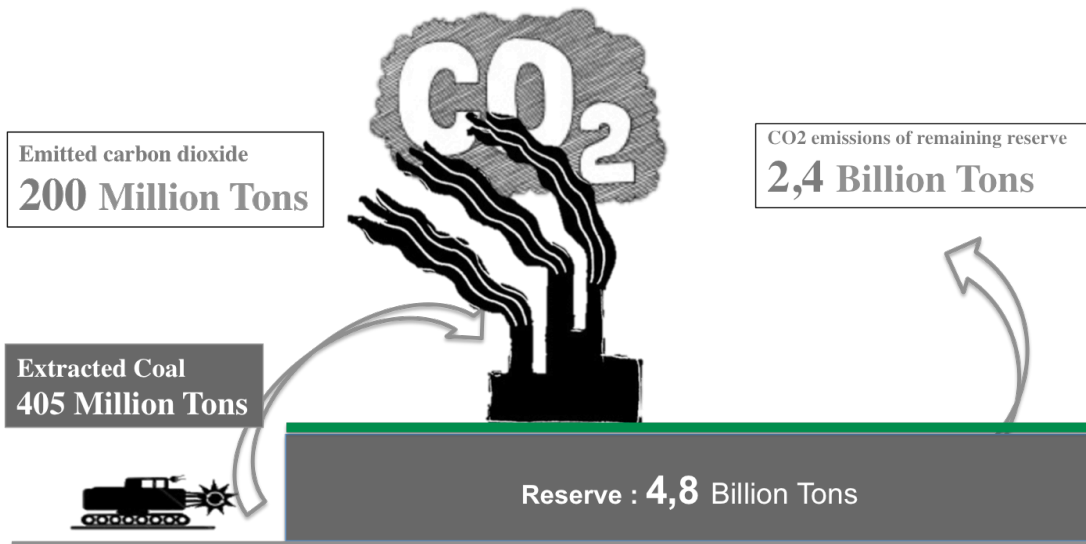

Afşin-Elbistan Coal Power Plants

Changing climate rather than producing electricity!



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Contents

Summary.....	3
Afşin Elbistan Lignite Reserve.....	4
Electricity Production	5
Are Afşin-Elbistan Power Plants Producing Electricity?	5
Working Hour of Afşin-Elbistan Power Plant.....	6
Changing Climate Rather Than Producing Energy.....	8

List of Figures:

Figure 1- Afşin-Elbistan coal sites map.....	4
Figure 2- Annual electricity productions of Afşin-Elbistan A (AEL-A) and B (AEL-B) plants.....	5
Figure 3- Annual unit operational period average and general average of Afşin Elbistan Plants A&B.	6
Figure 4 - Annual coal consumption and emitted carbon dioxide of Afşin-Elbistan A and B Plants	8

List of Tables:

Table 1 – Dates of Opening for Operation of Units of Afşin Elbistan Plants A and B	5
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Summary

Scientific reports shows that more than 80% of the world's known coal reserve has to stay in earth in order to keep the global temperature raise under 2°C. But Turkey has, on one hand, increased its lignite reserve amount by resuming its coal exploration activities, which were intermitted in 1984, and on the other hand developed a new market structure for presenting those reserves to economy. As the result of the economic policies based on fossil fuels, Turkey has reached a point of producing coal in a doubled amount compared with 1990 and importing a coal amount that is 5-6 times¹.

As the result of the coal exploration activities, the reserve in Afşin-Elbistan region has increased to a current amount of 4,8 billion tons. **Only one tenth of Afşin Elbistan site, which has 1 unit of each 3 units of lignite reserve of the country, has been used and 405 million tons of coal has been combusted in A and B plants until now. It has taken a role in accelerating the climate change by emitting 200 million tons of carbon dioxide to the atmosphere for producing 173,3 billion megawatt hour (MWh) electricity.**

In case Turkey establishes plants in C, D and E sites besides the existing A and B sites and permits the private sector for other sites, the reserve coal will be extracted more rapidly from the earth and will be combusted. Indeed, preliminary license has been obtained for a project with 400 MW installed power in Akbayır region and EIA application process has been commenced for Elbistan Power Plant, which has an installed power of 500 MW. **If the entire reserve is combusted for electricity production with those plants, which have been developed and which will be permitted by Turkey, 2,4 billion tons of carbon dioxide will be emitted to the atmosphere.** In other words, the reserve remaining in the earth will emit 21 times the carbon dioxide emitted by Turkey in 2013 for electricity production to the atmosphere only from this region.

