Coal & Climate Change - 2017

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About the Author

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Abbreviations

EMRA : Energy Market Regulatory Authority
INDC : Intended Nationally Determined Contributions
MENR : Ministry of Energy and Natural Resources
GDM : General Directorate of Meteorology
PA : Privatization Administration
TEİAŞ : Türkiye Elektrik İletim Anonim Şirketi (Turkish Electricity Transmission Incorporated)
TKİ : Turkish Coal Enterprises Institution
TTK : Turkish Hard Coal Institution
TÜİK : Turkish Statistics Institution

Units

toe	Ton of oil equivalent
mtoe	million ton equivalent oil
kW	Kilowatt (10^3 watt)
MW	Megawatt (10^3 kilowatt)
GW	Gigawatt (10^3 megawatt)
TW	Terawatt (10^3 gigawatt)
Krş	0,01 Turkish Lira
kWh	kilowatt-hour (103 watt-hour)
MWh	megawatt-hour (103 kWh)
GWh	gigawatt-hour (106 kWh)
TWh	terawatt-hour (109 kWh)

Report Summary

In 2016, extreme climatic events have occurred more frequently and more intensely. While 2016 was being recorded as the hottest year measured in the world, it has been measured as the fourth hottest year in Turkey. The frequency and intensity of extreme climatic events in Turkey have increased. With 752 extreme climatic events that occurred in that year, the 67 events, which was the average for the years between 1990-1999, has been exceeded to a great extent. Monthly temeperature records have been detected in February at 59 stations.

The Paris Climate Agreement has entered into force in a period, during which climate change accelerated. As of June 2017 153 countries have become a party to this Agreement, which has complied with the conditions of entering into force in a very short period of 1 year. During the G20 summit, which took place in the days following USA's expressing that it wants to withdrawl from the agreement, Turkey announced that it would not become a party to the Paris Agreement.

Turkey emitted 214 million tons of greenhouse gases to the atmosphere in 1990 and 475,1 million tons of greenhouse gases in 2015, and declared that its target for 2030 is 929 million tons before the Paris Agreement with Intended Nationally Determined Contributions (INDC). In the last 25 years, Turkey increased 262 millilion tons of greenghouse gas emisson while planing to increase 454 million tons more in the next 15 years, between 2015-2030. This is the reason why Turkey did not ratifying the aggreement.

There is a relation between the increase in greenhouse gas emissions of Turkey and its *energy need discourse* and hence the fossil fuel consumption. In 1990, Turkey consumed 53 million toe energy, while this amount increased to 129 million toe energy with an increase of 142% in 2015. Half of this increase was caused by natural gas alone. The statement of "creation of diversification in energy" of natural gas did not work for other fossil fuels. **After 2010, coal consumption began increasing together with the consumption of petroleum and natural gas.**

1/2
Share of natural gas in the increase of total energy consumption

Turkey is now a country that is "fully dependent" on both imported coal as imported natural gas and imported petroleum. Natural gas represents the half of the energy increase in Turkey. Coal and petroleum consumption continued to increase in spite of the natural gas, which was encouraged with the energy diversification statement. 70.2 million toe of 75.9 million toe increase in the energy consumption of Turkey has a fossil fuel origin.

Turkey supports fossil fuel dependency with public resources. Only within 2016 the resources transferred to or the exemption provided for coal plants from our public resources is in excess of 2 billion TL. Incentives have been provided for imported turbins and accessories of 1,31 billion dollars. **With the provided incentives, 2530 MW imported coal plant projects have been supported.**

As the result of the warranties and subventions provided by the state, the domestic banks have become the financers of coal projects. 7 banks have provided loans for power plant projects having a total installed power of 9 GW. By this way, the Turkish banks have become directly responsible for half of the coal plant- origin emissions.

29 Million ton
Increase in Coal import

2017 has shown that, in spite of support mechanims, coal is expensive. While the firm awarded with the contract in Çayırhan B privatization, the firm claimed 6.04 cents per each kwh electricity production, despite the average bid was 3,3 cents, and the minimum bid was -1,61 cents in the wind tender. Although a local production requirement, the tender held for solar energy offered 6,99 cents/kwh, which showed that it is competing with coal plants.

0
Imported coal power plant capacity before 2000

The reason for the increase in coal is the imported coal and the plants burning imported coal. While Turkey was supplying only 54,5 million tons of coal in 1990, this amount has increased to 93 million tons in 2015. 29 million tons of this increase in coal consumption was caused by import. ***In 1990, the coal import was 5.5 million tons but it has increased up to 6 times reaching 34.5 million tons in 2015.***

On the other hand, domestic coal policy encouraged the imported coal plants. Turkey had an installed power of 5.2 GW at coal plants in 1990 and it had no plants operating with imported coal until 2000. **Today, Turkey has 62 coal power plants, with 16,7 GW installed power.** 7 GW of this capacity uses imported coal, however much more electricity is produced by other coal plants.

The share of imported coal plants is increasing. 1890 MW of new coal power plant has been installed since 2015 and 1400 MW of these capacity belongs imported coal. Turkey has 20 plants having 9.4 GW total installed coal power plant wcich are licensed and are under construction and 7,6 GW of this capcity eill burn imported coal

In 1990 **24,1** million tons

In 2015 **80,3** million tons

CO_2 emissions of coal power plants

The domestic coal policies will encourage import also in the future. The total power of 12 plants, which have obtained license from EMRA, is 6.3 GW and 4.2 GW of this power will burn coal. All of the 9 plants that are being assesed are imported coal plants, which means a power of 8,4 GW. By adding 25.2 GW candidate plants to the existing 16.2 GW installed power, this means that a potential of 41,9 GW is obtained.

In this case, there are 20,2 GW imported coal plant projects at different stages in comparison to 5 GW domestic coal projects that are at privatization / royalty /license stages.

The fossil-energy dependence of Turkey resulted in a fast increase of greenhouse gas emissions. Beweeen 1990-2015, Turkey increased greenhouse gases 261.1 million ton while 235,2 million tons is carbondioxide and 193.7 million tons of the increase in carbon dioxide is coming from usage of three fossil fuels.

Coal Power Plants have an important role in the increasing greenhouse gases. While coal power plants emitted 24,1 million tons of carbon dioxide to the atmosphere in 1990, this amount reached 80,3 million tons in 2015. With the completion of the candidate plants, the transactions of which are continuing at EMRA, this amount may raise to 225 million tons. New coal power plants will be added and with this new carbon dioxide emission, it will be impossible for Turkey to de-carbonize its economy in the future. **Moreover, it will increase the extreme climatic events and this will result in irreparable loss.**

Turkey provided 2 Billion TL incentives for coal plants in 2016 and obtained electricity using more expensive coal. With these policies, in the following 15 years, Turkey change more compared to what it has done in the past 25 years. All of this is happening with the probability of encountering almost ten times the extreme climatic events that occurred in 1990. Turkey, which has become more dependent on high carbon, wants to make use of financing and technology to ratify the Paris Agreement. However, it is spending a much higher amount for encouraging coal and fossil fuels. Today, Turkey's economy has become dependent on imported coal, natural gas and petroleum. It is obvious that in recent years, those three fuels had a tendency of increasing as if they are in a race. We can say that those policies will result in "***irreparable losses***" in the future for Turkey.

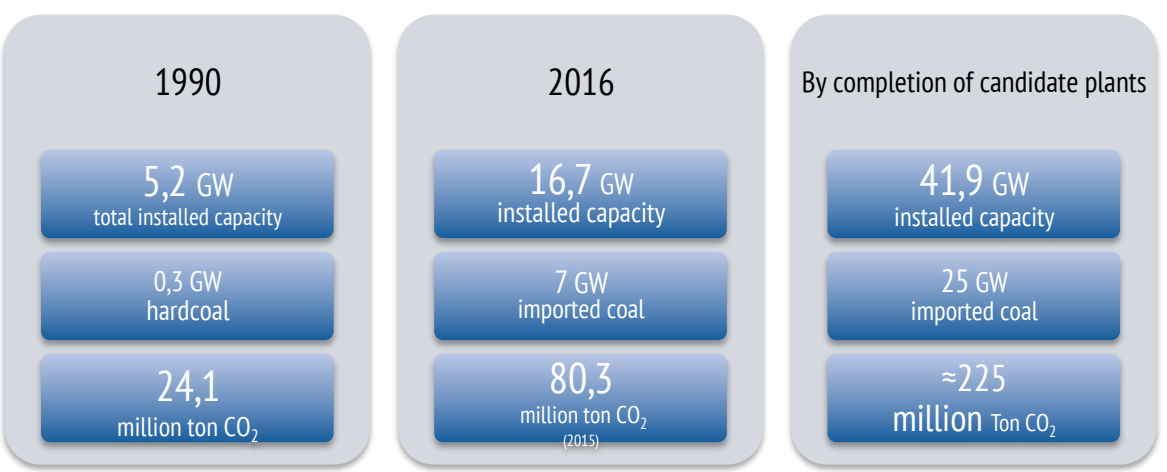


Figure 1- Power and fuel projection for coal power plants of Turkey

Introduction

The report "**Financing Coal**", which was published in 2015 had the purpose of providing a different point of view for the ones, who accept the climate issue as their own issue, but who can not perceive coal and energy policies, in spite of the limited data.

The report "**Coal and Climate Change – 2016**", which was published in 2016 played an important role in the clarification of the obtained data from 2015.

The report Coal and Climate Change 2017 tried to define the role of coal in the frame of general energy data on the high carbon economy policies of Turkey, the coal power plants and the policies. It combined the development of coal plants including the greenhouse gas projections and also examining the existing plants and the candidate plants in the permission process, under three headings, namely energy – coal – climate change. It showed especially the fossil fuel and coal dependence of Turkey, the role of "domestic coal" discourse in this situation and how the imported coal plants have increased. The Coal and climate Change 2017 report has the purpose of both developing and furthering such information and analysis.

The approach in the previous report is also used in this report without any changes made[1]. **However, since a re-calculation has been performed in April 2017 inventory, where Turkey's data for 2015 is given, all data of the past years have changed. Therefore, the Coal and Climate Change -2017 report has renewed all of the data from the previous years.** Furthermore, each subject is examined with its own scope in its own context for the ones, who are not experts of the subject.

This study examines especially the data that is difficult to understand and tries to establish a relation for the data in terms of climate change. Therefore, the data that is determinative in terms of climate change is used rather than the data such as the coal amounts or the plant numbers in the report, and such data is converted whenever necessary. The report does not confine itself to the existing data, and submission of parliamentary questions are ensured to provide bases for policies. The answers given for the issued parliamentary questions are also examined in the report.

After 2004, during which Turkey has become a party to UN Climate Change Framework Convention, it restarted coal explorations and developed a royalty model. And after 2009, when Turkey became a party to the Kyoto Protocol, Turkey announced 2012 as the "year of coal". It held coal tenders with record prices after not being a party to the Paris Agreement. The Coal and Climate Change-2017 report examines the role of coal in Turkey's turning towards a fossil fuel centered policy on one hand while becoming a party to climate change agreements on the other hand. The data and analysis show that Turkey is trying to open high carbon economy to the private sector and that it is continuously feeding the policies of including coal in the scene in order to expand the privatization, royalty, preparation for investment and the market. Furthermore, it also provides data showing that Turkey is more desirous than the past to change the climate on one hand while becoming a party to the climate agreements on the other hand.

[1] Algedik Ö., Coal And Climate Change 2016, pg:8 for access. http://www.onderalgedik.com/coal-2016/

Background

On terms of climate change, 3 important developments occurred in 2016; new temperature records were broken, number of extreme climate events were increased substantially and the Paris Climate Agreement entered into the force. The first two developments showed the point the climate change has reached while the third development – even if late – shows the alacrity of countries for a global agreement.

The Paris Agreement, which was settled on **December 12th 2015,** was opened for signature on April 22nd 2016 with a ceremony in which 195 countries participated. Before the Agreement could enter into force, 55 countries had to become parties and these countries had to be responsible for 55% of the greenhouse gases. This process, which for other agreements took a few years, took a much shorter time for the Paris Agreement. Upon compliance with conditions on October 5th 2016, the Paris Agreement entered into force on November 4th 2016. 153 countries became party to the Agreement as of June 2017[2].

