:<0.05 ppm, Alkanilite:20-400 ppm, hardness: 20-400 ppm, chlorine: <0.02, carbon dioxide:<20 ppm.

California Imperial Valley Geothermal Heated Fish Production Farm

THERMAL TOURISM (THERMALISM, SPA USE)

According to archaeological studies, thermal waters have been used by many communities for spa treatment for more than 10 thousand years.
Some examples of the current situation in the world;
For thermal tourism purposes, 12 million people go to Germany and Hungary, 8 million people to Russia, about one million to France, 800 thousand people to Switzerland.
In Japan city called Beppu has 13 million people come for thermal tourism purposes. Baden Baden Hot Springs/Germany, Das Leuze Hot Springs and Recreation (Stuttgart/Germany) are visited by 8,000 people in a day during the summer months. This figure is an average of 3000 people/ day per year.
Thermal tourism has a capacity of 100 million overnight stays with 1500 hot springs in Japan. In Beppu, 1000 litres / second of geothermal water is used for thermal tourism purposes.
There are 210 hot springs in the United States for thermal tourism purposes, which have been used for nearly 10,000 years, coming from Native American culture. 4.5 million people a year benefit from these spas.

The current state of thermal tourism in Turkey and the properties of thermal waters;

For to become healthier, to get away from stress, to rest the body and mind, the use of spas is increasing in our country as well as like the rest of the world.
Turkey is among the top 7 countries in the world . In terms of resource wealth thermal waters in Turkey are superior to thermal waters in Europe with both their flow and temperatures and their various physical and chemical properties. In our country, there are 1300 thermal sources with flow rates ranging from 2-500 lt/sec. In Turkey , 16 million people a year benefit from 350 hot springs for treatment of many diseases, rehabilitation - transportation and vacation purposes.
In medicine it is called 'thermomineral waters' ,it is the thermal water naturally comes out of the underground to be used in the hot spring, its temperature is above 25 degrees, at least it has litre /1 gram mineral should be found. In Turkey, 10 million people go to Hot Springs a year. Whether who has an inveterate disease, or healthy person in disease situations to strengthen the treatment, experts recommends taking a spa treatment once a year to strengthen the immune system.

Diseases , which spas are recommended for treatment :

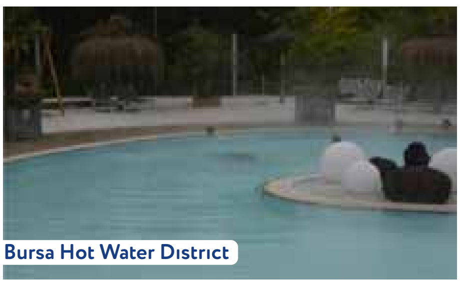
* Rheumatic diseases
* Respiratory system diseases
* Skin diseases
* Diseases of the skeletal system
* Heart diseases of the circulatory system
* Gastrointestinal diseases
* Kidney and urinary diseases
* Obstetrics and diseases
* Neurological diseases

More than 80% in Turkey and 60% in the world on average rheumatic diseases, general muscle and fatigue pains are known to be effective on the other important effect of spa treatment is to improve the quality of life of the patient and provide rehabilitation to continue his life actively. Strengthening of the body with purification and cleaning, therefore, the SPA has recently been described as 'detox' due to the fact that people throw off the aggravating effects of their diseases.
In addition to the spa treatment to get a certain age limit is not noted experts in advanced age and children can easily receive cure application from the Hot Springs indicate. In children, hay fever, asthma, upper respiratory diseases such as hot spring cures are being used, while in the elderly with old age in many chronic diseases that occur, such as hypertension, kroner heart disease, in cases such as diabetes , chronic lung disease, the positive effects of spa treatments have been proven. The selection of suitable hot spring water according to the type of diseases, utilization techniques and times should be made with the advice of an expert. Since spa treatment is a warning and adaptation treatment, it is usually performed at least 10 days and the most suitable is 15 days. Again, the ideal water temperature in Hot Springs is 36-38 degrees, but in some cases (not children and the elderly people) are also recommended 40-degree baths.
Thermal mineral waters in Hot Springs after the most common treatment element, a slightly different Thermo physical properties of water is healing mud.
Healing water and bath therapy can be applied in many hot springs in our country.
In some thermal facilities in Turkey, economic activity is about twice as large as sea, sand, solar tourism due to both duration and treatment. So it is possible to accept income of $ 2000-2500 per person.
The people who come to our country for thermal tourism are from the 3rd age group. This age group makes its expenditures for treatment and accommodation only for its own health, the foreign exchange it leaves is much more than the foreign exchange left by tourists from other branches of Tourism.
Advantages of combining thermal water with sea;
Thermal water treatment with the sea is combined to ensure family integrity. So young people and the elderly people can benefit from sea and thermal treatment together. Turkey is one of the rare countries where thermal water meets the sea.
Integrating the sea with thermal tourism in our country
Çeşme, Kuşadası, Seferihisar,Bodrum, Edremit, Kestanbol, Dikili, Aliağa etc. can be given.