Mining the reserves in Afşin-Elbistan region creates a serious danger for the nature and life as well as increasing the emission of greenhouse gases. Taking into consideration the properties of coal, it is known that **2,7 billion tons of volatile ash has been emitted to the environment through the chimneys as the result of combusting the coal mined in 2014.** Since plant A does not have a stack gas de-sulfurization plant, it is not known how much of **270 thousand tons of sulfur content** has been emitted to the atmosphere in the form of sulfur dioxide.

Turkey's policy of presenting low – quality coal to the economy by combusting it at power plants results in serious problems in Afşin-Elbistan. The units, which can not be operated regularly, combined with the operational problems, result also in accidents. **Taking into consideration that the annual operation period of thermal plants is about 8000 hours, it is seen that the average operational period of 8 units of 2 plants is very low and has been 2422 hours in 2013.**

The efforts for gaining Afşin – Elbistan coal sites of Turkey for high – carbon economy result in climate change, pollution of natural life with volatile ash, sulfur – dioxide, the importance of which has increased more with climate change, and in the extraction of water from the nature rather than producing electricity.

¹ Algedik, Ö, Financing Coal (High Carbon Arithmetic of Turkey), 2015

Afşin Elbistan Lignite Reserve

Afşin – Elbistan, which contains 1 tone of each 3 tons of lignite reserve of Turkey, is accepted an important value in terms of high carbon economy. While plant A with an installed power of 1355 MW and plant B with an installed power of 1440 MW use the coal from Kışlaköy and Çöllolar areas, C, D and E sites and the sites belonging to the private sector have not been opened to use for electricity production, yet. In terms of lignite potential, which is defined as a domestic energy source by Turkey, policies in favor of high carbon economy are prioritized through mining more coal in Afşin – Elbistan site and through electricity production.

Detailed survey of 40.000 km² area has been performed by MTA between 1939-1984 and 117 lignite sites have been found in Turkey as the result of a total of 1.459.000 meters of boring. As the result of those studies, 8,3 billion tons of lignite reserve has been found. **After 1984, until 2005, the process of development of coal sites in Turkey has been stopped.**

In 2005, the exploration works have been re-started as a sign of the acceleration in the return of Turkey to coal use. As the result of MTA's new reserve exploration efforts, as of the end of 2009, the lignite reserve² has been determined to be 11,45 billion tons, in 2013³ as 13,9 billion tons, and the total reserve in the sites found until 2014 has been determined to be 14,2 billion tons. The lignite reserve of Turkey is expected to exceed 15,6 billion tons as the result of MTA studies as of 2015⁴.

1,8 billion tons of the reserves, which increased in that period, belong to Konya – Karapınar site and 1,3 billion tons of them belong to Afşin-Elbistan site. Afşin –Elbistan reserve, which was known to be 3,4 billion tons until 2005, has increased to 4,8 billion tons with the exploration activities performed as the result of MTA's efforts for developing coal reserves. **With a total reserve of 4,8 billion tons, Afşin-Elbistan basin has one third of the coal reserves of Turkey.**

