



**Report for Thermal Power Plant Investment in  
Derinçay Basin (Karlova/Bingöl)**

**BİNGÖL INVESTMENT SUPPORT OFFICE**

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## CONTENTS:

- Executive Summary.....3
- Energy Production and Thermal Power Plants.....5
- Lignite Potential of Derinçay Basin in Bingöl – Karlıova.....8
- Establishment Process of a Thermal Power Plant.....10
- Incentives and Supports.....11
- References.....12

## EXECUTIVE SUMMARY

The resources that countries going to use for their energy needs and amount of these resources are becoming an important issue in recent years. Especially the amount of fossil fuel is declining worldwide and this made the non-renewable energy resources in the world much more important and even led to the development of new energy policies and search for renewable alternative energy resources. The damage of the fossil fuels to the environment has also led the search for renewable energy resources. However, when the statistics have been taken into consideration it can be obviously seen that the big part of energy amount is still getting from the non-renewable energy resources in the world.

1/3 of Turkey's energy production is provided from Hydroelectric Power Plants while 2/3 of production is provided from Thermal Power Plants. However, the amount of energy provided from the alternative renewable energy resources is very low. This shows that Thermal Power Plants are still so important in Turkey in terms of energy production.

Lignite and natural gas are usually used in Thermal Power Plants in Turkey as fuel resources. When the lignite resources in Turkey examined, it can be seen that some of those resources that have the potential of being fuel for Thermal Power Plants is not benefited from. One of these resources is the Lignite area that is situated in the Deriñay Basin, Karlova District, Bingöl Province. In this lignite area, there have been numerous researches made by MRE (Mineral Research and Exploration General Directorate), GDTC (General Directorate for Turkish Coal), TEA (Turkish Electricity Authority) and Eltem-TEA (a side foundation of Turkish Electricity Authority) beginning from the year 1965 that lignite existence has discovered. 2-3 thousand tons of coal has been produced between 1981 and 1983 with open pit operation model. However, because of the marketing problems of the low quality coal, a sustainable production was not provided. GDTC has got a processing project done to Middle East Technical University Mine Engineering Department Research Center in 1984. In 1986, TEA has started a research about the amount and the quality of the lignite, underground water situation and slope analysis in order to establish a Thermal Power Plant. In this manner, there have been 24 drilling made by Eltem – TEA. According to these researches, including the operation loss costs, coal reserve amounts are:

For Open Pit Operation: 9.989.149 tons

For Closed Pit Operation: 46.555.995 tons

According to drilling data, the average lower heating value of the coal in the basin changes from 1211 to 1683 kcal/kg. Since the sulfur ratio is low in the coal, the amount of SO<sub>2</sub> that is going to be emitted by atmosphere will be low as well.

Bingöl – Karlıova Lignite field is the most second important Lignite Basin after Afşin-Elbistan in East Anatolia region. However it has not been benefited from the year 1965 when lignite existence has been found in the area. In 1983 and 1986 groundbreaking ceremony was held for thermal power plant construction but it was not continued.

The important stages in the establishment process of a Thermal Power Plant are “Electricity Generation License” application which is going to be provided from EMRA<sup>1</sup> (Energy Market Regulatory Authority), “EIA (Environmental Impact Assessment) Positive Certificate” which is going to be provided from Ministry of Environment and Forest<sup>2</sup>, and nationalization processes that are going to be made by EMRA.

In scope of promoting energy investments in Turkey, there is Value Added Tax (VAT) exemption and Customs Duty exemption.

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<sup>1</sup>The Energy Market Regulatory Authority was established in 2001 with the Law numbered 4628 as the “Electricity Market Regulatory Authority” and in the same year it was named as the “Energy Market Regulatory Authority (EMRA)” with the enactment of the Natural Gas Market Law numbered 4646. The Authority was assigned the duties of directing, monitoring, regulating and supervising the petroleum market in 2003 with the Petroleum Market Law No:5015 and the liquefied petroleum gases market in 2005 with the Liquefied Petroleum Gases Market Law No: 5307. The main duty of EMRA is to establish a financially viable, stable and transparent energy market, which functions as per the provisions of private law and within a competitive environment to ensure the independent regulation and supervision of the market in order to provide sufficient electricity, natural gas, petroleum and LPG of good quality to consumers, at low cost, in a reliable and environment friendly manner.

