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EFFECTS OF THE EUROPEAN GREEN DEAL ON TURKEY'S ELECTRICITY MARKET

Göktuğ ŞAHİN¹

Muhammed Ali TAKSİM²

Burak YİTGİN³

Abstract

As it is commonly believed that the planet is facing environmental disasters as a consequence of climate change problematics, the European Union intends to inspire a sustainable green transition. The European Commission presented "The European Green Deal" as an indicator of this leading mission, which is a reaction to a warming atmosphere, climate change and air pollution. The European Green Deal aims to transform the countries and citizens of the European Union into a fair and competitive environment where greenhouse gas emissions will be zero by 2050. Above all, the European Green Deal is also committed to transforming the greenhouse gas emissions of other countries. Turkey, one of the leading countries in terms of the volume of trade with Europe, is required to examine the issue of carbon emissions in detail. If it were not, the European Union and Turkey could end the commercial agreements under the carbon-border adjustment mechanism of the Commission aimed at reducing carbon leakage risk, where the electricity sector is one of Turkey's most associated greenhouse gas emissions sectors. The objective of this study is to examine the effects of the Green Deal on Turkey's electricity market from both the supply and demand side, which will be affected by the Deal's carbon limits or enforcement. In addition, in this study, a road map for Turkey's electricity market is offered via comparative analysis method under the requirements of The European Green Deal.

Keywords: European Green Deal, Electricity Markets, Energy, Energy Economics

JEL Codes: Q48, Q52, Q54, Q56, R11

AVRUPA YEŞİL MUTABAKATI'NIN TÜRKİYE ELEKTRİK PİYASASINA ETKİLERİ

Öz

Genel anlamda gezegenin, iklim değişikliğinin bir sonucu olarak çevresel felaketlerle karşı karşıya olduğuna inanıldığı için Avrupa Birliği, sürdürülebilir bir yeşil geçişe ilham vermeyi amaçlamaktadır. Avrupa Komisyonu, ısınan atmosfere, iklim değişikliğine ve hava kirliliğine tepki olan bu öncü motivasyonun bir göstergesi olarak "Avrupa Yeşil Mutabakatı"nı ortaya koymuştur. Avrupa Yeşil Mutabakatı, Avrupa Birliği ülkeleri ve vatandaşları açısından 2050 yılına kadar sera gazı emisyonlarının sıfır olacağı adil ve rekabetçi bir dönüşümü amaçlamaktadır. Ayrıca Avrupa Yeşil Mutabakatı, aynı

¹ Lecturer Doctor, Ankara Hacı Bayram Veli University, goktug.sahin@hbv.edu.tr, Ankara-Turkey, ORCID ID: 0000-0001-9925-9132

² Power Trader, Engie GEM Turkey, mataksim@gmail.com, İstanbul-Turkey, ORCID ID: 0000-0002-6487-4984

³ PhD Candidate, Yeditepe University, burakyitgin@gmail.com, İstanbul-Turkey, ORCID ID: 0000-0002-8596-6466

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zamanda diğer ülkelerin sera gazı emisyonları açısından da ilgili dönüşümü sağlamaya kararlıdır. Avrupa ile ticaret hacmi açısından önde gelen ülkelere biri olan Türkiye, karbon emisyonları konusunu detaylı olarak incelemek zorundadır. Aksi halde Avrupa Birliği ve özellikle elektrik sektörü gibi Sera Gazı Emisyonu ile yüksek derecede ilişkili olan sektörlerden birine sahip Türkiye arasındaki ticari anlaşmalar, karbon kaçağı riskini azaltmayı amaçlayan Komisyon'un karbon sınırı ayarlama mekanizması kapsamında sektöre uğrama riskine sahiptir. Bu çalışmanın amacı, Avrupa Yeşil Mutabakatı'nın sonucunda karbon limitlerinden veya uygulamasından etkilenecek olan Türkiye elektrik piyasası üzerindeki etkilerini hem arz hem de talep yönünden incelemektir. Ayrıca karşılaştırmalı olarak inceleme yapılan bu çalışmada, Avrupa Yeşil Mutabakatı gereklilikleri kapsamında Türkiye elektrik piyasası için bir yol haritası sunulmaktadır.

Anahtar Kelimeler: Avrupa Yeşil Mutabakatı, Elektrik Piyasaları, Enerji, Enerji Ekonomisi

JEL Kodları: Q48, Q52, Q54, Q56, R11

INTRODUCTION

As it is commonly believed that the planet is facing environmental disasters as a consequence of climate change problematics, the European Union (EU) intends to inspire a sustainable green transition. The European Commission presented “*The European Green Deal*” as an indicator of this leading mission, which is a reaction to a warming atmosphere, climate change and polluted air. The European Green Deal aims to transform the countries and citizens of the European Union into a fair and competitive environment where Greenhouse Gas (GHG) emissions will be zero by 2050.

Namely, the GHGs are considered as “*carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and natrium trifluoride (NF₃)*”. The main driving forces behind GHG are the economic sectors and climate change have severe impacts on human activities. What is more, the five main emission source sectors can be listed as fuel combustion and fugitive emissions from fuels (energy including logistics); industrial processes and product use (IPPU); agriculture; land use, land use change and forestry (LULUCF); waste management (EUROSTAT, 2020a).

Climate change and global warming as a result of human activities are major threats for all the life in the world owing to the diverse and comprehensive effects on biodiversity, the environment, the economy, the human health and the well-being. It is a common concern for everyone who wants a global solution to reduce the threats and consequences of climate change. It is discussed by the Commission through European regulations and policies on the reasons and consequences of climate change and is an ambitious partner for international activities in this field. Also, high-quality data are extremely critical for tracking progress in reducing GHG emissions along with drivers, effects and adaptation to climate change.

The European Green Deal is also committed to the transformation of other countries. It is clearly observed in the ‘*Communication on The European Green Deal*’ (European Commission, 2019a);

“As long as many international partners do not share the same ambition as the EU, there is a risk of carbon leakage, either because production is transferred from the EU to other countries with lower ambition for emission reduction, or because EU products are replaced by more carbon-intensive imports. If this risk materializes, there will be no reduction in global

emissions, and this will frustrate the efforts of the EU and its industries to meet the global climate objectives of the Paris Agreement.”.

As the European countries and the rest of the world appear to have austere environmental issues, such as climatic impacts and extreme weather events in the near future, the EU is among the leading regions struggling with the climate change and trying to lower the GHG emissions. Globally, the “UN Framework Convention on Climate Change” which is an international environmental agreement for governing the struggle against climate change came into effect in 1994. It has been endorsed by 197 countries with all the member countries of the EU included. The main aim of the treaty is “*stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system*”. Another international environmental agreement, which is the first one concurrent to the UN Framework Convention on Climate Change, is the Kyoto Protocol. The main aim of the agreement is to set obligatory targets for emission reduction objectives on industrialized countries again with all the member countries of the EU included. Furthermore, the most recent international environmental agreement is the Paris Agreement which came into effect in 2016 and can be identified as “*the first-ever universal, legally binding global climate agreement*”. The goals of the Paris Agreement are to regulate the globally increasing temperature, increase adaptive capacity, improve resilience and reduce vulnerabilities. In line with its 2030 framework of climate and energy, the EU has taken a lead in the international efforts to achieve the Paris Agreement on reduction of GHG emissions. Likewise, the EU has recently strengthened its pledge to becoming by 2050 the first continent to be climate-neutral (United Nations, 1992; United Nations, n.d.: a, b, c).