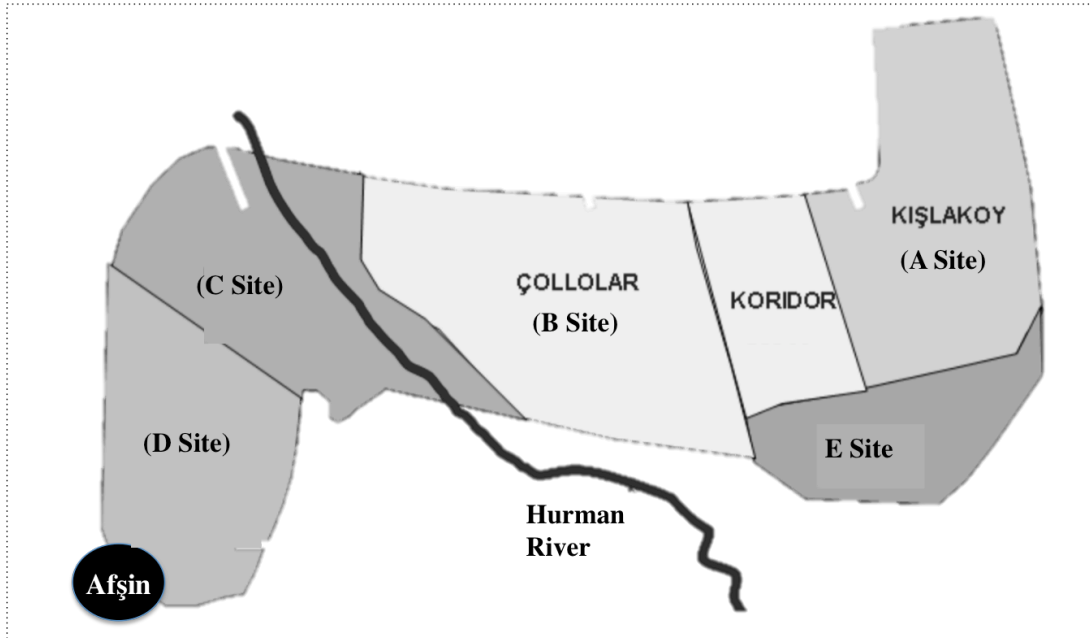


Figure 1- Afşin-Elbistan coal sites map

Plant A obtains coal from Kışlaköy site and Plant B obtains coal from Çöllolar site, and the map shows the sites belonging to EÜAŞ. There are also lignite mines belonging to the private sector besides this region.

² Coal Sector Report (Lignite) 2010, TKİ

³ Coal Sector Report (Lignite) 2013, TKİ

⁴ Minister of Energy, declaration dated October 7th 2015

Electricity Production

Due to their low quality, it has been preferred to use Afşin-Elbistan basin coal reserves for electricity production. Following the test production in Plant A, the construction of which was commenced in 1975, the units of the plant were commissioned between 1984 and 1987. The construction of plant B was commenced in 2000, its test production was started in 2004 and all of its units were commissioned in 2006.

Plant B is much younger in comparison with plant A and it is included among the plants of Turkey younger than 10 years. **With an initial investment cost of 1,8 billion dollars, Plant A, and with an initial investment cost of 1,6 Billion Dollars⁵, Plant B are included among the important energy investments of Turkey.**

Afşin-Elbistan	Unit No	Unit Power	Date of Operation
Plant A (1355 MW)	1	340 MW	07.07.1984
	2	340 MW	03.05.1985
	3	340 MW	25.01.1986
	4	335 MW	21.11.1987
Plant B (1440 MW)	1	360 MW	03.03.2006
	2	360 MW	18.09.2006
	3	360 MW	23.06.2006
	4	360 MW	14.11.2006

Table 1 – Dates of Opening for Operation of Units of Afşin-Elbistan Plants A and B

Are Afşin-Elbistan Power Plants Producing Electricity?

While plant A has 11,9 billion MWh and plant B has 12,6 billion MWh theoretical annual production, 7 billion MWh production has been obtained by plant A only in 1998 and 1999 and by plant B between 2008-2010. Plant A, which has been in operation since 1986, succeeded to have an electricity production in excess of 5 billion MWh only for 6 years until 2014, while plant B, which has been in operation since 2006, could exceed this production only for 5 years. The total electricity production of two plants has been only 5.5 million MWh in 2014.

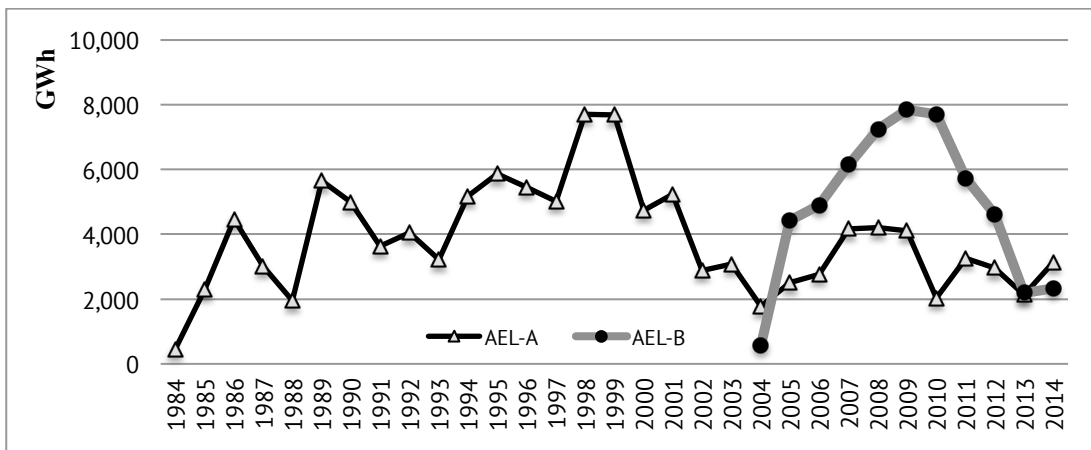


Figure 2- Annual electricity productions of Afşin-Elbistan A (AEL-A) and B (AEL-B) plants

The data is compiled from EÜAŞ Sector Reports and World Energy Council- Turkish National Committee studies.