<sup>2</sup>The Law on Establishment and Duties of Ministry of Environment and Forestry No. 4856 (Official Gazette: 08 May 2003, No. 25102) defines the mandate of the MoEF as identifying appropriate technologies for environmental protection and pollution prevention; setting the environmental standards which are applicable in Turkey; developing waste management policies; inspecting the installations for waste, fuel and pollutants; issuing guidelines for emergency cases and risk management; establishing laboratories for analysis, checks and measurements; identifying and monitoring the sectors and zones prone to pollution and executing the necessary studies for technical, administrative and financial solutions for such areas; conducting and supervising environmental impact assessment and strategic environmental assessment studies; and raising awareness, starting from the local administrations, by holding continuous training programs.

## ENERGY PRODUCTION and THERMAL POWER PLANTS

Today, the energy policies of countries are based on which resources that are going to provide the needed energy, that is determining the energy resources and usage ratios. In order to achieve a sustainable development, it is important that the energy resources going to be used should not damage the environment. Primary energy sources like Petroleum, coal and natural gas are commonly used in the world. These resources that are also named as “conventional energy resources”, are run out when they used and damaging the environment by leaving less or more waste.

Coal, which takes second place after the petroleum in terms of consumption of energy resources, started to leave its place to natural gas from the year of 2000. During recent years, use of the nuclear energy resources are also increasing but problems of wastes emerging during the operation and security are the major issues that should be solved for getting energy production from this kind of resource. Countries are diversifying the resources that they use at electricity production according to their development levels and aiming to minimize the fossil fuel usage to the possible lowest level.

**Chart 1: Portions of the different resources in total energy demands in OECD countries**

	<b>Coal</b>	<b>Petroleum</b>	<b>Natural Gas</b>	<b>Nuclear</b>	<b>Others*</b>
<b>1973</b>	21,1%	54,1%	19,1%	1,4%	4,3%
<b>1979</b>	21,0%	51,5%	18,8%	3,8%	4,9%
<b>2002</b>	20,5%	40,3%	21,8%	11,7%	5,7%

*\*Contains renewable energy types such as hydrological, geothermal, solar and wind.*

Energy policies in Turkey are determined according to increasing the productivity rather than raising the consumption of energy per individual in last years.<sup>3</sup> Turkey is using the some portion of water potential in energy production. However, 1/3 of Turkey’s energy production is provided from Hydroelectric Power Plants while 2/3 of production is provided from Thermal Power Plants. In contrast to the world, coal has the biggest portion as a primary energy production resource instead of petroleum in Turkey.

Although the first electricity production that has economic value was hydrological in Turkey, total electricity production capacity of the thermal power plants which are cheaper and easier to build, are higher than total electricity production capacity of hydrological power plants.

<sup>3</sup> T.R. Prime Ministry State Planning Organization. (2000) Long Term Strategy and 8<sup>th</sup> Development Plan (2001-2005). State Planning Organization Publication, Ankara, p. 142.

**Chart 2: Development of Turkey's electricity production capacity over years (MW)**

<b>Year</b>	<b>Thermal Power Plants</b>	<b>Hydrological Power Plants</b>	<b>Geothermal and Wind Power</b>	<b>TOTAL</b>
<b>1923</b>	32	-	-	32
<b>1930</b>	74	3	-	77
<b>1940</b>	209	7	-	216
<b>1950</b>	390	18	-	408
<b>1960</b>	860	411	-	1272
<b>1970</b>	1509	725	-	2234
<b>1980</b>	2987	2130	-	5118
<b>1990</b>	9535	6764	17	16317
<b>2000</b>	16052	11175	36	27264
<b>2007</b>	27212	13394	170	40777

Coal, lignite, fuel-oil, natural gas, diesel, liquid propane gas and similar fossil fuels and geothermal resources are used as fuel in Thermal Power Plants in Turkey. Most of these Thermal Power Plants are using lignite and natural gas.

There are lignite resources in 150 different areas in Turkey. Total lignite reserve is around 8.2 billion tons. However, less than half of it is suitable for operation. Although the quality of lignite is low, it has enabled the construction of thermal power plants that use lignite as fuel. Lignites of Turkey have 36,5% humidity, 21% ash and 2% sulfur as average. All physical attributes of the coal depends on the how much humidity that coal contains and how this humidity connected to the coal. If the humidity ratio is high in the coal, productivity of the thermal power plant decreases.

