Overview of the Turkish Electricity Market

October 2021

pwc

PRESIDENCY OF THE REPUBLIC OF TURKEY
INVESTMENT OFFICE

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Foreword

A. Burak Dağlıoğlu
Presidency of the Republic of Turkey Investment Office, President

The Turkish economy achieved average growth of 5.1 percent between 2003 and 2020, thanks to the success of the macro policies implemented, reforms carried out without interruption and political stability achieved under the leadership of President Erdoğan. In the same period, Turkey established itself as a centre for investments in its region by attracting 225 billion dollars of foreign direct investment (FDI).

The timely adoption of targeted measures against Covid-19 not only made Turkey's fight against the pandemic more effective, but also ensured that its economy was relatively less affected. According to the IMF, in 2020 Turkey recorded the second-highest growth among G20 countries, becoming the world's 11th largest economy in terms of purchasing power parity. In the first quarter of 2021 it maintained this position with growth of 7 percent. 56 percent of this growth rate resulted from net exports and investments, which is an indicator of balanced and healthy growth.

This sustained economic growth and strength of the health industry in spite of unforeseen conditions and crisis has proven the resilience of Turkey.
Worldwide, FDI figures were among the areas adversely affected by the pandemic. Global FDI dropped by 35 percent in 2020, according to United Nations Conference on Trade and Development (UNCTAD) figures. Turkey attracted around USD 7.8 billion of FDI in 2020, a nearly 15.5 percent decline.

One of the main factors that draws attention to the FDI environment in Turkey is the sectoral diversity of investments. The development of electricity markets is also important. Major investments have been undertaken in order to meet the rapid growth of electricity demand since the 1980s. This has resulted in a considerable increase in Turkey's total installed capacity as well as in its electricity generation.

The substantial rise in Turkey's total installed capacity continues with the increase in recent years of the incentives given to power plants generating electricity from renewable energy and domestic resources.

International companies with significant investments and/or supply chains in Turkey currently create substantial demand in the Turkish market for a supply of electricity produced from renewable energy in accordance with their decarbonization goals.

I would like to express my gratitude to PwC for preparing this report titled “Overview of the Turkish Electricity Market”. I hope that this study will provide our valued readers with answers to their questions regarding the electricity market and the investment environment in Turkey.

Foreword

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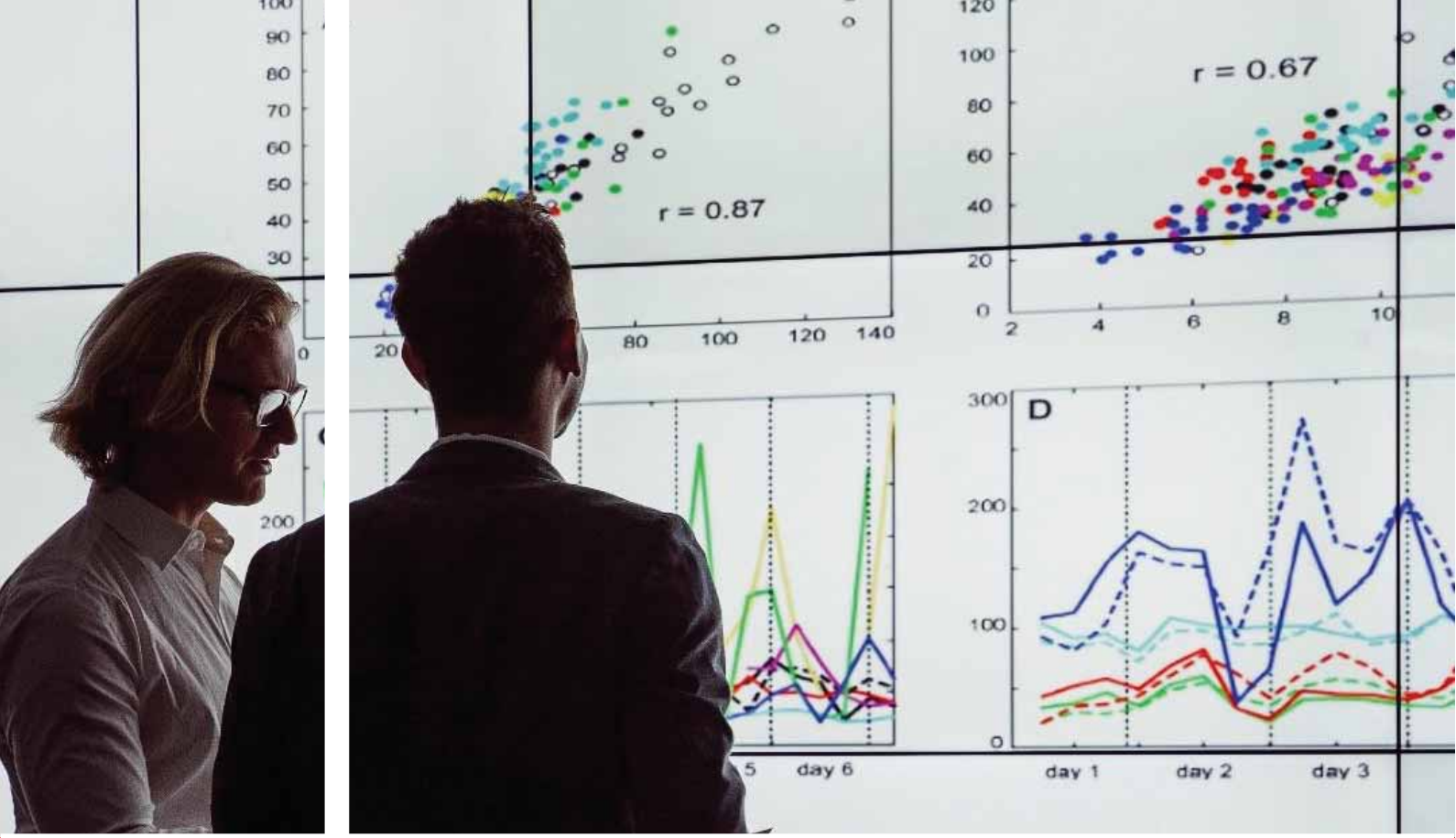
2020 has been a challenging year for Turkey on many fronts due to the negative impacts of the Covid-19, as for all countries in the world. The fight against Covid-19 brought about a temporary halt to sustainable economic growth Turkey has been experiencing as a developing country. However, authorities and private institutions at all fronts organized very well and cooperated effectively to minimize the impact of the pandemic on the health and living standards of Turkish citizens as well as on the economic and industrial activity.

Despite the negative impact Covid-19 caused on other industries, the electricity generation activity and investments in Turkey remained relatively untouched. The total electricity consumption remained almost stable whilst most countries experienced decrease in consumption, some as high as in the range of 5% - 10%. The impact of increasing electrification coupled with the demand for electricity consumption from households made up for the loss experienced in industrial consumption during 2020. Consumption in 2021 proved to be stronger and early indicators are suggesting that Turkey will experience a strong growth in electricity consumption.

With the support of Presidency of the Republic of Turkey Investment Office; PwC Turkey updated this public document, first issued in 2020, to factor in the latest developments Turkey experienced through 2020 and 2021 in its electricity sector. The electricity sector regulators and investors continued to work towards the ideal of achieving Turkey's long-term targets in electricity, uninterrupted by the unfortunate pandemic impact, to the extent possible. This document is intended to provide background to dynamics constituting the electricity sector whilst also elaborating on the latest developments and likely short-to-mid term expectations that will occupy the participants' agendas. The information in this assessment is collected from various public resources controlled by market regulators, all of which possess high standards of transparency.

We hope the industry stakeholders as well as all other parties find our research useful in understanding the dynamics of Turkish Electricity Market. Our sole purpose in publishing this research is to be able to help raise more awareness among the public towards the Turkish Electricity Market and contribute to its development by creating another source of clearly visualized and explained industry data.



1

Market Background

The development of the Turkish electricity market can be split into three stages. The introduction of the Electricity Market Law, which is characterized as the beginning of the growth stage, increased market liberalization and growth.

Development Stages

Early Stage (1920s-1960s)

- A number of state funded and privately financed activities,
- Stage characterized by the lack of long-term/full scale planning and a need for more active involvement by the regulatory authorities

Structuring Stage (1960s-2000s)

- Start of long-term planning, significant capacity increases as well as beginning of market liberalization.
- Regulatory authorities appear for the first time: Turkish Electricity Administration (TEK), Ministry of Energy and Natural Resources (MENR)
- Share of independent power producers (IPPs) in electricity generation increase

Growth Stage (2000s-Present)

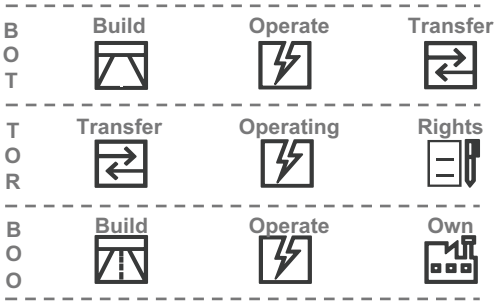
- Enactment of the Turkish Electricity Market Law,
- Amendment of Renewable Energy Law to make way for the introduction of incentives for renewable energy,
- Founding of the Energy Market Regulatory Authority,
- Establishment of the organized electricity market.

[1]Data as of August 2021

Key Themes

- Minimal state intervention due to budget constraints,
- Electricity demand gradually increasing with growing population and infrastructure requirements,
- Focus on building and spreading the country's electricity network,
- Municipalities and private companies active in generation and distribution.

Emergence of BOT/TOR/BOO concepts and privatizations,

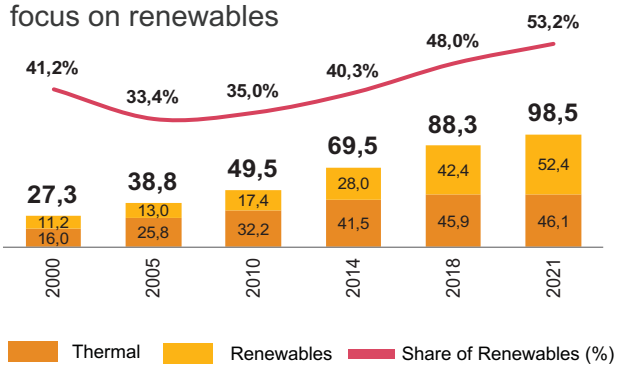


Split and reform of authorities operating government-owned assets.

Graph 1

Installed Capacity by Source Type (GW) (2000-2021[1])

Significant increase in installed capacity with focus on renewables



The Turkish electricity market reform began in March 2001 with the enactment of Electricity Market Law (EML) No. 4628, which aimed to introduce competition and maintain sustainable growth in the market.

The purpose of the market law is to provide consumers with continuous electricity at an affordable price. The law established EMRA, which functions as an autonomous body responsible for regulating the electricity market.

Later, the functions of EMRA were extended to cover the natural gas, liquefied petroleum gas and petroleum markets. EMRA performs its duties through the Energy Market Regulatory Board which is the main decision-making body.

Also in 2001, the Turkish Electricity Generation and Transmission Company (TEAŞ) was unbundled into the three parts:

Electricity Transmission Company (TEİAŞ)

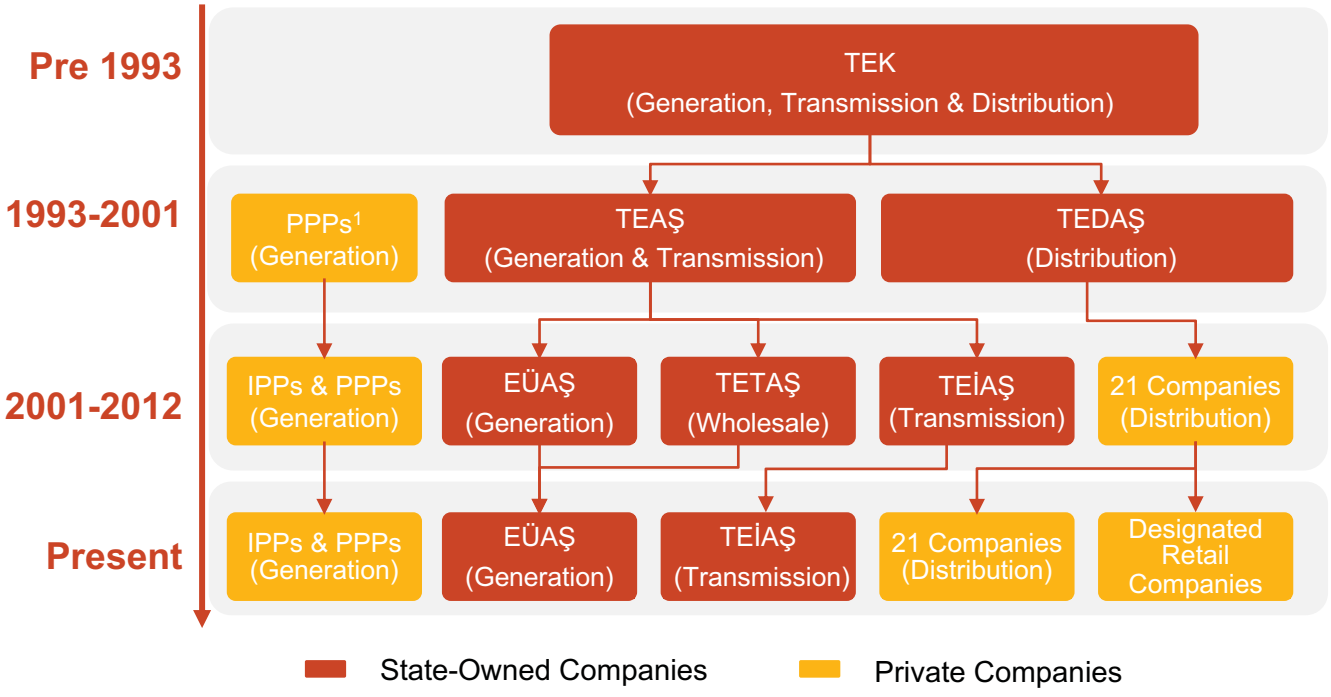
✓ Developing, maintaining and operating electricity transmission system

Electricity Generation Company (EÜAŞ)

✓ Operating state-owned electricity generation capacity

Electricity Trading and Contracting Company (TETAŞ)

✓ Wholesale electricity trade including the long term PPA's with BOT and TOR companies



[1]The emergence of IPPs essentially started with the introduction of BOT and TOR power plants in the 1990s. Gradually as the necessary regulations were developed for greater participation from the private sector, IPPs began developing their own greenfield investments. Further details on the privatization timeline of the electricity market can be found in the report.

Source: EMRA, TEİAŞ, EPİAŞ

Growth Stage Timeline

2001
- Electricity Market Law
- Establishment of EMRA

2006
- Establishment of the Organized Electricity Market

2011
- Amendment of Renewable Energy Law
- Start of unlicensed Electricity Generation

2013
- New Electricity Market Law
- Completion of the Privatization Process of Distribution Assets

2016
- First YEKA Tenders Announcement
- Power Purchase Guarantee for Lignite Power Plants

2017
- First Wind and Solar Power YEKA Tenders Completed

2018
- EÜAŞ-TETAŞ Merger under EÜAŞ
- Ancillary Services Market
- Capacity Mechanism Enters Into Force

2019
- Introduction of the new unlicensed generation regulation
- Second YEKA WPP tender completed
- Expiration of the majority of BO and BOT Agreements

2020
- Announcement of the new Mini YEKA SPP-3 competition
- Announcement of Green Tariff

2021
- The new Mini YEKA SPP-3 tender completed
- Announcement of new Mini YEKA WPP-3 (2021) and Mini YEKA SPP-4 (2022)
- Annoncement of The New Feed in Tariff Regulations
- Establishment of Power Futures Market
- Establishment of YEK-G Certificates & System

A new electricity strategy was adopted in March 2004 with the aim of privatizing the electricity distribution sector by the end of 2006. Separate renewable energy and energy efficiency laws were adopted in 2005 and 2007, respectively, setting the framework for the renewable energy and energy efficiency strategy of the country.

Between 2004 and 2006, TEDAŞ was restructured into a holding company and into 21 regional subsidiaries (from a previously centralized administration) to privatize the distribution sector in line with the strategy outlined in 2004. The privatization of the distribution segments was completed in 2013.

The 2004 strategy also envisioned developing a power exchange in the Turkish Market. Establishment of a temporary balancing and settlement mechanism was targeted by January 2005, and the establishment of a day-ahead market by July 2006 was planned. Following a period of planning, the day-ahead planning mechanism was set up in 2009 and continued operating until the launch of the day-ahead market in 2011, while the balancing and settlement mechanism was set up in 2006. TEİAŞ was put in charge of operating the balancing and settlement mechanism in Turkey, also called the Electricity Market Financial Reconciliation Centre (PMUM). In 2015 PMUM separated from TEİAŞ to become an independent body, the İstanbul Energy Exchange (EPİAŞ). TETAŞ and EÜAŞ were combined under EÜAŞ on 9 July 2018.

2021 saw key developments in the electricity industry, which started with the introduction of new FiT for YEKDEM to replace the previous tariff that had been in place for 10 years. The establishment of the YEK-G system was important as it gave electricity consumers the opportunity to confirm the renewable source of the energy they purchase.

Market Value Chain

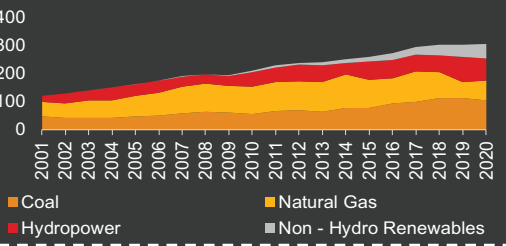
Generation → Transmission → Wholesale → Distribution → Retail

Generation

Both state-owned and independent power producers who hold generation licenses are permitted to generate electricity. **EÜAŞ** owns and operates the state-owned power plants.

The total installed capacity of Turkey was **98.5 GW** as of August 2021.

Electricity Generation by Source (TWh)



Transmission

Transmission Line Length
71.098 km (2020)

Transmission Losses
1.9% (2020)

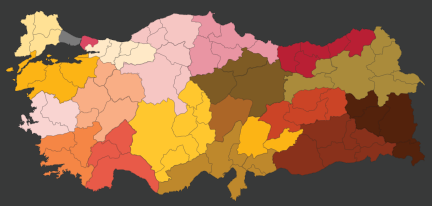
TEİAŞ is the state-owned monopoly that owns and operates the electricity transmission in the country. It is also responsible for operating the balancing power market and the ancillary services market.

Wholesale

Private and state-owned companies are responsible for wholesale activities. **EÜAŞ** (after its merger with TETAŞ in July 2018) is a state-owned wholesale company responsible for selling electricity to market players.

Key Players:

- EÜAŞ
- EPİAŞ
- Private Wholesalers
- Over the Counter (OTC) Market



21 Distribution Regions

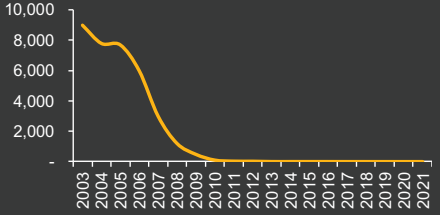
Distribution

Distribution systems are responsible for the transportation of electricity over shorter distances in lines below 36 KW (low and medium voltage). There are a total of 21 distribution regions, all of which have been operated by private entities since 2013. These companies operate based on the operational rights contracts signed with TEDAŞ.

Retail

Retail refers to sale of electricity to end consumers. Companies with a retail license can sell to users without distribution zone restrictions. Consumers with consumption that exceeds the annual eligible consumer limit (**1,200 kWh** as of 2021) have the right to choose their suppliers. The designated retail suppliers in each distribution region are responsible for meeting the electricity demand of consumers who do not prefer to use their eligibility rights, with the demand being supplied through the national tariff.

Eligible Consumer Limit, (kWh)



Source: EMRA, TEİAŞ, EPİAŞ

Several public institutions are responsible for the regulation and operation of the electricity market

Key Public Institutions

MENR

Strategy and Policy Maker

The Ministry of Energy and Natural Resources is the main governmental body responsible for carrying out energy policies.

EMRA

Independent Regulator

The Energy Market Regulatory Authority is responsible for regulating and supervising the electricity, natural gas, and liquefied petroleum gas markets.

TEİAŞ

Transmission Operator

The Turkish Electricity Transmission Company is the state-owned monopoly that owns and operates electricity transmission in the country. In addition, upon attaining the "Transmission License'' from the Energy Market Regulatory Authority (EMRA) in 2003, the company became responsible for managing nationwide regional directorates and local dispatches. It is also responsible for the operation of the power balancing market and the ancillary services market.

EÜAŞ

Public Generation

The Electricity Generation Company owns and operates the state-owned power plants and following July 2018 also took over the wholesale trading responsibilities of TETAŞ (former state-owned wholesale electricity company).

EPİAŞ

Market Operator

The İstanbul Energy Exchange is the market operator responsible for operating the day-ahead, intra-day and balancing markets in the country, and has managed the eligible consumers in the spot markets since 18 March 2015. The company has also operated the spot natural gas market since 1 April 2018. In addition, it provides comprehensive, real-time data for the electricity and natural gas markets with the EPİAŞ Transparency Platform. This platform provides transparency in these markets as well as equal access to the data for market participants. The company will also operate the Power Futures Market and YEK-G system, both of which are scheduled to start operating from 1 June 2021, as well as the Gas Futures Market which is planned for 1 October 2021.

Source: MENR

2019-2023 Strategic Plan issued by MENR revolves around 7 main strategic goals aiming to contribute to the development of the domestic energy market

The main goals of Turkey's energy policy can be split into **seven** main pillars:

#1 Achieve Sustainability in the Energy Supply

#2 Prioritize and Increase Energy Efficiency

#3 Invest in Human Capital and Technology Infrastructure

#4 Increase Local and Global Effectiveness in Energy and Natural Resources

#5 Develop and Adopt New Technologies in the Field of Energy and Natural Resources

#6 Increase the Predictability of the Turkish Electricity Market

#7 Increase Potential of Mining Industry with Sustainable Policies and Applications

The 7 main goals are supported by 31 achievement targets, the development of which is constantly observed across 131 key performance indicators (KPIs)

Source: MENR

Targeted Areas of Development

1 Achieve Sustainability in the Energy Supply

- Increase the share of domestic and renewable energy in installed capacity to 65% by 2023.
- Invest in nuclear energy
- Improve natural gas and electricity distribution infrastructure

2 Prioritize and Increase Energy Efficiency

- Invest in demand-side management infrastructure for the electricity and natural gas markets
- Complete energy network planning for the integration of electric cars

5 Develop and Adopt New Technologies

- Increase the amount of local content in investment equipment
- Support R&D projects and incentivize adoption of locally generated technology in infrastructure investments

7 Increase Potential of Mining Industry

- Continue to explore and unleash Turkey's mining potential
- Design competitive investment projects based on profiles of domestic mines available

2

Electricity Demand Analysis

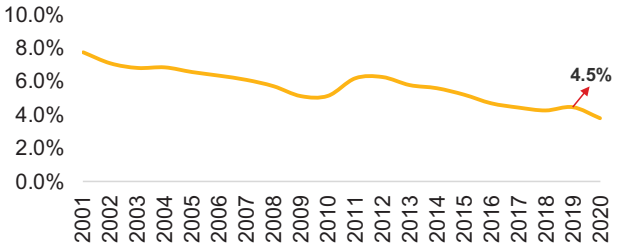
Consumption in the Turkish electricity market grew rapidly until the end of 2018. In 2019 and 2020 electricity consumption remained flat, mostly due to Covid-19 in 2020.