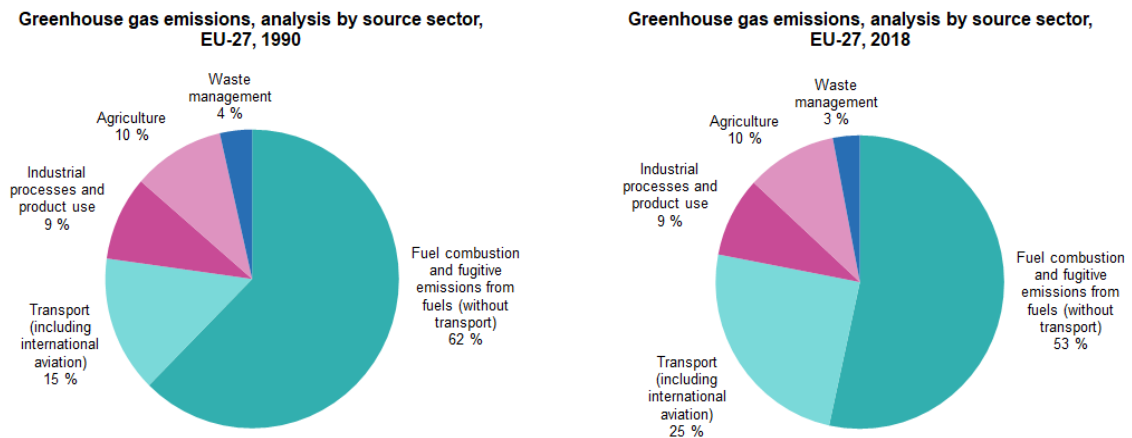


Figure 1. The EU GHG emissions share by source sector for 1990 and 2018. Source: EEA (2020)

The fuel combustion and fugitive emissions of fuels (energy excluding transport) have resulted in 53% with a lead in the EU 's overall GHG emissions in 2018, whereas that of 62% in 1990 is shown in Figure 1 where GHG emissions are obtained from the major sources.

Table 1. Total GHG emissions by countries between 1990 and 2018 (LULUCF excluded and international aviation included) (Million tonnes of CO₂ equivalent)

	1990	1995	2000	2005	2010	2015	2018	Share in EU-27 (2018) (%)
EU-27	4,911.6	4,626.5	4,543.4	4,647.1	4288.3	3936.7	3,893.1	100.0
Austria	79.4	80.7	82.0	94.4	86.7	80.7	81.5	2.1
Belgium	149.6	157.4	154.4	149.9	138.5	123.8	123.6	3.2
Bulgaria	102.5	75.5	59.8	64.7	61.2	62.5	58.6	1.5
Croatia	32.4	23.0	25.9	30.2	28.3	24.5	24.4	0.6
Cyprus	6.4	7.9	9.3	10.2	10.4	9.1	9.9	0.3
Czechia	199.6	158.5	151.2	150.0	141.8	130.0	129.4	3.3
Denmark	72.6	80.5	73.6	69.3	66.0	51.3	51.3	1.3
Estonia	40.4	20.2	17.3	19.2	21.1	18.3	20.2	0.5
Finland	72.2	72.7	71.3	71.2	77.4	57.1	58.8	1.5
France	556.9	553.7	567.2	570.7	527.9	475.0	462.8	11.9
Germany	1,261.6	1,136.4	1,063.0	1,016.4	966.9	931.0	888.7	22.8
Greece	105.8	112.0	129.0	139.1	121.1	98.4	96.1	2.5
Hungary	94.5	75.9	74.0	76.2	65.6	61.4	64.1	1.6
Iceland	4.0	3.8	4.6	4.5	5.3	5.5	6.2	0.2
Ireland	56.6	60.3	70.1	72.2	63.6	62.0	64.2	1.7
Italy	520.4	535.3	560.5	595.1	522.6	449.1	439.3	11.3
Latvia	26.6	13.1	10.6	11.6	12.6	11.5	12.2	0.3
Lichtenstein	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.0
Lithuania	48.4	22.5	19.6	22.9	21.0	20.6	20.6	0.5
Luxembourg	13.1	10.7	10.6	14.3	13.4	11.6	12.4	0.3
Malta	2.8	3.0	3.1	3.2	3.3	2.6	2.7	0.1
Netherlands	226.3	239.3	229.7	225.7	224.0	207.4	200.5	5.1
Norway	52.1	52.2	56.0	56.3	56.8	56.0	53.8	1.4
Poland	475.7	447.5	396.7	405.4	414.4	393.6	415.9	10.7
Portugal	60.2	70.4	83.7	88.0	71.6	71.0	71.6	1.8
Romania	248.8	187.9	143.6	151.8	124.7	117.1	116.5	3.0
Slovakia	73.6	53.4	49.3	51.4	46.5	42.0	43.5	1.1
Slovenia	18.7	18.7	19.1	20.5	19.6	16.8	17.6	0.5
Spain	294.2	335.6	398.4	455.0	371.3	352.5	352.2	9.0
Sweden	72.5	74.6	70.1	68.6	66.6	55.9	54.6	1.4
Switzerland	57.3	56.8	58.0	59.1	59.1	53.5	52.1	1.3
Turkey	219.9	248.6	300.4	340.5	404.8	483.8	533.0	13.7
United Kingdom	809.7	768.1	742.5	726.6	642.4	541.7	498.7	12.8

Source: EEA (2020)

When the GHG emissions of the member countries of the EU is examined, according to Table 1, the ranking of the top three countries' share in the total GHG emissions of the EU in 2018 is Germany (nearly the quarter of the emissions), France and Italy. In 2018, the leading growth in the GHG emission levels was in Cyprus while the leading decline was in Lithuania compared to 1990.

