

HISTORY OF GEOTHERMAL



YEAR	USE OF GEOTHERMAL IN THE WORLD
B.C. 1.500	Bathing,heating and cooking
630	Hot baths
1200	European people started to use thermal water to heat houses
1891	First regional heating system
1904	Generating electricity out of thermal for the first time
1920	First geothermal wells
1931	First geothermal power plant in Italy
1945	Using thermal on heating the greenhouses
1978	First thermal food drying system
1985	Thermal power plants reached to a capacity of 2000 MW throughout the world
1992	In 21 country ,electric generating capacity reached to 6000 MW

IN TURKEY

YEAR	
1984	First thermal power plant in Turkey(second in Europe after Italy) was built
1987	First central thermal heating system was built
2001	Turkey's thermal heating power became 493 MW
2009	Turkey's biggest thermal power plant was built



USE OF GEOTHERMAL IN THE WORLD AND TURKEY

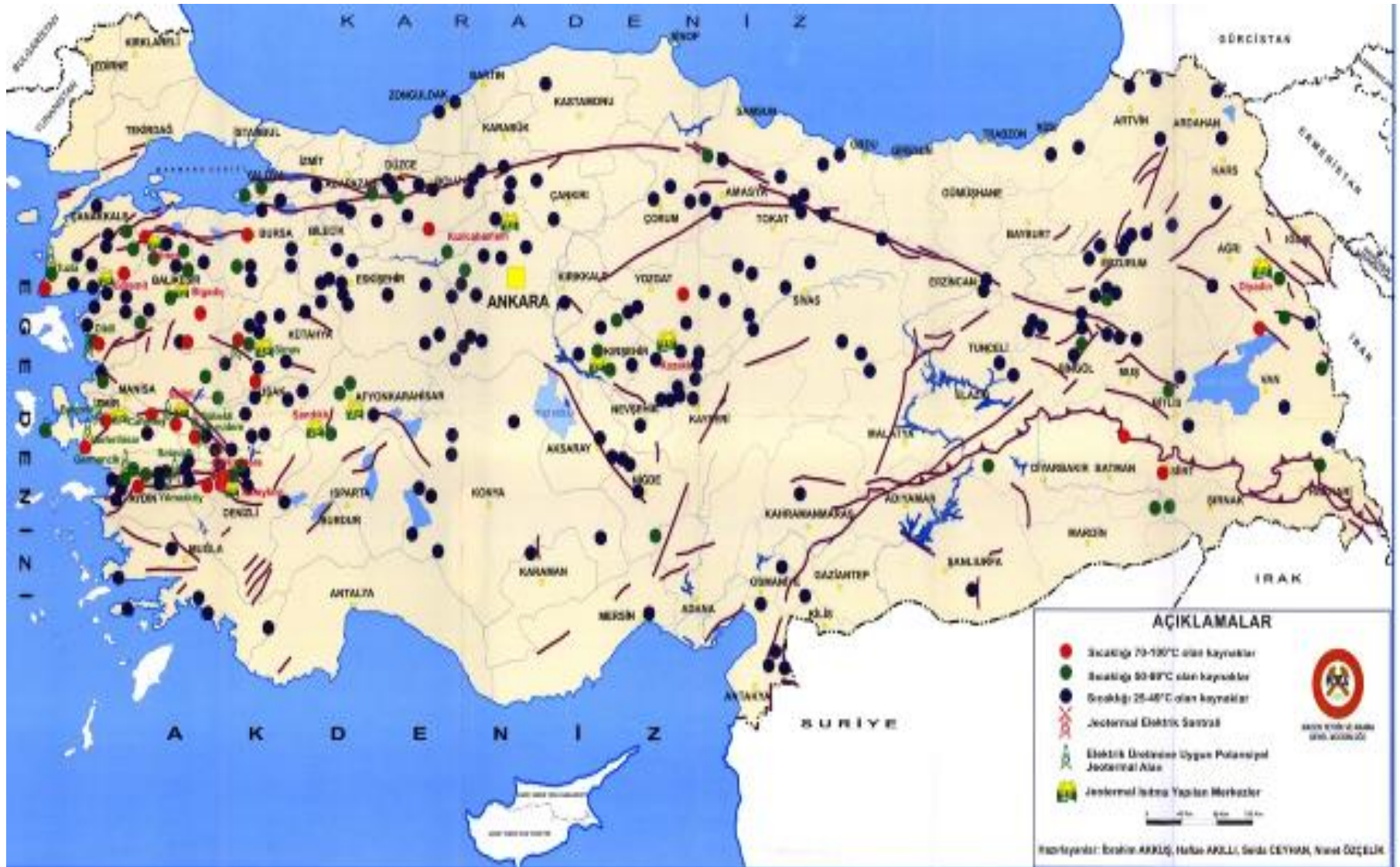
THE COUNTRIES THAT USE GEOTHERMAL ON GENERATING ELECTRICITY

COUNTRY	CAPACITY (MW)
USA	2544
PHILIPPINES	1931
MEXICO	953
INDONESIA	797
ITALY	790
JAPAN	535
NEW ZEALAND	435
ICELAND	202
TOTAL	8912