Prior to the global economic crisis, Turkish electricity demand grew rapidly, growing an averaging of 6.6% annually between 2001 and 2008. Electricity demand decreased during the global economic crisis of 2009, but growth afterwards did not match pre-crisis levels.

The 10-year moving average demand growth curve indicates that electricity demand in Turkey has started to shift from high growth towards average growth.

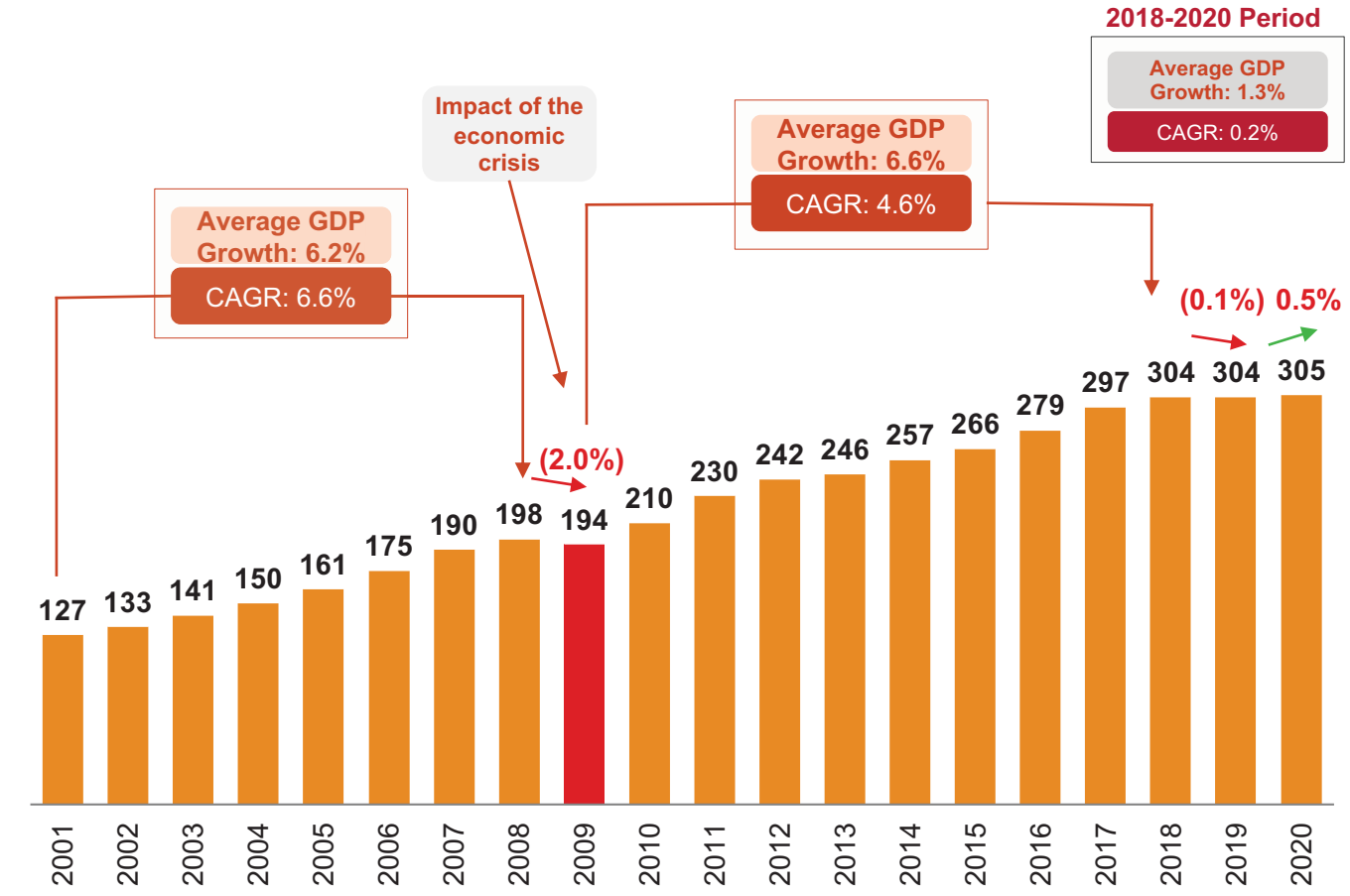
Graph 2

10Y Moving Average Growth of Electricity Demand (2001-2020)



Graph 3

Historical Electricity Demand (2001-2020, TWh)



Source: EPİAŞ, EMRA

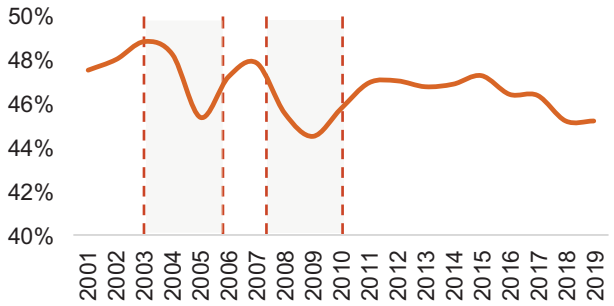
The correlation between electricity demand and GDP is attributable to industrial production demand, which can be observed particularly during economic recessions. However, the fact that the industrial demand share of the total has remained constant in recent years might indicate other factors have also started to influence demand

Energy consumption in developing countries that import primary energy sources directly affects gross domestic product (GDP). Turkey imports **99%** of its natural gas supply from Russia, Azerbaijan and other countries. Therefore, the average marginal cost of electricity generation in the country is directly linked to the prices and volume of imported fuel sources.

The industry sector is dependent on electricity, as it utilizes it to process raw materials into finished goods. Industrial productivity may slow down due to fluctuations in price or changes in the supply security of imported energy sources due to their impact on electricity prices. This leads to a direct correlation between industry development and economic growth.

Graph 4

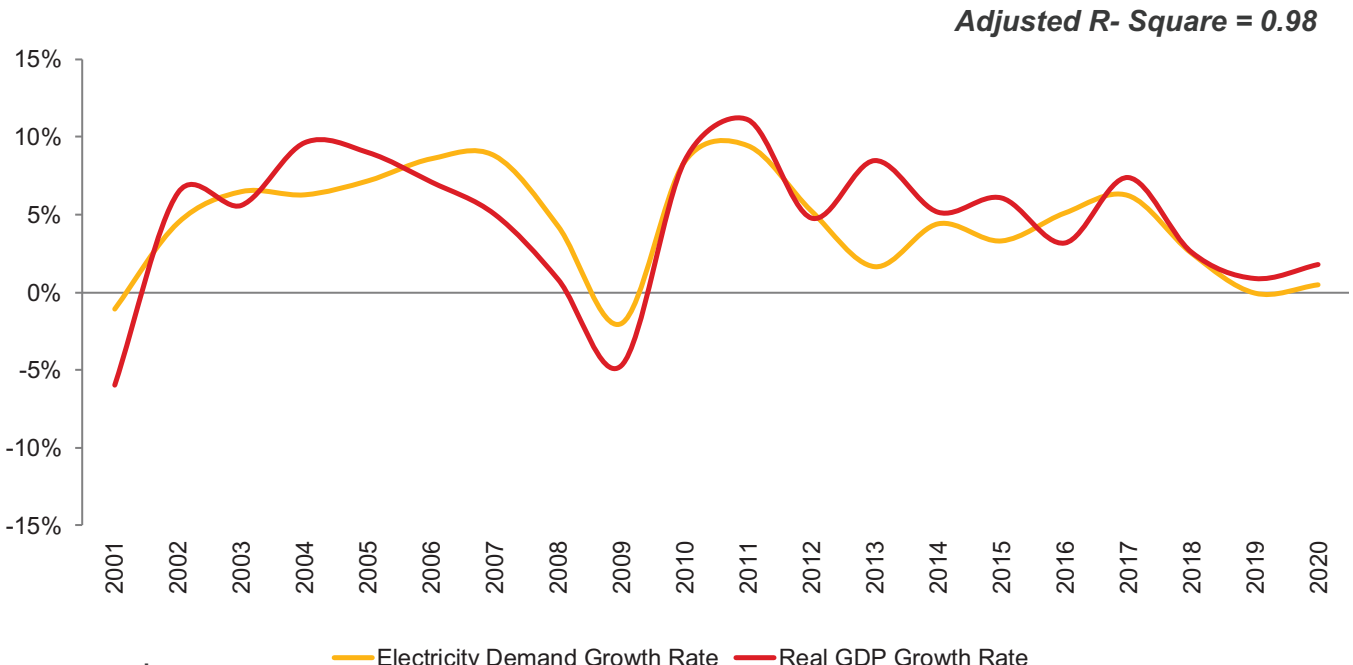
Share of Industrial Demand, (2001-2019)



The percentage of industry demand within the energy balance decreased during the 2009 global economic crisis but was stable in the following years. This indicates that there are factors other than GDP which impact electricity demand.

Graph 5

Correlation Between Electricity Demand and Real GDP Growth, (2001-2020)



Source: TEİAŞ, CBRT

Net Electricity Demand

255 TWh	=	281 TWh	+	23 TWh	-	0.5 TWh	-	46 TWh	-	2 TWh
83.9%[1]		92.5%[1]		7.5%[1]		0.2%[1]		15.2%[1]		0.8%[1]
Net Demand (2019)		EÜAŞ & IPP Generation		Autoproducers		Net Imports / (Exports)		Transmission Losses & Internal Consumption		Oil Refineries

Gross Demand = 304 TWh (2019)

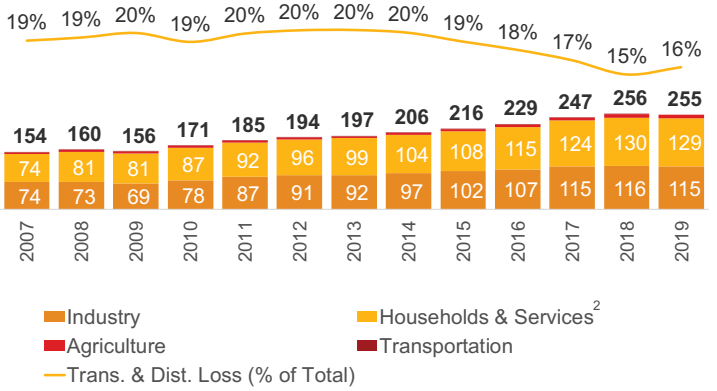
[1] As a Percentage of Gross Demand

Net demand in Turkey comes mostly from industrial production, which accounted for 45.2% of total demand in 2019 and grew by 3.8% on average annually between 2007 and 2019.

The specific demand for the transportation and agriculture sectors grew in a manner comparable to overall demand growth between 2007 and 2018, maintaining the same share of the energy balance throughout this period.

Graph 6

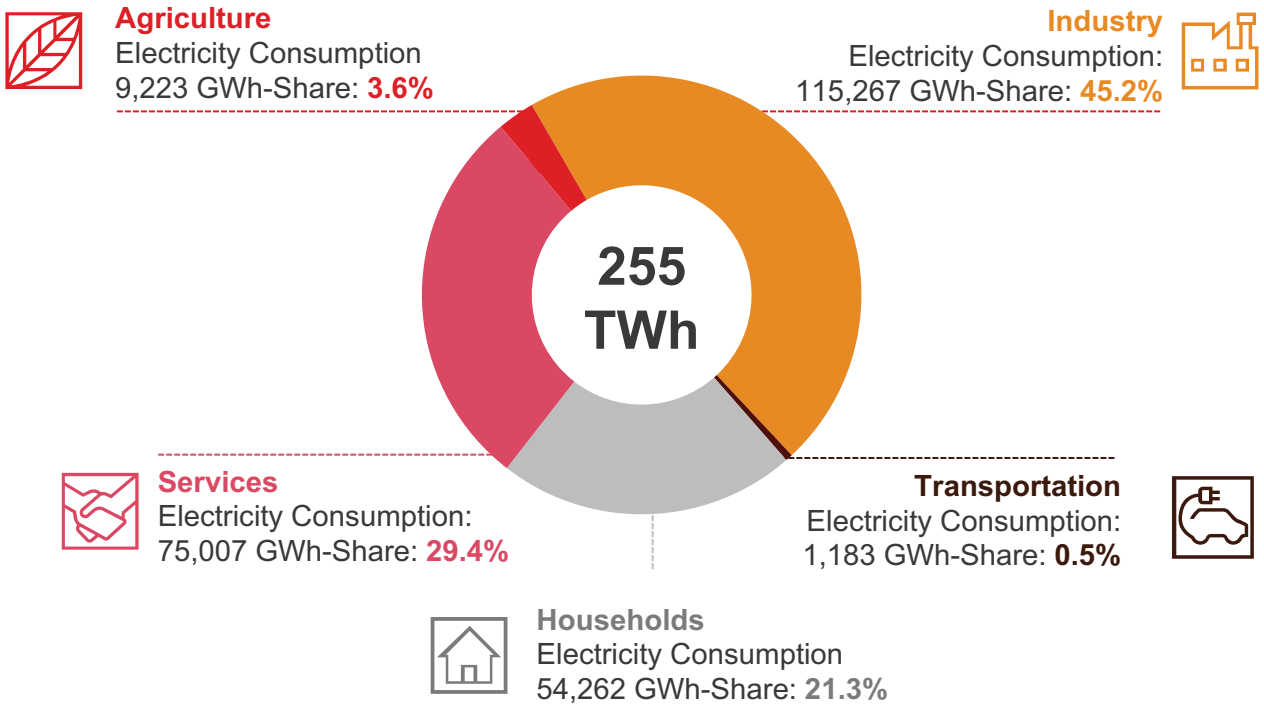
Net Demand By Sector (2007-2019, TWh)



[2]Prior to 2016, the households & services demand data was not published separately. For purposes of integrity, the net demand for these sectors were consolidated between 2016 to 2018.

Graph 7

Total Demand by Sector (2019)[1]



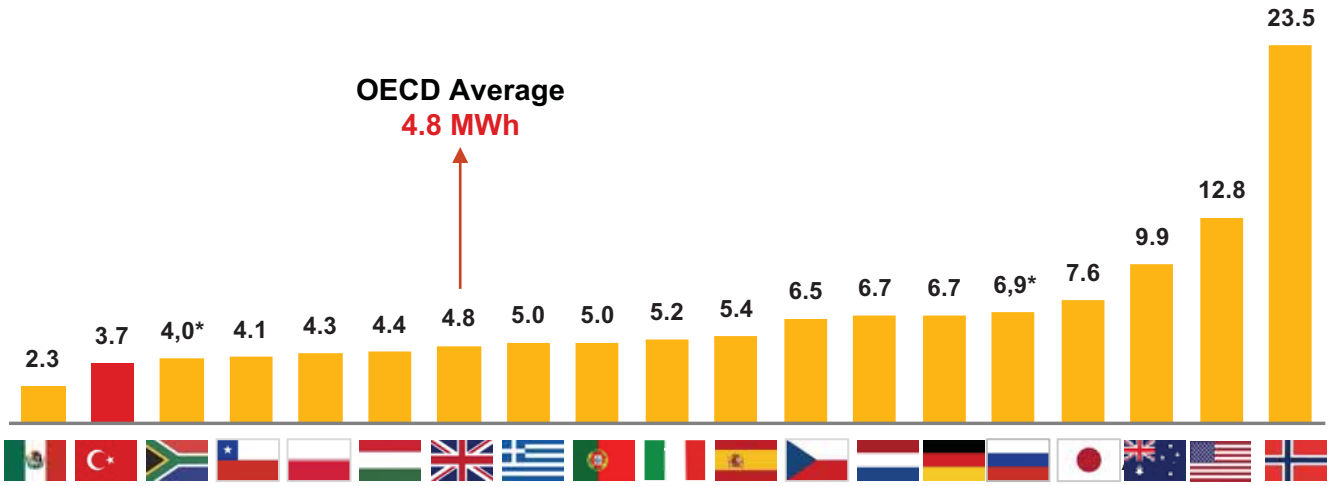
[1] The most recently published energy balance table has been used within the scope of this report.

Source: MENR

Turkey's electricity demand per capita is below the OECD average. Per capita demand figure has remained the same for past four years due to slowdown in demand growth

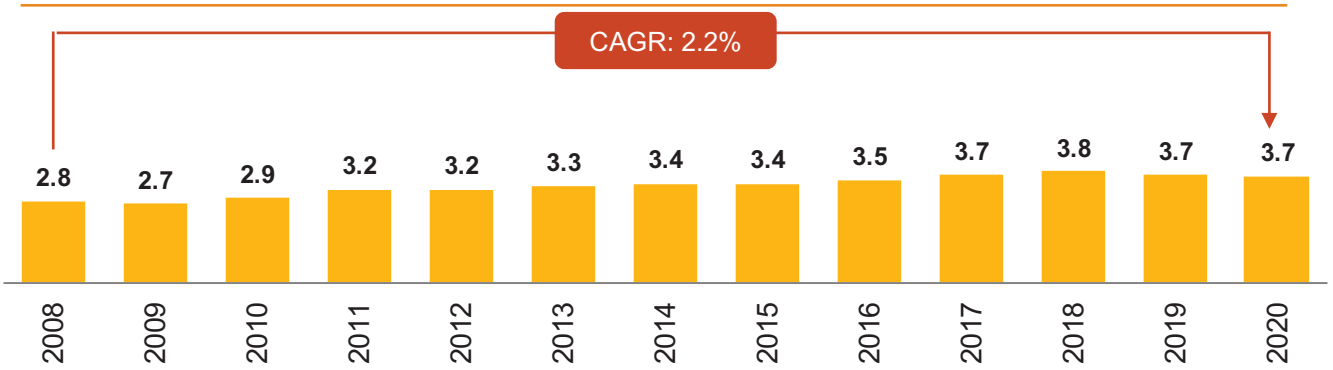
Graph 8

Per Capita Electricity Demand of Selected OECD Countries, (2019, MWh)



Graph 9

Per Capita Electricity Demand of Turkey, (2008-2020, MWh)



Demand is supported by different blends in different countries.

Table 1

Electricity Demand Share by Sector (%) (2018)

Country	Industry	Services	Household	Transportation	Agriculture
	45%	29%	21%	1%	4%
	53%	18%	24%	2%	3%
	53%	20%	22%	0%	4%
	40%	35%	21%	2%	1%
	44%	22%	29%	3%	2%
	31%	31%	35%	2%	1%
	39%	25%	35%	0%	1%
	45%	27%	25%	2%	1%
	40%	32%	22%	4%	2%

Source: IEA, Statistical Review of World Energy 2020

The Covid-19 outbreak resulted in decreased electricity consumption in Turkey, particularly in April and May. Demand has recovered quickly, with consumption in June reaching pre-pandemic levels

Table 2

Electricity Consumption (2019-2020)

TwH	2019	2020	Δ
Brazil	613	590	-4%
Canada	553	540	-2%
Korea	540	531	-2%
Germany	511	488	-4%
France	445	423	-5%
Turkey	304	305	0%
U.K.	303	288	-5%
Italy	302	286	-5%
Mexico	271	266	-2%
Australia	240	234	-3%
Spain	243	228	-6%
Poland	152	147	-4%
Czechia	61	59	-3%
Romania	55	52	-6%
Greece	52	48	-7%
Hungary	41	41	0%

While the rest of the world experienced lower electricity consumption throughout 2020 due to the impact of the pandemic, Turkey was one of the few countries which managed to retain its consumption levels. Turkey made up for the losses experienced in April and May with higher consumption in the summer months and the rest of the year.

The improvement in the second half of 2020 can be attributed to the developments below:

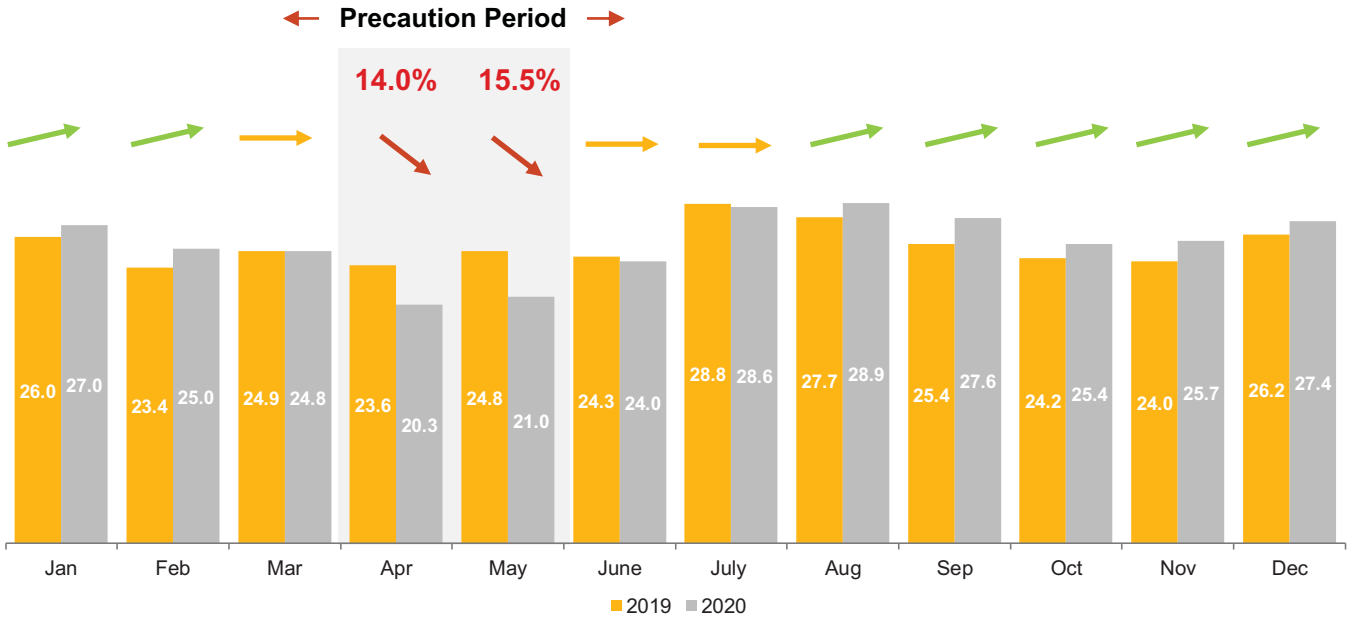
Loosening of some precautionary measures such as curfews and travel bans in the summer months

Impact of measures taken to support economic activity which in turn increased electric consumption

Increasing electricity consumption of households due to remote work, and more time spent indoors during curfews, which were reinstated after the summer

Graph 10

Impact of the Covid-19 Outbreak on Electricity Demand (2019-2020, TWh)

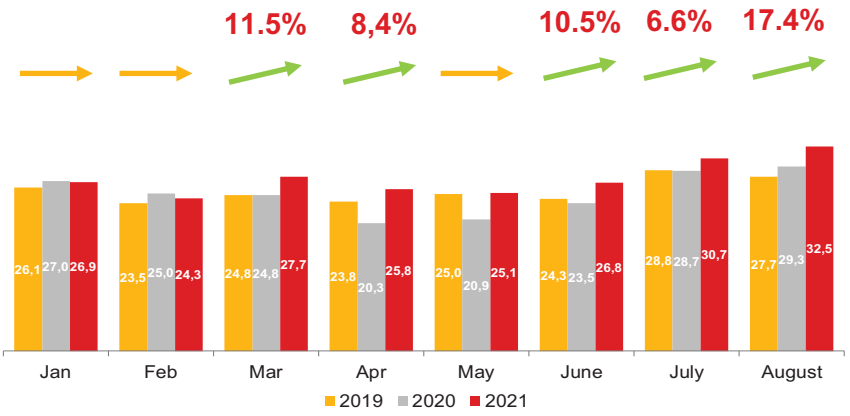


Source: TEİAŞ, IEA

Electricity demand was robust in 2021, and was higher than the demand in the first half of 2019.