Turkey has become a party to the UN Climate Change Framework Convention in 2004 and to the Kyoto Protocol in 2009. After becoming a party to the Convention, Turkey restarted coal explorations. Furthermore, it opened the path to coal production through royalty and electricity production through royalty[3]. 3 years after becoming a party to the Protocol, it announced 2012 as the "Coal Year". Although Turkey joined *signature ceremony of the Paris Agreement* on April 22nd 2016 together with 195 countries, has still not been approved by the national assembly. After the withdrawing steps taken by the USA[4], Turkey announced[5] that it will not ratify the Paris Agreement.

In June 2017 the step of the USA president for withdrawal from the Paris Climate Agreement has carried the process to another dimension. It is obvious that the withdrawal, as well as its participation, of the USA, which is the second big country following China in terms of greenhouse gases, will have different consequences.

In the period, during which the Paris Agreement, which is based on the obligations of countries between **2020- 2030**, entered into force, important events occurred in terms of climate change. The World Meteorology Organization announced that 2016 has been 1,1^{0}C warmer in comparison to the period before industrialization and that it has been recorded as the hottest year that has been measured[6]. 2015 and 2014 followed 2016 in terms of highest temperature. The target of the Paris Agreement to keep the increase of temperature under 1,5°C was not very far away. Hence, although there is still limited for 2°C, which science finds risky, it has become obvious that there is not much time left for the target of keeping it under 1,5°C.

Meanwhile, the carbon dioxide amount in the atmosphere broke new records in comparison with the pre-industrialization period. In the year of establishment IPCC, the carbon dioxide amount in the atmosphere just exceeded 350 ppm, which is the safe limit[7]. This ratio reached 408,87 ppm in June 2017. By this way, carbon dioxide density, which was at a 280 ppm level before industrialization, was now permanently above a 400 ppm limit. Within a period of 150 years the fossil fuel industry returned to the carbon dioxide amount that the world had 4,5 million years ago[8].

1.1°C
Temperature increase in 2016
compared to pre-industrial level

[2] For updated list: http://unfccc.int/paris_agreement/items/9444.php

[3] Algedik Ö, Climate Change with Royalty Model May 2016. For access: https://goo.gl/9YceBi

[4] Romm J., Domino effect: Turkey won't ratify Paris climate accord, citing Trump's exit, July 10th 2017, for access https://goo.gl/kt2CHM

[5] Anadolu Agency news, for access, http://aa.com.tr/en/world/g20-split-on-climate-/857258

[6] WMO, Bulletin nº : Vol 66 (1) - 2017 https://goo.gl/emPULg

[7] parts per million .

[8] https://350ankara.org/400-ppm-nedir/

Extreme Climate Events and Turkey

The findings and events in 2016 revealed that climate change has shown its effect at a national as well as a global level. 2016 has been the hottest year measured in the world, and **it has been the 4th hottest year in Turkey with an average temperature of 14,5°C**. From a different angle of view, 2016 is 1°C hotter when compared to 1981-2010 average has been lived in Turkey. 2010, which is the hottest year measured in Turkey, was a year that was 2°C hotter with an average temperature of 15,5°C.

Table 1- Annual temperature records in Turkey

Year	Average Temperature
2010	15,5 ° C
2014	14,9° C
2001	14,6° C
2016	14,5° C
2015	14,3° C

(Reference: MGM data)

The extreme temperatures were not limited with the summer months, temperature records were broken also in the winter months. In accordance with the study performed by Meteorology General Directorate (MGM) for 2016[9] , the stations in Turkey have broken maximum temperature records between February 15th-19th 2016. **While 59 stations were measuring maximum temperature records, 8 stations repeated the previous records.** Moreover, the maximum temperature records were broken three times in 5 days at each of Ankara, İzmir, Aydın, Şanlıurfa and Siverek meteorology stations between February 15th-19th. The record of Milas, whose February temperature record was 24,9°C since long years, has been extraordinary and the highest temperature measured in Milas in the period of February 15th- 19th was 32,4°C on February 16th. Hence, **after long years the temperature record of Milas increased with 7,5°C.**

There was another record, namely the number of extreme climatic events that occurred. In accordance with the MGM reports, 555 extreme climatic events occurred in 2010, during which the temperature record was broken. Almost half of this number consisted of storms and tornados, which we started seeing in recent years. 156 of the extreme climatic events were water floods. In 2016, more extreme climatic events occurred in comparison to 2010. In 2016, during which 752 extreme climatic events occurred, 341 storms and tornados and 144 floods have been observed. As is the case at global level, the extreme climatic events started to be more frequent and intense at national level.

After the extreme climatic events of 2015, while cities faced flood frequently, 2016 has been the second year which bearded a highest number of extreme climate events. Furthermore, there has been an increase in terms of the long period average. While the average number of extreme climatic events per year in the 1990-99 period is 67, while 2010-2016 average is 584 events.

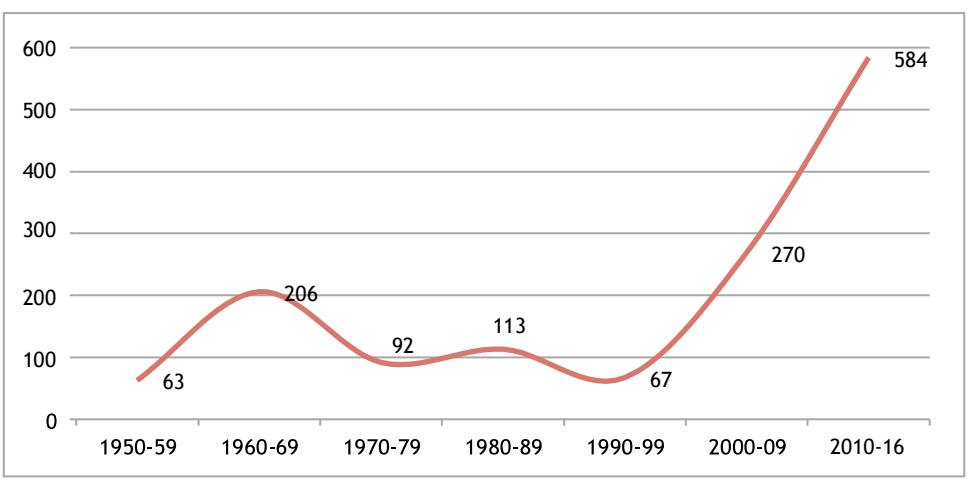


Figure 2- Variation of extreme climatic events in Turkey

[9] MGM, February 15th -19th 2016 Extremely High Temperatures, https://goo.gl/8P3tSB

Coal Policies of Turkey

Coal always had an important role in the traditional energy policy of Turkey. An integrated approach consisting of works for increasing the coal reserves on one hand and models for mining and burning more coal, encouragement of those models and beyond this, opening the path for imported coal on the other hand is continuously being developed.

A model of coal production under a royalty agreement opened the path to more coal mining in Turkey. With the royalty model, which has also been applied before, only 447 000 tons of coal was mined in 2004, but this amount reached 4,7 million tons in 2014 with the insisting policies[10].

Model of electricity production with royalty contract resulted in burning more coal through power plants. With this model, Turkey had a portfolio of plants, a part of which are operating, with a total power of 3 thousand MW installed on a reserve of 887 million tons[11]. Turkey has put 9 contracts for electricity production through royalty into application. Except Bingöl-Karlıova and Şırnak among those plants, the remaining ones started production or license process (Annex-2). The conditions and details of those projects, which are executed under a royalty model, are now known clearly by the public. The first motion given in relation with this matter on January 22nd 2016 was responded on September 1st 2016[12] indicating that the "payments were compliant with the royalty contract" for Bolu Göynük plant. In the response to another parliamentary question dated May 3rd 2016, it is indicated that price for kwh will be collected or the electricity to be produced for 30 years after the tendering and commissioning of various plants after 2005[13]. While model of electricity production under royalty model is open for answers by the Ministry, in the response given on September 1st 2016 for another parliamentary question dated May 10th 2016, it is said: "There is no electrical energy produced through royalty and purchased by TETAŞ "[14].

It is obvious that the method of issuance of areas prepared for investment under the royalty method against a small price against a warranty for purchase that has been applied since 2005 against is not preferred anymore. Together with this process, the Minister of Energy and Natural Resources clearly expressed that "He is not very fond of royalty system in the operation of coal areas". In his statement, he said "I think we will be able to commission the new model, which we think will be more efficient, this year", announcing that the areas found by MTA and prepared by EÜAŞ for electricity production would be tendered by the Privatization Administration Presidency (PAD) [15].

Turkey used the privatization model before for transferring the public plants to the private sector. By this way, the plants that had an installed power of 4,6 GW were transferred to the private sector with their assets. The works were expedited after 2010 with this policy and now only a limited number of plants are left in the public sector such as Afşin-Elbistan.

The model of reserve privatization for electricity production has been put into application. In accordance with this model, the reserve would be privatized against electricity production right. The first example of the model was Çayırhan B power plant. It has been taken into the scope and schedule of privatization under the Privatization Superior Board resolution dated 26.09.2016 and numbered 2016/57 for the privatization of the reserve by PAD in Çayırhan – II section included in the license area belonging to EÜAŞ for the establishment of a coal-based electricity production plant. Thereafter, the plan change works have been commenced by the Ministry of Environment and Urbanization. On January 6th 2017, the plan change public display period for has begun[16]. It is estimated that 3 million 850 thousand tons of coal will be burnt with the project, which is planned to have a power of 720 MW. Furthermore, it is expected that 1 million ton ash will be produced and 4 million tons of carbon dioxide will be emitted to the atmosphere each year. PAD collected the bids before the project objections were completed and announced its decision before the plan was finalized at the end of the public display period. The group, which proposed 6,04 cents per kilowatt hour was awarded with the contract. The Privatization Superior Board

[10] Algedik Ö, Climate Change with Royalty Model May 2016., pg:6 For access: https://goo.gl/hmFKea

[11] ibid. pg:4

[12] For access to the response given by the Minister for the parliamentary question given by Parliament Member Bülent Kuşoğlu of Ankara: http://www2.tbmm.gov.tr/d26/7/7-1955sgc.pdf

[13] For access to the response given by the Minister on September 1st 2016 for the parliamentary question given by Parliament Member Ahmet Akın of Balıkesir: http://www2.tbmm.gov.tr/d26/7/7-5320sgc.pdf

[14] For access to the response given by the Minister for the parliamentary question given by Parliament Member Ahmet Akın of Balıkesir: http://www2.tbmm.gov.tr/d26/7/7-5522sgc.pdf

[15] Sabah Newspaper, March 23rd 2016, for access: https://goo.gl/UWmSsn

[16] http://www.csb.gov.tr/iller/ankara/index.php?Sayfa=duyurudetay&Id=179093

ratified the tender with the meeting it held on March 3rd 2017[17]. The objections were not accepted much later than PAD ratification and it has been notified at the end of May that the plan change was acceded[18].

It is expected that **opening coal areas for production through privatization model** will be applied also for Afyonkarahisar-Dinar, Eskişehir Alpu, Konya-Karapınar and Tekirdağ Çerkezköy areas, which are included the Strategic Plan (2015-2019)[19] of Ministry of Energy. By this way, the processes before investment with public resources will be prepared and the way for the use of 4,7 billion tons of coal in those 4 areas for electricity production after 2020 will be opened. On the other hand, **the works for preparation for investment by the state** continued in parallel with those models. It is observed that various preliminary investment preparations for coal areas from surveys to Environmental Impact Assessment are being performed with public resources.

Coal import has been both complementary to those policies and determined their dimensions. The market, which was limited with domestic production, was opened for imported coal, and by this way, an increase in import in excess of production has been ensured.