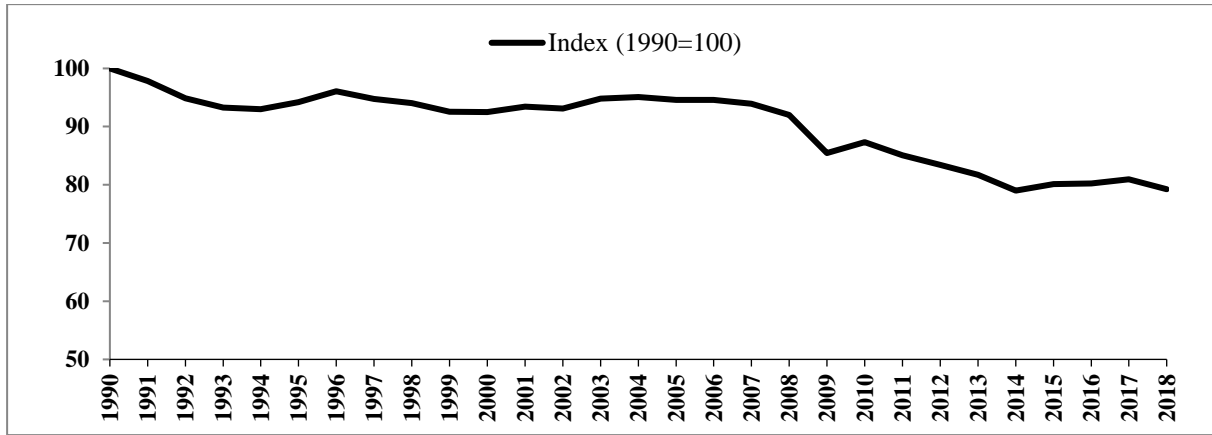


Figure 2. The EU GHG emissions trend between 1990 and 2018 (LULUCF excluded and international aviation included). Source: EEA (2020)

According to Figure 2, as the EU's GHG emissions between 1990 and 2018 are observed, the trend was downwards in general in the period of 1990 and 1999; stayed rather unchanged in the period of 1999 and 2008; abruptly downwards in 2009 (because of the global financial crisis); upwards in 2010; downwards in the period of 2011 and 2015; upwards to a slight extent in the period of 2015 and 2017. In 2018 GHG emissions declined by 2.1% compared to the previous year.

In a nutshell, in this study, it is aimed to examine the potential effects of The European Green Deal on Turkey's electricity market and the relevant issue is examined as follows: Firstly, a general information about The European Green Deal and the carbon border adjustment is given to have a brief insight about the subject. Afterwards, the situation of Turkey on GHG emissions is presented. Moreover, the potential impacts of the European Green Deal on Turkey's cross border electricity trade and on Turkey's power market and merit order are examined in detail. Finally, the findings are evaluated and a roadmap on the subject is proposed in the conclusion and discussion part.

1. THE EUROPEAN GREEN DEAL

The regulations brought by the EU on combating climate change, the incentives and the steps it wants to take in this regard continue as well as after the Paris Agreement in history. If the Paris Agreement is deeply examined, the sensitivity of the EU, which seems to be one of the most efficient implementers, can be seen in detail in the EU green deal. At this point, it has not only limited the Green Deal to certain sectors, but actually reflected this situation from the supply of end-user products that may affect climate change to energy consumption in homes and even agricultural policies.

The European Green Deal is the name given for all the action plans implemented by the EU in order to play a dominant role in the battle against the climate crisis and global warming. This agreement includes a series of studies aimed at making all the EU member states carbon-neutral by 2050. The key EU regulations and policies on the matter can be listed as follows (European Commission, 2019c); "Climate Change Investments, Contribution of Forests and Lands in Combating Climate Change, Energy Efficiency and Renewable Energy Investments, EU Emissions Trading System, Member States'

Objectives for Non-Emissions Trading Sectors, Preparing for the Effects of Climate Change, Progressively Reducing Fluorinated GHGs, Protecting the Ozone Layer, Reducing GHG Emissions in Transportation, Supporting Low-carbon Technologies.”.

In this sense, the EU implements a series of measures, especially the climate law and the carbon border tax, within the scope of this agreement. Simultaneously with these measures, the EU tries to support this process by creating various transition funds so that companies can move away from carbon and fossil-based energy and fuel in order to switch to green energy. The size of the funds allocated by Europe for environmental projects in the next 10 years is over one trillion dollars (European Parliament, 2020a). In this context, it is the leading fund set for a regulation on climate change in the history of the world and the EU.

Nowadays, the increasing need for energy along with price and production-based volatility in energy markets have turned the direction of investments around the world into clean energy, that is, green finance. Increasing awareness of global warming and environmental sensitivity has also directed the investments of governments, financial institutions, investors and businessmen to spend the least harmful technologies on the environment.

The main goal of the European Green Deal is described as a carbon neutral Europe and the aim is to achieve zero GHG emissions across Europe by 2050 as mentioned before. Actually, this statement does not mean zero emissions. It articulates zero emission increase compared to 1980. The first step is to create a new European Climate Law and put it into effect as soon as possible. In addition, when Europe's GHG emission value for 1990 is taken as reference, the 40% emission reduction target previously envisaged for 2030 has been raised to the 50-55% band.

The EU Commission plans to review all laws and regulations and align them with the European Green Deal goals. In this context, firstly, the Renewable Energy Directive and the Energy Efficiency Directive will start with, at the same time the Emission Trade Directive will be reviewed. These regulations are expected to be submitted to the EU Parliament in March 2021 (European Commission, 2019c). Consequently, the European Green Deal appears to be a guide that aims to increase the efficient use of resources, stop environmental pollution and climate change, and protect biological diversity with the help of the circular economy. This agreement is expected to be the basis for all decisions and regulations to be taken by the EU, especially in the next ten years, in order to create a carbon-neutral Europe in 2050.

Besides, Turkey may be effective and efficient in the development of the EU's digital energy market. EU's most important natural area of logistics Turkey, it can take an active role in EU gas and hydrogen infrastructure. Circular Economy will increase employment in Textile, Construction, Electronics and Plastics Sectors. The adaptation of Turkey's industry to Circular Economy will lead to product diversity and profitability and will also strengthen new employment. The Turkey's construction sector can undertake important projects in the EU by developing projects that comply with sustainable and energy efficiency standards. In addition, there are 50 million buildings in the EU's renovation stock

(European Parliament, 2020b). These small projects are also a great potential and opportunity for Turkish contractors. Turkey can be effective in areas from agriculture to digital technologies.

Essentially, one of the main goals of the European Green Deal is not only achieving the two aforesaid goals of Europe. The important feature that aspired to provide with the European Green Deal of Europe can be defined as increasing the competitiveness of the countries in the EU. At this point, the EU also comprehends the European Green Deal as a tool to save its own economy. The relative competitiveness of companies that act in line with the emission standards introduced by the EU outside Europe will decrease and they will be more competitive with neighboring countries with the European Green Deal. If the subject is examined in more detail, actually there is an emission trading system in the EU like the companies are responsible for the carbon emissions of the electricity they produce and consume. It would be appropriate to go through the sectors of cement, iron and steel which are the most carbon intensive electricity consuming sectors to give a concrete example.