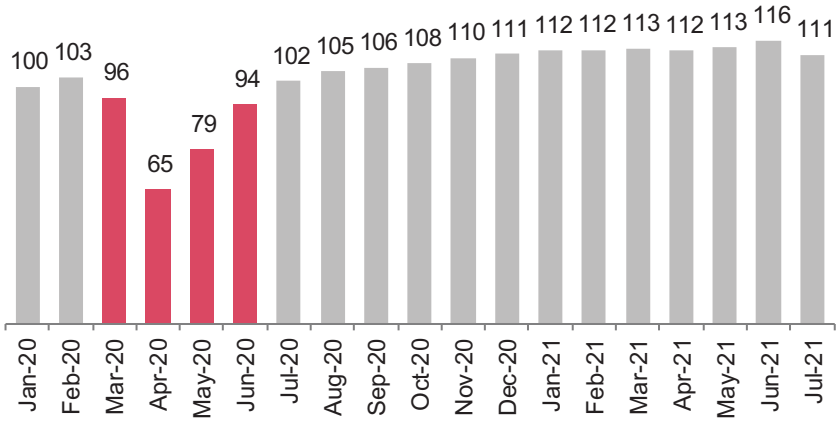
Graph 11

Development of Electricity Demand
(2019-2021), TWh)



Graph 12

Development of Turkey's Industrial Production Index
(2020-2021)



Electricity demand increased significantly in March and April 2021 compared to the same months of previous years. Similar trend was observed through summer months.

Measures taken in 2020 and 2021 to sustain economic activity under Covid-19 paid off in the first half of 2021. Even though Turkey experienced an increasing number of cases during March and April 2021, industrial activity was uninterrupted. As a matter of fact, Turkey implemented very strict lockdown measures between 29 April 2021 and 17 May 2021 in order to halt the surge of the number of cases.

Source: TEİAŞ, TUIK

Five key factors are expected to drive future demand in the electricity market. Expansive government policies and strong industrial development are expected to have the largest impact on future demand

Industry Development & Economic Growth

Industry sectors utilize raw materials and electricity to create value-added products. Increased production directly impacts the overall electricity utilized, and thus, demand. Higher industry production volumes will increase electricity demand in the long run, though higher efficiency and economic downturns might have opposite impacts.

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Government Policies

Government subsidies can directly or indirectly impact electricity consumption. For example, the household consumption support mechanism subsidizes the electricity costs of 2 million households, effectively increasing consumption through government support.

Wealth and Population

A large portion of the increase in global electricity demand comes from developing economies like Turkey. This phenomenon is attributable to (i) Increases in wealth, which leads to higher demand for consumer goods, and **(ii)** Increases in population, as a higher number of consumers leads to higher consumption.

Efficiency in Electricity Use

While electricity demand continues to increase with rising wealth and a growing population, efficiencies from technological development and government policies are able to counter this increase. Turkey's National Energy Efficiency Action Plan is expected to have a significant impact on electricity consumption in future years.

Process of Electrification

Electrification is the process of shifting consumption from combustion-based raw resources to electricity. Examples of this include the introduction of electric vehicles, development of electric-arc furnaces and use of electric heating in households. Turkey is expected to follow the global policy of shifting towards electrification in an effort to reduce its dependency on imported energy sources.

Source: MENR

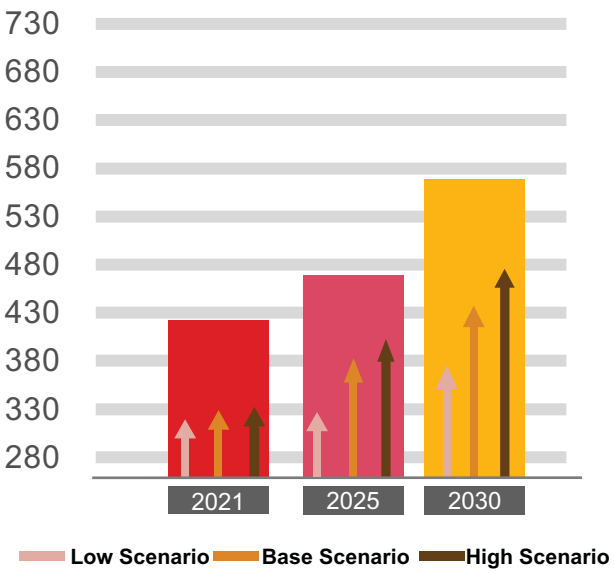
TEİAŞ publishes a demand forecast report with three demand growth scenarios (low, base and high), combining forecast results from distribution companies and for licensed Organized Industrial Zones. The latest report was released in November 2020 and projects electricity demand in Turkey for the following 10 years

According to the Electricity Market Demand Forecasts Regulation, distribution companies are obliged to annually report 10-year electricity demand forecast for their distribution regions to MENR and TEİAŞ. Similar reporting obligations for 5-year periods apply to designated retail companies. TEİAŞ combines information from these reports with the information obtained from organized industrial zones to prepare the demand forecast.

The gross electricity demand in Turkey for the 12 months up to and including August 2021 was 325.9 GWh, which was higher than TEİAŞ's high scenario demand forecast for 2021.

Graph 13

Total Electricity Demand (GWh)



Graph 14

TEİAŞ Electricity Demand Forecasts (2021-2030)

	Low Scenario		Base Scenario		High Scenario	
Year	Demand (GWh)	Growth Rate (%)	Demand (GWh)	Growth Rate (%)	Demand (GWh)	Growth Rate (%)
2021	284,773		295,913		307,753	
2022	293,486	3.1%	307,045	3.8%	331,924	7.9%
2023	305,258	4.0%	321,445	4.7%	349,759	5.4%
2024	313,490	2.7%	333,023	3.6%	365,321	4.4%
2025	321,022	2.4%	342,994	3.0%	378,540	3.6%
2026	328,180	2.2%	352,695	2.8%	391,763	3.5%
2027	335,631	2.3%	362,732	2.8%	405,552	3.5%
2028	343,534	2.4%	373,772	3.0%	421,543	3.9%
2029	351,246	2.2%	384,443	2.9%	436,600	3.6%
2030	359,252	2.3%	395,918	3.0%	453,590	3.9%

Source: TEİAŞ

3

Generation

The installed capacity of EÜAŞ-owned facilities increased significantly between 1970 and 1990. Following increasing investments from IPPs and large scale privatizations in the last 20 years, the share of EÜAŞ-owned capacity in the market decreased significantly

1 Limited Private Presence

- Generation owned by local municipalities and state-owned generation company TEK,
- Long standing autoproducers and few concession companies operating.

2 State owned Expansion

- Generation owned by local municipalities and state-owned generation company TEK,
- Long standing autoproducers and few concession companies operating.

3 Beginning of Privatizations

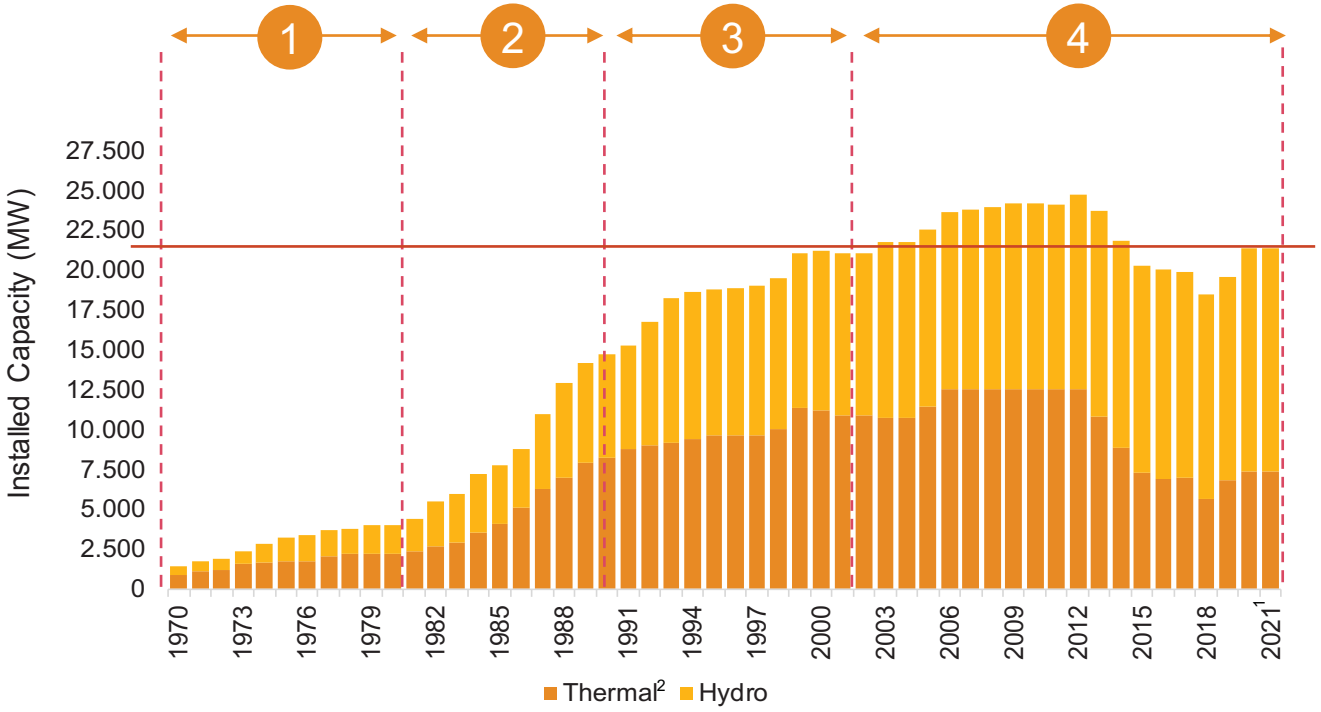
- Introduction of public private partnerships,
- Signing of several large-scale BOT models, thus reducing EÜAŞ's share of capacity,
- Increasing number of autoproducers.

4 Market Liberalization

- Privatization of state generation assets,
- Incentives provided to increase IPPs' shares in the generation market,
- Expiration of most of the BO-BOT agreements by the end of 2019.

Graph 15

Installed Capacity of EÜAŞ (1970-2021)



[1] Data as of August 2021
[2] Includes a small portion of geothermal and wind power plants

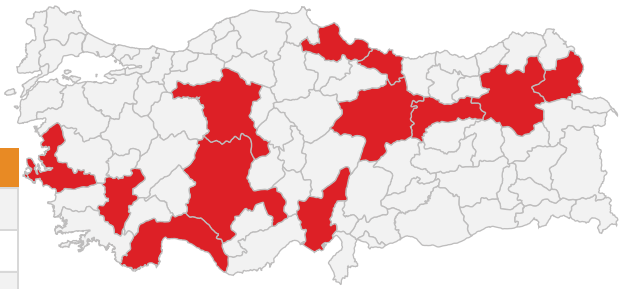
Source: EÜAŞ, TEİAŞ

There are several small and large HPPs owned by EÜAŞ awaiting privatization

Table 3

Privatization Project Pipeline

Facility Name	Capacity (MW)	City
Çamlıca 1 HPP	84,0	Kayseri
Kesikköprü HPP	76,0	Ankara
Demirköprü HPP	69,0	İzmir
Seyhan 1 HPP	60,0	Adana
Topçam HPP	60,0	Ordu
Derbent HPP	56,0	Samsun
Çamlıgöze HPP	32,0	Sivas
Kepez 1 HPP	26,4	Antalya
Tortum HPP	26,2	Erzurum
Girvelek 2-Mercan HPP	11,6	Erzincan
Seyhan 2 HPP	8,0	Adana
Yüreğir HPP	6,0	Adana
Kepez 2 HPP	6,0	Antalya
Çal HPP	2,2	Denizli
Dereiçi HPP	0,4	Kars
Koyulhisar HPP	0,2	Sivas
Total	**524,0**	



*There are several hydropower plants currently awaiting the privatization process. These HPPs have an installed capacity of **524 MW** in total.*

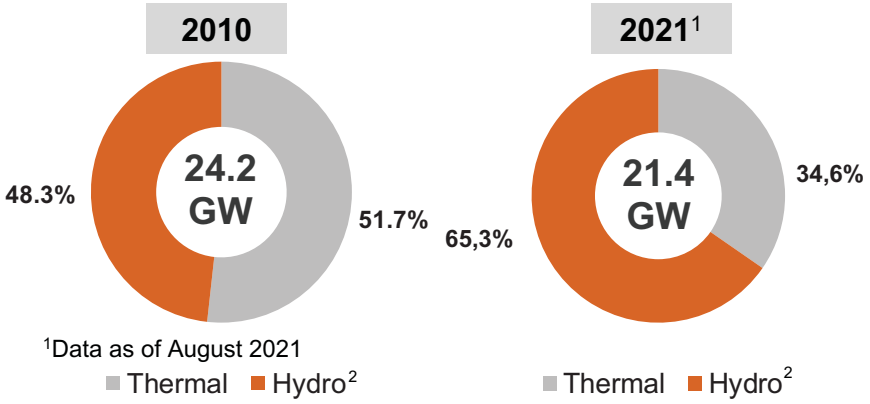
Largest EÜAŞ Owned Hydropower Plants

- **2,405 MW** Atatürk HPP
- **702 MW** Altınkaya HPP
- **1,800 MW** Karakaya HPP
- **672 MW** Birecik-Nizip HPP
- **1,330 MW** Keban HPP
- **670 MW** Deriner HPP
- **1,200 MW** Ilısu HPP
- **510 MW** Berke HPP

Latest large scale privatization was completed as 24 September 2021, as Aydem Yenilenebilir Enerji acquired Akköprü HPP from EÜAŞ for a privatization fee of 605m TL, at a competitive tender. Akköprü, located in Muğla, owns 115 MW in installed capacity and can generate 343 GWh of electricity per annum.

Graph 16

Installed Capacity Of EÜAŞ by Energy Source (%)



[2]Includes a small portion of geothermal and wind power plants

Source: Directorate of Privatization Administration, EÜAŞ

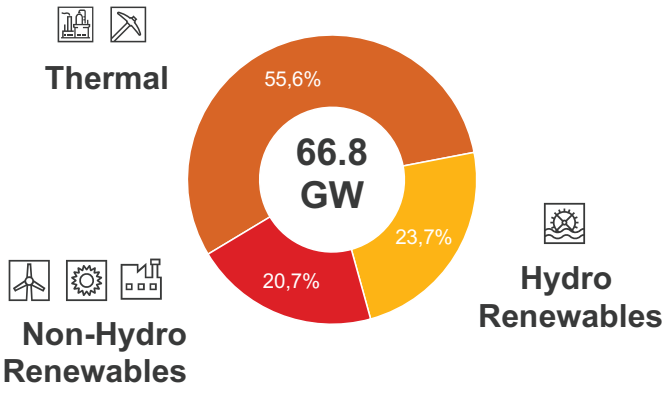
The total installed capacity of EÜAŞ had decreased from 24.2 GW to 21.4 GW as of August 2021. This was mainly due to large scale privatizations in the last 10 years. The share of EÜAŞ-owned capacity in the market decreased from 48.9% in December 2010 to 21.8% in August 2021.

The share of state-owned installed capacity has been shrinking since the early 2000s due to the increase of investments by IPPs as well as large scale privatizations.

IPPs had a 67.8% share of the total installed capacity of Turkey in August 2021 which was mainly made up of a mixture of thermal, non-hydro and hydro renewables. The increase in installed capacity of IPPs in recent years is mainly due to the increase of hydro and natural gas power plants.

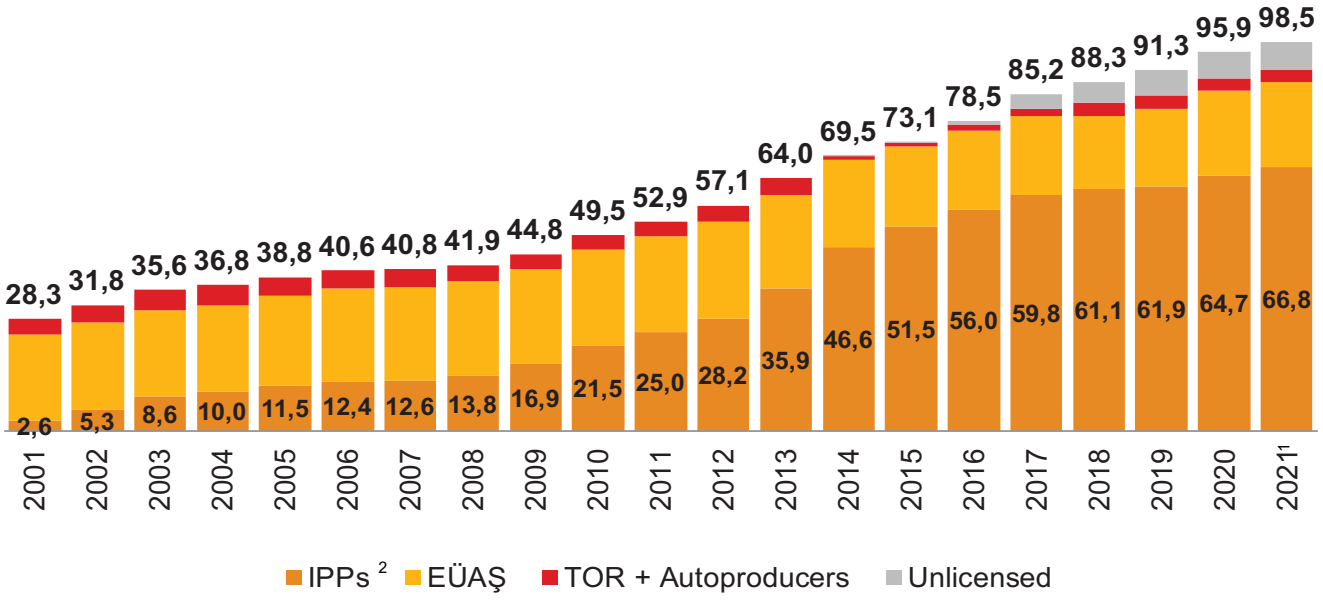
Graph 17

Installed Capacity Breakdown of IPPs, (August 2021)



Graph 18

Installed Capacity Share by Ownership Sources, (2001-2021, GW)[3]



[1]Data as of August 2021

[2]The share of the private companies prior to 2006 are BOT agreements signed with private companies under concession agreements.

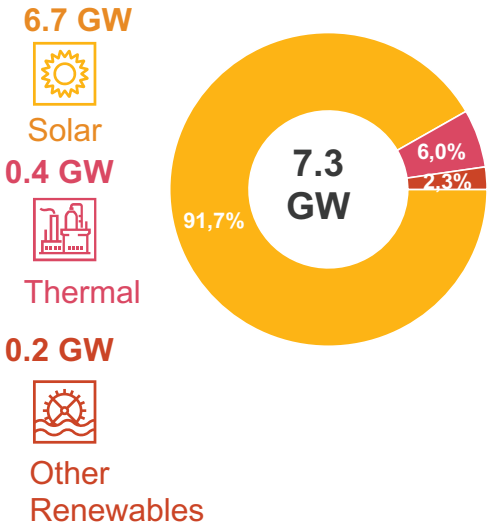
[3] The figures announced in the TEIAS monthly reports, based on the installed capacity of currently operating power plants.

Source: TEİAŞ

Unlicensed capacity increased, particularly through solar investments. 2019 regulations replacing FiT with active energy cost curbed investors' appetite for unlicensed facilities. The development of unlicenced solar facilities on land will be possible only under certain conditions

Graph 19

Unlicensed Installed Capacity (August 2021)



The total installed capacity of the unlicensed power plants increased significantly over the last couple of years, from around **0.4 GW** by the end of 2015 to as high as **7.3 GW** by August 2021. As of August 2021, 91.7 % of the unlicensed capacity in Turkey comes from solar energy, whereas other renewables have lagged significantly behind. There are several key factors attributable to the high amount of unlicensed solar energy in Turkey:

1) Efficiency is not driven by scale

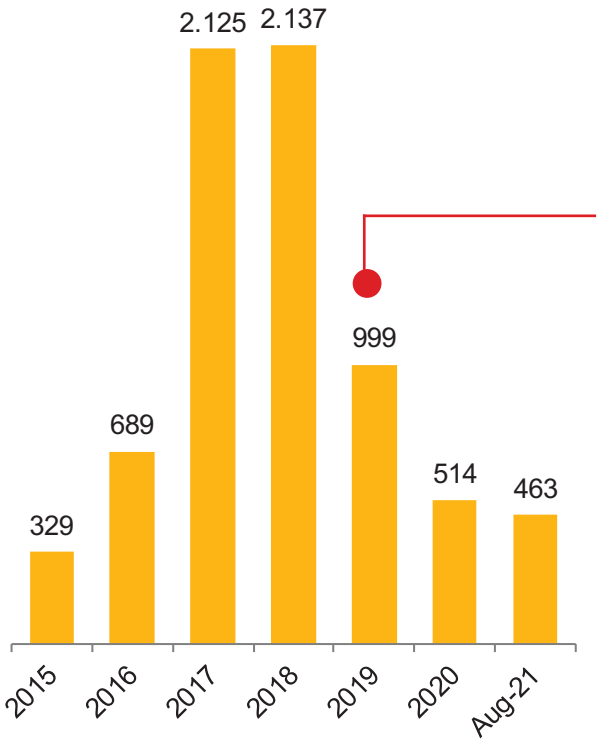
2) Panel costs decreasing over time

3) Turkey's huge solar energy potential

4) Simple operations compared to other technologies

Graph 20

Development of Unlicensed Installed Capacity



Key Regulation Revisions on Unlicensed Generation

1) The presidential decree published in the Official Gazette on 10 May 2019 raised the limit for unlicensed electricity generation to 5 MW, up from the previous 1 MW.

2) New, unlicensed generation facilities established after 12 May 2019 are set to benefit from a new feed-in tariff mechanism which will be based on the "active energy cost" and be applicable for a period of 10 years. Moreover, effective from 12 May 2019, all unlicenced solar facilities are to be established on rooftops, land facilities were temporarily prohibited.

3) A new provision of the Renewable Energy Law effective 2 December 2020 opens the way for unlicensed facilities to continue to sell excess electricity after the end of the FiT, as long as they continue to pay a licence fee, which will be equal to 15% their production valued at DAMP. The Presidency of Turkey was authorized to decide on the price details for unlicensed facilities after the end of FiT period.

Source: TEİAŞ

"Rooftop Legislation" was first introduced in early 2018, in an attempt to regulate the processes for establishing and operating unlicensed solar power plants. Future increases in unlicenced installed capacity are expected to come from rooftop demand and internal consumption driven projects.

After a couple of changes in 2019, the key aspects of the regulation that stand out are as follows.