⁵ Turkey Engineering News / Volume 442-443 - 2006/2-3

Working Hour of Afşin-Elbistan Power Plant

One of the most important reasons of low electricity production is the inability of some units to produce electricity for the entire year due to the problems encountered at plants. In accordance with EÜAŞ 2013 report of the Court of Accounts, **the third unit of plant A has not produced any electricity between 2011-2013, its fourth unit has not produced any electricity in 2011 and the third unit of plant B has not produced any electricity in 2013.**

Thermal plants are assumed to be operated for a total of 8760 hours within 365 days 24 hours theoretical operation period. The annual operation period of the plant is assumed to be around 8 thousand hours due to reasons such as maintenance and repair. This period may be lower as the result of downtimes due to internal reasons such as failures, fuel problems and due to external reasons such as system demand.

Taking into consideration the annual average of the operational periods of units of plants A and B of Afşin Elbistan thermal plants in 2007-2013 period, it is seen that they could not reach an average operational period of 7 thousand hours. The average operational hours of 4 units of plant A did not exceed 5 thousand hours ever in this period, while its second unit was operated for a maximum period of 4295 hours in 2013 and its third unit did not perform any production at all, which resulted in an average of 2497 hours for all four units.

Although it was commissioned 20 years after plant A and did not reach an operational life of ten years, plant B reached a maximum average operational period of 6.949 hours in 2009. Thereafter, its operational period started to decrease and in 2013, its third unit was not operated at all, and its second unit was operated only for 531 hours, which resulted in an average operational period of 2349 hours for all four units. **The average of total production hours of the units of plants A and B in 2013 decreased to its minimum as 2422 hours.**

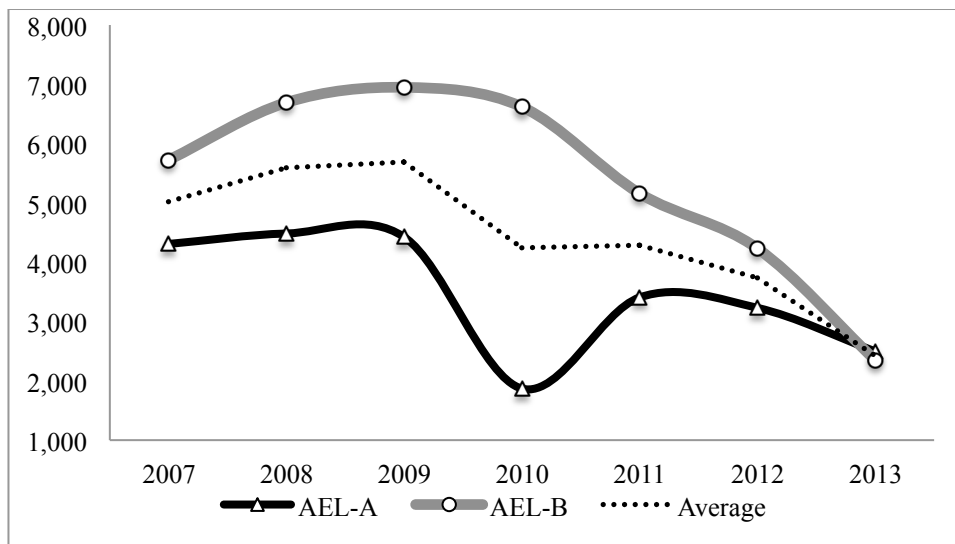


Figure 3- Annual unit operational period average and general average of Afşin Elbistan Plants A and B

Compiled from the reports of Court of Accounts.

The performance problems at Afşin Elbistan plants A and B can be categorized in two groups as fuel – sourced and plant – sourced problems.

Fuel – sourced problems;

- The coal in the basin generally has approximately 53% humidity, 19% ash, 20% volatile matter, 7% fixed carbon, 2% sulfur and 1.150 kcal/kg lower heating value⁶.
- Due to the landslide that occurred in 2011 in Çöllolar mine, plant B uses the coal obtained from Kışlaköy mine, which is the fuel source of plant A, however this amount is insufficient.

Plant and Operation – Sourced Problems;

- Environmental criteria are not complied with; Plant A requires electro-filter rehabilitation, and the stack gas de-sulfurization plant has still not been constructed since 1999⁷.
- In 2013, the greatest share belongs to Afşin-Elbistan Plant B with 30,4% and to Plant A with 22,8% as the result of reasons such as unavoidable downtime, repair and maintenance, and due to load decrease, which are among group A energy losses.