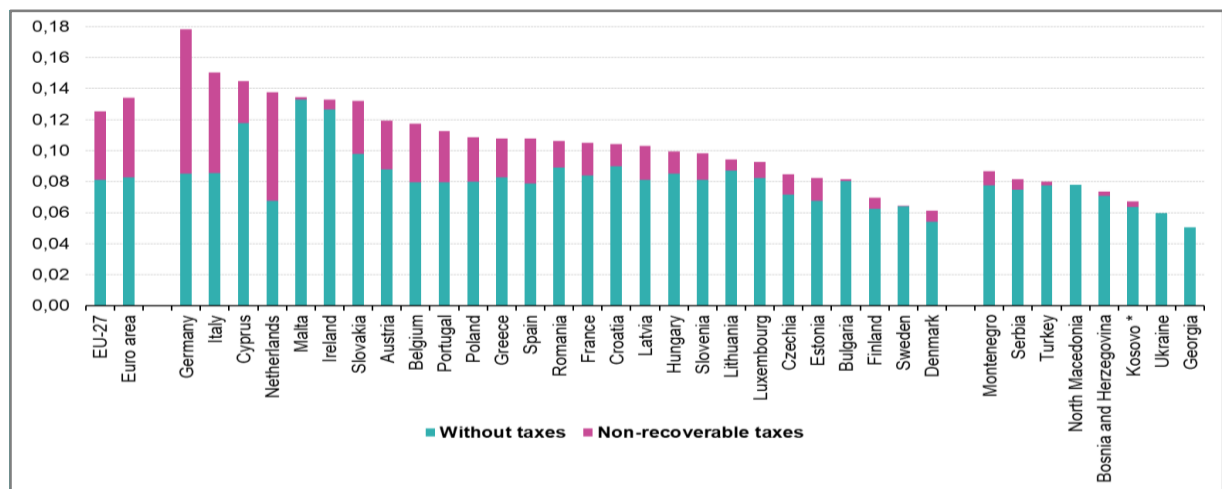


Figure 3. The prices of electricity for non-household consumers in the first half of 2020 (EUR/kWh).
Source: EUROSTAT (2020b)

Additionally, if there is full competition in the world in the basic economics concept, it is considered that the goods of all products in the world are equal unless they are the only comparative countries. As a case, let's take into account the cement plants from the countries close to the EU. The foresaid cement factory produces the electricity it consumes, sometimes using it more expensive that may vary between 20% and 30% due to the emission trading system and the additional costs it brings (IENE, 2020). Figure 3 represents the electricity prices of the non-household consumers in the first half of 2020. As it may be seen from the figure, the average electricity prices within the Europe is way higher compared to the neighboring countries. The main reason for this difference is the mandatory carbon cost in the EU. Considering that sectors such as cement and iron-steel are energy-intensive, it is apparent that countries within the EU will be less competitive than countries outside the EU. In this context, it is obvious that the cement producers exporting to Europe can provide it with much more advantageous prices compared to cement producers in the EU.

The main purpose of addressing this issue is that Europe, which aims to create a more environmentally friendly, sustainable and natural economy with its climate sensitivities, causes economic losses due to the fact that the whole world does not have the same mentality or the same practices. Many products that can be produced in Europe, especially energy-intensive products, are exported to Europe just because of these emission taxes and fees. This situation can be shown as one of the reasons of the increasing employment problem in the EU, rather than just a self-sufficient Europe. In this context, the EU basically aims to attain the producers within the EU to equal competition conditions with the producers outside the EU.

At this point, reducing carbon emissions is an attainable situation in terms of structure. It is extremely easy to design this on paper by introducing taxation and additional incentives. The EU's climate plan this time differs from one of the priorities at this point. Along with the regulation, the EU shows that the current climate understanding is requested not to harm its own economic power. The EU has already lost its competitiveness, especially in energy-intensive sectors in line with its climate policies, and its exports have decreased, and its imports have increased. The negative effects of these climate policies are observed not only in the trade balance but also in the unemployment data. When the related informative data of Turkey is observed, it can be seen that more than two times the spike in carbon emissions to 1990 levels is valid. The main reason behind this increase comes from the energy, industrial production, transportation and construction sectors. The EU aimed to reduce emissions by 50% compared to 1990 levels by 2030 and to create "*domestic climate neutrality*" by 2050 with the European Green Deal (European Commission, 2019b).

2. THE CARBON BORDER ADJUSTMENT

According to EUROFER (n.d.), the Carbon Border Adjustment (CBA) is a method to promote the EU's climate leadership by representing the carbon intensity of goods imported into the EU. This process is critical because the EU producers have the highest environmental and climate conservation targets in the world-and higher production costs that follow this initiative.

It is known that the details of the carbon border regulation will be clarified as a result of the meetings to be held with stakeholders in the next year. Although the details of this point are not yet finalized in the system and methodology, it is known what it aims at as of its philosophy. The EU wants to use its increased market power in line with new energy policies and create a more competitive environment. Although there are many regulations on how to do this, it mainly focuses on "*carbon leakage*". The basic rationale behind carbon leakage is this subject. If there is no "*carbon cost*" in every country in the world, there is no logic in applying this to products produced in the EU.

In a framework in which a good produced for 10 euros; it may be expected to have an additional cost of 2 euros coming from the ETS, in that sense it would cost 10 + 2 euros, with a total cost of 12 euros, even though the cost of goods to be imported from elsewhere in the EU is 11 euros as an example, consumer choice of a product of 11 euros will be fair. At this point, not only the producers in the EU

become less competitive, but also carbon emissions continued worldwide. Based on this example, it should be noted that the biggest deficit is in energy-intensive sectors worldwide. Electricity trade has the same problem from the EU perspective as well. The EU Commission is still working on its policy to overcome this issue as well; however, it is still uncertain and need to be implemented with the stakeholder engagement. Also, it is uncertain that which sectors the EU will prioritize under which headings and implement this policy (SHURA, 2020b).

At this point, stakeholders pushed the EU commission to consider different implementation options. It is essential to declare under which standards a carbon emission system will be accepted within the EU and accordingly it will not be re-taxed at the EU border. Otherwise, double carbon taxation would be possible. The issue of how the importer obligations will be is a complete mystery. The most realistic approach in this matter is to categorize the products and determine the "*default benchmark levels*" on the basis of product groups. At this point, the EU averages can be taken as well as world averages.

Actually, it is well-known that the negotiations are being conducted between the World Trade Organization (WTO) and the European Commission. On the other hand, the fact that Turkey is considering at this situation is obviously far more complicated. Since 1995, Turkey has been a member of the EU Customs Union. The EU-Turkey Customs Union Agreement covers all products that are manufactured but not unprocessed agriculture, services and public procurement. Bilateral concessions to trade concern commodities from agriculture, coal and steel. The EU is not clear yet about how to regulate it, while it is one of Turkey's largest trading partner. One similar tariff can be applied to Turkey and Turkey's entry into the EU's emissions trading system is also among the foremost options. At this point, it is essential to discuss the options with an increase in the level and application of dialogue between Turkey and the EU.

In 2019, approximately 70 billion euros of imports from the EU is realized by Turkey while about 9 billion dollars of these exports came from energy-intensive industries. In the short term, sectors such as iron and steel, electricity and glass would have to pay this system's bill. Turkey will face the short-term cost of just a 12% export item, although these costs could be lethal on behalf of the sector concerned. It is well known that a crisis is often an opportunity. Carbon cost of protection on behalf of Turkey's trade with the EU are also another way of payment. Turkey's folding lower carbon prices would improve the productivity of the current industry, and these investments need to be minimized on behalf of EU trade due to higher productivity in the long run, which will make Turkey a more sustainable economy (SHURA, 2020a).

3. TURKEY'S GREENHOUSE GAS (GHG) EMISSIONS POSTURE

The information related to Turkey's GHG emission is necessary for policies concerning climate issues in Turkey and the World. Turkey faces increases in GHG emissions alongside with the rapid growth in its economy.