1) This regulation aims to increase the application of rooftop solar power plants by incentivizing consumption facilities to generate their own energy from available rooftop and facade spaces in their own manufacturing facilities.

2) For each facility, the installed capacity is limited to 10 kW for residential tariff and the application capacity cannot exceed the power amount of the relevant consumption facility discussed in the connection agreement. For industrial and commercial tariffs, Companies are limited to their installed capacities based on transformer contract power in their substation infrastructure.

3) In its earliest version, rooftop regulation allowed for any excess electricity to be sold to a designated retail company based on FiT prices for solar power.

A new edit to the regulation published in May 2019, For the surplus electricity generated, it has been decided that the active energy price of its subscriber group, announced by the Energy Market Regulatory Authority (EMRA), will be applied for a period of 10 years.

4) The process for establishing rooftop power plants is much less complicated than that for other types of unlicensed power plants. Since the opening of the rooftop solar market in Turkey in 2019, the number of applications grew to more than 2,000 with installed capacity of more than 750 megawatts according to Fatih Dönmez, head of MENR, during his speech at the Energy Consumer Summit. This is more or less approved by the additional unlicenced demand throughout 2020 and 2021, which is predominantly driven by rooftop projects.

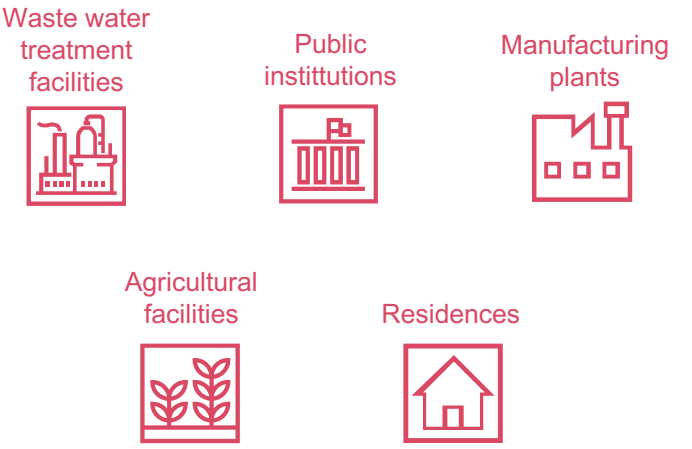
A new communique published in the Official Gazette on 9 May 2021 provided further advantages for unlicensed facilities, some of which are as follows.

1) There is no longer an installed capacity limit, projects that received call letters after 12 May 2019 will be allowed to increase capacity.

2) Land facilities were put back in play under certain conditions.

3) Local incentives will be applicable for facilities that start operating after 30 June 2021.

It is expected that a short-mid term capacity increase in unlicensed facilities will come from internal, consumption-driven, unlicensed plant projects in the below areas:



Source: EMRA

Total installed capacity has expanded and diversified rapidly in the last decade, especially through the expansion of renewable energy sources between 2014 and 2021

Turkey's installed capacity mix diversified and grew considerably with the introduction of new, non-hydro, renewable sources such as **wind, solar and geothermal energy**, and the expansion of existing sources such as **natural gas** and **imported coal**. Total installed capacity in Turkey grew significantly between 2001 and 2020 with a **CAGR of 6.6%**, reaching **95.9 GW, up from 28.3 GW.**

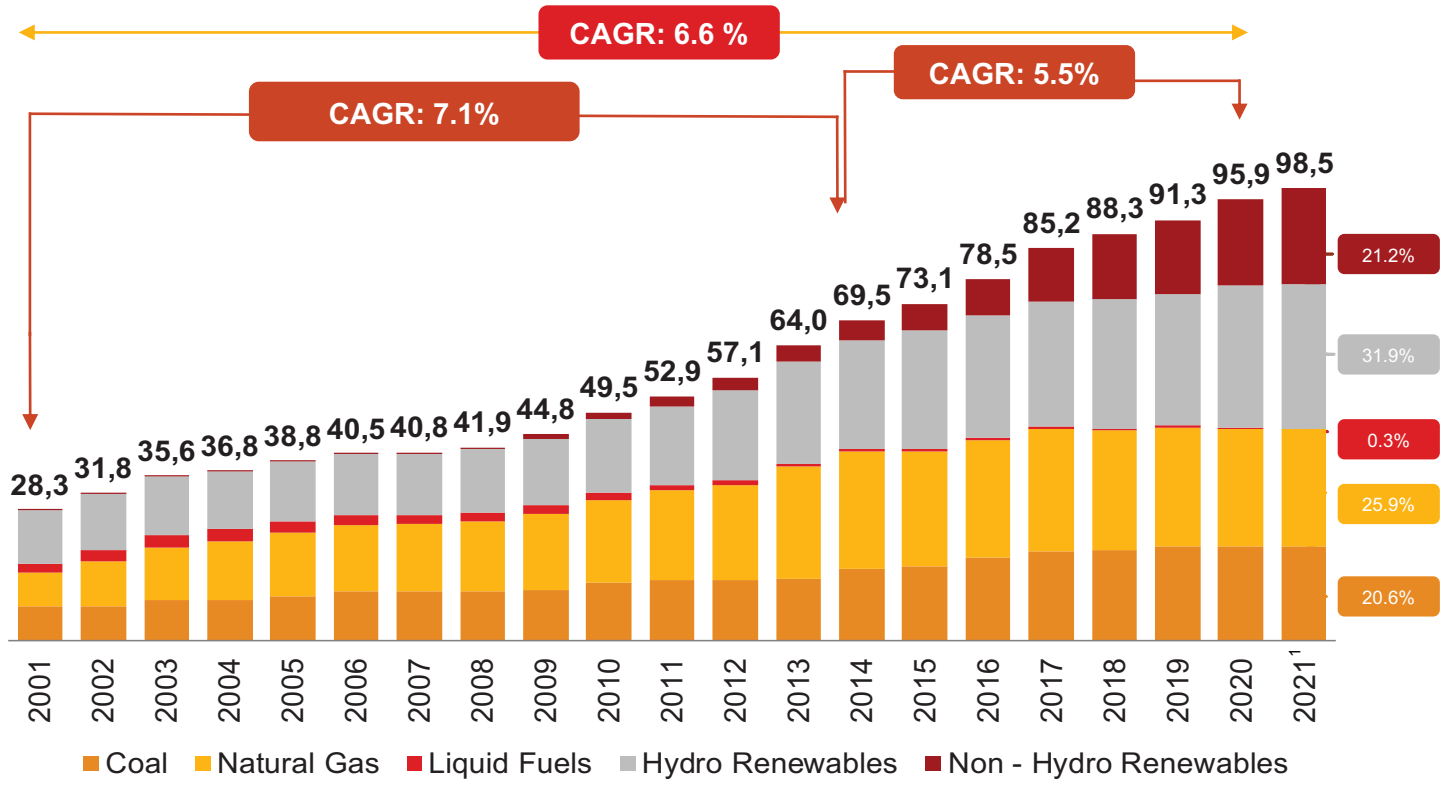
Renewable and natural gas investments between 2009 and 2014 started generating electricity between 2013 and 2017, which led to a period of rapid growth of market supply.

Following the drop of market prices in 2015, new projects were deemed less feasible and the profitability of existing power plants based on thermal sources decreased.

2020 saw a rapid increase in installed capacity, likely to extend into 2021, even with the slowdown due to Covid-19. The additional installed capacity of around 7.2 GW over the 20 months prior to August 2021 came from renewables. Of all investments in that period, HPPs accounted for 2.9 GW and WPPs accounted for 2.5 GW of the total increase.

Graph 21

Installed Capacity by Energy Source (2001-2021[1], GW)



[1]Data as of August 2021

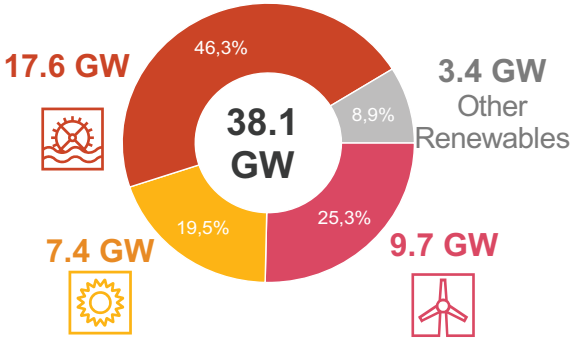
Source: TEİAŞ

Non-hydro renewable capacity in Turkey has increased significantly following the introduction of YEKDEM. Prior to the increased number of YEKDEM participants, the major renewable energy sources utilized in Turkey were run-of-river and reservoir hydropower.

Installed capacity from renewables has increased significantly since 2008, particularly that of hydropower. 46% of total capacity increases between 2009 and August 2021 were attributable to HPPs. However, capacity growth starting from 2014 onwards primarily relied on the development of non-hydro renewable energy sources. This is mainly due to the FiT support provided to renewable energy resources and the decline in the costs of these technologies.

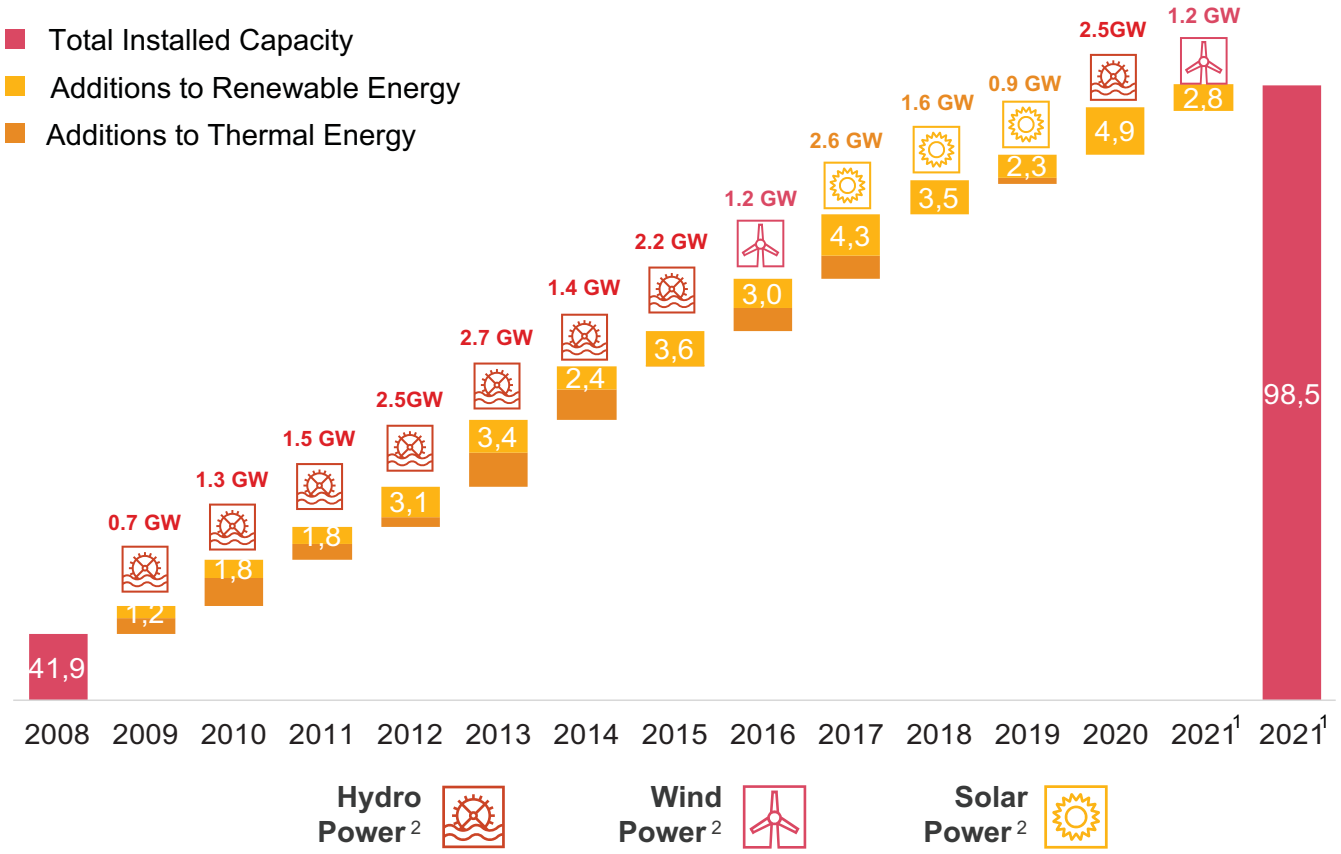
Graph 22

Additions in Renewable Installed Capacity (2009-2021[1])



Graph 23

Breakdown of Increases in Renewable Installed Capacity (2009-2021, GW)



[1]Data as of August 2021
[2] The icons above show the electricity source with the highest growth of installed capacity

Source: EMRA

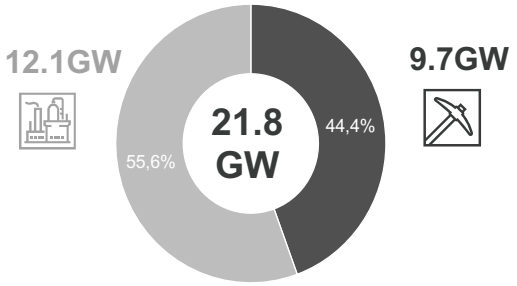
Installed capacity additions from thermal energy sources in the last twelve years came primarily from natural gas and coal

Historical spreads and future expectations led to an increase in installed capacity for CCGTs from 2009-2013. 2013 was particularly notable, due to the completion of the construction of 4 CCGTs, each with more than 500 MW of installed capacity.

The construction of CCGTs slowed down after 2014, following the sharp drop in market prices. Thereafter investors favoured imported coal due to lower costs and higher efficiency.

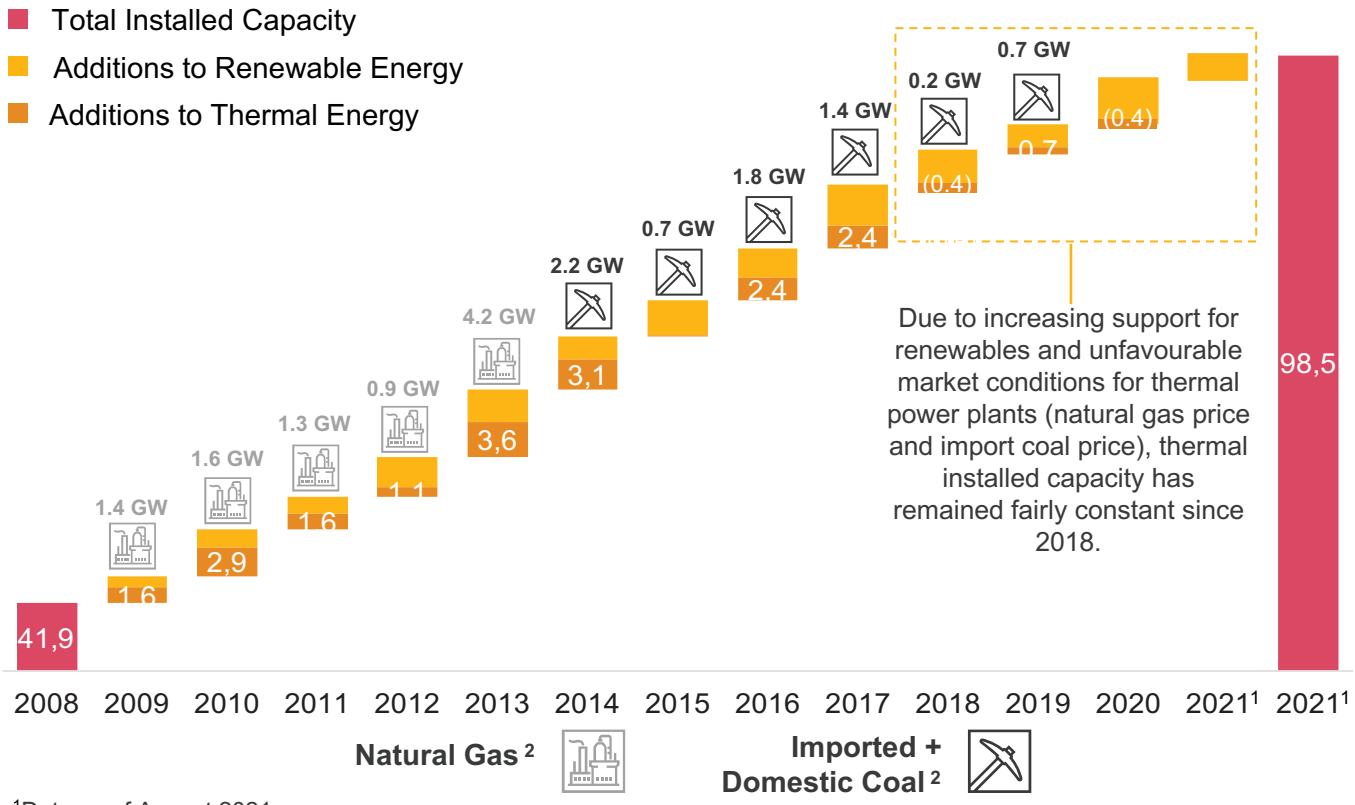
Graph 24

Additions in Thermal Installed Capacity (2009-2021[1])[3]



Graph 25

Breakdown of Increases in Thermal Installed Capacity (2009-2021, GW)



[1]Data as of August 2021
[2] The icons above show the electricity source with the highest growth of installed capacity
[3] The numbers above represent the gross additions to installed capacity. The net increase is measured as 18.5 GW. This difference is due to the decreases in the installed capacity for natural gas (1.7 GW) and liquid fuel (1.6 GW) power plants.

Source: EMRA

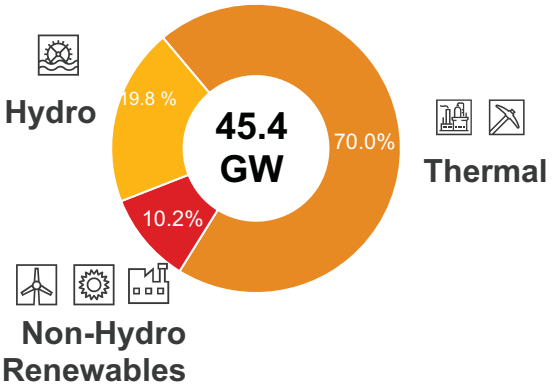
There are currently 16 independent power producers in the electricity generation market that have an installed capacity exceeding 1 GW

Although the mix of installed capacity has changed significantly since **2014**, the largest source of installed capacity for many of the largest companies continues to be coal and natural gas.

The largest IPPs of Turkey, illustrated below, accounted for a total of **45.4 GW** of installed capacity as of **July 2021**, which is roughly **46.6%** of total installed capacity. **70.0%** of the installed capacity of **the largest IPPs** is related to thermal energy sources.

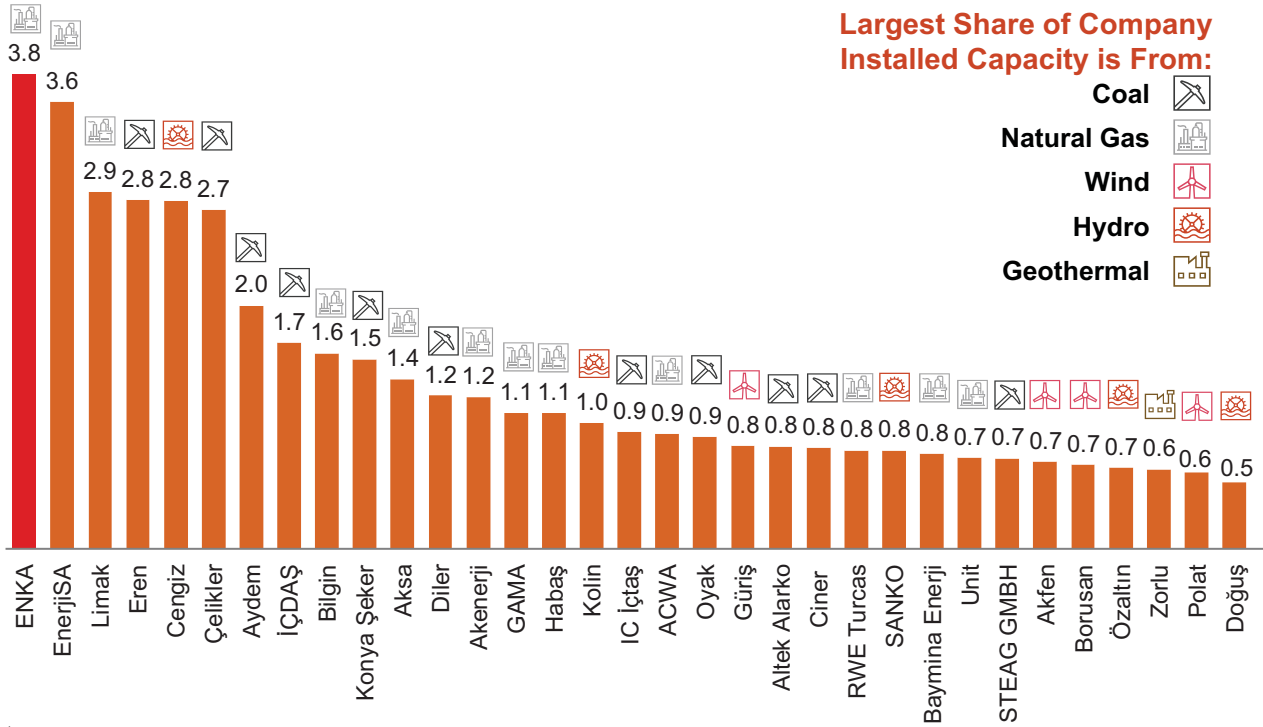
Graph 26

Installed Capacity Breakdown of Largest IPPs (2021)



Graph 27

Largest IPPs by Installed Capacity[1] (2021, GW)



[1]Installed capacities of the independent power producers have been adjusted based on the equity share of their co-owned power plants. Power plants under construction were not considered as part of the total capacity. The analysis above includes ENKA and the 33 largest IPPs by installed capacity after ENKA. ENKA is distinguished in this analysis due to its CCGT installed capacity being mothballed as of the date of this report. Only the installed capacity of licensed power plants have been taken into consideration in determining the installed capacity figures provided above.

Source: Publicly Available Sources (As of July 2021)

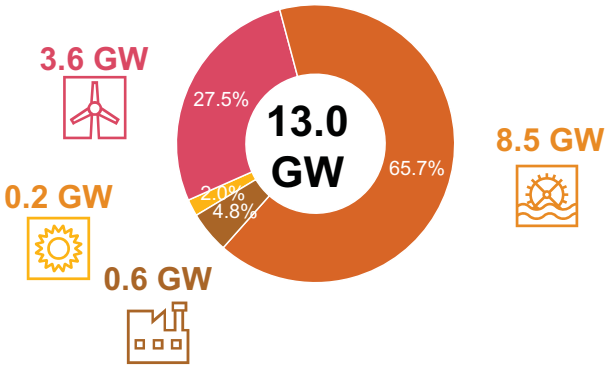
There are 17 companies in Turkey that have more than 250 MW of capacity based on renewable sources. These companies primarily operate HPPs, with fewer large market players investing solely in wind, solar and geothermal power plants

The largest companies in terms of installed renewable capacity primarily operate HPPs. For the companies listed below, the share of renewable assets within their total portfolios accounted for **64.3%** of total installed capacity as of **July 2021**. Only a small portion of these companies utilize solar power plants, while several have expanded solely through wind power plants.