What Can Be Done;

In Turkey, the production of (40c) 50 thousand liters/second of geothermal water for thermal spring purposes is an estimated potential value. That means at least 8 million people a day benefit from our thermal potential and Hot Springs. To evaluate this potential in Turkey; with the financial support of the Ministry of Culture and Tourism, geothermal thermal water production wells, transportation, distribution, reenjection and similar systems are installed and operated, cheap and suitable thermal water should be provided to investors by providing the necessary land, Treasury, governorship and municipalities for the thermal plant and by renting it to investors. Private administration, Municipal and private sector together or municipal companies should establish and operate such facilities for recreational and thermal tourism purposes (in Germany
As municipal corporations do).


Ilıca Thermal Facılıtıes


Bursa Hot Water Dıstrıct


Alangülü Thermal

Nazilli Chamber Of Commerce

MISSUNDERSTANDINGS IN GEOTHERMAL

Wrong: geothermal energy is not a renewable resource.
In fact: geothermal energy is supplied from magma, water, steam and hot rocks in the near layers of the Earth, and therefore can be used as long as the Earth exists. Geothermal is a natural and clean energy source, sustainable, reliable, environmentally friendly and domestic energy source.
Wrong: geothermal energy can not provide continuous energy.
In fact: geothermal energy sources produce electricity 24 hours a day, 7 days a week, regardless of weather conditions. The energy produced by a geothermal power plant is predetermined, and since it is not affected by external factors, it facilitates energy planning with remarkable accuracy.
Wrong: geothermal energy is polluting water supplies.
In fact: the nature is not harmed when producing geothermal energy. To eliminate the local water regime and its possible effects on the surface, groundwater is certainly not mixed together with geothermal water. However, geothermal energy, which is subject to strict procedures with laws and inspections, is left back to nature again in the same way as it is taken from nature.
Wrong: generating electricity from geothermal energy leads to environmental pollution.
In fact: closed-circuit power plants built with modern techniques to generate electricity with geothermal energy do not emit greenhouse gases. An average geothermal power plant that has been in production for 30 years is causing only about 0.05 kilograms of carbon emissions. The carbon release that a car releases into the atmosphere with only one tank of gasoline is 8.91 kg.'dir.
Wrong: toxic smoke mixes in the air in geothermal production.
In fact: geothermal is the only water vapor released into the air as it is obtained from the warming waters below the Earth layer. Similar water vapor output occurs in dams and irrigated fields, but it is misunderstood to see this on a more intensive scale in a geothermal power plant.
Wrong : Geothermal Energy is a source of energy that is newly heard and whose future is uncertain.
In fact: geothermal energy has been used since the first time in the world. The Paleo Indians are known to use heat and minerals from geothermal energy in hot springs. The use of geothermal, also seen in the Anatolian geography, spread throughout the world through the Roman Empire. Heating and the beginning of individual use projects dates back to the 1890s.
Wrong: we cannot use geothermal energy in our daily life.
In fact: Geothermal Energy has a positive impact on our economy as well as protecting the environment. In Turkey last year, 1 million households in the first 6 months of electricity needs were met with geothermal. Geothermal, which has a heating function as well as electricity, is widely used to heat homes, while in cold countries it is even used to heat roads. Mineral waters obtained from underground also support the expansion of thermal and thermal tourism.
Wrong: geothermal power plants are harming agricultural activities and trees.
The fact is: the increase in the carbon dioxide rate, the greenhouse gas effect and the resulting global temperature increase are causing the air temperature to rise and drought. Geothermal energy in the region is produced in accordance with the regulation does not damage the natural life. Geothermal energy, on the contrary, provides for the increase of agricultural activities. Especially in our country, which is an important place among agricultural activities is used in greenhouses and 4 seasons makes it easier to obtain products.

WASTEWATER AND RECOMMENDATIONS AT GEOTHERMAL

Nowadays, the most appropriate method of getting rid of waste hot water is to send the water back to the nearby underground reservoirs again. In this case, both pollution problems are thought to be eliminated and heat losses are reduced by ensuring that hot water feeds the reservoir again. However, this situation does not apply in many areas in practice, but also creates serious pollution problems. Moreover, the increasing use and capacity is necessitates developing new strategies.
Understanding the interaction between western Anatolian geothermal fields and alluvial aquifers can provide crucial insights in developing a new strategy. Different options such as sea, lake,stream discharge, physical and chemical treatment or increasing natural treatment performance in the current path with a chemical recipe to be added to the waste water should be studied in the field and basin specific.
If appropriate and economic treatment options cannot be developed, the use of geothermal waters in polluting content may be limited New treatment techniques can be developed to solve the problem of boron, which is the most important contaminant in agricultural terms, and even thermal waters can be used for irrigation purposes after treatment. Sustainable management of geothermal waters requires understanding of the geothermal and Environment and providing forward-looking environmental predictions by producing accurate, accurate, valid, complete and adequate data. The current environmental conditions and how we can turn these conditions in our favour are crucial to the future of geothermal waters and should be clearly understood.