Although the cost of royalty electricity is not known today, it can be estimated with the latest developments. With the amendment made in the Electrical Market Law in June 2016, an article allowing purchase of coal against a special price has been acceded under the resolution of Board of Ministers. The Board of Ministers allowed purchases against a price of 18,5 krş/ kWh following such amendment. This amount is a price that is much higher than 14,04 krş/kWh, which is the average for year 2016. The second development occurred in February 2017. For the construction of a second plant on the coal reserve in Çayırhan, the plant area and the production right have been privatized with a tender. The consortium, which proposed 6,04 cent/kWh for the plant having an installed power of 720 MW with 15 years purchase guarantee was awarded with the contract[20]. By this way, the payment of a price that is approximately 7 krş higher than the average of wholesale electricity production price for 2016, was accepted. In other words, a high purchase price was given besides purchase guarantee for the electricity obtained from coal.

While Soma mine disaster was still in the memory of the people and while royalty in electricity was being questioned, Turkey gave up talking about this model. Instead of it, it privatized the production right and clearly provided a purchase guarantee and a high price in a period, during which Paris Agreement was on global agenda. Such a policy being brought in a period, during which Chile paid 2,91 cents for the electricity obtained by solar energy, was important. Bids of 3,3 cents/kWh were being collected in average in the wind capacity assignment tender after Çayırhan B tender and the lowest bid received was minus 1,62 cents/kWh[21], which shows once again the coal is expensive as well as being far from being competitive.

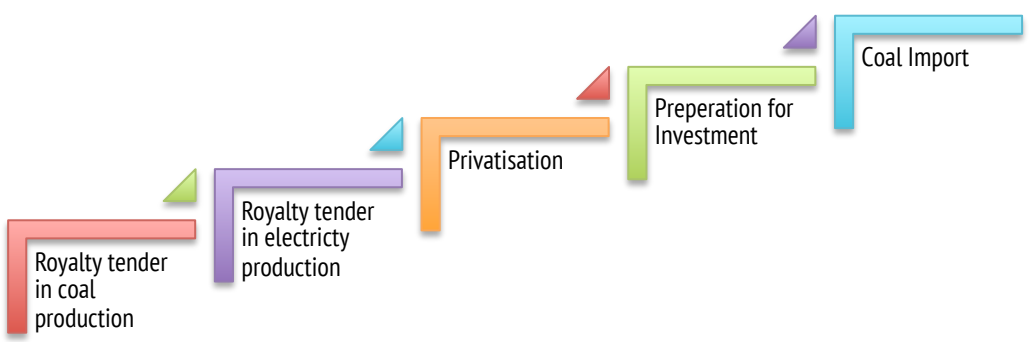


Figure 3 - Mechanisms of Turkey for expanding its coal market

2,91 cent
Price of be paid by Chile for 1 Kwh solar electricity to the producer.

3,3 cent
Average price for 1 kwh for wind competitions held in June 2017

6,04 cent
Price to be paid to the producer for 1 Kwh in Çayırhan B tender

[17] The resolution is published in the Official journal dated March 9th 2017 and numbered 30002: https://goo.gl/nnf4KS
[18] For a copy of the communiqué: https://350ankara.org/nallihan-itirazina-bakanlik-cevabi/
[19] MENR, 2015-2019 Strategic plan, for access: http://sp.enerji.gov.tr/MENR_2015_2019_Stratejik_Plani.pdf
[20] http://www.bik.gov.tr/cayirhan-ozellestirme-ihalesi-sonuclandi/
[21] For full list: http://www.tureb.com.tr/files/yarismalar/res_yarisma_sonuclari.pdf

Finance of Coal Power Plants

The power plants, which were financed with public resources in the past, are now transferred to the private sector with "liberalization". With the liberalization of the sector, it is expected that the costs of new investments will be financed by the investor and an amount shall be met with the sale obtained from the production. However, the coal plants are being encouraged in a way that is not much different from the past as in liberalizing the energy sector. Public resources are used for supporting the investments of the private sector at every stage.

1- Financing of preliminary investment: The preliminary preparations of investment are being provided by the state. The expense items of those investments, which are prepared using public resources, are included both in the budget and in the strategy plans. As shown in the budget plan of 2016, the survey and project budget reserved for the coal reserves by EÜAŞ was 160 million TL in the 2016 Investment Program. Those budgets are related with the areas of targets such as Afyonkarahisar-Dinar, Afşin-Elbistan, Çayırhan, Thrace.

2- Investment Financing: Coal plants require support to ensure competitiveness in favor of the coal plants against renewable energy. In 2016, Turkey provided subventions for the first investments and modernization of power plants corresponding to a total of 6.3 Billion TL[22]. When the subvention certificates issued in 2016 are being examined it shows that:

- Turkey has provided subventions for a total of 3 535 MW coal plant investment having a fixed investment price of 6.3 Billion TL. 2 570 MW of that investment consists of new investments regarding burning imported coal. The remaining consists of the modernization of existing plants.
- For those investments, a machine import corresponding to a total cost of 1.3 billion $ will be made. This amount is exempt from customs tax.
- It is seen that with the provided subventions and items such as Customs Tax Exemption, VAT Exemption, Tax Discount Ratio, Investment Support, an amount of 1.2 billion TL is not collected.

The taxes that are not collected from those investments are eventually paid by the public.

The coal plants, which are continuing their investments being exempt from the taxes paid to the economy, also use loans for the main amounts necessary for those investments. As a result of the regulations for coal loans at global level, the loans provided by domestic banks become more prevalent. There is a relation between the low interest of the provided loan and the investment risks have. Especially an instrument such as a purchase guarantee will facilitate those investments and will decrease costs by lowering the loan interests. The Coal Producers Association indicates in its relevant statement[23] the difficulties of foreign credit for the future investments and expresses that purchase warranty would ensure an increase. Consistently, in 2016, the amendment made in the Electrical Market Law and the following privatization tenders have provided the purchase guarantee to a great extent. By this way, Turkey provides exemptions to the investor in order to decrease the cost of coal plant investments and provides purchase guarantee to decrease the costs of the investor. Consequently, the investor becomes able to make a big investment with a limited equity.

Table 2 - List of coal power projects that received incentives in 2016

Project	Power	Investment Million TL	Imported machines Million $	Exemptions
Polat Enerji Kütahya	51 MW (Lignite/ Modernization)	3,5	0,61	Customs Tax Exemption, VAT exception, Tax Discount Ratio, Interest Support
Tosyalı,	1236 MW (import)	2 800	541,5	VAT exception, Customs Tax Exemption
EMBA , Adana	1334 MW,(import)	3 500	767,7	VAT exception, Customs Tax Exemption
Yatağan Termik	639 MW Modernization	0,39	0	Interest Support, Tax Discount, VAT Exception, Customs Tax Exemption
Aksa-Göynük Bolu	275 MW Modernization	1,9	0	Interest Support, Tax Discount, VAT Exception, Customs Tax Exemption
	TOTAL	**6,3 Billion TL**	**1,31 Billion $**	

[22] List of Investment Incentives Certificates issued in the Official Journal, for access: https://goo.gl/b4kk8e

[23] Dünya Newspaper, news dated November 21st 2016, for access: https://goo.gl/wjWCXE

3- Production Finance: Besides financing resources provided for the investor with a series of incentives and instruments in the preliminary investment and investment periods, there are 2 policies providing relief about production costs and loan payments.

a) Privileged purchase from existing plants. An amendment was made in the Electrical Markets Law in June 2016[24]. With this amendment, the right to enter into electrical purchase contract "from electricity production plants with domestic coal fuel" against the price determined by the Board of Ministers was given to Türkiye Elektrik Ticaret ve Taahhüt Anonim Şirketi-TETAŞ. The Board of Ministers, with its resolution numbered 2016/9096 at its meeting dated August 4th 2016, determined a price of 185TL/ MWh for 6 Billion KWh electricity purchase[25]. By this way, a high price was provided for the coal plants with a price that is much higher than 140,06 TL/MWh, which is the clearing price of the electrical market for 2016[26]. In other words, an excess amount of 270 million TL above the amount paid to the market was transferred to electricity produced from coal. TETAŞ announced that it would purchase 18 billion KWh electricity in 2017 in the frame of the same application[27].

b) High – price tenders for new plants. With another amendment made in the Electrical Market Law in June 2016[28], a regulation assigning a role to the Privatization Administration Presidency in energy privatizations was made. Consequently, the Privatization Administration Presidency (PAD) had the duty of entering into "Electricity Sales Agreements". PAD held the Çayırhan B power plant tender as its first activity. The consortium that proposed a price of 6,04 cents/Kwh with a purchase warranty of 15 years was awarded with the contract of the tender held on 06.02.2016. This price, which approximately corresponds to 22 kuruş/kwh has been a much higher price compared to the general average of 2016. The Privatization Superior Board ratified the resolution on March 3rd 2017[29].

Today, Turkey has an integrated policy that finances the costs of coal plants. While financing preliminary investment with public resources, the provision of subventions and purchase guarantees have strengthened the role of loan provision in the sector of banking. This process increased the importance of domestic banks. The banks provided loans for 4 thousand 700 MW coal plant projects until 2015[30]. With the new ones to be added till 2017, the installed power - for which loans are provided by the banks - reached a level of 9 thousand MW. Consequently, the projects which are corresponding to more than half of the coal plant capacity of Turkey is financed by private banks.

Table 3- Coal projects, for which Turkish banks provide loans

Plant name	Status	Fuel	Installed power	Loan Bank
Aksa Göynük	Royalty	Lignite	270	Garanti, İş Bankası
Zetes-3	Construction	Import	1320	Garanti, İş Bankası
Seyitömer KES	Privatization	Lignite	600	İş Bankası, Vakıfbank, Halkbank, Ziraat, Deniz Bank
Aliağa KES	License	Import	350	Garanti
Silopi KES	License	Asphaltite	270	Garanti
Atlas Termik Sant.	License	Import	1200	Garanti
Cenal KES	License	Import	1320	Ziraat, Halk bank, Denizbank, Finans Bank
Kemerköy KES	Privatization	Lignite	630	İş Bankası, Ziraat Bankası, Garanti
Yeniköy	Privatization	Lignite	420	İş Bankası, Ziraat, Garanti
Kangal KES	Privatization	Lignite	457	İş Bankası, Garanti, Vakıfbank, Ziraat, Yapı Kredi
Yatağan KES	Privatization	Lignite	630	İş bankası
Çan Termik-2	Construction	Lignite	330	Halkbank, Yapı Kredi
Bekirli 1 & 2	Construction	Import	1200	İş Bankası

(Source: Bank reports)

[24] Law on Electrical Market numbered 6446 Annex: Annex: 4/6/2016-6719/24 article

[25] Official Gazette, August 9th 2017, for accesshttps://goo.gl/1bLz7t

[26] Epiaş, Report on Brief Information on Electrical Market for 2016, for access: https://goo.gl/LrffpH

[27] Enerji Günlüğü news dated 30.12.2016. for access: https://goo.gl/wTzWDk

[28] Electrical Market Law numbered 6446 Annex: 4/6/2016-6719/22 article.

[29] Official Gazette, March 9th 2017, for access: https://goo.gl/sJLyuS

[30] Algedik Ö. Financing Coal, for access: https://goo.gl/vHukrq

14 krş/kwh
2016 electrical market average clearing price

18,5 krş/kwh
Price paid for domestic coal in 2016

While imported coal was also making use of those policies, an important development occurred in recent years. The imported coal plants, which until then could find loans from international resources, faced a new problem with the Paris Agreement. After the agreement, the loan – provider organizations started withdrawing from coal loans. At that point, loan export banks – Eximbanks – became more important. In parallel with the Paris Agreement, OECD made a regulation for export loans[31]. This regulation has been a factor making it difficult to find financing for the new plants in Turkey[32] . With this regulation, the export loan banks of OECD countries supported only the projects with ultra-super critical technologies among the projects greater than 500 MW, while defining stricter criteria for smaller ones. In this case, a danger occurred with the probability that the national banks providing loans for the domestic coal projects would provide a similar loan for imported coal.