The share of renewable energy in total capacity for these companies is expected to increase in the future.

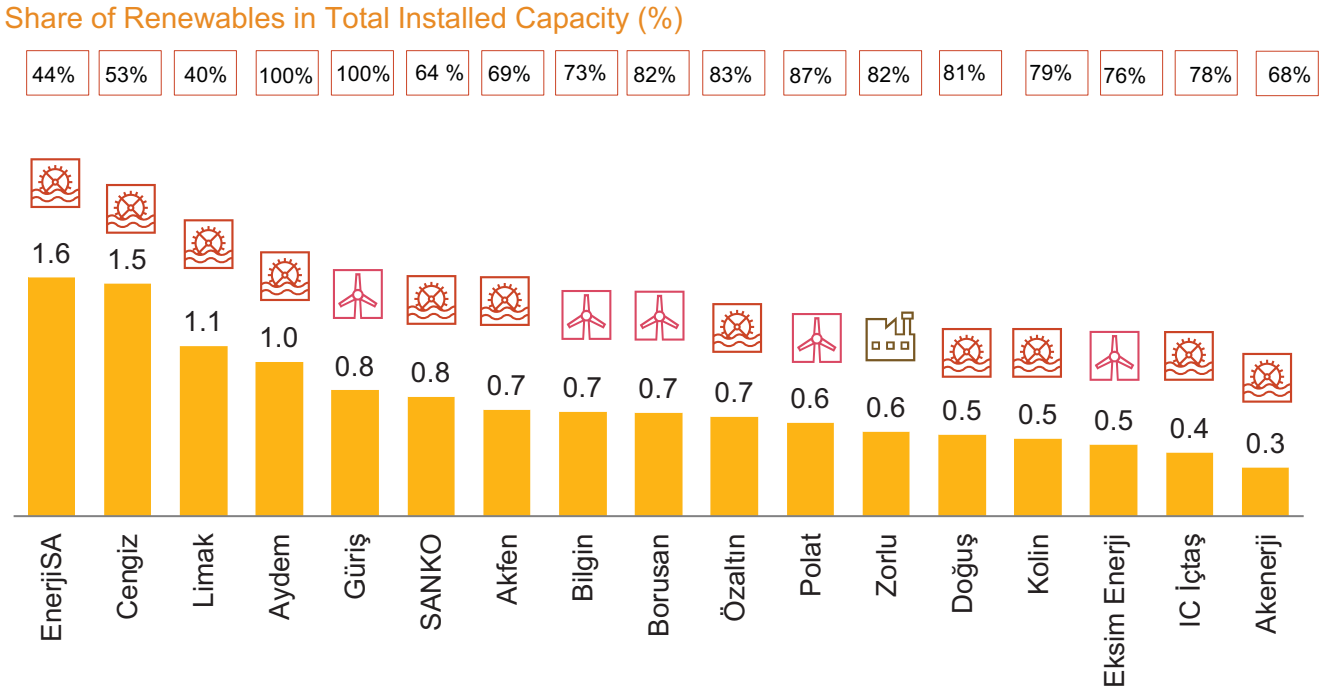
Graph 28

Renewable Capacity Breakdown of 17 Major Renewable IPPs (2021)



Graph 29

Major IPPs by Installed Capacity in Renewables (2021, GW)



Source: Publicly Available Sources (As of July 2021)

The electricity generation mix in Turkey has greatly diversified over the last 50 years

1. In the 70s and early 80s, the electricity supply was made up of a mixture of hydropower, domestic coal and liquid fuels.

2. The share of liquid fuels decreased over the years as the share of coal and hydropower increased and natural gas was introduced to the generation mix.

3. Despite the increasing capacity, hydropower generation has fluctuated depending on annual climatic conditions.

4. Generation from natural gas facilities started in 1985 and picked up pace following by the first ever importing of natural gas in 1987. In the 90s, there has been a strong influx of natural gas BOT facilities.

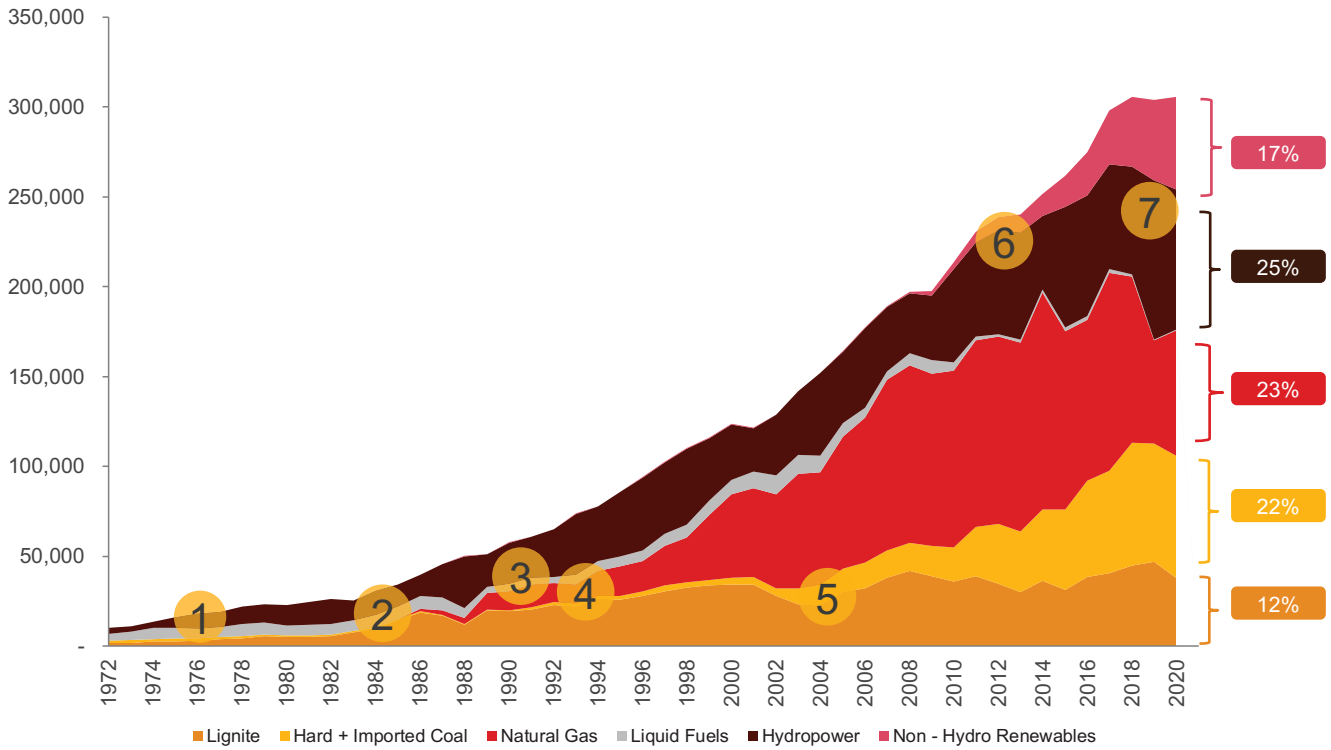
5. The imports of hard coal began to increase following the increase of hard coal power plant investments. This increase was attributable to the lower marginal cost of generation of imported coal compared to local coal sources.

6. Share of generation from non-hydro renewables started to increase significantly post-2014 due to two main reasons:
i) Turkey's FIT scheme under YEKDEM started to provide more favorable price levels compared to DAMP
ii) Investment costs for renewable technologies started to decrease

7. The decrease in total electricity demand in 2020 caused by the Covid-19 epidemic also led to decreases in the production of thermal power plants with high marginal costs.

Graph 30

Electricity Generation by Source (1970-2020, GWh)



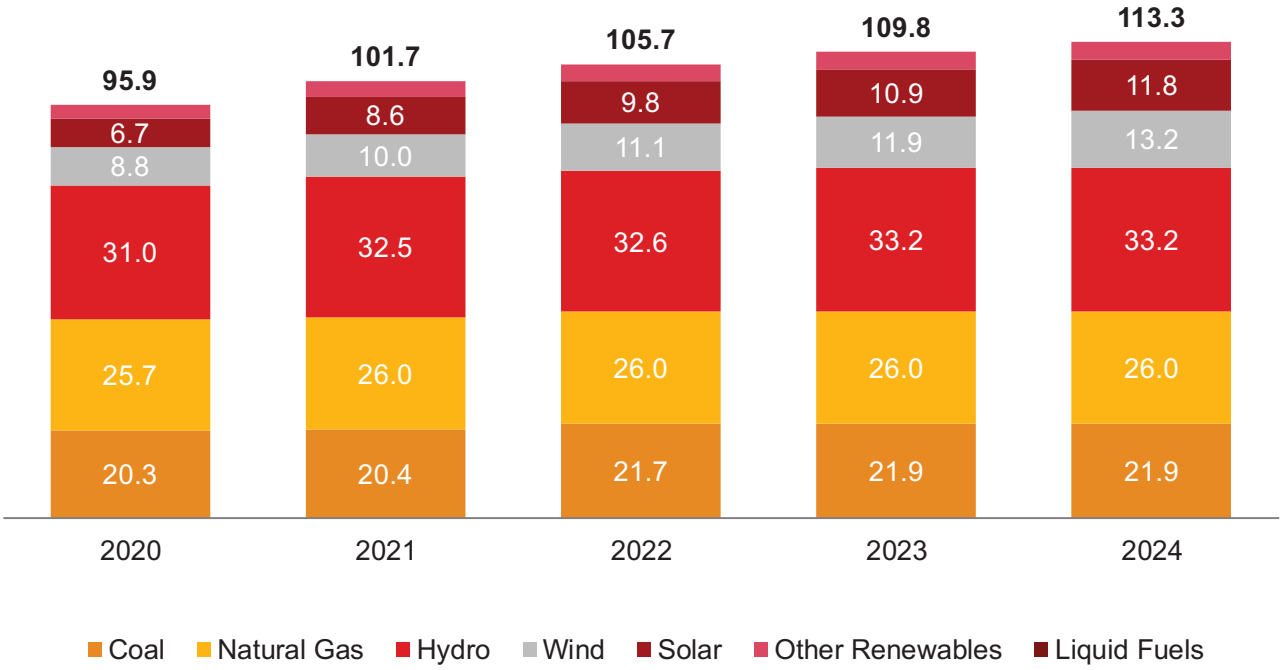
Source: TEİAŞ

TEİAŞ' 2020 expectations for the total installed capacity was to reach 101.7 GW in 2021, around 3.2 GW more than the realized installed capacity in August 2021

Actual installed capacity fell short of TEİAŞ forecasts for 2020 and 2021, primarily due to the lower than expected demand growth.

Graph 31

TEİAŞ Installed Capacity Forecasts (2020-2024, GW)



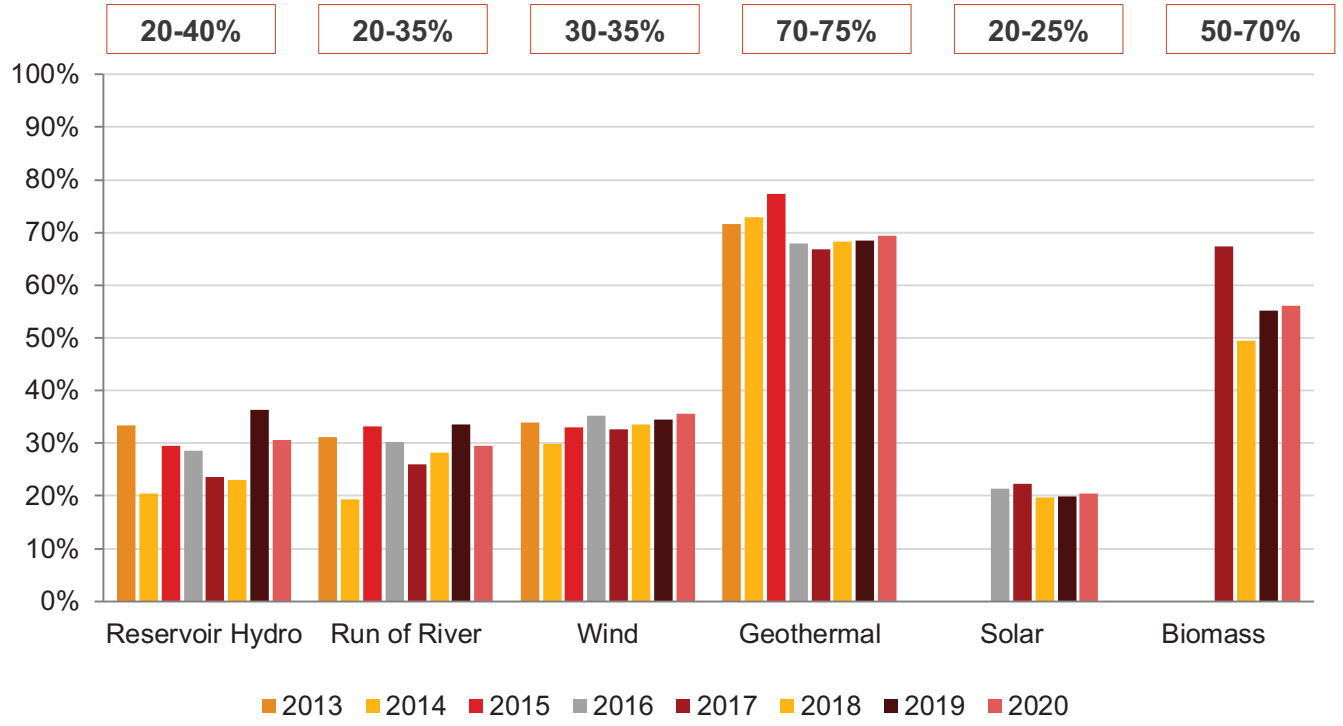
	Coal	Natural Gas	Liquid Fuels	Hydro	Wind	Solar	Other Renewables	Total
2020	20.3	25.7	0.3	31.0	8.8	6.7	3.1	95.9
2021	20.4	26.0	0.5	32.5	10.0	8.6	3.6	101.7
2022	21.7	26.0	0.6	32.6	11.1	9.8	3.9	105.7
2023	21.9	26.0	1.8	33.2	11.9	10.9	4.1	109.8
2024	21.9	26.0	3.1	33.2	13.2	11.8	4.1	113.3

Source: TEİAŞ

Turkey's renewable energy sources exhibit varying capacity factors, hydro sources tend to have the most fluctuating capacity factor. Reserve margin exhibited stable trend last two years.

Graph 32

Capacity Factors (2013-2020)



Capacity factor refers to how much electricity a plant generates compared to its theoretical maximum generation capacity. The highest percentage change is with reservoir hydro power plants, as the capacity factor of these plants decreased from 36% in 2019 to 31% in 2020. The decline in 2019 is due to being the wettest year on record higher than the average. However, hydropower electricity generation in 2020 is still high compared to previous years.

Source: TEİAŞ

Many factors have an impact on the generation mix of a country, the most important being government policy

The generation mix of a country may change based on several factors:

- ✓ Government policies and targets
- ✓ Level of technological advancement
- ✓ Financial resources and planning
- ✓ Availability of natural resources and renewable energy sources
- ✓ Geographical location and proximity to certain energy hubs.

Govermental Policies

Utilizing natural coal reserves and increasing share of renewables

Eliminating coal from generation mix until 2025

Significantly reducing dependency on nuclear energy

Investment in solar energy to promote growth

Phasing out nuclear and coal facilities in the near future

Reducing the share of coal generation to 60% by 2030

Decommissioning nuclear reactors and developing renewables

Continued expansion of hydropower and large offshore oil and gas discoveries

Adopting a new law making the net zero emission target by 2050

Meet the obligations for greenhouse gas emissions for Renewable Energies in 2020

Increasing energy efficiency and promote use of renewable energy in electricity generation

Reducing coal and gas imports and increase energy efficiency

Reducing the share of coal generation focusing on diversification of the power mix by 2030

Reducing greenhouse gas emissions and for 100% of electricity to come from renewables by 2050.

Source: Fitch Solutions, OECD

The energy mixes of most countries around the world are dominated by fossil fuels. In future years we will see more dependence on low carbon resources as the source of electricity generation.

Table 4

Electricity Generation Mix by Country (2019)

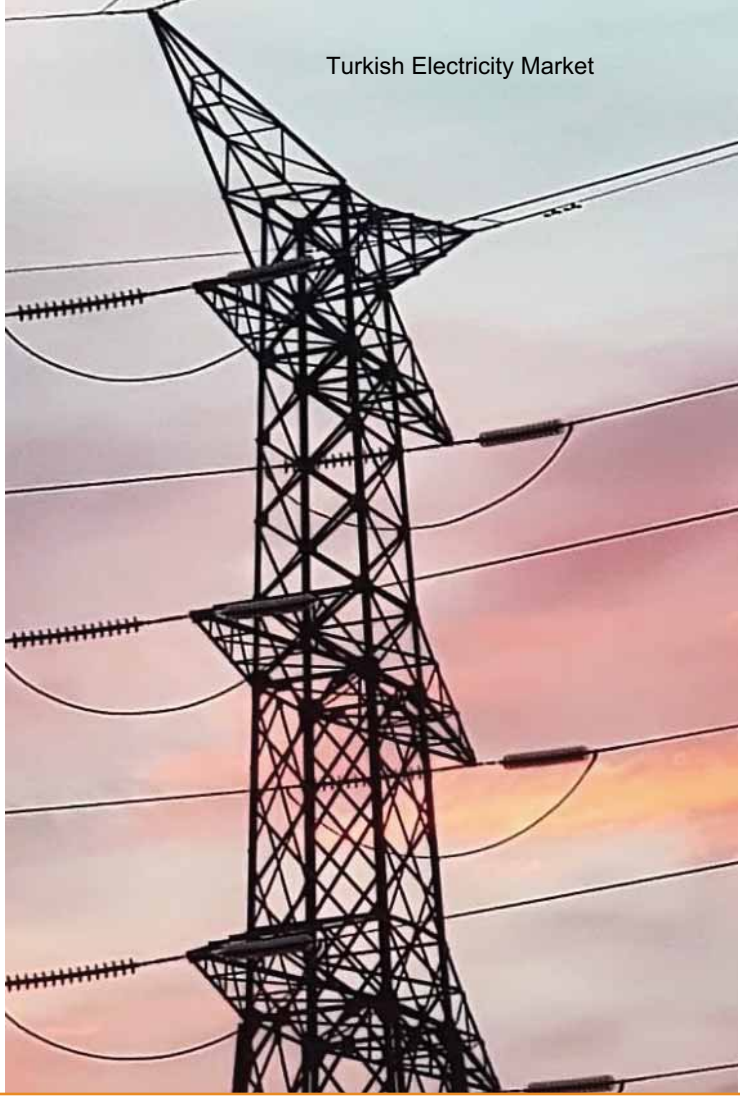
	Coal	Natural Gas	Liquid Fuels	Nuclear	Hydro	Non-Hydro Renewables	Total Renewables
	37%	19%	0%	0%	29%	15%	44%
	2%	5%	1%	71%	12%	9%	21%
	5%	39%	1%	19%	2%	33%	35%
	11%	45%	4%	0%	18%	24%	41%
	37%	13%	1%	12%	4%	34%	37%
	78%	7%	1%	0%	1%	12%	13%
	14%	21%	5%	20%	13%	26%	39%
	4%	10%	2%	3%	64%	19%	82%
	12%	25%	0%	48%	1%	14%	15%
	24%	15%	1%	19%	26%	15%	41%
	1%	65%	3%	6%	20%	5%	25%
	9%	60%	10%	3%	7%	10%	17%
	88%	0%	0%	5%	2%	5%	7%
	16%	59%	1%	3%	0%	20%	20%

Source: IEA

4

Transmission & Distribution

Transmission System



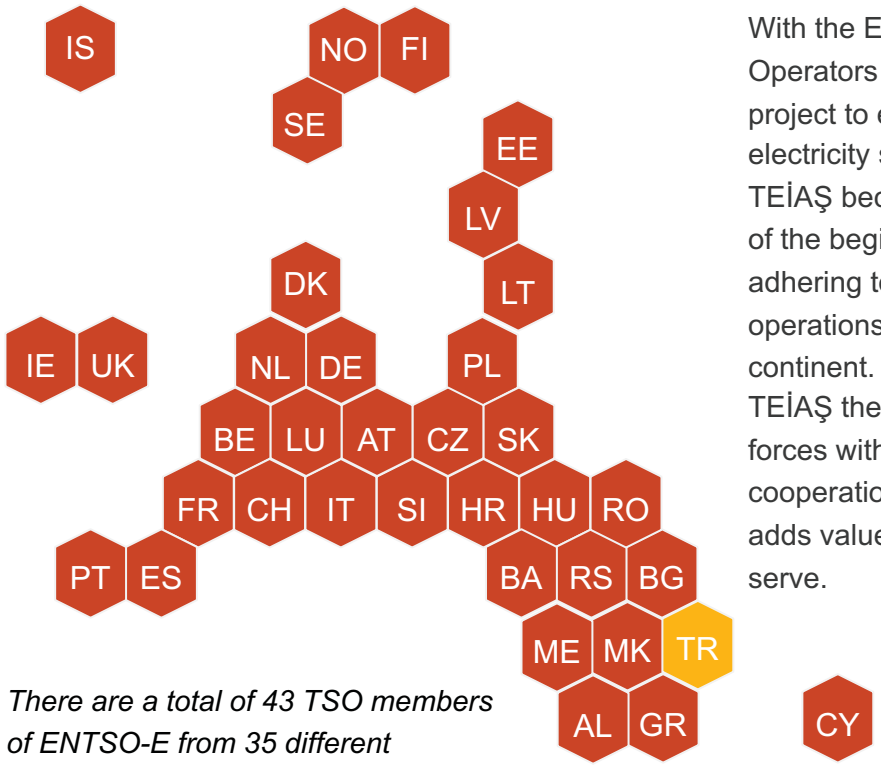
Capacity

As of the end of 2020, the total length of transmission lines in the country amounted to **71,098 km**, and there were 1,214 transformer centres and 2,327 transformers worth 210,920 MVAs in total. There are 11 interconnection lines with neighbouring countries.

Trade through Transmission System

As of 2020, electricity exports in Turkey reached 2,484 GWh, whereas total electricity imports amounted 1,888 GWh. Greece constituted the highest share of electricity exports with 74.1%, and 89.4% of total electricity was imported from Bulgaria in 2020.

Country of Origin of the Transmission System Operators Members of the ENTSO-E



There are a total of 43 TSO members of ENTSO-E from 35 different countries. TEİAŞ, the Turkish TSO, has been an observing member of ENTSO-E since 2016.

With the European Network of Transmission System Operators (ENTSO-E), Turkey has developed a project to establish a connection between its national electricity system and the European electricity system. TEİAŞ became an observer member of ENTSO-E as of the beginning of 2016. TEİAŞ committed to adhering to the very high standards for system operations common to the other grid operators of the continent. The observer member status will give TEİAŞ the opportunity to attend groups and task forces within the association. This will facilitate cooperation between ENTSO-E and TEİAŞ when this adds value for operators and the customers they serve.

Source: TEİAŞ, ENTSO-E

Prior to 2004, the distribution network in Turkey was operated by TEDAŞ, a state-owned monopoly. Following government policy directed towards privatization, the distribution network was split into 21 regions controlled by private market players

The privatization of the distribution sector concluded in 2013. The sector is controlled by 21 distribution companies that are active in their related regions and are responsible for the following.