FIG AND GEOTHERMAL

The Aydın-Germencik region has very high agricultural potential. The main crop of the region is figs and olives. The social importance of the product is also great because it provides the livelihood of a large segment that provides services for the additional labor force, processing and market delivery required during the harvest period in Fig farming, which is done in the form of small family type Management in the region. In addition to this, geothermal energy studies started in 1980 and later, the increasing number of geothermal power plants in the region. According to many producers, the quality and efficiency of the fruit in terms of reduction in the threat created the idea that the future of figs in this region is under threat. Fig producers in the region are expressing serious concerns about the issue. Fig producers in the region, both the press and the official institutions, written and spoken many complaints . In the light of all this information; Adnan Menderes University ; Under the guidance of Engin ERTAN, Sunay DAĞ conducted a doctoral thesis titled "Determination of potential effects of geothermal energy plants on yield and quality in Fig" and it was concluded in 2015. For this purpose, in 2013 and 2014 fig production seasons, the geothermal plant located in the "Alangüllü" area of Germencik District of Aydın province was determined as a garden of two types of sarılop figs, which were selected at a distance of 600-650 m (close distance), 1100-1150 m (middle distance), 1500-1650 m (far distance) and 5000 m (far distance).

In every two years in which the trial was conducted, samples of leaves and dried fruit were taken from the gardens during the fig production season and in three periods. In leaf and dried fruit samples taken from gardens at different distances from the plant, nitrogen (N,%), phosphorus (P,%), potassium (K,%), calcium (CA,%), magnesium (Mg,%), iron (Fe, ppm), copper (Cu, ppm), zinc (Zn, ppm), manganese (Mn, ppm), cadmium (Cd, ppm), nickel (Ni, ppm), chromium (Cr, ppm), analyses of lead (PB, ppm), cobalt (Co), boron (B, ppm) and sulfur (s, %) elements were conducted. In the experiment, the amount of water soluble dry matter (%), amount of titreable acid (%) and pH values were determined in dried fig fruit samples in relation to fruit quality. In Fig Gardens, in relation to fruit yield components, annual shoots of trees in gardens at different distances, exile length (cm), exile diameter (cm) and number of fruits in exile (pieces) values were determined.

Given the data obtained in the study, it is remarkable to see a downward trend in the value of moisture as geotherm goods move away from the facility, especially given August humidity values in 2014. The same applies to July's humidity values, except for the humidity value at the farthest distance. (600-650 m) in fig groves located in geothermal power plant, the pH values of these soils, far from the plant tend to increase from 7.92-7.68 (starting from 4.79 to 5.92 every two years,), i.e. very strong acid slightly alkaline, with high content in terms of alkaline property leaf and dried fig fruit samples, nutrients and heavy metals.

CO_2 is one of the major factors that are effective in changing the soil reaction. This gas combines with water to form carbonic acid. The greater the CO_2 pressure,the greater the H concentrate - ration in the soil. Carbonic acid and its bicarbonates are transported to the lower floors of the soil in moist areas. So the soils acidify. Acidification means increasing the amount of hydrogen and aluminum ions in the soil. As a result of excessive acidification, Al, Fe, Mn, H and NH_4 amounts in the soil increase and the availability of nutrients such as Ca, Mg, K decreases and the plant development is adversely affected. The study found that the B content in leaf samples in particular was significantly higher than the 300 ppm

limit value in each two years (1 in leaf samples in 2013. Period: 285.063 ppm, 2.Period: 360.827 ppm, 3. Period: 546,757 ppm; 2014 in leaf samples 1. Period: 318.737 ppm, 2.Period: 450.290 ppm, 3. In the period: 482.340 ppm), as well as the results of the evaluation of the yield and quality of dried figs, similarly, it was determined that the negative effect decreases as we move away from the source. Dried fruit samples from 2014 were found to be more acidic than dried fruit samples in 2013. With a general assessment, it was clear that the content of the dried fruit samples in 2013 (%) was higher than that of the samples in 2014. In the study conducted with a general assessment in the light of the literature, shoots showed thin and weak development, especially in the trees of nearby gardens, while the fruit attitude rate was less due to this situation than in gardens at other distances. As a result, this study is a due diligence on whether figs, which are intensively grown in the area of Alangüllü, which covers the agricultural activities of Germencik District of Aydın province, are affected by geothermal activities in this region again in terms of yield and quality parameters. In this sense, the results obtained from the study were generally evaluated when it was found that in Fig orchards located close to the geothermal plant (600-650 m), leaf and dried fig fruit samples had higher content in terms of nutrient elements and heavy metals in general than other distance , and the heavy metal content of fruit samples was reduced In addition, the results of the evaluation of the yield and quality of dried figs were similarly determined to decrease the negative effect as they moved away from the plant.