Turkey reserved 160 million TL for investment preliminary preparations in 2016. In the same year, it provided exemptions for coal projects having a fixed investment amount of 6,3 billion TL. Consequently, materials worth of 1,3 billion dollar were imported being exempt from taxes in some way. New plant projects, 2 thousand 570 MW of which will burn imported coal, were supported using public sources. For the existing plants, a high purchase guarantee was given and the way to selling electricity against a higher price than the market was opened for the domestic coal plants by providing a high purchase warranty. For new projects, a longer purchase guarantee and a higher price was provided. Even only this picture means that a source of approximately 2 billion TL is either not collected from the investor nor provided in excess to the investor.

2 Billion TL
Money spent for coal subsidies in 2016

9000 MW
Total coal power plan capacity financed by Turkish Banks

[31] OECD, Arrangement On Officially Supported Export Credits, 2017. http://www.oecd.org/tad/xcred/theexportcreditsarrangementtext.htm

[32] For Kirazlıdere 1 and 2 projects, which are wanted to be constructed in Çanakkale, positive EIA decisions are obtained from the Ministry of Environment and Urbanization on May 5th 2015 one after the other, and Energy Market Regulatory Board (EMRA) made a license merger. The firm, which applied to the export loan banks for obtaining a loan, had to change its technology in compliance with the loan and renewed its EIA application.

Fossil Fuel Dependency of Turkey

The policies based on energy need statements effect the production side on one hand and the consumption side on the other hand. While increasing energy production on one hand, Turkey is applying policies that will increase energy consumption on the other. Consistently, the Regulation on Energy Performance in Buildings, some provisions of which would expire on May 2nd 2017, was postponed up until January 1st 2020. This resulted in the postponement of taking the relevant steps in the buildings. With the amendment published in the Official Journal[33] the sanctions that would be applied in cases where buildings obtain or do not obtain identification documents. Consequently, a step towards keeping the energy demand live has been taken.

In order to understand the role of coal in energy need statements the production side has to be examined. For the change in the production side, the role of fossil fuels and the role of coal among those fuels has to be determined. In one sense, the tendencies of dependence on fossil fuels and coal have to be determined.

The determinative factor for the increase compatible with energy need statement has been the fossil fuels. Turkey used 53 million toe energy in 1990. Until 2015, the total energy consumption of Turkey has increased by 143% and reached 129 million toe. The approach that this increase is caused by the increase in energy consumption is not sufficient to explain this condition. Consistently, **the share of fossil fuels in total energy, which was 82% in 1990, increased to 88% in 2015.**

In spite of the extraordinary increase in natural gas, there has also been an extraordinary increase in coal. Since 1990, policies improving natural gas are being applied against the statement of "increasing energy diversity". In 1990 natural gas provided 3,1 million toe energy, while until 2015 this increased to 39,2 million toe creating a serious jump. In spite of the extraordinary increase in natural gas, there has been an extraordinary increase in coal, too. Between the years 1990-2015, the energy obtained from coal increased by 116%.

In spite of the extraordinary investment made in hydropower plants, it remained as the lowest fuel with 5.8 million toe which it provided in 2015. The share of renewable energy except HEPPs was 14,5% in 1990, but decreased to 7,4% in 2015. Consequently, wood, animal waste, wind, solar and geothermal energy which provided 7.7 million toe in 1990, provided only 9,6 million toe energy in 2015.

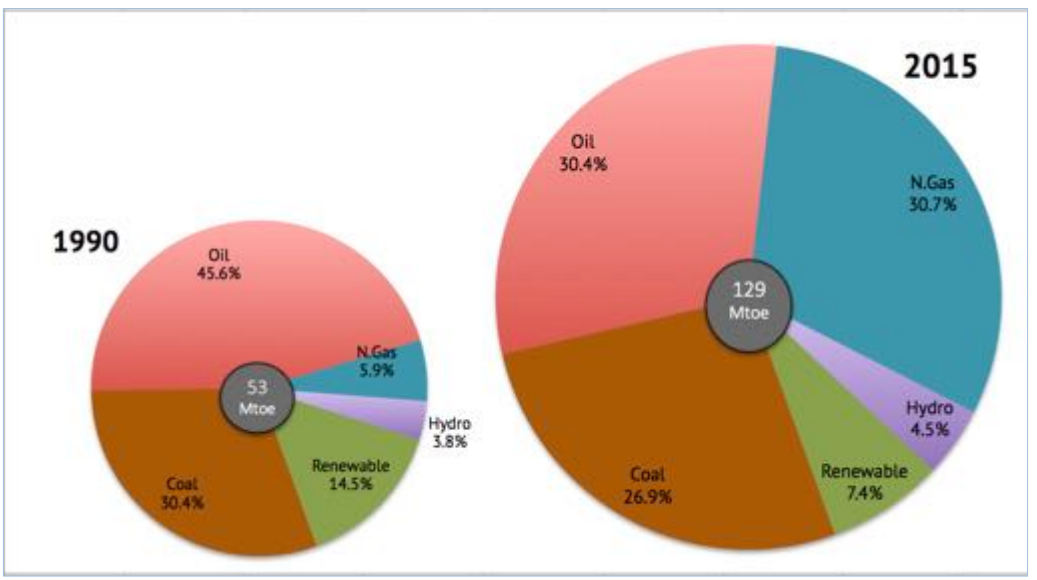


Figure 4- Shares of primary energy sources

Source: MENR Energy Balance Tables

[33] Official Journal dated April 28th 2017, no:30001, https://goo.gl/MJh4F

When the distribution of the increase between 1990-2015 is examined, it is seen that ¾ of it is caused by natural gas and coal. When petroleum is added to this, it will be seen once more that the factor responding to the energy need statement of Turkey is that of the fossil fuels.

Table 4- Primary energy supply comparison between 1990-2015

Million toe	1990	2015	Changes (toe)
Coal	16.1	34.7	18.6
Petroleum	24.2	39.2	15.1
Natural gas	3.1	39.7	36.5
Hydro	2.0	5.8	3.8
Renewable	7.7	9.6	1.9
Total	**53.1**	**129.0**	**75.9**

(Reference: Energy Balance Tables, MENR)

An important situation occurred in 2010 in terms of tendency. In addition to coal, which accompanied the leader role of natural gas in the increase, petroleum started accompanying them after 2010. Consequently, the 3 fossil fuels had a similar increasing tendency without being the alternative for each other. In one sense, **it is observed that Coal accompanied the increase in natural gas after becoming a party to the Climate Change Framework Convention in 2004 and petroleum accompanied the increase in natural gas after becoming a party to the Kyoto Protocol in 2009.** Energy need statement has become more clear after 2010 as an absolute fossil fuel dependency.

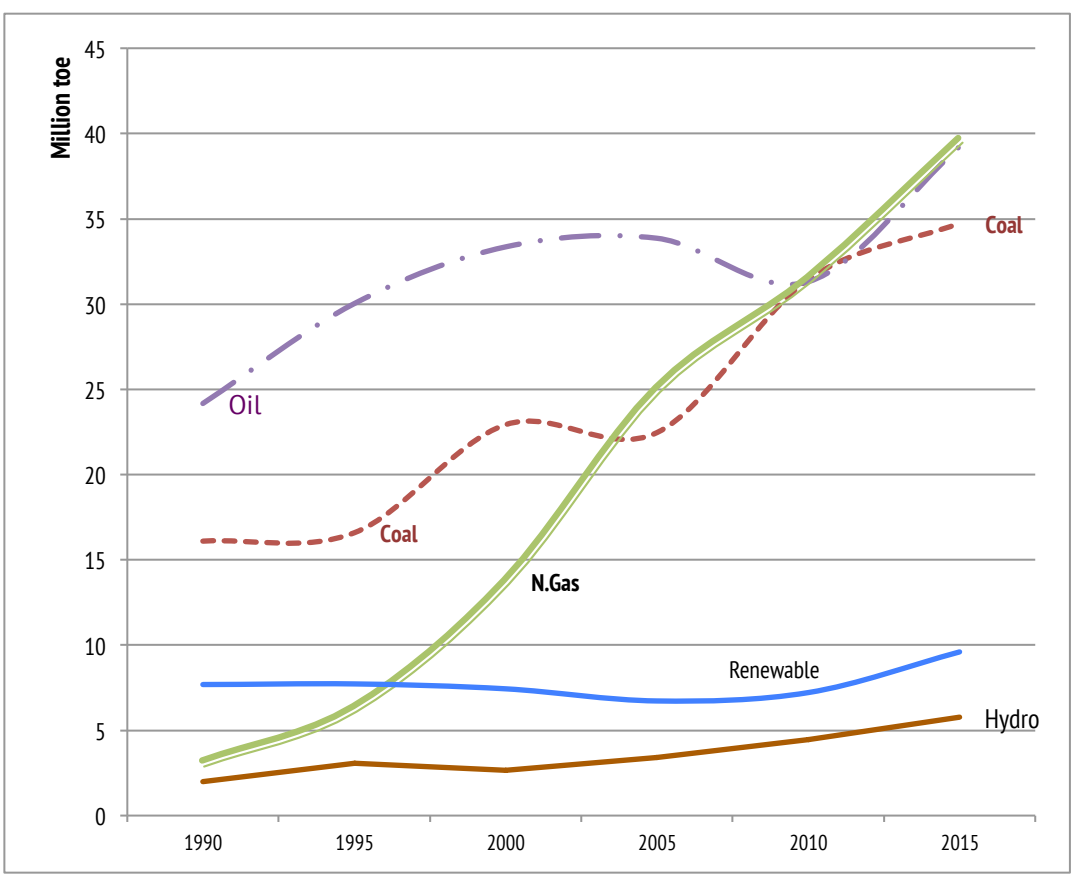


Figure 5 – Primary energy usage of Turkey

Source data: Energy Balance Tables, MENR

Turkey's Coal Dependency

Although the coal consumption of Turkey is increasing inconsistently in terms of amount, it has shown almost a linear increase in terms of energy amount. In 1990, 54,5 million ton coal was consumed, only 5,6 million tons of which were imported. In 2015, the total coal consumption increased up to 93 million tons. Consequently, an increase of 71% occurred in comparison with 1990.

The amount of energy obtained from coal has shown a more linear and consistent increase. This increase accelerated after 2000. The energy obtained from coal in 1990 was 16,1 million toe. In 2015 this reached 34,7 million toe. **In spite of the 71% increase in coal amount, it has been much higher in energy obtained from coal, being 116%.**

Table 5 - Coal consumption data for 1990 and 2015

	1990	2015	Change %
Coal consumption (million ton)	54.5	93.0	71%
Coal consumption, toe	16.1	34.7	116%
Coal import (million ton)	5.6	34.5	520%

(Reference. Energy Balance Tables, MENR)

The main problem here is the increase in the energy obtained from coal rather than the increase in coal amount. The reason of this is the increase of coal import. In 1990, Turkey imported 5,6 million tons of coal or it was being used in the industry. In 2015, the import increased to 34,5 million tons with an increase close to 29 million tons. Hence, the coal import had an increase of 520%.

In this case, the coal – sourced carbon dioxide emission, which was 60,4 million tons in 1990 - increased to 123 million tons in 2015.

5,6 million ton
Imported coal in 1990.

34,5 millyon ton
Imported coal in 2015 .