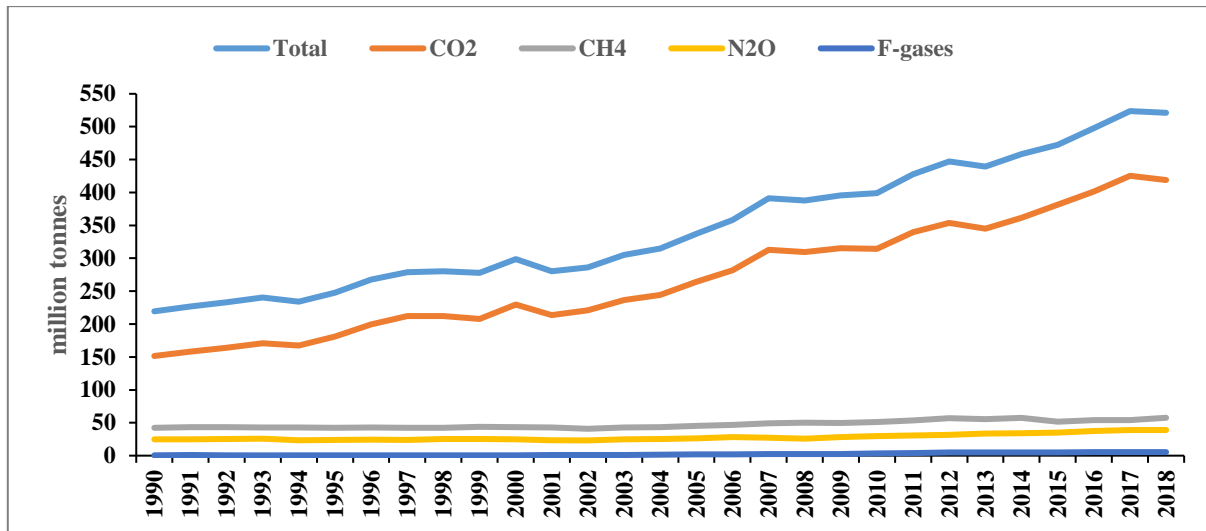


Figure 4. GHG emissions of Turkey between 1990 and 2018 (million tonnes of CO₂ equivalent). Source: TURKSTAT (2020a)

In 2018, a total of 520.9 Mt GHG emissions were realized which indicates a 138% increase compared to 1990 and 0.5% decrease compared to 2017. As a result of the differentiation in the solid fuels' share of electricity generation, the emissions unimportantly decreased in 2018 (TURKSTAT, 2020a). Moreoverly, as shown in Figure 4, there is an increasing trend in the total emissions along with the CO₂ emissions, whereas CH₄, N₂O and Fluorinated gases (F-gases) emissions are not changing significantly between 1990 and 2018. Additionally, in 2018, total CO₂ emissions increased by 176.7%, total CH₄ emissions increased by 35.8% and N₂O emissions increased by 56.8% compared to 1990 (excluding LULUCF).

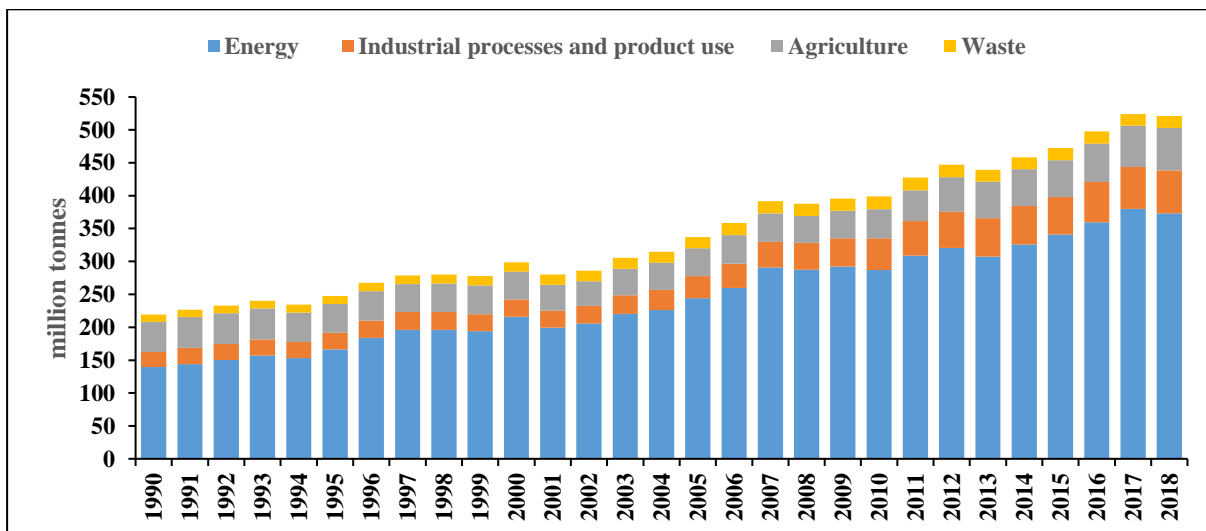


Figure 5. GHG emissions by sectors of Turkey between 1990 and 2018 (excluding LULUCF) (million tonnes of CO₂ equivalent). Source: TURKSTAT (2020a)

According to Figure 5, the annual changes in the GHG emissions for each sector are differentiating either in increasing or decreasing trends in 2018 compared to previous year whereas there is a continuous increasing trend in emissions of total and sectors by each between 1990 and 2018. In

2018, LULUCF and energy sectors are showing a decreasing trend while the ones with increasing trend are IPPU, agriculture and waste sectors. The main causes of the increase in emissions of energy sector in 2018 can be specified as the combustion emissions in public electricity, heat production sector and transport (TURKSTAT, 2020a).

As stated by TURKSTAT (2020a), Turkey's energy system is primarily powered by combustion of fuel, accompanied with fugitive emissions from fuels. It is followed by transport and storage of CO₂. The main causes of overall emissions in 2018 were energy sector related emissions along with CO₂ emissions. Energy sector GHG emissions increased by 160.6% (CO₂ equivalent) from 1990 to 2018, as a general upward trend. In addition, GHG emissions share from heat and public electricity generation in overall fuel combustion was 24.4% in 1990 and 41.0% in 2018. The decline of the share of natural gas in electric generation in 2018 contributed to an increase in CO₂ emissions and a decline in consumption of fuel prior to 2017. On the other hand, as a result of population and production growth, the industrial process and product use (IPPU) sector emissions increased by 185.5% from 1990 to 2018. In 2018, the emissions from IPPU sector accounted for 12.4% of CO₂ and overall emissions of Turkey (excluding LULUCF) and CO₂ emissions accounted for 89.1% of overall IPPU emissions while N₂O and CH₄ had minor impacts.