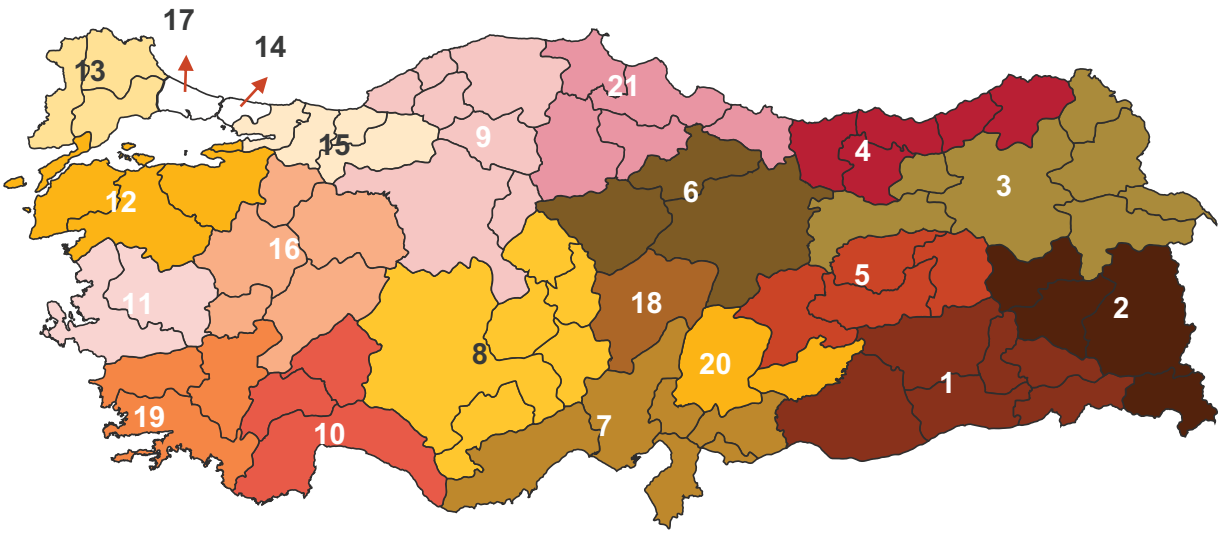
- Maintenance of the local distribution network,
- Development of the distribution network,
- Collecting metering data and engaging in the billing process,
- Forecasting electricity demand of the region.

Local and foreign investors, some of whom were already engaged in electricity generation, participated in the privatization process. After the unbundling of distribution and retail activities, private distribution companies now also have separate retail arms and the right to engage in retail electricity sales in their regions.

Table 5

List of Distribution Regions

Region	DSO Name	Operating Firms
1	Dicle Edaş	Eksim
2	Vedaş	Türkerler
3	Aras Edaş	Çalık-Kiler
4	Çoruh Edaş	Aksa
5	Fırat Edaş	Aksa
6	Çedaş	Kolin-Cengiz
7	Toroslar Edaş	EnerjiSA
8	Medaş	Alarko-Cengiz
9	Başkent Edaş	EnerjiSA
10	Akdeniz Edaş	Kolin-Cengiz
11	Gdz	Aydem
12	Uedaş	Limak
13	Tredaş	Ic Içtaş
14	Ayedaş	EnerjiSA
15	Sedaş	Akenerji-CEZ
16	Oedaş	Zorlu
17	Bedaş	Kolin-Cengiz
18	Kcetaş	Kayseri Municipality
19	Adm	Aydem
20	Akedaş	Kipaş
21	Yedaş	Çalık



Source: EMRA

The privatization of the distribution sector has brought greater investment and lower technical & non-technical loss ratios

As part of the market liberalization process, the distribution sector was privatized between 2008-2013, resulting in deals with a total value of USD 13 bn. The total investment in distribution networks between 2014 and 2020 reached USD 9 bn, with an annual average investment of USD 1.2 bn.

The privatization of the distribution sector provided the following benefits.

- Increased investment in distribution networks by the private sector
- Decreased technical & non-technical losses following new investments and operations
- Increased efficiency due to the increasingly competitive environment.

Graph 33

Private Sector Investments (2011-2019, USD bn)

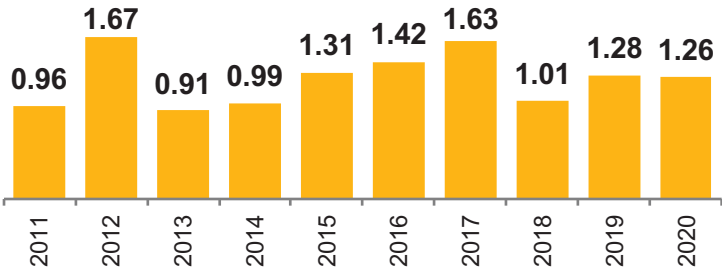


Table 6

List of Distribution Companies Privatized (2008-2013)

#	DSO	Tender Price (USD m)	Tender Year	Price per kWh (USD)	Price per Customer (USD)	Owner
1	Dicle Edaş	387	2013	25	352	Eksim
2	Vedaş	118	2013	40	289	Türkerler
3	Aras Edaş	129	2008	54	172	Çalık-Kiler
4	Çoruh Edaş	227	2009	88	223	Aksa Energy
5	Fırat Edaş	230	2010	98	338	Aksa Energy
6	Çedaş[1]	259	2010	111	347	Kolin-Cengiz
7	Toroslar Edaş	1,725	2013	109	629	EnerjiSA
8	Medaş	440	2008	72	278	Alarko-Cengiz
9	Başkent Edaş	1,225	2008	101	385	EnerjiSA
10	Akdeniz Edaş[2]	546	2012	84	352	Kolin-Cengiz
11	Gdz	1,231	2012	91	515	Aydem
12	Uedaş[3]	940	2010	80	394	Limak
13	Tredaş	575	2010	101	785	Ic Içtaş
14	Ayedaş	1,227	2013	132	547	EnerjiSA
15	Sedaş	600	2008	67	446	Akenerji-CEZ
16	Oedaş[4]	485	2009	94	370	Zorlu
17	Bedaş[5]	1,960	2012	96	496	Kolin-Cengiz
18	Kcetaş	0	2009	n.a.	n.a.	Kayseri ve Civarı Elk.TAŞ
19	Adm	110	2008	n.a.	n.a.	Aydem
20	Akedaş	60	2011	n.a.	n.a.	Kipaş
21	Yedaş	442	2009	98	291	Çalık

*The tender price and number of customers presented are as of the date of the privatization

[1] Tender winner was the Cengiz-Limak-Kolin joint venture. Limak left the joint venture in late 2016.

[2] Tender winner was the Cengiz-Limak-Kolin joint venture. Limak left the joint venture in late 2016.

[3] Tender winner was the Cengiz-Limak-Kolin joint venture. Limak took over the company in late 2016.

[4] Tender winner in 2010 was Yıldızlar SSS Holding. In 2013, EMRA took over management of the company because Yıldızlar SSS Holding did not fulfil its obligations. In the beginning of 2017, the company was sold to Zorlu Enerji for USD 360 m.

[5] Tender winner was the Cengiz-Limak-Kolin joint venture. Limak left the joint venture in late 2016.

Source: TEİAŞ, Directorate of Privatization Administration

The technical & non-technical loss ratio of the distribution areas have decreased significantly in the last couple of years, sliding from 13.4% in 2016 to 9.5% as of 2020.

The technical & non-technical loss is the difference between total electrical energy entering the distribution area and total electrical energy billed to consumers. It is the amount of electricity consumed that was not officially recorded.

Technical & non-technical loss is calculated by dividing the loss-leakage amount by the total electrical energy entering the distribution system. Some of these losses are technical losses while non-technical losses are caused by pilferage.

Although some distribution regions had above-average realized technical and non-technical loss rates, a downward trend was observed in most of the distribution regions. Therefore, the average target technical and non-technical loss rates of these 21 regions dropped during the observed period.

Graph 34

Average Technical & Non-Technical Losses (2016-2020, %)

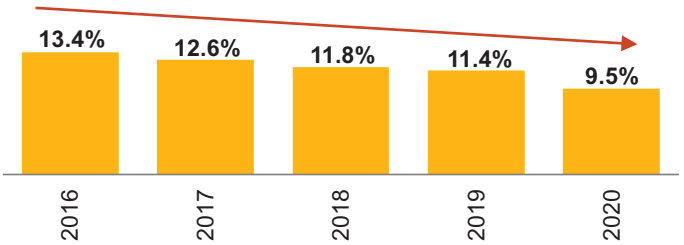


Table 7

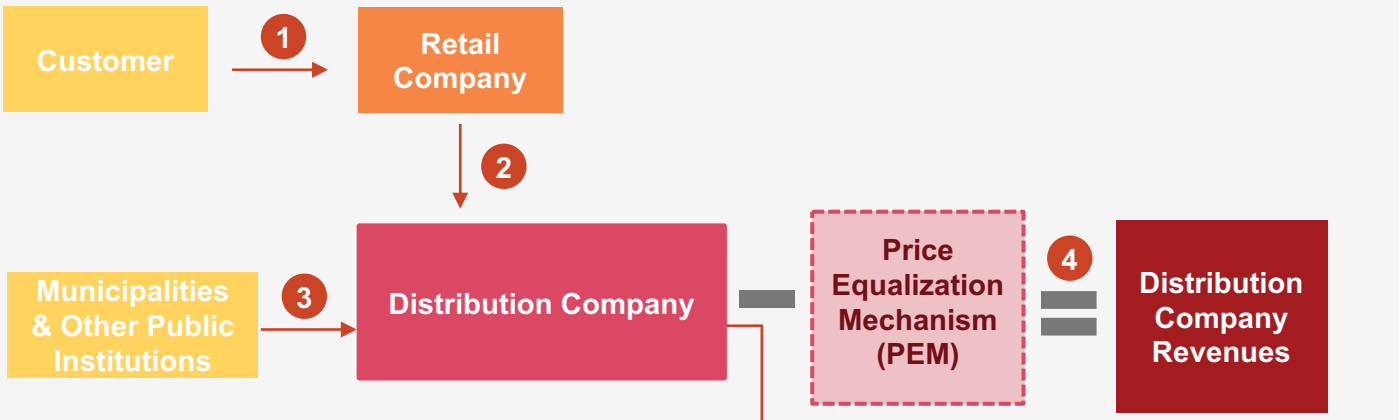
Realized Technical & Non-Technical Loss Ratios and Share of Consumption (2017-2020)

	Realized Loss Rate		Share of Consumption
Region	2017	2020	2020
Dicle Edaş	64.8%	46,32%	5%
Vedaş	53.3%	44.6%	1%
Aras Edaş	24.6%	20.6%	1%
Toroslar Edaş	11.4%	11.4%	12%
Fırat Edaş	11.0%	9.8%	1%
Çoruh Edaş	8.1%	7.3%	2%
Yedaş	7.4%	7.3%	3%
Bedaş	6.7%	7.6%	11%
Gdz	7.3%	6.4%	8%
Sedaş	6.4%	5.9%	7%
Oedaş	7.0%	6.5%	4%
Medaş	5.8%	6.1%	5%
Başkent Edaş	6.1%	6.2%	8%
Ayedaş	6.1%	5.4%	5%
Kcetaş	6.0%	6.1%	2%
Akedaş	5.5%	6.1%	2%
Akdeniz Edaş	6.7%	7.1%	4%
Çedaş	6.6%	7.6%	1%
Adm	5.3%	6.2%	4%
Tredaş	5.1%	5.6%	4%

Source: EMRA

Distribution networks with high technical & non-technical loss ratios have low electricity consumption rates. Hence, supported by the electricity consumption parameter, Turkey's average technical loss ratio is on a downward trajectory.

The revenues of the distribution companies are regulated by EMRA and are announced for each five-year regulatory period. The retail company stands in the middle, collecting revenue from customers and transferring the relevant portion to the distribution company



1 *Retail Company procures and supplies the electricity and customers pay the total bill amount to retail company.*

2 *Retail Company transfers distribution related components of the bill to the distribution company directly.*

3 *Electricity used by municipalities for illumination are invoiced by Distribution Company and related revenue is retained in the Distribution Company.*

4 *Distribution Company can not earn more than the revenue cap approved by EMRA at the beginning of the year. If the total amount collected is greater than the revenue cap, the difference amount is distributed to other distribution regions through PEM. Price equalization mechanism (PEM) is established to protect consumers from cost differences between distribution regions*

How does the revenue cap mechanism for distribution companies work?

Electricity distribution is a regulated sector supervised by EMRA. The revenues of electricity distribution companies are regulated by the revenue cap model, which is commonly implemented in European countries. Revenue caps are estimated and announced for each tariff period. The latest tariff period started in 2021 and will be valid until 2025.

Major components of the revenue cap are the following:

- Annual **CAPEX** figures and regulated asset base
- **Return ratios** applied over regulated asset base and annual return expectations
- Reimbursement of **OPEX** as allowed by EMRA and
- **Tax Difference** arising from the different useful lives applied to revenue cap calculations and legal accounts

Source: PwC Analysis, EMRA

The determination of the distribution tariff are based on Revenue Caps determined by EMRA for every five years period

Incentive Based Regulatory Framework

Uniform regulation and RAB based framework are applied for all distribution companies.

	1st Tariff Period (2006-2010)	2nd Tariff Period (2011-2015)	3rd Tariff Period (2016-2020)	4th Tariff Period (2021-2025)
Revenue Components and Incentives	**Regulated Revenue Cap** • WACC return (RAB x WACC) • CAPEX reimbursement • OPEX allowance • TAX Difference adjustments		**Incentives** • CAPEX outperformance • OPEX outperformance • Technical & Non-technical Loss Margin • Quality indicators	
CAPEX Reimbursement	5 years	10 years		
WACC	9.35%	9.97%	11.91% - 13.61%	12.30%

In each tariff period, components of the revenue cap are determined such that the expected return on the regulated asset base, allowed operating expenses and CAPEX requirements of distribution companies can be met. Per EMRA regulations, new additions to the asset bases of distribution companies are amortized over a period of **10 years**. The current WACC, determined by EMRA, to be used in the annual return calculation, is **12.30%** for the 4th tariff period.

There are other revenues of distribution companies that are not necessarily capped by the revenue mechanism. These revenues include illumination revenue, net technical and non-technical loss income and revenue related to quality indicators. The distribution cost, which consists of the components of the revenue cap determined in the national tariff and the cost of technical and non-technical loss, is invoiced to the final consumer. The costs related to public illumination are paid to distribution companies by municipalities with a pre-determined margin.

Distribution Revenue	Regulated	Not regulated
CAPEX Allowance	Return on Regulated Asset Base CAPEX Reimbursement	• Return on RAB = Average RAB x WACC • Reimbursement of CAPEX
OPEX Allowance	Fixed Costs Variable Costs Uncontrollable Costs	• Operation costs related to distribution network • Pass through transmission costs
Other Revenues	Illumnination Revenues Technical & Non-technical Loss Margin Other	• Illumination revenue • Target technical & non-technical loss margins • Revenues related to quality indicators

Source: PwC Analysis, EMRA

The revenue of distribution companies is comprised of 3 elements and is mostly fixed in nature as the bulk of revenue is determined by EMRA tariffs

1 - CAPEX Allowance

CAPEX Component of Revenue Requirement = 1 Current year amortisation + 2 Return on unamortized RAB + 3 Tax Difference Adjustment

Capital expenditures of distribution companies are regulated by EMRA and each company is obliged to fulfil the CAPEX requirement in the specified years. CAPEX figures and the annual return ratio are determined by EMRA.

1. The distribution companies are entitled to reimbursement from EMRA for the current year amortization, along with a return for the unamortized portion of its fixed asset base.
2. The return on the unamortized RAB is calculated based on the RAB at the start and at the end of the tariff year, plus new investments, minus depreciation. The reimbursement for amortization and the return obtained for the unamortized portion of RAB are the main sources of revenue for distribution companies.
3. Fixed assets are amortized over 10 years as per EMRA, whereas amortization is calculated based on the remaining license period per Turkish GAAP. The difference is calculated and the tax effect is included in the ceiling estimate This effect reverses towards the end of the licence period and the net effect is zero at the end of the licence period.

2 - OPEX Allowance

OPEX Component of Revenue Requirement

OPEX allowed by EMRA is included in the revenue cap calculation and the predetermined OPEX figure is reimbursed to the distribution company. If the company achieves an actual OPEX figure that is lower than the OPEX allowed by EMRA, the resulting efficiency improves the company's profitability.

Fixed OPEX	Components not affected from number of customers, demand, distributed electricity etc.
Variable OPEX	Components affected from number of customers, demand, distributed electricity etc.
Uncontrollable Expenditures	Pass through transmission expenses Taxes except corporate tax, VAT, licensing fees, etc.
Planned Maintenance	Determined at three different levels: first level (observation, second level, and third level (partial network renovation)
R&D	R&D expenses paid back through revenue cap (2% of fixed and variable costs)

3 - Other Income

Illumination: Distribution companies are also responsible for the illumination of public areas and are entitled to obtain a profit over illumination sales. The sales price is calculated on a **cost + margin basis**. The margin is determined as **2.38%** by EMRA for the current tariff period.

Technical and non-technical loss: Technical and non-technical loss efficiency is the difference between regional targets and actual ratios. If distribution companies achieve actual loss ratios lower than the targets determined by EMRA, they will be entitled to an income.

Source: PwC Analysis, EMRA

Cost Structure of Distribution Companies

Costs & OPEX for Distribution

Cost of sales mainly comprises the cost of electricity procured from EPİAŞ, TETAŞ and via bilateral agreements. Cost of distribution includes transmission line costs that are costs related to technical and non-technical loss efficiency.

Illumination Costs

Distribution companies carry out illumination activities within the framework of the EMRA General Lighting Regulation, and are entitled to buy the energy required for public illumination that constitutes illumination cost. Distribution companies are permitted to obtain profits for illumination costs, and a predetermined margin of **2.38%** is applied to costs.

Actual Loss Costs

The technical and non-technical loss tariff is determined at the national level by EMRA. Distribution companies are entitled to buy energy to compensate for technical and non-technical energy loss based on the stated target.
If the distribution company's technical and non-technical loss performance is below the target, the company keeps the difference; if it is above the target, it bears the cost.

Transmission Costs

Transmission costs cover the cost of electricity transmission from the generating station to the network. These costs are pass-through as they are charged to end customers and directly transferred to the related transmission company.

OPEX

Operating expenses include fixed and variable expenses. Distribution companies can benefit from OPEX efficiencies over the OPEX approved by EMRA. The main OPEX components include:

- **Personnel expenses**
- **Material expenses**
- **Insurance expenses**
- **Rent Expenses**
- **Regulatory expenses**
- **Outsourced expenses**
- **Other**

Source: PwC Analysis, EMRA

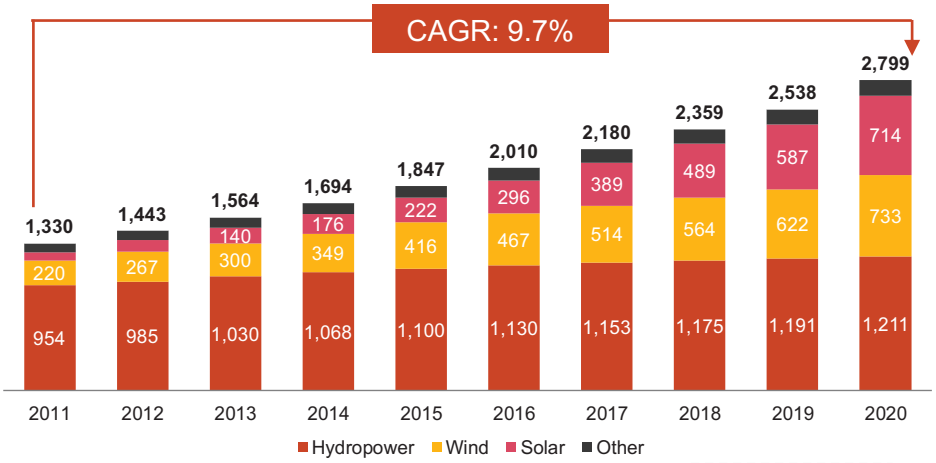
5

Renewable Energy in Turkey

The global total of renewable energy installed capacity has increased by 9.7% since 2011 and reached 2,799 GW in 2020. In the same period, renewable energy installed capacity in Turkey had a CAGR of 11.1% and reached 49.6 GW.

Graph 35

Installed Capacity of Global Renewable Energy (2011-2020, GW)

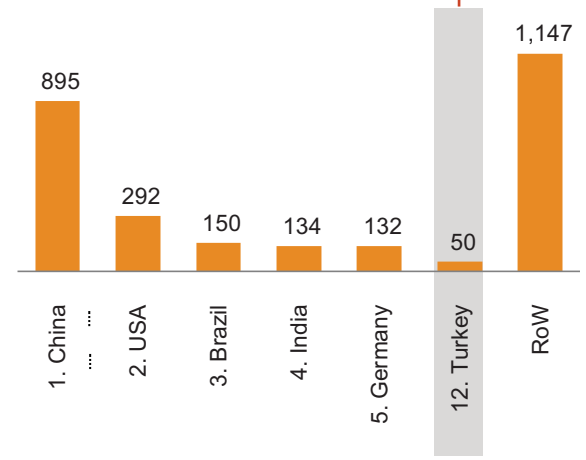


CAGR 11-20	World	Turkey
	2%	7%
	28%	25%[1]
	14%	20%

Table 8

Global Installed Capacity Rankings for Turkey (2010-2020)

	2010	2020
Hydropower	13th	9th
Wind	17th	13th
Solar	51th	16th
Bioenergy	47th	18th
Geothermal	12th	4th
Total	**14th**	**12th**

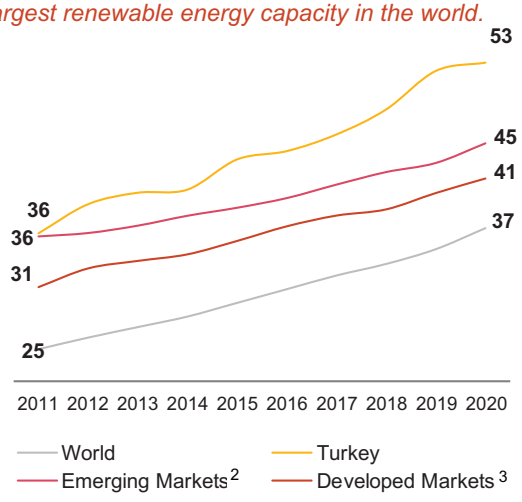


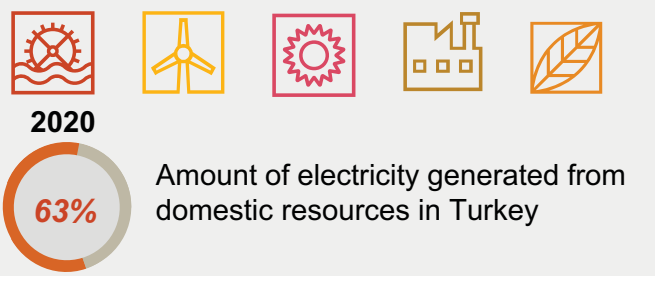
Source: EMRA, IRENA

Graph 36

Renewable energy share of electricity capacity (%)

Turkey's focus on renewable energy over the last 10 years distinguished it from other countries. Turkey has the 12th largest renewable energy capacity in the world.