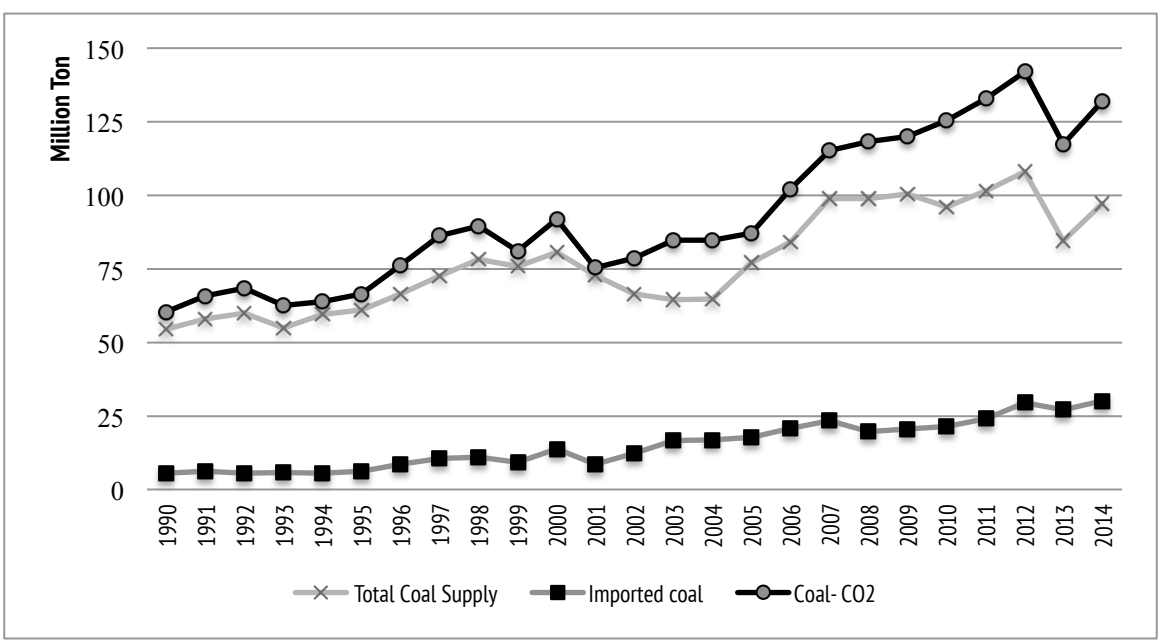


Figure 6 - Change in coal consumption, import and carbon dioxide amount between 1990-2015,.

Coal and Climate Change

Turkey is emitting more greenhouse gases to the atmosphere due to its energy dependency and due to the fossil fuels, which play the main part in this dependency. What is determinative in climate change is the energy amount rather than the mass of the burnt fuel. Turkey contributed to climate change in proportion with the amount of energy it obtained from coal rather than the amount of coal it consumed. Hence, it emitted more greenhouse gases to the atmosphere in relation with the increase in energy rather than the increase in amount.

Role of Coal in Greenhouse Gases

Turkey emitted 214 million tons of greenhouse gas to the atmosphere in 1990. In 2015, the amount emitted increased to 475,1 million tons. In this period, an increase of 122% has occurred. By this way, it emitted 261,1 million tons more greenhouse gases. 235,2 million tons of this increase consists of carbon dioxide, which has the greatest share. Among the sectors, the energy sector has been determinative with an increase of 205,7 million tons. **The increase in the energy sector has been in excess of the total emissions of Turkey in 1990.**

Table 6 - CO_2 and energy sector emission comparison between 1990 and 2015

	1990	2015	Increase (Million ton)	Increase (%)
Carbon dioxide among gases	148,2	383,4	235,2	159%
Energy among sectors	134,4	340,0	205,7	153%
Total	214,0	475,1	261,1	122%

The main reason for 261,1 million ton higher emission of greenhouse gases between 1990-2015 is due to the fossil fuels. The amount of carbon dioxide caused only by natural gas has exceeded 84,4 million tons. As is the case for the increase in energy amount, the increase in the energy obtained from coal in spite of the natural gas has affected the emitted carbon dioxide amount. While the coal – induced carbon dioxide amount in 1990 was 60,3 million tons, an extra 62,7 million tons have been added in 2015. Although the increase in petroleum seems to be proportionally less, it has had an important share by adding 40 million tons to the emissions in 1990.

193,7 million tons of 235,2 million tons increase in the carbon dioxide amount between 1990-2015 is caused by burning three fossil fuels. It is obvious that even if natural gas is the determinative factor in the amount of increase, the extraordinary increase in coal has a serious role too.

261,1 million tons

Emission increase between 1990-2015.

193,7 million tons

CO_2 increase induced by 3 fossil fuels between 1990-2015

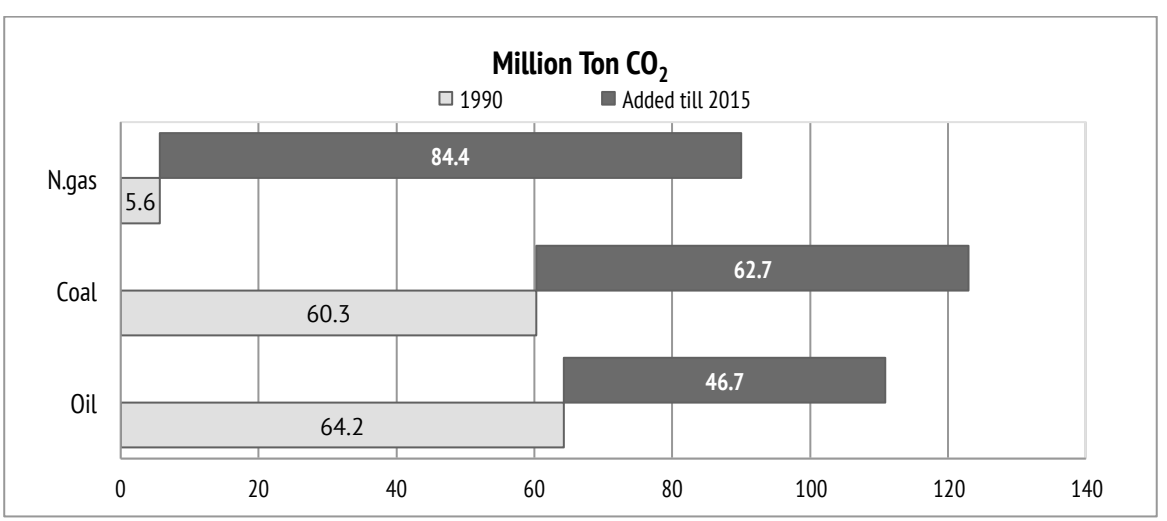


Figure 7- Increase in carbon dioxide induced by 3 fossil fuels between 1990-2015

Sectors in Coal Supply

Turkey burnt 30,4 million tons of coal at power plants in 1990. In that period, there wasn't even one plant operating with coal. In 2015, 65,4 million tons of coal was burnt at power plants. Consequently, a coal amount that is in excess of the total coal consumed in 1990 was consumed by the power plants alone in 2015.

When examined in terms of energy amount, the increase is higher. While power plants provided 5,2 million toe energy in 1990, they provided 17,9 million toe energy in 2015. Consequently, there has been an increase in the energy of the burnt coal rather than the amount at the power plants.

Between 1990-2015, Turkey increased its coal consumption with 38,5 million tons in terms of amount and with 18,4 million toe in terms of energy. 35,1 million tons of 38,5 million ton increase has been power plant – sources. The power plants alone were responsible for 12,4 million toe of the 18,4 million toe increase. **Consequently, more than 90% of the increase in coal amount and two thirds of the increase in energy obtained from coal were caused by the coal plants.**

Although a proportional increase occurred in industry sectors, which are the key to economic development, it was not multiplied as is the case for power plants. However, 1,1 million tons were added to 13,1 million tons consumption reaching 14,2 million tons. In terms of energy obtained from coal, only 1,8 million toe were added to the consumption that was 5,8 million toe in 1990.

The house and service sector consumed 8,9 million tons coal in 1990, and this number was increased only by 1 million ton in 2015. In terms of obtained energy, the increase was much higher. The consumption that was 3,3 million toe increased up to 6 million toe in 2015. In this case (a) The coal used in buildings was not reduced in spite of natural gas and (b) an increase of 2,7 million toe occurred in terms of energy with the use of high – calorific value coal, especially imported coal.

The increase in Turkey's coal supply is not increasing in relation with the industrial production but rather with power plants. In 2015, it is clearly seen that the increase is caused by power plants, especially the plants which are burning coal.

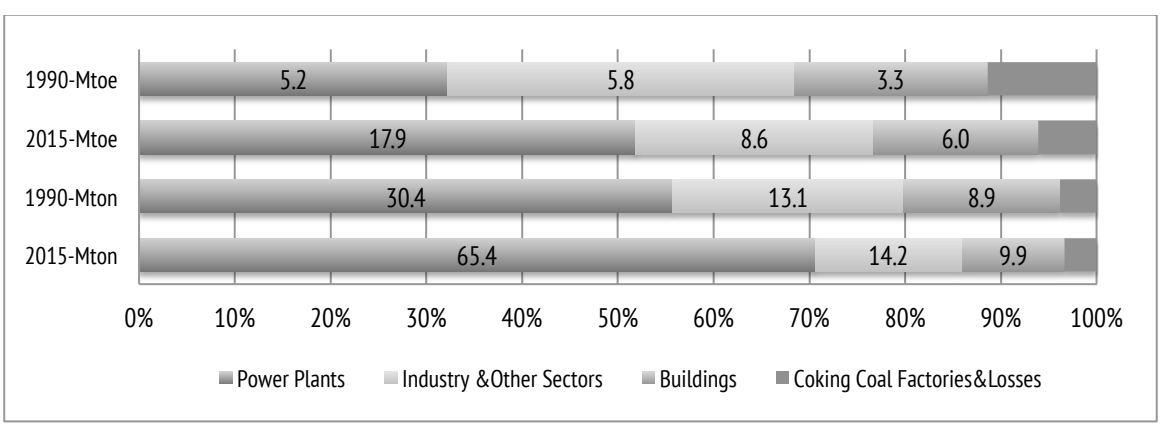


Figure 8- Comparison of sector-based consumption of coal

Coal Powered Power Plants

In accordance with MENR data, the capacity of coal power plants of Turkey in 1990 was 5.228 MW. 4.896 MW of this capacity consumes lignite, and the remaining capacity belongs to the power plants using hard coal as fuel. Turkey, which did not have any plants burning imported fuel until 2000, opened 145 MW Çolakoğlu KES in 2000 and 1210 MW İsken Sugözü KES in 2003 **and started the process of imported coal dependency.**

Today, Turkey has 16.715 MW installed power operating with coal. 6 thousand 975 MW of this is operated with imported coal and the remaining is operated with domestic coal. In one sense, Turkey added 11,5 GW new capacity and 7 GW of this capacity belonged to imported coal plants and 4,5 GW of it belonged to domestic coal plants. Especially after the imported coal plant that was opened in 2003, the balance completely shifted to the imported coal side.

Turkey, which added one unit of new capacity to domestic coal burning plants since 1990, added 1,5 unit capacity to the plants burning imported coal after 2000.

233%
Between 1990-2015 CO_2 increase caused by coal power plants

Carbon dioxide Emissions

The existing power plants burnt 30,4 million tons of coal in 1990 and emitted 26 million tons of carbon dioxide to the atmosphere in 1990. After 2000, imported coal plant capacities have been added rather than lignite and asphaltite. Consequently, the coal consumption amount at coal power plants increased by 116% while the greenhouse gases caused by those plants increased with 233%.

In 2015, the coal power plants emitted 80,3 million tons of carbon dioxide to the atmosphere. In other words, 54,3 million tons have been added to the carbon dioxide emissions in 1990. Until 1990, one unit of coal emitted 0,8 unit of carbon dioxide. After 2010, this balance was completely reversed. Due to the increase in imported coal, 1 unit of coal emitted 1,2 unit carbon dioxide to the atmosphere. **Hence, more greenhouse gases were emitted to the atmosphere against 1 kg coal.**

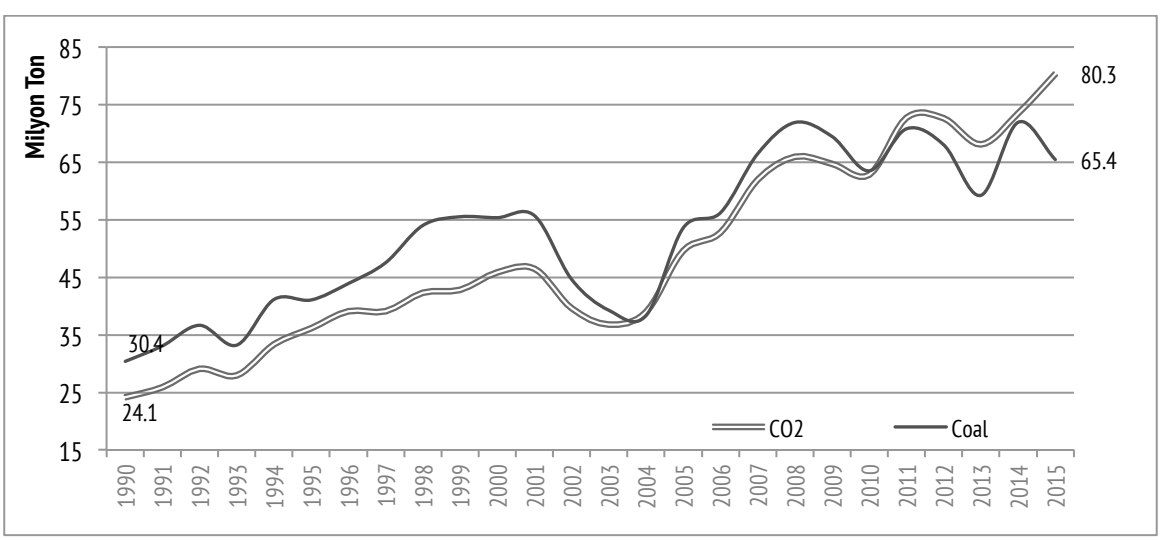


Figure 9- Coal consumption and CO_2 emissions at power plants between 1990-2015

Existing Plants

In accordance with EMRA data, the power plants have a capacity of 14.825 MW[34, 35] as of the end of 2015. 7 units belonging to 6 projects have been commissioned in 2016 and thereafter. Consequently, there are 62 plants having a total installed power of 16 thousand 175 MW, and almost half of them are projects that had auto-producer status before and then licensed. The full list of 62 plants is given in Annex–1.