It is thought that geothermal energy plants, which tend to increase in numbers in Aydın province, may affect figs as the main product of the region in the future, both in terms of cultivation, in terms of yield and quality relations, as well as in terms of physiological stress factor. Intensive agricultural activities of the region were considered measures to be taken per day, inspections to be carried out and forward looking planning should be well surveyed and prepared. It is our duty to protect the future of figs, which is one of the most important agricultural export products of our province and to work to take protective measures regarding both quality and yield and continuity of the product.

GEOTHERMAL POWER PLANTS IN AYDIN PROVINCE

EFELER GEOTHERMAL POWER STATION	AYDIN	GÜRİŞ HOLDING COMPANY	162MW
PAMUKÖREN GEOTHERMAL POWER STATION	AYDIN	ÇELİKLER ENERGY	68MW
GALİP HOCA GERMENCİK GEOTHERMAL POWER STATION	AYDIN	GÜRİŞ HOLDING COMPANY	47MW
MAREN GEOTHERMAL POWER STATION	AYDIN	KİPAŞ HOLDING COMPANY ENERGY GROUP	44MW
DORA 3 GEOTHERMAL POWER STATION	AYDIN	MB HOLDING COMPANY	34MW
MELİH GEOTHERMAL POWER STATION	AYDIN	KİPAŞ HOLDING COMPANY ENERGY GROUP	33MW
EFE 7 GEOTHERMAL POWER STATION	AYDIN	GÜRİŞ HOLDING COMPANY	25MW
KEN 3 GEOTHERMAL POWER STATION	AYDIN	KİPAŞ HOLDING COMPANY	25MW
MEHMETHAN GEOTHERMAL STATION	AYDIN	KİPAŞ HOLDING COMPANY	25MW
DENİZ GEOTHERMAL POWER STATION	AYDIN	KİPAŞ HOLDING COMPANY ENERGY GROUP	24MW
KEN KİPAŞ GEOTHERMAL POWER STATION	AYDIN	KİPAŞ HOLDING COMPANY ENERGY GROUP	24MW
KEREM GEOTHERMAL STATION	AYDIN	KİPAŞ HOLDING COMPANY ENERGY GROUP	24MW
KUBİLAY GEOTHERMAL POWER STATION	AYDIN	ÇEVİK GROUP	24MW
EFE 6 GEOTHERMAL POWER STATION	AYDIN	GÜRİŞ HOLDING COMPANY	23MW
PAMUKÖREN 2 GEOTHERMAL POWER STATION	AYDIN	ÇELİKLER ENERGY	23MW
PAMUKÖREN 3 GEOTHERMAL POWER STATION	AYDIN	ÇELİKLER ENERGY	23MW
SULTANHİSAR 2 GEOTHERMAL POWER STATION	AYDIN	ÇELİKLER ENERGY	23MW
KUYUCAK GEOTHERMAL POWER STATION	AYDIN	TURCAS ENERGY	18MW
3S KALE GEOTHERMAL POWER STATION	AYDIN	3S KALE ENERGY	25MW
DORA 4 GEOTHERMAL POWER STATION	AYDIN	MB HOLDING COMPANY	17MW
SULTANHİSAR GEOTHERMAL POWER STATION	AYDIN	ÇELİKLER ENERGY	14MW
BUHARKENT GEOTHERMAL POWER STATION	AYDIN	LİMGAZ ELECTRICITY GENERATION	14MW
GÜMÜŞKÖY GEOTHERMAL POWER STATION	AYDIN	BM HOLDING ENERGY GROUP	13MW
KARKEY UMURLU GEOTHERMAL POWER STATION	AYDIN	KARADENİZ ENERGY	12MW
UMURLU 2 GEOTHERMAL POWER STATION	AYDIN	KARADENİZ ENERGY	12MW
DORA 2 GEOTHERMAL POWER STATION	AYDIN	MB HOLDING	9,50MW
DORA 1 GEOTHERMAL POWER STATION	AYDIN	MB HOLDING	7,95MW
PAMUKÖREN 4 GEOTHERMAL POWER STATION	AYDIN	ÇELİKLER ENERGY	32MW

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