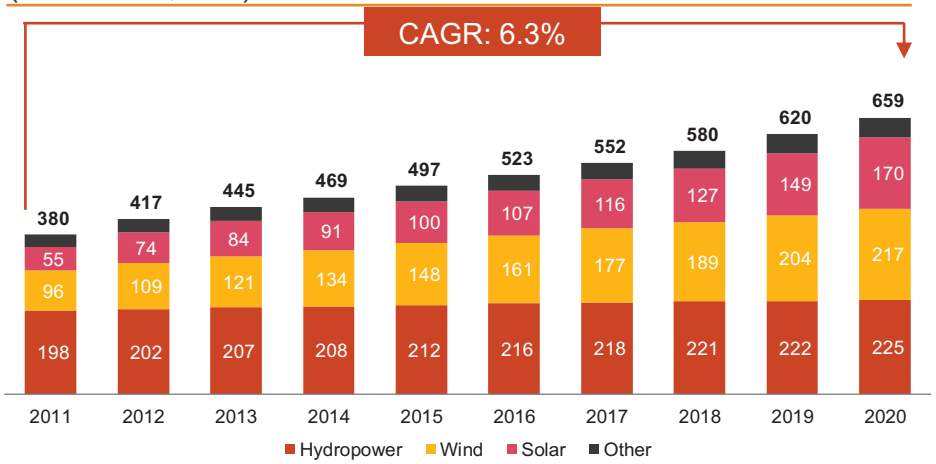


[1]The solar energy CAGR is calculated for the period between 2017 and 2020, considering realization of negligible electricity capacity from solar energy in 2016 and earlier periods.
[2]Argentina, Brazil, China, India, Indonesia, Mexico, Poland, South Africa, South Korea and Turkey
[3]United States, Japan, United Kingdom, Canada, Germany, France, Netherlands, Italy, Spain, Australia

Installed renewable energy capacity in Europe has increased by 6.3% since 2011, reaching 659 GW in 2020. Turkey commands the 5th largest installed renewable energy capacity in Europe, and is second only to Norway in terms of hydropower capacity.

Graph 37

Installed Capacity of Renewable Energy in Europe (2011-2020, GW)

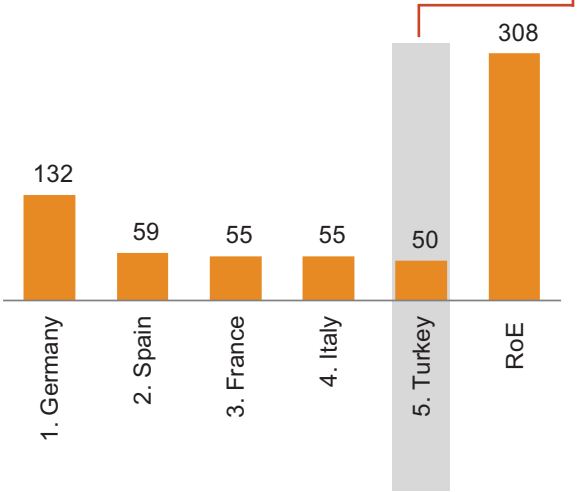


CAGR 11-20	Europe	Turkey [1]
	1%	7%
	13%	25% [2]
	9%	20%

Table 9

Renewable Electricity Installed Capacity Country Rankings (2020)

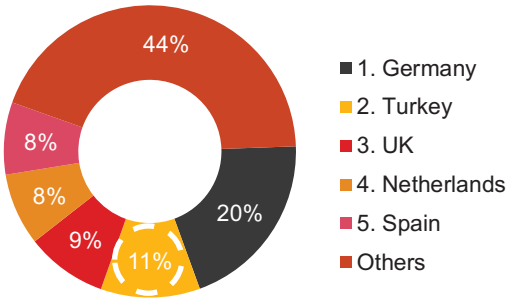
	1st Place	2nd Place	3rd Place	Turkey's Ranking
Hydropower	Norway	Turkey	France	2nd
Wind	Germany	Spain	UK	7th
Solar	Germany	Italy	Spain	8th
Other[3]	Germany	UK	Sweden	5th
Total	**Germany**	**Spain**	**France**	**5th**



Graph 38

Share of total renewable energy installed capacity addition in Europe (2016-2020)

Turkey ranked second in Europe renewable energy installed capacity additions in the last five years.



Share	47%	6%	9%	20%
Ranking	1st	7th	5th	2nd

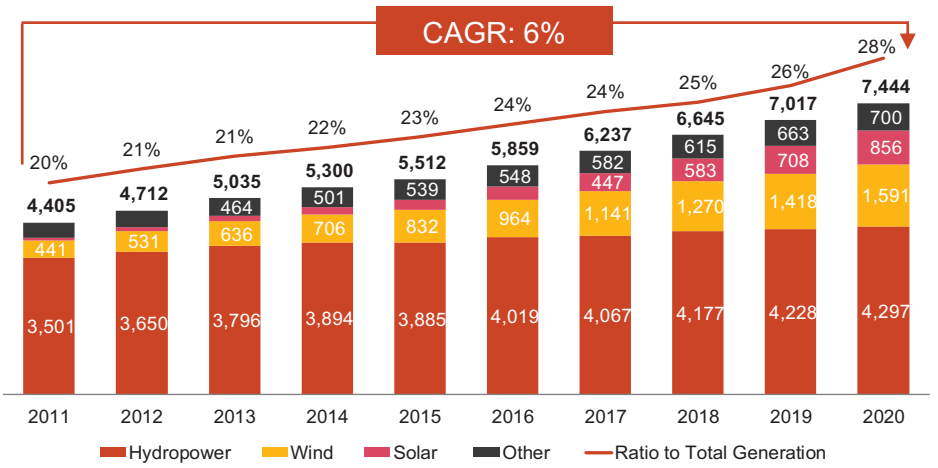
Source: IRENA, Fitch, EMRA, GÜNDER

[1] Argentina, Brazil, China, India, Indonesia, Mexico, Poland, South Africa, South Korea and Turkey
[2] The solar energy CAGR is calculated for the period between 2016 and 2020 considering realization of negligible electricity capacity from solar energy in 2015 and earlier periods.
[3] Includes electricity installed capacity from geothermal, biomass and other

The total global electricity generation of renewable energy increased by 6% each year since 2011 and reached to 7,444 TWh in 2020. Total electricity generation in Turkey reached a record high of 305.4 TWh in 2020, more than double the production in 2000 while considerable contribution came from renewable sources with a CAGR of 9% between the period of 2011 and 2020.

Graph 39

Development of Global Renewable Electricity Generation (2011-2020, TWh)

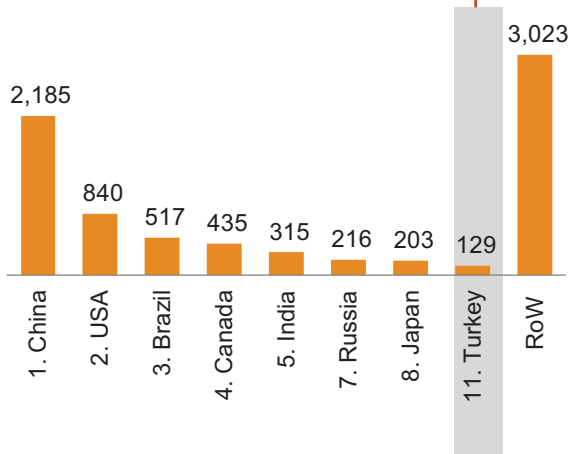


CAGR 11-20	World	Turkey
	2%	5%
	33%	81% [1]
	15%	20%

Table 10

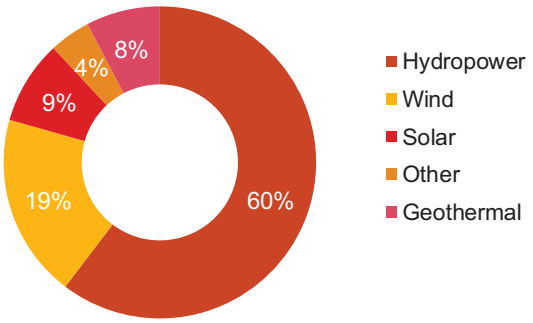
Renewable Electricity Generation Country Rankings (2020, TWh)

	1st Place	2nd Place	3rd Place	Turkey's Ranking
Hydropower	China	Brazil	Canada	8th
Wind	China	USA	Germany	11th
Solar	China	USA	Japan	13th
Other[2]	China	USA	Brazil	11th
Total	**China**	**USA**	**Brazil**	**11th**



Graph 40

Technology Breakdown of Renewable Electricity Generation in Turkey (2020)



Turkey has experienced impressive growth in renewables in the past decade driven by a favorable resource endowment, strong energy demand growth and supportive government policies. Accordingly, renewable electricity generation for Turkey has nearly tripled in the last decade.

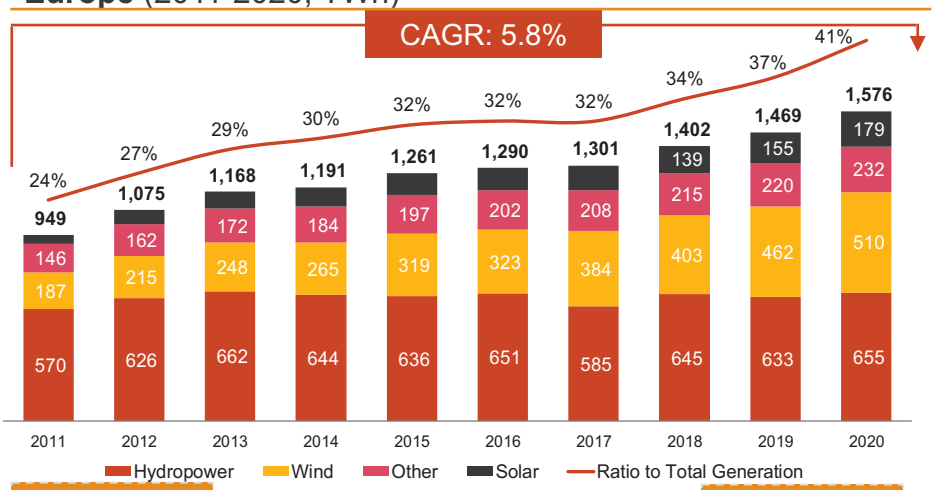
Source: EMRA, BP

[1] The solar energy CAGR is calculated for the period between 2016-2020 considering realization of negligible electricity generation from solar energy in 2015 and earlier periods.
[2] Includes electricity generated from geothermal, biomass and other.

From a generation point of view, Turkey is fourth in Europe in terms of utilisation of renewable sources.

Graph 41

Development of Renewable Electricity Generation in Europe (2011-2020, TWh)

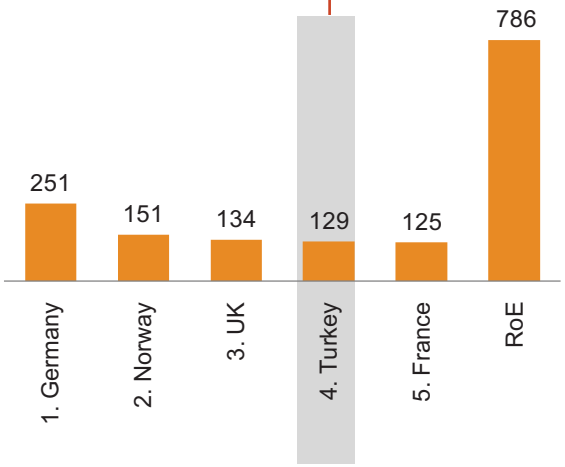


CAGR 11-20	Europe	Turkey
	2%	5%
	16%	81% [1]
	12%	20%

Table 11

Renewable Electricity Generation Country Rankings (2020, TWh)

	1st Place	2nd Place	3rd Place	Turkey's Ranking
Hydropower	Norway	Turkey	Sweden	2nd
Wind	Germany	UK	Spain	5th
Solar	Germany	Italy	Spain	5th
Other[2]	Germany	UK	Italy	5th
Total	**Germany**	**Norway**	**UK**	**4th**

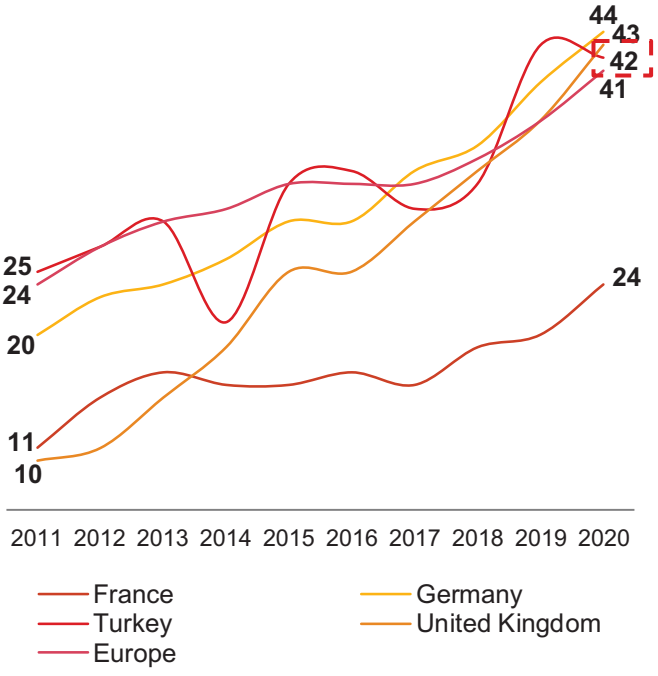


Source: BP, EMRA

Graph 42

Renewable energy share of total electricity generation (%)

Between 2011 and 2020, the CAGR for total electricity generation in Turkey was 3%. In contrast, the CAGR from renewable energy sources was 9%, demonstrating an increase in the share of renewable energy in total energy generation.



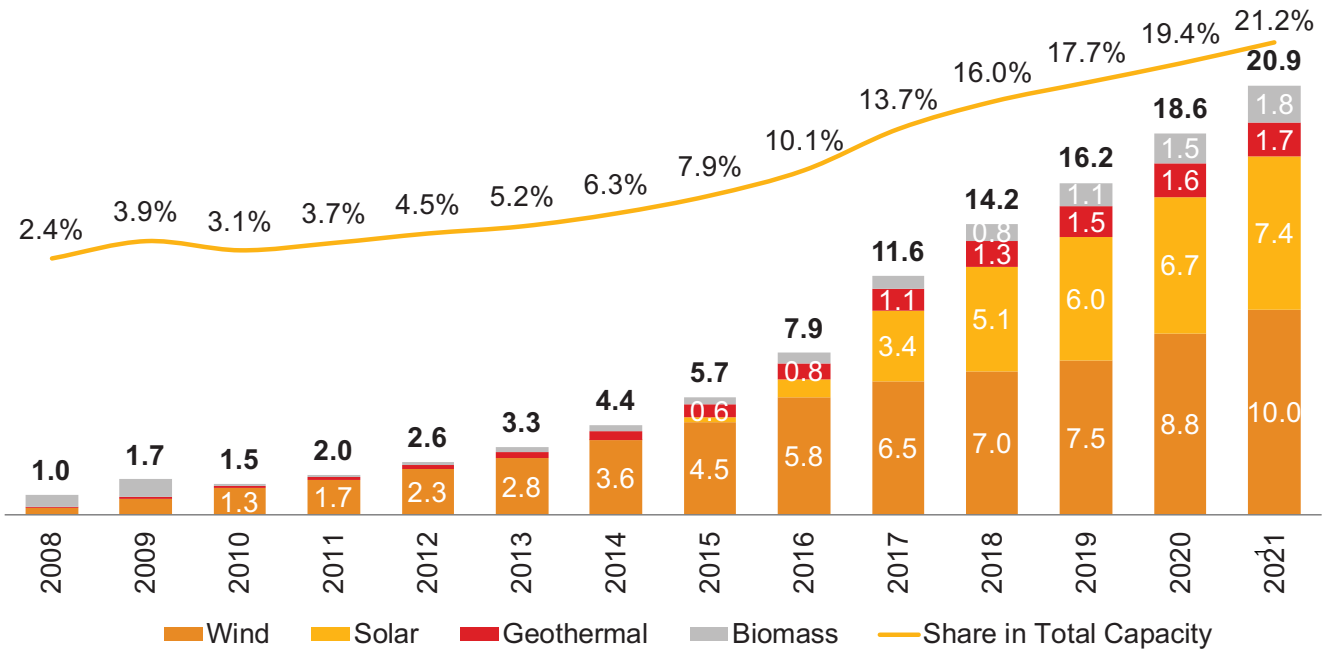
[1] The solar energy CAGR is calculated for the period between 2016 and 2020 considering realization of negligible electricity generation from solar energy in 2015 and earlier periods.
[2] Includes electricity generated from geothermal, biomass and other.

Non-hydro renewable installed capacity in Turkey grew substantially in the last decade due to continuous government support, particularly through YEKDEM.

Development of Non-Hydro Renewables	December 2007	August 2021	% of Total Capacity as of August 2021
Wind Large amount of investments due to attractive FiT Schemes under YEKDEM	148 MW	10,014 MW	10.2%
Solar Strong growth in the past few years, mainly attributable to unlicensed generation	0 MW	7,435 MW	7.5%
Geothermal High number of geothermal sources in Turkey which can be utilized for generation	23 MW	1,650 MW	1.7%
Biomass Less interest due to high CAPEX and dependency on external source factors (waste collection).	21 MW	1,813 MW	1.8%

Graph 43

Installed Capacity of Non-Hydro Renewables (2007-2021, GW)



[1]Data as of August 2021
Source: TEİAŞ

The introduction of YEKDEM to the Turkish electricity market increased investments in renewable energy plants, as it provided the required framework and incentives for market players looking to engage in renewable investments

The previous YEKDEM FiT provided renewable generators with the option to sell their output at fixed prices for ten years. **Renewable energy power plants commissioned up to 30 June 2021 were covered by the previous FiT of the YEKDEM scheme**.

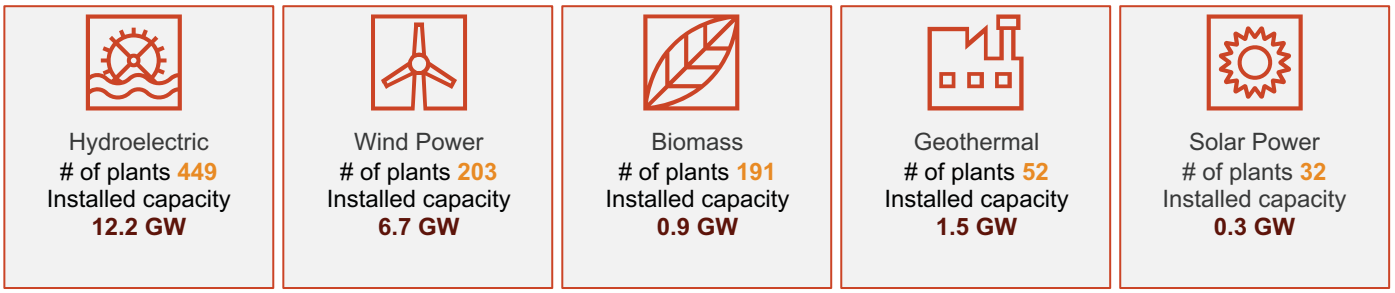
Table 12

Previous Feed-in Tariff Under YEKDEM and Incentives

Source	Feed-in Tariff (US¢/kWh)	Incentive (US¢/kWh)
Hydro	7.3	1.0 – 2.3
Wind	7.3	0.6 – 3.7
Geothermal	10.5	0.7 – 2.7
Solar	13.3	0.4 – 5.6
Biomass	13.3	0.5 – 6.7

A new support mechanism encompassing new conditions for the power plants to be commissioned after June 30, 2021 was announced by the Ministry. Renewable power plants commissioned between 1 July 2021 and 31 December 2025 will benefit from the new 10-year feed-in tariffs and 5-year domestic production incentives.

The number of applications benefitting from the previous FiT that have been approved increased by **13%,** reaching **927** at the end of 2020, implying a total renewable installed capacity of **21.6 GW**. **9.4 GW** of total installed capacity is comprised of non-hydro renewables. The difference between non-hydro renewables in the YEKDEM FiT list **(9.4 GW)** and the actual installed capacity of non-hydro renewables, which is **20.9 MW**, can atlarge be explained by unlicensed installed capacity. Sales from unlicensed power plants were also priced using the YEKDEM FiT until mid 2019. However, these companies are not considered on the list of 927 licenced applicants.



Source: EMRA

For all renewable power plants that will become operational between 1 July 2021 and 31 December 2025 and want to be involved in YEKDEM, the new FiT will set the basis for guaranteed price support. As opposed to the old FiT, the new FiT will be based on prices quoted in TL

Table 13

Feed-in Tariffs Under New YEKDEM and Incentives

Power Source	Feed in Tariff (TL/kWh)	Domestic Component Incentive (TL/kWh)	Price Caps (US¢/kWh)
Hydraulic	0.40	0.08 for all	6.4
Wind	0.32		5.1
Geothermal	0.54		8.6
Solar	0.32		5.1
Biomass (Landfill gas)	0.54		5.1
Biomass (Biomethanization)	0.50		8.6
Biomass (Thermal disposal)	0.32		8.0

A **0.08 TL**/kWh domestic manufacturing components incentive is granted to each company for 5 additional years if an independent board of auditors ensures that at least **51%** of manufacturing components are domestic.

FiT prices quoted in TL cannot at any time be higher than the price caps expressed in TL based on the average of the monthly average USD/TL FX rates which are in turn based on the FX rates announced by the Central Bank of Turkey, for the 3 months that are 2, 3 and 4 months prior to the first month of the current tariff period.

FiT prices will be revised every quarter based on an indexation formula that reflects the impact of the increase of inflation and hard currency FX rates on the FiT price. Similar to the previous FiT mechanism, guaranteed price support for applicants will be available for a period of 10 years.

Price indexation formula

$$FiT(t) = FiT(t-1) \times [26\% \times (PPI(t)/PPI(t-1)+CPI(t)/CPI(t-1)) + 24\% \times (USDFX(t)/USDFX(t-1)+EURFX(t)/EURFX(t-1))]$$

Indexation Formula

Formula Explanation

FiT(t) = Price at current 3 months tariff period
FiT(t-1) = Price at previous 3 months tariff period
PPI(t) = Monthly producer price index announced two months prior to the first month of the current tariff period
PPI(t-1) = Monthly producer price index announced five months prior to the first month of the current tariff period
USDFX(t) = Average of monthly average USD/TL FX rates based on announced FX rates by Central Bank of Turkey, for the three months that are two, three and four months prior to the first month of the current tariff period
USDFX(t-1) = Average of monthly average USD/TL FX rates based on announced FX rates by Central Bank of Turkey, for the three months that are five, six and seven months prior to the first month of the current tariff period
EURFX(t) = Average of monthly average EUR/TL FX rates based on announced FX rates by Central Bank of Turkey, for the three months that are two, three and four months prior to the first month of the current tariff period
EURFX(t-1) = Average of monthly average EUR/TL FX rates based on announced FX rates by Central Bank of Turkey, for the three months that are five, six and seven months prior to the first month of the current tariff period

Source: EMRA

Turkey's wind and solar power capacity development has been realized in several phases. After an initial phase without auctions, 3 auction methodologies have been used, followed by the use of the large-scale YEKA model

A Initial YEKDEM Phase

- Initial YEKDEM phase which received limited attention
- Feed-in-tariffs provided on a first come, first served basis
- No tender process in place.