The dependency on imported coal that occurred as a continuation of energy and coal dependency is clearly seen in the capacity added after 2015. After January 2016, until the first quarter of 2017, 1890 MW new coal plant capacity has been commissioned. 1400 MW of this capacity came from plants burning imported coal[36]. In one sense, while 490 MW domestic coal was added, the capacity added to imported coal has been 1400 MW.

Table 7 - New coal plants added after 2015 and their capacities

Plant name	Type of fuel	Added capacity	Commissioning
Bolu-Göynük KES	Lignite	135 MW	29/01/16
Yunusemre KES	Lignite	145 MW	25/02/16
Tufanbeyli KES	Lignite	150 MW	25/03/16
Kahramanmaraş Kağıt San. KES	Imported	9,7 MW	09/06/16
Eren Enerji (Zetes)	Imported	700 MW	30/06/16
Eren Enerji (Zetes)	Imported	700 MW	11/08/16
Kardemir Demir Çelik KES	Various	50 MW	06/01/17
	TOTAL	**1890 MW**	

Source: TEİAŞ

When the basically existing plants are examined;

- 26 of 62 plants have an installed power in excess of 50 MW and the remaining 36 plants are small plants that are generally meeting the needs facilities.
- Today, 7 GW coal power plants basing on imported coal and 9,8 GW power plants basing on domestic coal exist. However, the electricity amount obtained from imported coal has a vast difference compared to the electricity amount obtained from domestic coal. The power plants burning imported coal, which has a high calorific value, produced 43,75 terawatt hours of electricity in 2015 while the domestic coal plants produced approximately 32,4 terawatt hours.
- Hence, carbon dioxide emission related with electricity production has also increased. More than half of the carbon dioxide emissions caused by coal plants in 2015 had imported coal source, and less than half of them is caused by plants using domestic coal. In other words, while the domestic coal of Turkey emits one unit of carbon dioxide, the imported coal emits more than 1 unit.

[34] In accordance with MENR balance tables, 15.523 MW coal power plantes exist as of the end of 2015 and in this section, the data compiled from EMRA data is used.

[35] TKİ Coal Sector Report 2015 shows 61 plants and 15 687 MW installed power as of the end of 2015.

[36] It is estimated that the fual of Kardemir Demir Çelik CPP is imported coal

Candidate Plants

Turkey, which opened two imported coal plants in 2000 and which started coal explorations in 2005, announced 2012 as the coal year. At the point which is reached today, the imported coal contributes to electricity production in a ratio higher than the domestic coal. In 2015, the domestic coal plants produced 32,4 million Mwh, while imported coal plants produced 43,75 million MWH. In the increasing energy dependency of Turkey, and in the increasing fossil fuel and coal dependency, the dependency on imported coal can be more clearly seen among the candidate plants. Although the domestic coal statement is defined in the development plans[37], in fact the way of imported coal is being opened.

"We target to increase our supply safety, reduce our dependency on import and reduce the energy share on the current deficit by gaining the domestic lignite sources held by the public sector for the country economy and ensuring the conversion of this potential into electrical energy"

Ministry of Energy & Natural Resources[38].

When the candidate plants that can be added to the existing plants are examined, it is observed that imported coal exhibits a much more accelerated increase compared to domestic coal:

1- **Plants under construction**: Following license, the projects perform the administrative and technical works and commence the construction process. A total of 20 plants having 9.447 MW capacity are licensed by EMRA and are under construction. 7266 MW, which is the vast majority of those plants, will use imported coal.

2- **Plants that obtained preliminary license**: The projects, which pass the preliminary assessment, continue their license process preparations.. 12 plants, wcihh have a total installed power of 6254 MW, are included in the list of plants that have obtained preliminary license from EMRA. 4200 MW installed power of those plants is based on imported coal.

3- **Plants in assessment**: It includes the projects, which are taken to assessment stage by EMRA after providing the necessary information for a preliminary license application. The plants, whose licenses are assessed consist of 9 plants, which have an installed power of 8.386 MW. All of these plants in the assessment shall be used with imported coal.

34 candidate plants indicated herein, except the 7 plants, for which the incomplete units are waited for completion, show a new capacity of 24 thousand 87 MW in total. The full list of candidate plants is given in Annex-3.

Table 8 - Candidate plant numbers and capacities

	Plant number	Total Capacity	Imported Coal Capacity
Under construction	20	9.447 MW	7.266 Mw
Obtained preliminary license	12	6254 MW	4.200 MW
In assessment	9	8.386 MW	8.386 MW

[37] On page 174 of the 10th Development plan, "Evaluation of Domestic Coal for Electricity Production" is shown as the target.

[38] 2017 Budget Presentation, p:33, to access: https://goo.gl/Dxx

Projects/ Sites Developed by the State

In accordance with the TKİ reports[39], detailed survey for an area of 40.000 km² has been performed by MTA between 1939-1984 and 117 lignite areas have been determined by performing a total of 1.459.000 m boring. Coal exploration works have been re-started by MTA in 2005. As of the end of 2015, a total of 1.636.940 meter drilling has been performed.

When the coal exploration works, which were stopped in 1985, were re-started, Turkey had 8,3 billion ton lignite coal reserve[40]. After the exploration works commenced in 2005, today Turkey's lignite reserve has increased up to approximately 15,9 billion tons[41]. Approximately 8.8 billion tons of reserve is included in EÜAŞ structure. The reserves found after 2005 are given in the following table.

The situation is simpler in terms of hard coal. The most important hard coal reserves are in the Zonguldak basin. In the reserve exploration works have been performed in the basin up until today, 1,3 billion tons of reserve has been found and approximately 503 million tons section of this is accepted as visible reserve [42].

The reserve estimated for asphaltite is 70 million tons[43].

The reserve increasing efforts of Turkey are also reflected to the exploration license numbers. The total exploration license number of MTA was 25 in 2004, and as of the month September of 2016, the coal exploration license number is already 93[44].

Table 9 - Lignite reserve amounts found between 2005-2015

	Million ton
Konya-Karapınar	1 800
Eskişehir-Alpu	1 500
Elbistan EÜAŞ	1 300
Afşin-Elbistan (EÜAŞ)	1 300
Afyon-Dinar	941
Tekirdağ Çerkezköy	495
Isparta-Şarkikaraağaç	306,7
Manisa Soma (TKİ)	205
Pınarhisar-Vize	140
Beypazarı-Çayırhan EÜAŞ	83,3
Denizli Çardak	44,2
Konya-Ilgın	31
Malatya-Yazıhan	17
Amasya-Merzifon	9,2
Denizli Çivril	7,5
TOTAL 8 billion 180 million tons	

Source: TKİ, 2015 Coal (Lignite) Report

39 TKİ 2015 "Coal (Lignite) Sector Report", 2016, p:43 for access: http://www.tki.gov.tr/depo/2017/KomurSektorRaporu2015.pdf

40 Algedik Ö., "Climate Change With Royalty Model", 2016, p:6. For access: https://goo.gl/vYTqzD

41 2017 Budget Presentation pg:32

42 TTK, "Hard coal Sector Report", 2016 p:24 for access: http://www.taskomuru.gov.tr/file//duyuru/TTK_2015_Sektor_Raporu.pdf

43 TKİ 2015 "Coal (Lignite) Sector Report", 2016, pg:42

44 MENR 2017 budget discussions,pg:134, for access: https://goo.gl/82fEKN

Emission Projection

In 1990, coal power plants emitted 24,1 million tons of carbon dioxide to the atmosphere, and this amount increased up to 80,3 million tons in 2015. In 2015, the coal power plants, which had an installed power of 14,8 GW, reached 16,7 GW installed power upon the addition of 1,9 GW until today. The installed power would reach 41,9 GW by adding 25,2 GW capacity, which are licensed and under construction, under assessment according to EMRA classification or projects with royalty contracts.

What is important in terms of climate change is the consumed energy rather than the number of plants. There is a relation between the consumed energy and the carbon emissions. Efficiency determines the relation between the consumed energy and the produced electricity. In this case, taking into account that the candidate plants will have a similar performance as the actual performances of the existing plants, a carbon dioxide emission that will add almost 10 times to 1990 emissions and a potential of reaching 225 million tons occurs.

In this case, while Turkey emitted 1 unit carbon dioxide to the atmosphere in 1990 due to the coal plants, this has increased to 3 units in 2015. When the plants under construction are completed, it will be 5 units, and if the plants in preliminary license and assessment processes are completed, 10 units of carbon dioxide will be emitted to the atmosphere.

The emissions caused by the reserves are not included in this picture. However, upon the completion of opening the reserves found after 2005 for electricity production, the way to emission of 8 billion tons of carbon dioxide corresponding to 7,2 billion tons of reserve will be opened. Considering that some of those sites will be opened towards 2030, the coal – sourced carbon dioxide emissions can become 10 times the numbers for 1990 and 3 times the numbers for 2015 in accordance with their installed powers and the amounts of reserve they will use.

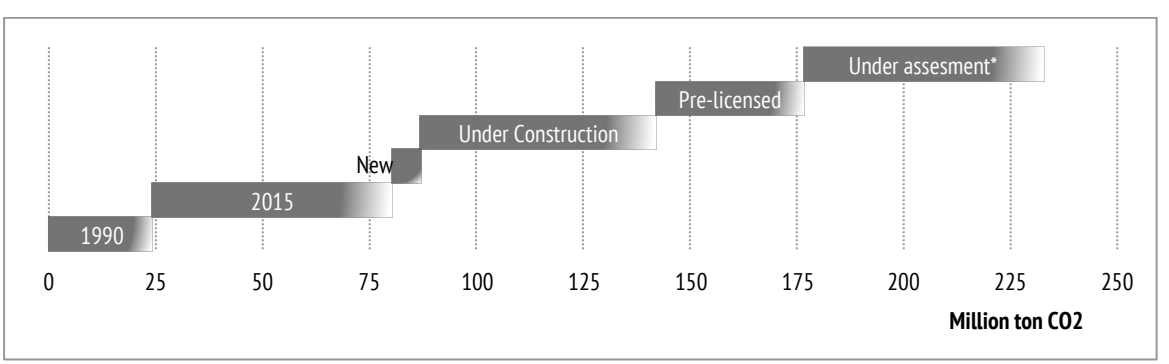


Figure 10- Past and projected CO_2 emissions of coal power plants.