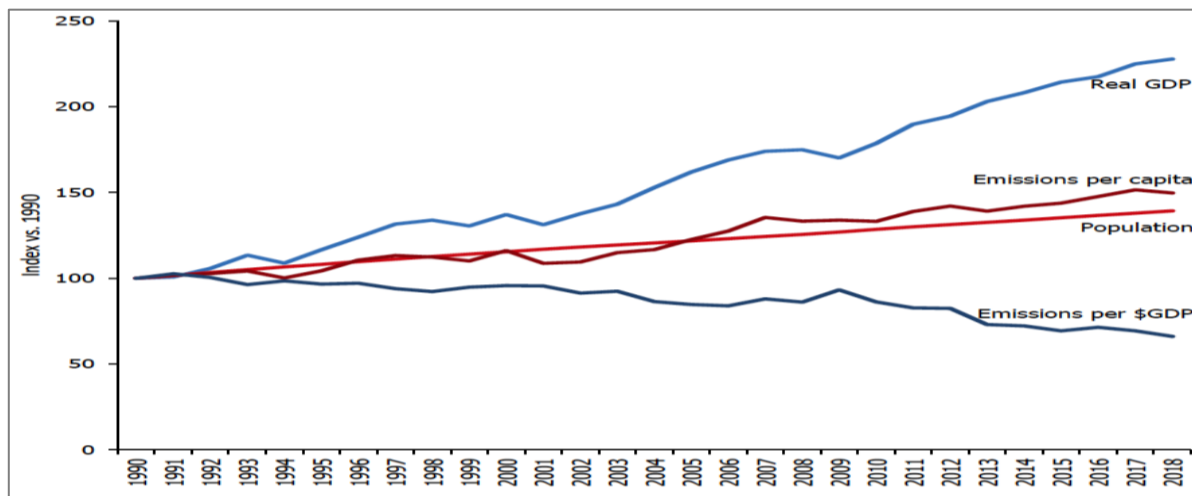


Figure 6. Turkey's GHG emissions per capita and per dollar of GDP between 1990 and 2018.
Sources: World Bank (2020), TURKSTAT (2020b)

As it is aforementioned before and can be seen from Figure 6, Gross Domestic Product (GDP) and population show a positive correlation with the total GHG emissions. The core ground of the increase in total GHG emissions in Turkey is the growth of population and economy resulting in a growth in energy demand when the 1990-2018 period is investigated. Moreover, the data show that in times of the economic recessions along with the 1994, 1999, 2001 and 2008 economic crisis in Turkey's economy had directly caused a decrease of 2.5%, 0.9%, 6.2% and 1.0% in the total GHG emissions respectively in comparison with each previous year which is another alibi of the correlation between GDP and the total GHG emissions in Turkey (TURKSTAT 2020b).

4. POTENTIAL IMPACTS OF THE EUROPEAN GREEN DEAL ON TURKEY'S CROSS BORDER ELECTRICITY TRADE

After the decisive statements from the European Commission, Turkey, one of the leading countries with respect to trade volume with Europe, is obliged to examine in detail the issue of carbon emissions. Otherwise, commercial agreements between EU and Turkey could be terminated by Commission's carbon border adjustment mechanism that is aiming to reduce the risk of carbon leakage.

Table 2. Import and export of EU (€) with Turkey between 2015 and 2019

Year	EU Import	EU Export	Trade Volume
2015	61,636,968,827	78,964,099,243	140,601,068,070
2016	66,592,315,973	77,917,299,315	144,509,615,288
2017	69,779,798,330	84,794,835,289	154,574,633,619
2018	76,191,980,788	77,147,191,691	153,339,172,479
2019	80,134,569,530	74,005,391,727	154,139,961,257

Source: European Commission Trade Statistics (2020)

Turkey and the EU are connected to each other with commercial ties as a result of their geographic and economic facts. According to European Commission Trade Database, it is seen that there is an increase of 9.6% in the last five years when the import and export figures between Turkey and EU are analyzed, as it is indicated in Table 2.

Table 3. Turkey's share with respect to the EU's total import and export volume (%)

	2015	2016	2017	2018	2019
Import	3.6	3.9	3.8	3.8	3.9
Export	4.4	4.5	4.5	3.9	3.6

Source: European Commission Trade Statistics (2020)

Furthermore, it is calculated that Turkey has approximately 8% share of EU total trade volume for consecutive five years as it is indicated in Table 3. Based on these two statements we can say that the Turkey and the EU depend on extent trade with each other which cannot be underestimated. The EU has to reach an agreement with Turkey to prevent unfair competition and the leakage of carbon emissions into Europe as mentioned in European Green Deal.

According to the study by Aylor et al. (2020), how the foreign trade of EU will be shaped after the European Green Deal is argued, and the potential problems and solutions from the perspective of the EU along with other countries and companies that are trading with Europe are stated. It is claimed that refined petroleum products, pharmaceutical products, chemical products, basic metals, computer-electronic-optical products, electrical equipment and motor vehicles are the industries which will be affected enormously in terms of their carbon and trade intensity (Aylor et al., 2020). From the perspective of Turkey, these industries are under threat when Turkey's exports and imports of good are

taken into consideration, and, last but not the least, the cross-border electricity trading will be also affected as a result of the European Green Deal.

Turkey has been trading power physically by using interconnected lines along with European countries for nine years as stated by ENTSO-E that the third phase which is the limited commercial exchange of energy between Turkey with Bulgaria and Greece, began in June 2011 (European Commission, 2011). Physical power trading between Turkey, Bulgaria and Greece is counted as foreign trade since the physical electricity is delivered like other goods in classical trade. Companies are attended daily, monthly or yearly capacity auctions which are organized by national transmission system operators and they have the right to transmit electricity if they win the tender. However, since the Bulgaria and Greece are the members of EU, they are obliged to comply with the EU Emissions Trading Scheme (ETS) in electricity generation while the same mechanism is not applicable in Turkey. The EU-ETS is an EU climate change policy tool that helps industries to minimize their CO₂ emissions in a cost-efficient manner. It requires an emission ceiling for all major sources of CO₂ emissions (EEA, n.d.). Since coal and gas power plants are large CO₂ emission sources, Bulgarian and Greek power plants must pay carbon tax under the EU-ETS while Turkey's power plants do not have to pay this tax. The current situation of cross-border power trading between Turkey, Bulgaria and Greece causes unfair competition for Bulgarian and Greek power generators.