The countries that use thermal directly (besides generating electricity)

COUNTRY	CAPACITY (MW)
USA	7.817
SWEEDEN	3.840
CHINA	3.687
ICELAND	1.791
TURKEY	1.229
Rest of the World	9.460
TOTAL	27.825

In terms of geothermal potential ,Turkey is the 1st in Europe and 7th in the World.



FIELDS OF APPLICATION

Thermal Potential in Turkey:

31.500 MW

- **A – Generating electricity,**
- **B – Central heating and cooling units and greenhouses**
- **C – Industrial use (in factories)**
- **D – Producing chemicals and minerals such as carbon dioxide, fertilizer, lithium, hydrogen etc..**
- **E – Using thermals springs on thermal hotels and hot baths**
- **F – Using low temperature (30 C) thermals in fish farms**
- **G – Producing mineral water**

Classification of thermal sources depending on their heat

- The thermal sources which contain liquid hotter than 150 C ,are used to produce electricity.
- The ones which contain liquid under 150 C , are used for other purposes.



- **Turkey is the 3rd in the world with thermal tourism practises.**



- **Geothermal electric is produced only in 20 countries in the world, whereas geothermal heating is available in 70 countries.**



Geothermal Greenhouses

In 2013 ,from the greenhouses heated by geothermal,250 million dollars worth crops were exported



The total area of the greenhouse which are heated by thermal , in the world is 10.000 acres.In Turkey that is 1.250 acres.

The largest thermal greenhouse is in Şanlıurfa and it is 250 acres.

Thermal Fishing



ECONOMY

- Production of 200.000 tonnes of carbon dioxide and dry ice
- 250 thousand bed capacity Thermal Tourism
- 15 million local and 250.000 foreign thermal tourists in a year
- Economical income:12.625 billion dollars
- With efficient use of geothermal ,1.6 billion dollars worth fuel oil can be saved in a year (Equal to 2.800.000 tonnes)

COST OF GEOTHERMAL POWER PLANTS

The cost of a power plant with a 80 MW capacity is 240 million dollars can produce:

- Electric Production:650 million kw/year**
- Geothermal steam production:650 tonnes/hour**
- Electric for 400 thousand houses**

Comparing the Production Costs

- Geothermal Power Plant : 2,9 cent / kWh
- Thermic Power Plant : 5,15 cent / kWh
- Fuel-oil Power Plant : 9,8 cent / kWh
- Gas Power plant: 6,25 cent / kWh

- **The total geothermal Power potential of Turkey is 31.500 MW, which is equal to the energy that will be used to heat about 5 million houses.**
- **In Turkey, using that huge potential means to save about 20 billion dollars a year from importing oil and gas.**

Geothermal applications have created job opportunities for 200.000 people



ADVANTAGES AND DISADVANTAGES



ADVANTAGES

Thermal power ;

- **is renewable,sustainable and unlimited**
- **is clean and environment friendly**
- **has almost zero emission ,unlike some other power sources**
- **Gives a wide range of usage oppurtunities (residences,agriculture,industry,greenhouses.....)**
- **Is not affected by weather conditions ,like wind,rain or sun**
- **Is ready to use and cheaper than the other energy sources**
- **The thermal wells can be transformed into re-injection areas**
- **% 95 efficient and no risk of fire,explosion or toxidity**
- **Unlike other power plants ,there is no need for large fascilities**
- **It is local .It can't be imported or exported so it can't be a cause for war or conflicts**
- **No need for transport.**
- **Thermal fascilities are relatively easy to build and maintain**

DISADVANTAGES

- **Although geothermal is an environmental friendly energy ,the thermal liquid may cause corrosion,decay or caicification.As it contains carbon dioxide ,sulfur and boron ,it may also pollute the fresh surface water.**
- **To prevent that pollution ,the thermal liquid is re-injected to the underground .This process is compulsory in many countries.**
- **Transporting thermal liquid is limited to 100 km,because of heat loss.**