(The calculations are performed taking the actual emissions and plant performances into consideration. This data is calculated for providing an opinion and may show differences in case of realization. The plants, for which royalty contracts are made, but which are not shown on EMRA lists, are calculated under the heading "In Assessment")

Conclusion

The most important political event of 2016 has been the entry into force of the Paris Agreement on November 4th 2016. This agreement, which has found parties within a short period, has an important role for the period after the Kyoto Protocol, which will be expired in 2020. The second most important event of 2016 has been extreme climatic events becoming ordinary and the records which have been broken. While 2016 has been the hottest year measured in the world, it was 1,1° C hotter compared to the pre-industrialization period. The reached point showed the weakness of the target of the Paris Agreement to keep the temperature increase below 2°C, and if possible below 1,5° C.

Turkey was not among the first 153 countries that ratified the Paris Agreement as of May 2017. However, it has been subject to extreme climatic events that are the results of climate change. 2016 has been the fourth hottest year that was measured and a serious increase has occurred in extreme climatic events. In Turkey, where an average of 67 climatic events occurred between 1990-1999, 752 extreme climatic events took place in 2016 in Turkey.

During all those, 2016 has been a year, during which the coal policies matured, changed form, and during which the lines got more clear in Turkey. While coal production with the royalty model continued, it continued 3 GW operating or investment – stage projects in electricity production with royalty model. Besides the existing plants and privatization, Turkey started to privatize reserves with the condition of electricity production. Although policies of preparation for investment through public were added to those models, the energy market of Turkey was opened to imported coal in order to strengthen the market. Only those 5 fundamental policies had very important results in 2016.

Turkey provided 2 billion TL of resources in 2016 for the coal plants project. An investment preparation of 160 million TL has been performed using public resources, and subventions of 6,3 billion TL have been provided for investments in the investment period. The lion's share of this investment belonged to coal. 2530 MW of 3535 MW investment, for which subventions are provided in 2016, consisted of new imported coal plants. Those plants did not pay any customs tax for the 1,31 billion $ equipment. Furthermore, domestic coal plants had electricity production subventions. The market average in 2016 was 14 krş/kwh, but with the new regulations, electricity produced with domestic coal was purchased against 18,5 krş/kwh.

As the result of those policies developed by the state, the domestic banks became the financer for coal projects. What is known for today, is that 7 banks provided loans for a total installed power of 9 GW. The project power for which loans are provided in 2015 was 4,7 GW.

It has been clear that coal would not be able to compete against wind and solar energy without the supports provided for coal in the last period. In solar energy renewable source area- YEKA tender held in 2017, the price occurred has been 6,99 cents /kwh in spite of the condition of production of all accessories in Turkey. The average bid price in wind energy capacity assignment tender held in June 2017 was 3,3 sent/kwh, and the lowest bid was -1,61 sent/kwh. **Turkey, which paid to 18,5 krş/kwh for the existing coal production on one hand, accepted to pay a record price of 6,04 cent/kwh in Çayırhan B tender on the other hand.**

Fossil fuel dependency lies behind the support for coal provided by Turkey and it has become fully dependent after 2010. While Turkey used 53 million toe energy in 1990, this increased to 129 million toe in 2015. Half of the increase of approximately 76 million toe was caused by natural gas and the other half was caused by coal. The most important issue is that while the development of natural gas braked and even reduced coal and petroleum, it lost this effect after 2010. 3 fossil fuels started to increase with the same acceleration in recent years. By this way, while fossil fuels met 82% of total energy need in Turkey in 1990, this ratio reached 88% in 2015.

Fossil fuel dependency of Turkey resulted in a faster increase in greenhouse gas emissions. Turkey emitted 214 million tons of greenhouse gases to the atmosphere. In 2015, the emitted amount increased to 475,1 million tons. 235,2 million tons of 261,1 million tons increase had carbon dioxide origin and 3 fossil fuels were responsible for 193,7 million tons of increase.

The source of the increase in coal has been power plants. While the coal production of Turkey between 1990-2015 with an amount of 38,5 million tons, 35,1 million tons of the increase was caused by power plants. **The increase in coal was caused by imported coal rather than domestic production.** While the increase caused by domestic production in the coal acquired by Turkey was 11 million tons, the increase caused by imported coal was 29 million tons. In this respect, each 1 unit domestic coal increase corresponded to 3 units of imported coal increase.

Domestic coal policy opened the way for imported coal plants. In 1990, Turkey's coal plants had an installed power of 5,2 GW. Until 2000, Turkey did not have any power plants operating with imported coal. Today, Turkey has an installed power of 16,7 GW with its 62 power plants. 7 GW of this capacity uses imported coal. Even if the capacity of plants obtaining electricity using produced coal seems to be higher, today, imported coal plants produce more electricity.

The power of imported coal plants is increasing. Of 1890 MW power, which is accepted and commissioned after 2015, 1400 MW has been coal plants. A similar condition will occur in the future:

- The share of import in 20 plants having 9,4 GW power, which are licensed and which are under construction is 7,6 GW.
- The share of imported coal in a total power of 6,3 GW among 12 plants, which have obtained preliminary license, is 4,2 GW.
- All of the 9 plants in assessment are imported coal plants and have an installed power of 8,4 GW.
- The project at royalty tender or privatization stage is 1,1 GW.

In this situation, another 41,9 GW potential occurs with the addition of 25,2 GW candidate plants to the existing 16,7 GW installed power.

The coal policy of Turkey is accelerating climate change. While coal plants emitted 24,1 million tons of carbon dioxide to the atmosphere in 1990, this amount reached 80,3 million tons in 2015. It can increase to 225 million tons upon the completion of the candidate plants, for which transactions are continuing at EMRA. This new carbon dioxide emission that will be added will, far from de-carbonization, increase the climatic disasters in Turkey and will result in irreparable damages.

In spite of the climate change, Turkey is making more investments in coal. The coal exploration works stopped in the 1980s and were restarted in 2005 and the reserve amount has increased from 8,3 Billion tons up to 15,9 billion tons. In spite of its low quality, high humidity, high powder and expensive price as well as its contribution to climate change, an extraordinary resource is being spent for electricity production. The public sector provides high prices and long purchase guarantees for the realization of projects as is the case for the Çayırhan B project.

The policy of Turkey for providing low quality coal to economy has proven its high cost, high damage and its effect opening the way to import. With 2 Billion TL subvention costs per year, 10 times more climatic events are occurring today in comparison with the past. The data shows the impossibility of de-carbonization of the economy of Turkey towards 2030.

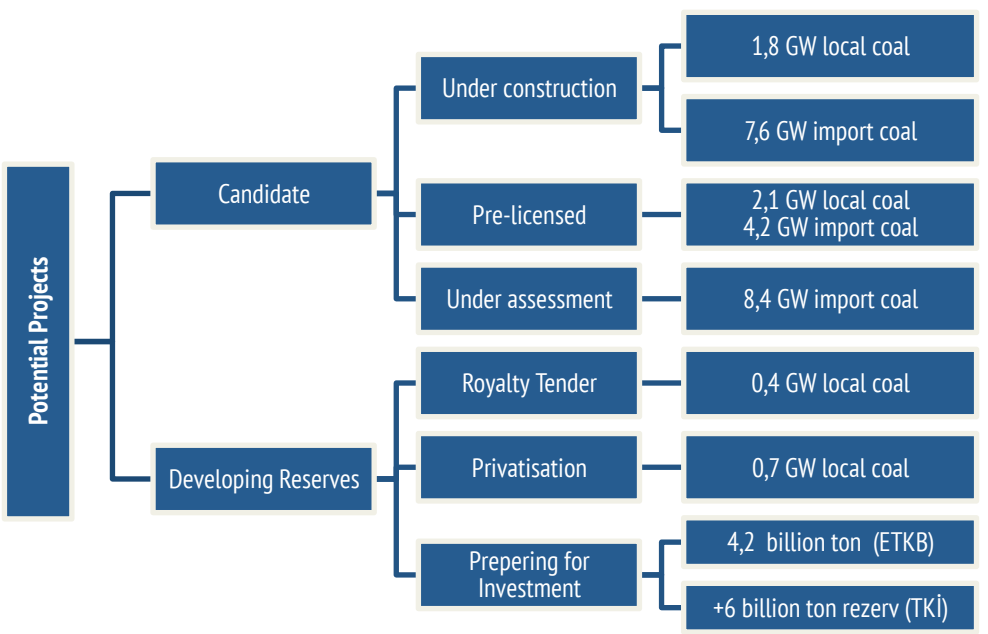


Figure 11- Potential coal plants that can be added after 2016.

(Candidate projects are the ones, which are in the process of application to EMRA and the some of the developed reserves are the ones subject to royalty contracts, privatization and the remaining are the reserve amounts included in MENR strategy documents and TKİ reports. For the reserves under the heading "Preparing for Investment", installed powers are not included, and they will be clarified when the investment preparations reach a certain stage)

Annex-1 : Coal Power Plants in Production

	Plant name	Type of fuel	Province	Plant district	Installed Power (Mwe)	In operation (MWe)
1	Çatalağzı Termik	Imported	Zonguldak	Merkez	2790	**2090**
2	Afşin - Elbistan B	Lignite	K.Maraş	Afşin	1440	1440
3	Afşin-Elbistan-A	Lignite	K.Maraş	Afşin	1355	1355
4	İsken- Sugözü	Imported	Adana	Yumurtalık	1210	**1210**
5	Atlas Termik Santrali	Imported	Hatay	İskenderun	1200	**1200**
6	İÇDAŞ Kes	Imported	Çanakkale	Biga	1200	**1200**
7	Soma B Termik Santrali	Lignite	Manisa	Soma	990	990
8	İzdemir KES*	Imported	İzmir	Aliağa	700	**350**
9	Kemerköy Termik Santralı	Lignite	Muğla	Milas	630	630
10	Yatağan Termik Santrali	Lignite	Muğla	Yatağan	630	630
11	Çayırhan Termik Santrali	Lignite	Ankara	Nallihan	620	620
12	Seyitömer TES	Lignite	Kütahya	Merkez	600	600
13	Kangal TES	Lignite	Sivas	Kangal	457	457
14	Tufanbeyli Termik Santrali	Lignite	Adana	Tufanbeyli	450	450
15	Yeniköy Termik Santrali	Lignite	Muğla	Milas	420	420
16	İçdaş Biga Termik Santrali	Imported	Çanakkale	Biga	405	**405**
17	Silopi Termik Santrali	Asfaltit	Şirnak	Silopi	405	405
18	Tunçbilek	Lignite	Kütahya	Tavşanli	365	365
19	Çan	Lignite	Çanakkale	Çan	320	320
20	Çatalağzı	Imported	Zonguldak	Merkez	314,7	**314,7**
21	Yunus Emre KES	Lignite	Eskişehir	Mihalıççık	290	145
22	Bolu-Göynük Elekt. Santralı	Lignite	Bolu	Göynük	270	270
23	Orhaneli	Lignite	Bursa	Orhaneli	210	210
24	Çolakoğlu Termik Santrali	Imported	Kocaeli	Gebze	190	190
25	Karabük Demir Çelik	Lignite	Karabük		77,5	27,5
26	Polat-1 Termik Santrali	Lignite	Kütahya	Tavşanlı	51	51
27	Eti Maden İşletmeleri	Lignite	Balıkesir	Bandırma	46,7	10,7
28	Soma Termik Santrali**	Lignite	Manisa	Soma	44	44
29	Çumra Termik Santrali	Coal	Konya	Çumra	37	37
30	Beypazarı ETİ-SODA Kojen.	Lignite	Ankara	Beypazari	24	24
31	Konya Şeker Sanayi	Lignite	Konya	Çumra	23,75	22
32	Kahramanmaraş	Imported	K.Maraş		15,7	**15,7**
33	Türkiye Şeker Fab.A.Ş.	Other	Konya	Ilgın	14,40	14,4
34	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Tokat		14,24	14,2
35	ETİ - Seydişehir Santrali	Coal	Konya	Seydişehir	12,93	12,9
36	Türkiye Şeker Fab.A.Ş.	Lignite	Afyonkarahisar		12,8	12,8
37	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Burdur		10,96	10,96
38	Eti Maden İşletmeleri	Lignite	Balikesir		10,66	10,66
39	Türkiye Şeker Fab.A.Ş.	Lignite	Sakarya		10,4	10,4
40	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Niğde		9,6	9,6
41	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Balikesir		9,6	9,6
42	Türkiye Şeker Fab.A.Ş.	Lignite	Konya		9,6	9,6
43	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Kahramanmaraş		9,6	9,6
44	Çimsa Atıkısı Santrali	Lignite	Mersin		9,56	9,56
45	Amasya Şeker Fab.A.Ş.	Lignite	Amasya		7,76	7,76
46	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Kastamonu		7,32	7,32
47	Kütahya Şeker Fab.A.Ş.	Lignite	Kütahya		7,13	7,13
48	Petlas Otoprodüktör Tesisi	Lignite	Kirşehir		6	6
49	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Yozgat		6	6
50	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Kirşehir		5,9	5,9
51	Aynes Termik Kojen.	Lignite	Denizli	Acıpayam	5,50	5,50
52	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Kirklareli		5,40	5,40
53	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Erzurum		5,40	5,40
54	Küçüker Termik Kojen.	Lignite	Denizli		5,00	5,00
55	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Samsun		4,75	4,75
56	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Erzincan		4,00	4,00
57	Türkiye Şeker Fab.A.Ş.	Lignite + f.oil	Uşak		3,72	3,72

58	Türkiye Şeker Fab.A.Ş.	Lignite	Afyonkarahisar		3,39	3,38
59	Çankırı Tuz Fabrikası Kojen.	Coal	Çankiri		1,64	1,64
60	Göknur A.Ş. TES	Lignite	Niğde		1,55	1,55
61	Bolluk Tesisi (Kojenerasyon)	Lignite	Konya		1,45	1,45
62	Alkim Kimya Bolluk Tesisi***	Coal	Konya	Cihanbeyli	0,39	0,39
					Under Oparation:	**16 715 MW**

* There are 2 different projects as İzdemir I and II and are shown under a single license at EMRA.