Map 1: Lignite Resources in Turkey



# BİNGÖL – KARLIOVA DERİNÇAY BASIN LIGNITE POTENTIAL

Map 1: Derinçay (Halifan) lignite field

Lignite field is situated around Derinçay (Halifan) Village in Karlıova District in Bingöl Province (Map 2). Area is 5 kilometers away from Bingöl-Karlıova road and 45 kilometers away from Bingöl town center. The field looks like a plateau. The Göynük Stream flows from north to south direction and is on the west border of the area. Flora is consisting of oak and pine trees. There is a little land suitable for agriculture. People usually do live stocking for earning money. Area is cold and snowy in the winter, dry and hot in the summer.



First researches in the field have been started by MRE in 1965. Geological map of the field was made by İsmail Şentürk and between 1968 and 1974 there were 30 drillings and 9 splitting that have a total length of 5722 meters. In 1978, a resistivity survey made by geophysical senior engineer Mehmet Özcan from MRE in order to determine the situation of underlying volcanic and Pliocene sediments that includes coal.

In 1981, İsmail Yiğitel from MRE has prepared the 1/25000 scaled geological map of the lignite field and its neighborhood. After these studies and researches, operation building and social facilities were built by GDTC and 2-3 thousand tons of coal has been produced between 1981 and 1983 with open pit operation model. However, because of the marketing problems of the low quality coal, a sustainable production was not provided. GDTC has got a processing project done to Middle East Technical University Mine Engineering Department Research Center in 1984. In 1986, TEA has started a research about the amount and the quality of the lignite, underground water situation and slope analysis in order to establish a Thermal Power Plant. In this manner, there have been 24 drilling

made by Eltem – TEA. According to these researches, including the operation loss costs, coal reserve amounts are:

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Results of analyses of examples taken from the drillings and splitting can be seen in chart 3.

**Chart 3: Analysis results of examples taken from drillings and splitting**

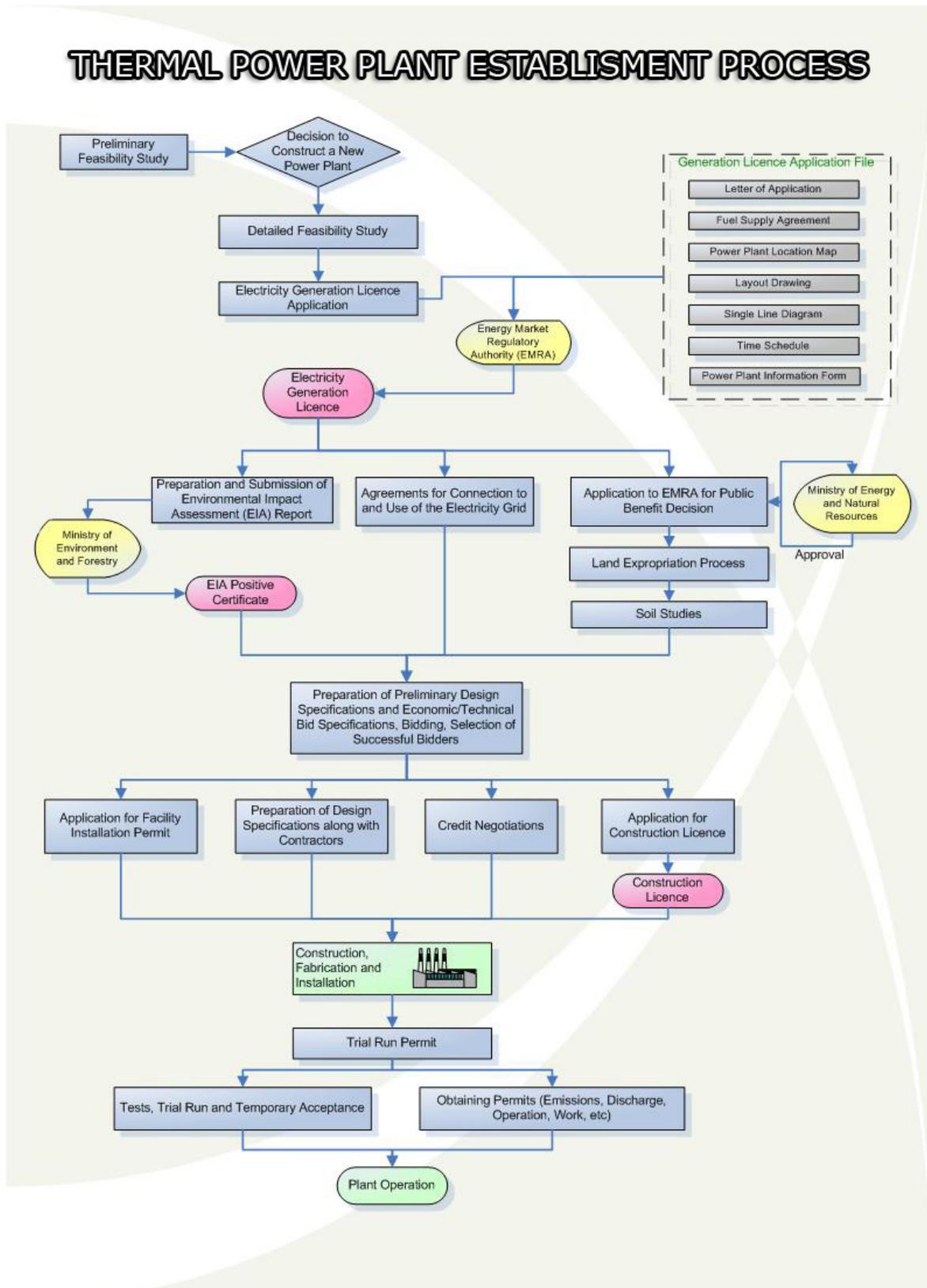
	<b>Open Pit Operation Area</b>	<b>Closed Pit Operation Area</b>
<b>Water (%)</b>	48,53	43
<b>Ash (%)</b>	24,21	24,63
<b>Volatile Matter (%)</b>	15,98	18,25
<b>Constant C (Carbon) (%)</b>	12,34	15,16
<b>Total S (Sulfur) (%)</b>	0,39	0,57
<b>Lower Heating Value</b>	1318 kcal/kg	1663 kcal/kj