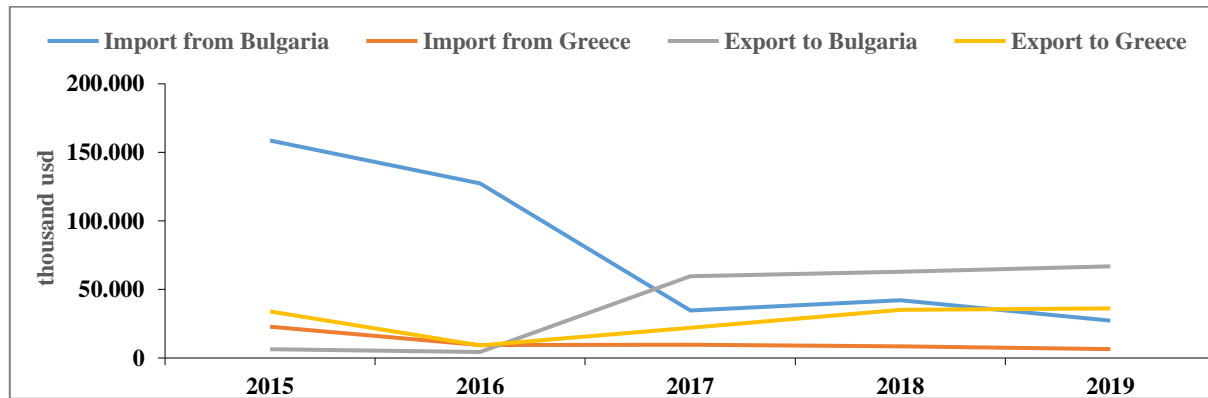


Figure 7. Turkey's cross-border trade of electricity between 2015 and 2019 with Bulgaria and Greece. Source: ITC (2020)

Furthermore, this is causing carbon leakage into Europe from Turkey which contradicts the objectives of the European Green Deal. As it is discussed before that European Commission intends to force non-EU countries to align with the agreement's goals. Under these conditions, Turkey's cross-border electricity trade is also at risk as other export sectors. International Trade Centre data indicate that, Turkey's power imports from Bulgaria decreased to 27 million dollars from 160 million dollars in five years while exports to Bulgaria is increased to 66 million dollars from 6 million dollars in five years. As same with Bulgaria border, Turkey's power imports from Greece decreased to 6 million dollars from 22 million dollars in five years while exports to Greece is increased to 36 million dollars from 33 million dollars in five years as it can be seen in Figure 7. If the European Commission introduces sanctions in the occurrence that Turkey fails to comply with the objectives of the European Green Agreement,

Turkey 's power export industry (as such a growing business in recent years with 100 million dollars of trade volume in 2019) would be at risk (ITC, 2020).

5. POTENTIAL IMPACTS OF THE EUROPEAN GREEN DEAL ON TURKEY'S POWER MARKET AND MERIT ORDER

Turkey's power market is split into three stages of which are early stage, structuring stage and growth stage according to PwC Turkey (2020) in their "*Overview of the Turkish Electricity Market*" study. In the early market stage, government had played an active role to support increasing usage of electricity and country's electricity network was building and spreading with municipalities. In the structuring stage, legal and regulatory authorities had been completed such as Turkish Electricity Administration (TEK) and the Ministry of Energy and Natural Resources (MENR). The long-term planning for Turkey's electricity supply had started in this stage with BOT, TOR and BOO concepts. BOT refers Build-Operate-Transfer while TOR refers Transfer-Operate-Rights and BOO stands for Build-Operate-Own. These three models are widely used in this stage which is resulted in significant capacity increases and the beginning of market liberalization. In the growth stage, Turkish Electricity Market Law is enacted which makes Turkey's power market's liberalization with renewable energy incentives, independent power producers and distributors as well. Energy Market Regulatory Authority (EMRA) and organized electricity market are established in this stage as a result of market liberalization (PwC Turkey, 2020). In the current stage, electricity is generated by independent power producers (IPPs), public-private partnerships (PPPs) and the state as Turkish Electricity Generation Company (EÜAŞ) while it is transmitted by only state as Turkish Electricity Transmission Company (TEİAŞ). In addition to demand and transmission side, electricity is distributed by 21 private companies and sold by designated retail companies for residential, commercial and industrial purposes. The European Green Deal is designed to reduce carbon emissions of large emitters which are power generators in power market. If the European Commission is determined to implement its goals, Turkey's power generators will be affected as it is strongly emphasized as "*The environmental ambition of the Green Deal will not be achieved by Europe acting alone.*" (European Commission, 2019a).

Electricity sector consists of both supply and demand sides which will be affected by carbon limits or enforcements of the European Green Deal. The supply side stands for electricity generator companies while the demand side is referring distribution and retail companies. In today's situation, electricity producers sell on the basis of short-term marginal costs while selling in the day ahead market. Short-Run Marginal Cost Curve (SRMC) is the cost of fuel burned to generate one MWh for combustion-based power plants that burn coal, natural gas, or petroleum. Thanks to the ETS mechanism, these types of fuel burned producers operating in the EU pay carbon tax in addition to the fuel cost. Consequently, EU companies is adding the carbon tax in their SRMC calculation while they are selling their electricity in the day-ahead market. As well as similar to Europe, Turkey's electricity generator

companies will definitely take into account the carbon price as a cost while selling the electricity to distribution and retail companies in case of the European Green Deal requirements are applied to Turkey.

Electricity prices occur at the intersection of supply and demand curves as a natural result of the economic balance. The electricity demand has an extremely fluctuating structure which is determined by micro and macro factors such as temperature and economic growth. It is differing from one hour to another, one day to the next, one season to another, one year to another. Supply side is always responding these variations of demand since there has to be instantaneous equilibrium between supply and demand. Therefore, the suppliers which are electricity generator companies are listed in an increasing order according to their marginal costs. This natural concept is called as “*merit order*” which is referring the sort of power plants by their marginal costs that are closely linked with their fuel type, efficiency and operational costs (Kirat and Ahamada, 2011).

Power prices are decreasing when renewable generation is increasing, or demand is decreasing since the intersection point lowers while the prices are increasing when renewable generation is decreasing, or demand is increasing (see Figure 8). In addition, the change in power prices occur when operating costs are changing especially for thermal power plants. Increased operating cost (mostly fuel prices) leads power generators to bid higher when they dispatch. In Europe, as it is mentioned before, power generators consider the carbon prices as a result of EU-ETS mechanism. The merit order will be shaped again as a consequence of the European Green Deal in Turkey since carbon emission values of various fuel types are differing. In the current situation, a price floor of 70 dollars per tonne is applied to imported hard coal used in electricity generation and 1,400 TL/sm³ is applied to natural gas used in electricity generation (SHURA, 2019; Argus, 2020)

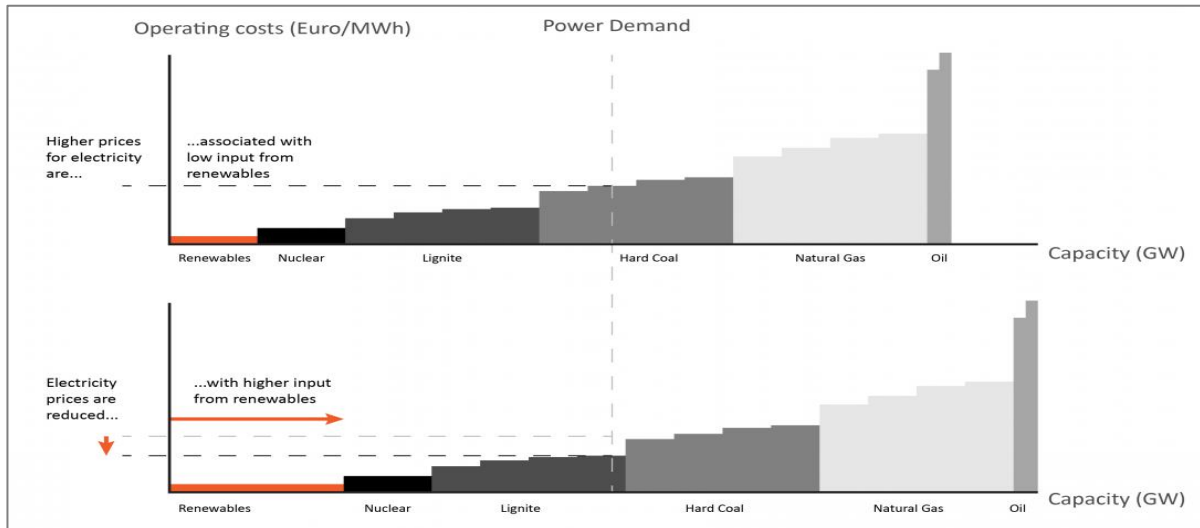


Figure 8. Electricity price and merit order. Source: Appunn (2015)