** License extension has been obtained in April 2016

*** It was converted into license in 2014 while it was auto-producer, and included newly in EMRA lists.

Annex-2: Potential Areas

Projects with Royalty Contract

Location	Tender date	Reserve (Mil.Ton)	Installed po. (MW)	Firm awarded	Latest condition
Silopi Harpul	2003	41,6	405	Park Elektrik	production
Bolu Göynük	**2006**	**39**	**270**	**Aksa Enerji**	**production**
Eskişehir-Mihalıççık	2007	40	290	Adularya	production
Adana-Tufanbeyli	**29.05.12**	**323**	**600**	**Teyo**	**Not listed on EMRA l ***
Manisa-Soma	28.08.12	153	450	Hidrojen -Kolin	construction
Bursa-Keles	**01.11.12**	**61**	**270**	**Çelikler**	**Preliminary license**
Kütahya-Tunçbilek	26.03.13	117	300	Çelikler	Preliminary license
Bingöl-Karlıova	**30.05.13**	**80**	**150**	**Flamingo**	**-****
Şırnak	29.08.14	31,2	270	MAM Enerji	-**

* :The firm made an Energy Production License application for 700 MW installed power on 02.01.2013 in accordance with TKİ reports.

*** : There is no update.*

Developed Areas

"Main Coal Areas that can be used for electricity production" in accordance with TKİ reports

Site	Reserve (1000 ton)	Ownership	Site	Reserve (1000 ton)	Ownership
Afşin-Elbistan Havzası	4.831.902	EÜAŞ	Kütahya Tunçbilek*	253.000	TKİ
Konya Karapınar	1.833.000	EÜAŞ	Kütahya Seyitömer	160.000	Private sector
Eskişehir Alpu	1.453.000	TKİ	Konya Ilgın	143.000	Özel
Afyon Dinar	941.000	MTA	Bingöl Karlıova *	103.662	TKİ
Manisa Soma *	688.000	TKİ	Çankırı Orta	94.390	Özel
Çayırhan Havzası **	425.896	EÜAŞ	Şırnak Asfaltit *	71.000	TKİ
Adana Tufanbeyli*	323.329	TKİ	Bolu Göynük *	37.875	TKİ
Tekirdağ Saray	283.000	TKİ	Adıyaman Gölbaşı	32.000	Private

*: Areas, for which royalty contract is signed.

**: Çayırhan B site was privatized in March 2017 for electricity production purposes.

Annex-3 : Candidate Coal Power Plants

Licensed and under construction

Plant name	Fuel type	Plant Location	Installed Power (MWe)	Construction Cap. (MWe)	Operating Cap.(MWe)
Cenal Power power plant	Import	Çanakkale	1320	1.320	0
Hunutlu TES	Import	Adana	1320	1.320	0
Karaburun Power plant	Import	Çanakkale	1320	1.320	0
Kirazlıdere Power plant	Import	Çanakkale	980	980	0
Selena Coal Plant	Import	Hatay	900	900	0
Zetes	Import	Zonguldak	2790	700	2090
Ayas Power plant	Import	Adana	625,5	625,5	0
Ilgın KES	Lignite	Konya I	505	500	500
Soma Kolin TES	Lignite	Manisa	460	460	0
İzdemir Enerji	Import	İzmir	700	350	350
Çan -2 Termik	Lignite	Çanakkale	330	330	0
Yunus Emre Power plant	Lignite	Eskişehir	290	145	145
Silopi Power plant	Asphaltite	Şırnak	135	135	0
Etyemez Coal Power plant	Lignite	Sivas	135	135	0
Hakan Coal Plant	Import	Adana	100	100	0
Karabük Demir Çelik	Lignite	Karabük	77,5	50	27,5
Eti Maden	Lignite	Balıkesir	46,66	36	10,66
Bandırma Bor ve Asit Fab. Kojen	Coal	BALIKESİR	46,66	36	0
Çayırhan Sodyum Sülfat Kojen.	Lignite	Ankara	2,66	2,7	0
Konya Şeker Sanayi	Lignite	Konya-Çumru	23,75	1,75	22
		Total Capacity under construction:		**9 447 MW**	

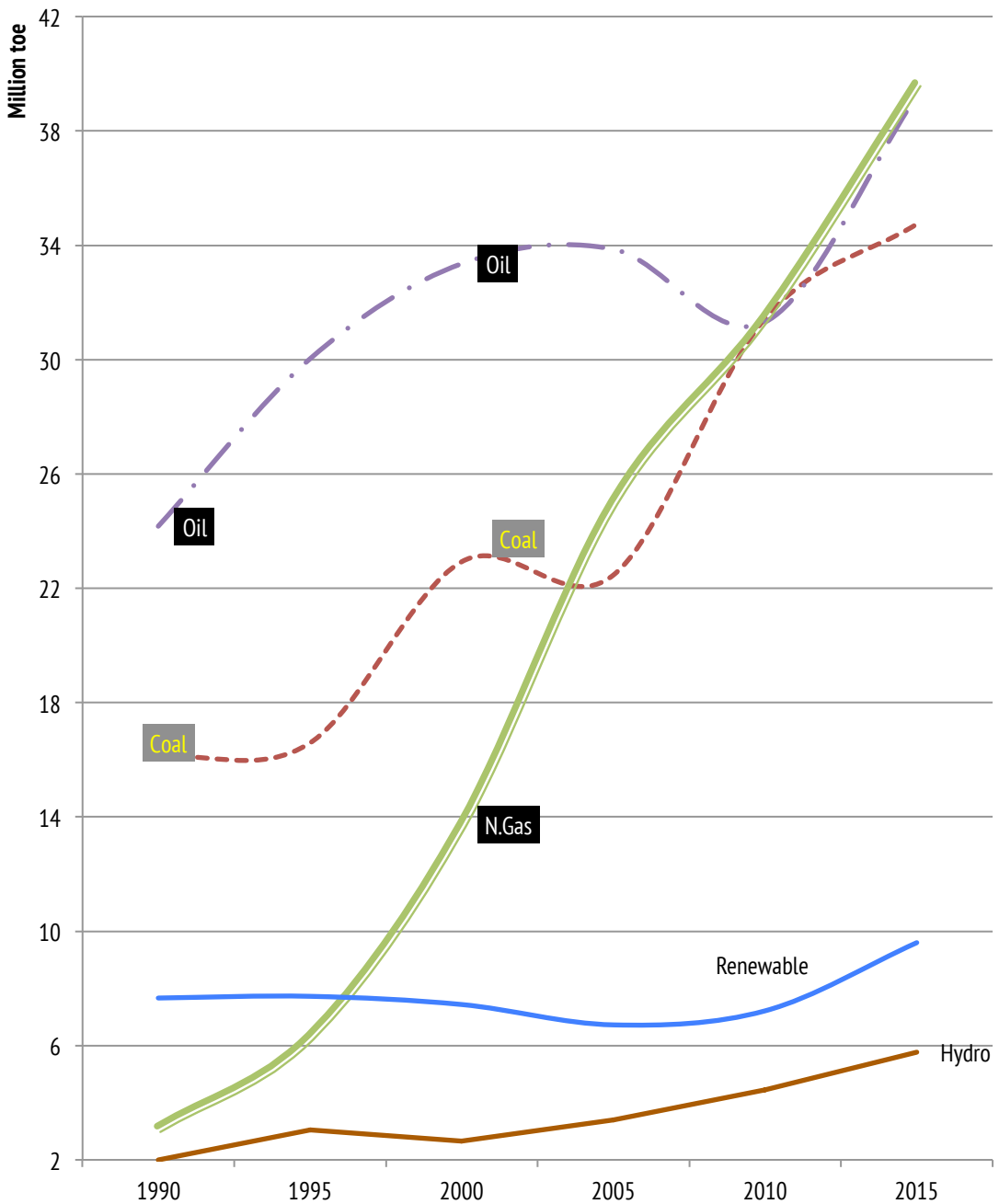
Projects that obtained Preliminary License

Plant name	Fuel type	Plant province	Plant district	Installed power(MWe)
AğanTES	Import	Çanakkale	Biga	1540
Tosyalı İskenderun Power plant	Import	Hatay	İskenderun	1200
Sanko Yumurtalık Power plant	Import	Adana	Yumurtalik	800
Kınık TES	Domestic	İzmir	Kinik	700
Atakaş Power plant	Import	Hatay	İskenderun	660
Gürmin Enerji Amasya Power plant	Domestic	Amasya	Merzifon	300
Çelikler Domaniç KES	Domestic	Kütahya	Domaniç	300
Çelikler Keles Power plant	Domestic	Bursa	Keles	270
ÇANKIRI-Orta Power plant	Domestic	Çankiri	Orta	150
Sanko Gölbaşı Power plant	Domestic	Adiyaman	Gölbaşi	150
Diler Elbistan Power plant	Domestic	Kahramanmaraş	Elbistan	135
DOSAB Power Plant	Domestic	Bursa	Osmangazi	49,5
			Preliminary license capacity ::	**6.245 MW**

Project in assessment

Power Plant	Fuel Type	Located City	Town	Power (Mwe)	Date of Assessment
Zorlu Enerji Kumpınar Termik Santralı	Import	Düzce	Akçakoca	1.240	19.02.2015
Akdeniz Power plant	Import	Adana	Yumurtalik	606,8	19.11.2014
Adana Yumurtalık Imported Coal Plant	Import	Adana	Yumurtalik	606	01.10.2014
Bandırma III Imported Coal Plant	Import	Balikesir	Bandirma	810	11.09.2014
Gölovası Power plant	Import	Adana	Yumurtalik	1.400	08.01.2013
Ada Power plant	Import	Adana	Yumurtalik	1.340	05.11.2012
Kilikya Power electricity plant	Import	Adana	Yumurtalik	670	11.01.2012
Çebi Power plant	Import	Tekirdağ	Marmaraereğlisi	365	01.05.2013
Irmak Electricity plant	Import	Çanakkale	Ezine	1.348	28.08.2013
			Total:	8386 MW	

Note: since there is no information on 6GW Ada KES, Biga KES, Misis KES, Sedef II, Güreci KES and Petkim KES, which are included in Coal and Climate Change 2016 report, they are not included in this list.


Million toe
42
38
34
30
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18
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10
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2
1990
1995
2000
2005
2010
2015
Oil
Oil
Coal
Coal
N.Gas
Renewable
Hydro