According to the processing project made done to Middle East Technical University Mine Engineering Department Research Centre by GDTC in 1984, it is determined that 26.124.200 tons of coal that has a lower heating value of 1458 kcal/kg can be produced in the basin and this coal can meet the fuel requirements of a thermal power plant which has a 100MW power for 24 years.

Bingöl – Karlıova Lignite field is the most second important Lignite Basin after Afşin-Elbistan in East Anatolia region. However it has not been benefited from the year 1965 when lignite existence has been found in the area. In 1983 and 1986 groundbreaking ceremony was held for thermal power plant construction but it was not continued.

# ESTABLISHMENT PROCESS of a THERMAL POWER PLANT

Figure 1: Scheme of the establishment process of a thermal power plant for private sector



When the scheme is examined, it can be seen that the important stages in the establishment process of a Thermal Power Plant are “Electricity Generation License” application which is going to be provided from EMRA (Energy Market Regulatory Authority), “EIA (Environmental Impact Assessment) Positive Certificate” which is going to be provided from Ministry of Environment and Forest, and nationalization processes that are going to be made by EMRA.

## **INCENTIVES AND SUPPORTS**

In scope of promoting energy investments in Turkey, there is Value Added Tax (VAT) exemption and Customs Duty exemption.

## REFERENCES

- Avcı, Sedat. (2005) *Türkiye’de Termik Santraller ve Çevresel Etkileri*. İstanbul Üniversitesi Edebiyat Fakültesi Coğrafya Bölümü Coğrafya Dergisi. Sayı:13
- T.R. Prime Ministry State Planning Organization. (2000) *Long Term Strategy and 8th Development Plan (2001-2005)*. State Planning Organization Publication, Ankara.
- Kösebalaban, A. , Ergüder, İ. ve Doğan, M. *Bingöl – Karlıova (Derinçay)Havzası Linyit Potansiyeli ve Değerlendirilebilirliği*. Türkiye Kömür İşletmeleri Kurumu Genel Müdürlüğü, Ankara.
- T.R. Energy Market Regulatory Authority  
<http://www.epdk.gov.tr/lisans/elektrik/bilgibelge/bilgibelge.htm>  
(Retrieved on 12/12/2010)
- T.R. General Directorate of Highways  
<http://www.kgm.gov.tr/Sayfalar/KGM/SiteTr/Bolgeler/8Bolge/Harita.aspx>  
(Retrieved on 14/12/2010)
- T. R. Ministry of Environment and Forest  
<http://www2.cevreorman.gov.tr/yasa/yonetmelik.asp>  
(Retrieved on 15/12/2010)
- Hökelek, M. Y. , Değirmenci, N. (2008) *Elektrik Sektörü ve Enerjide Özerk Fon Yönetim Modeli*. Türkiye Elektrik İletim A.Ş. , Ankara.  
<http://www.teias.gov.tr/eBulten/makaleler/2008/12%20ulusal/12.smpozyum%20bildirisi.htm> (Retrieved on 17/12/2010)