⁶ Electricity Generation Company(EÜAŞ) 2012 Report, Court of Account, Page:81

⁷ Afşin- Elbistan B Plant received EIA Positive decision with the condition of building stack gas de-sulfurization plant to A plant. Although de-sulfurization plant cost placed in 1999 investment plan, it has not constructed yet. (Electricity Generation Company(EÜAŞ) 2012 Report, Court of Account, Page:129-130)

Changing Climate Rather Than Producing Energy

A total of 404,5 million tons of coal has been extracted until 2014 for Afşin-Elbistan thermal plants A and B until 2014. With the extracted coal, Plant A produced 119,6 million MWh electricity and Plant B produced 53,7 million MWh electricity, and **total production has been 173,3 million MWh.**

Taking into consideration the low lower heating value of the extracted coal, which is 1150 kcal/kg, **Afşin Elbistan Plants A and B have emitted 200 million tons of carbon dioxide to the atmosphere until now.**

Taking into consideration only the performance in 2014, 13,48 million tons of coal was combusted for producing 5,473 million MWh electricity production. **Taking the properties of coal into consideration, it will be seen that 2,6 million tons of ash, 2,7 million tons of volatile ash was emitted to the environment through the stacks and 6.7 million tons of carbon dioxide contributed to climate change.** Since plant A does not have a stack gas desulfurization installation, it is not known how much of approximately 270 thousand tons of sulfur content has been emitted to the atmosphere in the form of sulfur – dioxide.

The preliminary license⁸ and application⁹ efforts are continuing for new coal plants for constructing thermal plants in C, D and E sites in Afşin-Elbistan site of Turkey and in mine sites belonging to the private sector. Targeting electricity production for presenting the reserve to economy due to its low quality will result in energy production by combusting fossil fuel, which occurred in the earth millions of years before, and in climate change. **When the reserve, which has not been combusted at the plants, yet, is used for electricity production, 2,4 billion tons of carbon dioxide will be emitted to the atmosphere.**

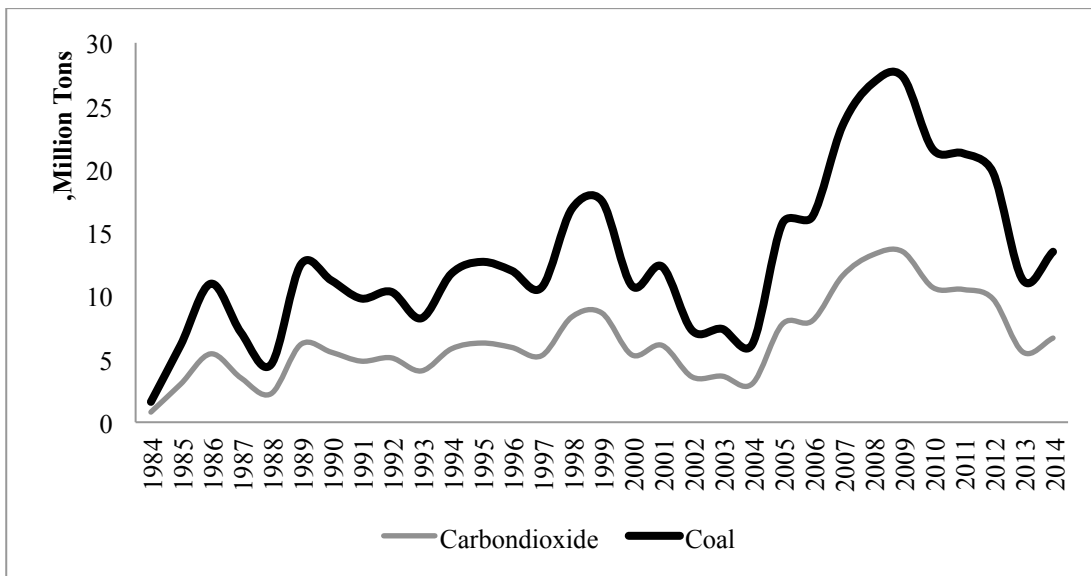


Figure 4 - Annual coal consumption and emitted carbon dioxide of Afşin-Elbistan A and B Plants

EÜAŞ reports, data from World Energy Council- Turkish National Committee reports has been calculated by the author.

⁸ Diler Elektrik Üretim A.Ş. obtained preliminary license for a thermal plant project on 2 sites with a reserve of 189 million tons on 25.12.2014.

⁹ Anadolu Enerji Üretim A.Ş. submitted EIA application file for Elbistan Thermal Plant having 500 MW installed power on 02.11.2015.