According to the methodology used by Liu et al. (2019), Turkey’s merit order is calculated with respect to Turkey’s current fuel prices before carbon pricing system that is illustrated in Before Carbon Price in Figure 9. The World Nuclear Association states that lignite power plants emit 1,054 tonnes CO₂e/GWh and coal power plants emit 888 CO₂e/GWh while gas power plants emit 499 CO₂e/GWh

(WNA, 2011). As a result of these emission values, the merit order of Turkey's electricity sector is will be shaped (calculated by using ICIS methodology for specific carbon price to the source according to its heating value and plant efficiency) as in After Carbon Price (see Figure 9) under the current circumstances and EUA prices which are around 28 euros in EU-ETS platform (ICIS, 2013). The calculations are considering 40% efficient coal power plants and %58 efficient natural gas power plants. Therefore, calculated numbers can differ from generator to generator according to their fuel price hedge strategy, efficiency and systematic limitations like seasonal efficiency rates, regional gas transmission costs.

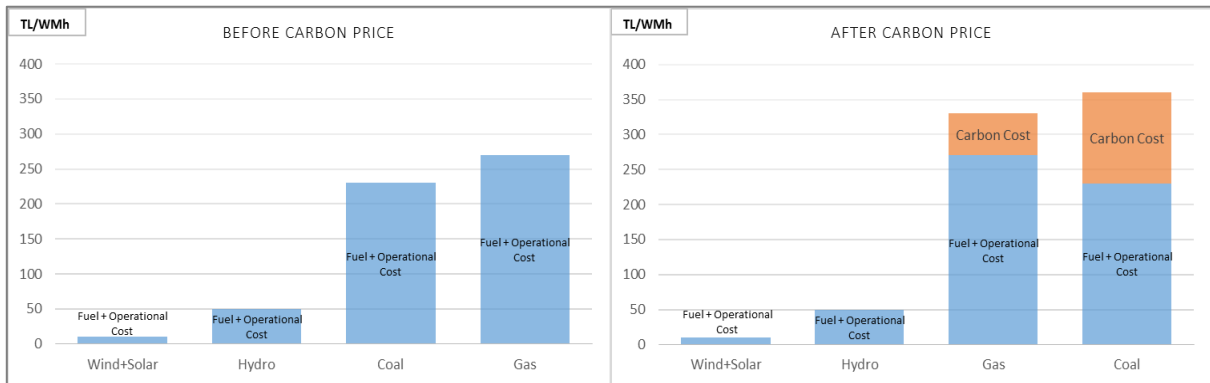


Figure 9. Merit order can be changed after electricity generators reflect the cost of carbon. Sources: WNA (2011), ICIS (2013)

On the other hand, demand side must experience consequences of occurring changes in supply side in terms of pricing. Turkey's power industry is relying on conventional power plants regarding meet the demand. According to TEİAŞ daily statistics, 56% of Turkey's electricity generation is realized by conventional power plants (coal and gas) in 2019 while 68% in 2018. TEİAŞ also indicates that, hydro generation is 30% and unconventional generation (wind and solar) is 14% while they were 20% and 13% respectively (TEİAŞ, 2020). As the statistics indicate that unconventional generation is not increased significantly, and hydrology is determinative component of this major difference between two years. Figure 10 is clearly picturizing that Turkey's electricity supply mix is depending on hydrology otherwise conventional power plants must close the gap between demand and supply as in December 2019.

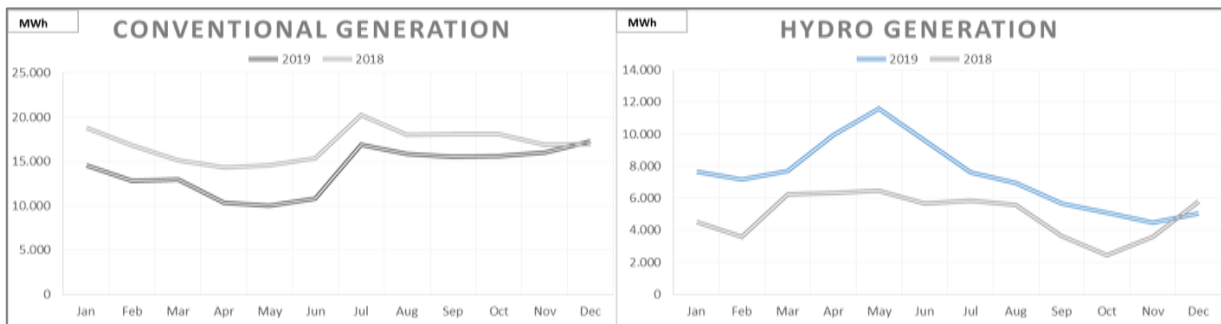


Figure 10. Conventional and hydro generations in 2018 and 2019. Source: TEİAŞ (2020)

CONCLUSION AND DISCUSSION

If Turkey decides to implement the requirements of the European Green Deal, electricity generators will be facing with the cost of carbon emission. As a result of this cost, distribution and retail companies face the consequences of a possible increase in spot market prices as it is discussed under merit order section, there is carbon cost for conventional power plants such as coal and gas power plants. According to current carbon price and foreign exchange rates, this carbon cost is calculated as 50 TL/MWh and 100 TL/MWh for gas and coal power plants respectively in the merit order section. It is difficult to measure the effects of carbon price on spot prices quantitatively since the mix of Turkey's electricity generation has different varieties with respect to weather or other variables on daily and seasonal basis. However, it can be stated clearly, the spot market prices would increase since the coal and gas power plants reflect carbon costs in their bid prices. Therefore, electricity sector must conduct research and feasibility studies for possible outcomes and effects of the European Green Deal. In case Turkey does not accept the requirements of the Deal, there will be financing and trade problematics between the European Union and Turkey such as electricity trade between Turkey and Greece or Bulgaria would be terminated. As mentioned earlier, the European Union has a trade volume of more than 150 billion euros and Turkey has the almost 4% of this trade volume. Electricity trade is one of the important items in aforesaid trade volume. Turkey and the European Union is trading electricity through Greece and Bulgaria with approximately 135 million dollars as it is stated in the study. Since, Turkey does not have carbon trading platform or any carbon cost for its power producers, trading electricity between Turkey and the European Union can be terminated as a result of the Green Deal. Turkey must determine a road map under the requirements of the European Green Deal and involve stakeholders after the necessary research is done meticulously.

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