B 2011 Wind Tenders

- First auction system for wind power plants commenced in 2011
- Based on a contribution fee to be deducted from the YEKDEM FiT
- Contribution fee on a TL/kWh basis, to be paid 20 years after the COD
- 5,500 MW of wind power capacity allocated in 13 competition regions.

C 2015 Solar Tenders

- New auction system commenced in 2015 for solar power plants
- TL-based contribution fees per MW to be paid 3 years after COD
- 600 MW of solar power capacity allocated.

D 2017 Wind Tenders

- In 2017 an auction took place for wind power plants
- 3,000 MW of capacity was allocated
- No YEKDEM FiT scheme, price offers based on independent offers or discounts based on future DAMP (negative price offers)

E YEKA Tenders

- **Current and future model for the development of renewable energies**
- **Organized for large-scale projects to be awarded to single investors**
- **Bidders offer a discount on the defined ceiling price per kWh. A PPA is signed for 15 years.**

Source: EMRA

The Ministry of Energy in Turkey was working on the development of a new investment model for large-scale renewable projects. The YEKA model was introduced in 2016 for this purpose

The regulation on the new YEKA investment model came into force after being published in the Official Gazette on 9 October 2016.

Under the model, installed capacities allocated to regions with specific renewable energy capabilities are shared between potential investors, based on their bids in tenders. Investors also have an obligation to build power plants with predetermined technical characteristics based on allocated capacity .

The main target of the investment model is to provide more efficient use of renewable energy resources and a more efficient model for potential investors.

Under some YEKA tenders, the designated areas will be assigned to investors who also enable domestic manufacturing of the equipment to be used in the power generation facilities. The requirement for domestically manufactured equipment in these areas aims to contribute to technology know-how transfer and further investment in research and development.

This regulation sets out the principles and procedures regarding:

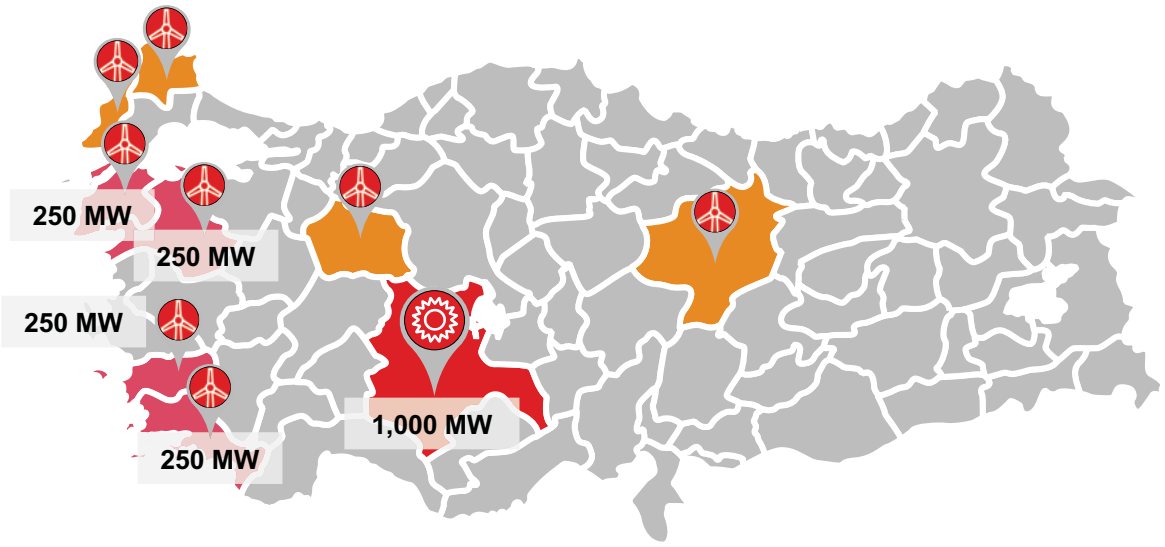
- The determination of Renewable Energy Resource Areas (YEKA) and capacity allocation for these areas
- Determination of domestic manufacturing requirements and utilization of domestic goods in the allocated capacity investment
- The conditions to be met by legal entities participating in the tender and in holding the competition
- The process for tender winners to apply for licenses to set up generation facilities in YEKAs.

The power generated in the power plants developed under the YEKA model will be evaluated in the scope of Turkey's YEKDEM. These power plants will not benefit from previously determined or newly-announced FiT prices per unit of electricity generated. Instead, the price will be determined separately in the tender for each project.

Source: MENR

Three YEKA tenders, for a total capacity of 3,000 MW, have been finalized. While none of these facilities have yet begun operating, the necessary groundwork to meet the local content obligations are well underway

Completed YEKA Tenders



In 2019 Kalyon Group completed the construction of the wind turbine factory where it will manufacture turbines. The factory has a capacity to produce a total of 500 MW annually. Additionally, they completed the construction of a manufacturing facility for solar ingots, cells and panels in 2020. As of April 2021, 190 MW of capacity has been commissioned, and it is projected that the planned 1,000 MW capacity will be fully utilized by 2022.

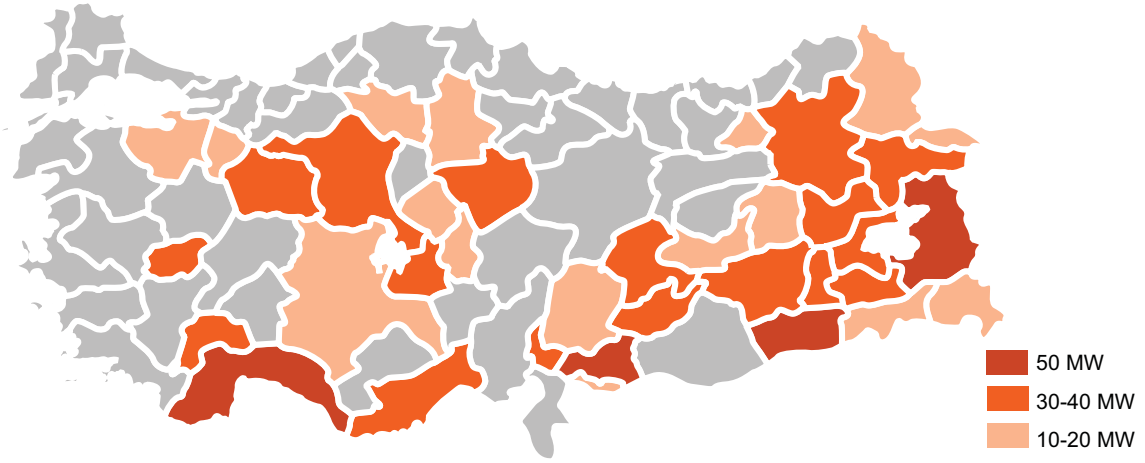
	YEKA SPP-1	YEKA WPP-1	YEKA WPP-2
Location	Konya - Karapınar	Edirne, Kırklareli, Sivas, Eskişehir	Aydın, Balıkesir, Çanakkale, Muğla
Date	March 20, 2017	August 3, 2017	May 30, 2019
Capacity	1,000 MW	Up to 1,000 MW	1,000 MW (250 MW * 4)
Ceiling price at tender	80 USD / MWh	80 USD / MWh	55 USD / MWh
Winning Offer	69.9 USD / MWh	34.8 USD / MWh	35.3 - 45.6 USD / MWh
Sponsor Company	Kalyon[1]	Kalyon, Siemens Gamesa, Türkerler	Enerjisa - Aydın + Çanakkale Enercon - Muğla + Balıkesir
Power Purchase Guarantee Period	15 Years	15 years	15 years
Local Content Ratio	60% for the first 500 MW, 70% for the second 500 MW	60%	55%

Source: MENR

[11]The YEKA SPP-1 was won by a Kalyon and Hanwha consortium. Hanwha exited the consortium in 2019.

The first mini Solar YEKA tender was completed on 27 May 2021. The allocation included total installed capacity of 1,000 MW in 36 provinces for a total of 74 SPPs with capacities of 10 MW, 15 MW or 20 MW

Completed First Mini Solar YEKA Tender



The competition announcement regarding the YEKA GES-3 (mini YEKA) capacity allocation of the MENR was first published in the Official Gazette dated 3 July 2020. It was announced that the total investment in 1,000 MW of installed power will be divided into SPPs with capacities of 10 MW, 15 MW and 20 MW, and that the tenders would be for 74 units in 36 provinces. A Dutch auction process was carried out with closed bidding, and the ceiling price was set at 350 TL/MWh. 19 tenders were held from 26 April to 29 April 2021, and additional tenders were postponed due to Covid-19 precautions. The remaining 55 tenders started on May 24 and were completed on 27 May 2021. As shown on the map, for most provinces more than one tender was organized.

An escalation formula that includes PPI, TL, CPI and exchange rates were applied in the competition. It was decided that the price could not exceed **53 USD/MWh** during the purchase guarantee period. After the completion of the 15-year purchase guarantee period, subject to legislation provisions, electricity generation will be carried out under free market conditions until the end of the license period.

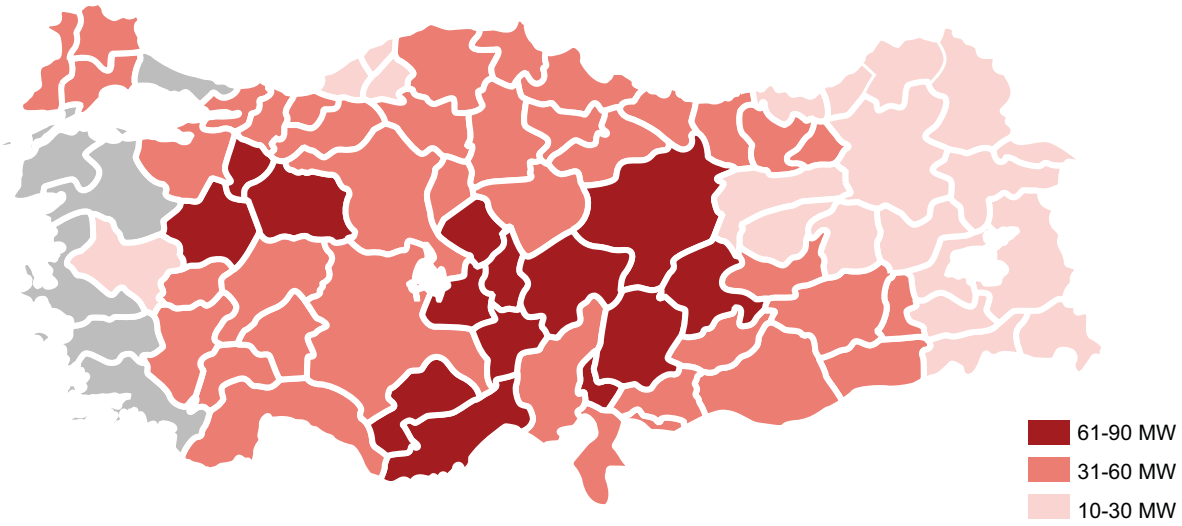
	Mini YEKA SPP-3
Location	36 Provinces
Date	May 27, 2021
Capacity	1,000 MW
Ceiling price at tender	350 TL/MWh
Power Purchase Guarantee Period	15 Years
Local Content Ratio	60%

Source: MENR

The lowest winning price was 182 TL/MWh for the SPP with a 15 MWh capacity in the Osmaniye-2 province, and it was won by Margün/Naturel Enerji. The highest winning price was 320 TL/MWh for the SPP with a 10 MWh capacity in the Hakkari-2 province, and it was won by Varen. The average winning price was **218 TL MWh**.

Under Mini YEKA-WPP-3, tenders will be held for WPPs in capacities ranging between 20-90 MW for 75 provinces and 42 regions, excluding the 6 provinces that were within the scope of previous WPP YEKA tenders.

In-progress Mini YEKA Tenders



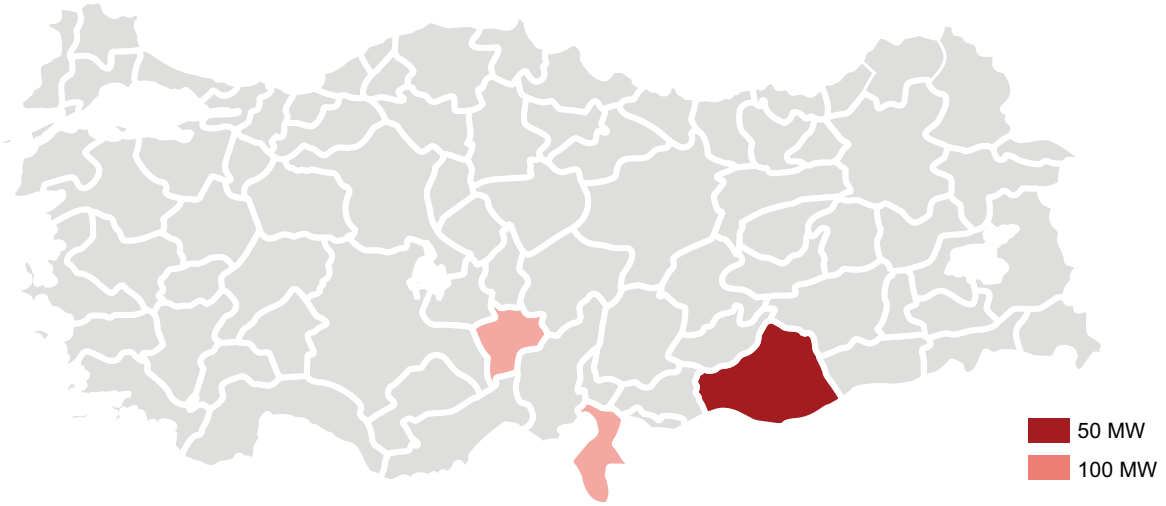
Applications to participate in the tenders are scheduled to be received on 12 October 2021. Tender dates are yet to be announced. Total installed capacity to be allocated will 2,000 MW.

	Mini YEKA WPP-3
Location	75 Provinces
Capacity	2,000 MW
Ceiling price at tender	450 TL/MWh
Power Purchase Guarantee Period	10 Years
Local Content Ratio	55%

Source: MENR

Under Mini YEKA-SPP-4, tenders will be held for SPPs in capacities ranging between 50-100 MW for 3 provinces and 15 regions.

In-progress Mini YEKA Tenders



Applications to participate in the tenders are scheduled to be received on 30 March 2022. Tender dates are yet to be announced. Total installed capacity to be allocated is 1,000 MW.

	Mini YEKA SPP-4
Location	3 Provinces
Capacity	1,000 MW
Ceiling price at tender	400 TL/MWh
Power Purchase Guarantee Period	10 Years
Local Content Ratio	75%

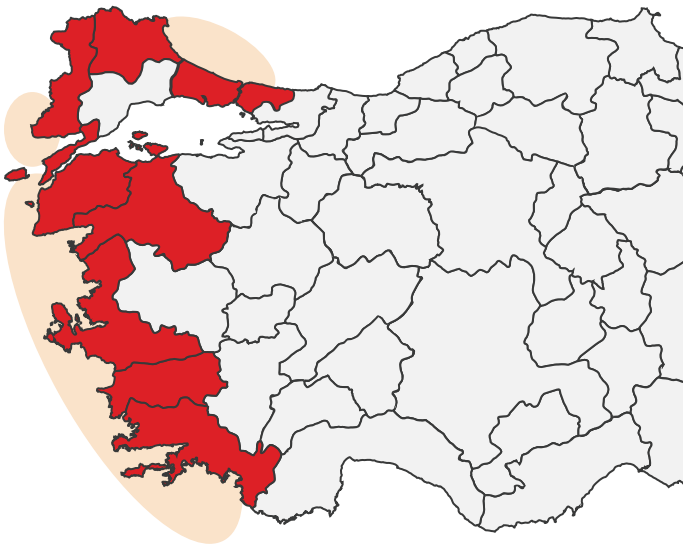
Source: MENR

There is strong potential for offshore wind facilities in Turkey, particularly off the coast of the Aegean Sea.

According to the World Bank, Turkey's technical potential for offshore wind is as high as 75 GW in total.

The north-western Aegean Sea region, where wind speeds rise as high as 9 m/s, has the highest potential for offshore wind farming. Furthermore, wind speeds in the Sea of Marmara and the Black Sea are around 7-8 m/s. It is estimated that areas with water depths of less than 50 m have technical installed capacity potential of 12 GW, whereas areas that are as deep as 1,000 m provide installed capacity potential of 57 GW.

Suitability of transmission capabilities: Transmission networks in the north and west are quite strong, with 380 kV and 154 kV lines. However, further investments will be needed to accommodate offshore wind.



75 GW
Total Offshore Wind Capacity Potential in Turkey

12 GW
Fixed

63 GW
Floating

Source: World Bank

6

Natural Gas and Coal Markets

6.1

Natural Gas Market

Natural gas plays a crucial role in setting prices in the electricity market. Natural gas prices are affected by a number of factors

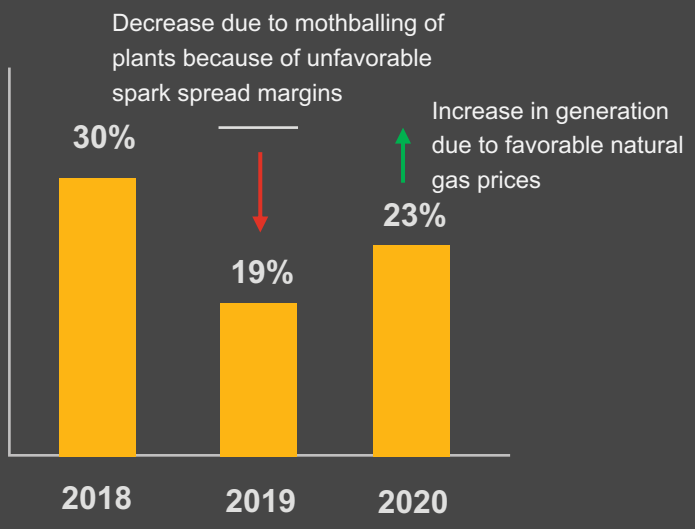
The cost of natural gas plays an important role in determining the short-run marginal costs of natural gas power plants. As such, the cost of natural gas is an important factor in determining price bids in the day-ahead market.

Natural gas prices have a stronger impact on determining DAMP than those of other fuel types such as imported coal. Natural gas power plants in the market are often the price setters, having substantially higher marginal costs compared to coal power plants, and higher start-up and shutdown costs.

In Turkey, natural gas is supplied via imports made through long-term pipeline and LNG contracts. Almost all of the natural gas supply is imported via long-term contracts, and the majority of these are pipeline contracts.

Graph 44

Share of Natural Gas Power Plants in Generation (%)



The main factors affecting the price of natural gas in the market

Brent Oil Prices

As per BOTAŞ contracts signed with Gazprom, the price of Brent oil affects the import price of natural gas, based on a 9-month moving average.

Exchange Rate

Nearly all the natural gas supply in the country comes from imported sources. The appreciation of the USD against the TL increases the cost of natural gas in TL terms.

Source: BOTAŞ, EMRA

Milestones of the Natural Gas Market

- **2001**
  - Natural Gas Market Law
  - Establishment of EMRA
- **2003**
  - Start of Greenfield Distribution Tenders
- **2004**
  - Regulatory Framework Related to Third Party Access to Transmission Network
- **2005**
  - First Contract Release
  - Tender, for 4 bcm, to Private Sector
- **2007**
  - Re-export NG to Greece
  - First Access to Transmission System by Private Sector
- **2009**
  - First LNG Cargo by Private Sector
  - Regulation Related to the Use of Underground Storage
- **2011**
  - Tariff Regulation for Natural Gas Distribution Companies
- **2016**
  - Natural Gas Market Law Amendment (Licensing of Distribution Regions)
  - First FSRU Investment by Private Sector
- **2017**
  - First FSRU Terminal Started Operating
  - First Phase of BOTAŞ Tuz Gölü Storage Facility Started Operating
- **2018**
  - Organized Wholesale Gas Trading Platform
  - FSRU in Dörtyol Started Operating
- **2019**
  - The European connection of the Trans-Anatolian Natural Gas Pipeline Project (TANAP), the most important link of the Southern Gas Corridor, was opened.
- **2020**
  - TurkStream Natural Gas Pipeline, that will carry Russian natural gas directly to Turkey and to Europe through Turkey, was launched.
- **2021**
  - Power Futures Market (PFM) was launched.
  - Natural Gas Futures Market (NFM) was launched under the country's energy exchange EXIST.

Several important milestones in the liberalization of the natural gas market in Turkey took place in the last two decades.

The first contract release tender for the private sector, for 4 bcm, occurred in 2005. 2009 was significant as it was the year the private sector received the first LNG cargo. The first floating storage regasification unit (FSRU) investment by the private sector began operating in 2017.

The new natural gas Organized Wholesale Gas Trading Platform (OTSP) was inaugurated in April 2018. The new platform allows for the spot trading of natural gas, making it easier for market actors to balance their portfolios and reconcile remaining imbalances.

As a result of these changes, the predictability of the market increased, giving CCGTs an opportunity to hedge against risks related to the spark spread.

Source: BOTAŞ

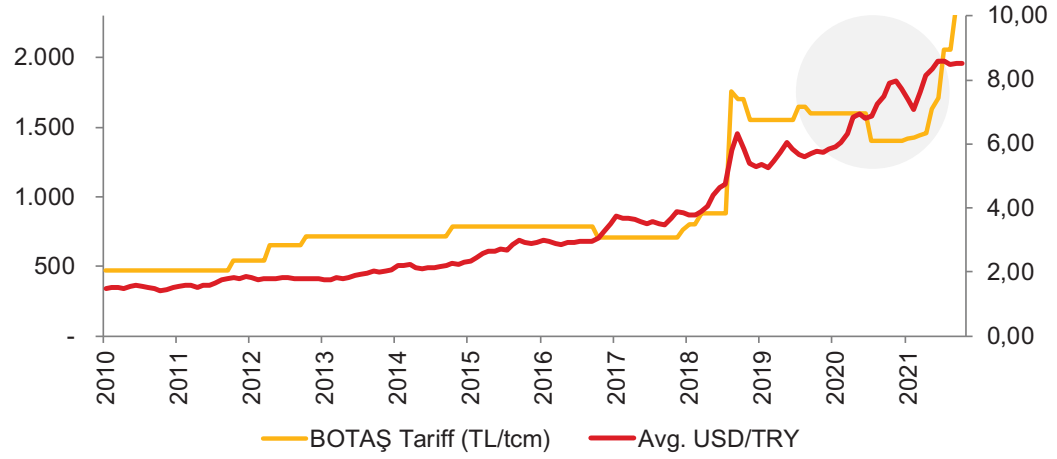
In 2019 BOTAŞ tariff methodology reverted to the previous method, after various methodologies were tested in 2018. However this time the methodology excluded subsidies

Prior to 2018, BOTAŞ determined natural gas prices independent of a specific tariff structure and based on subsidies, but also linked them to developments in Brent oil prices as per Gazprom contracts. Between January and July 2018, BOTAŞ shifted to a tiered tariff mechanism. However, in August 2018, this new pricing mechanism was abolished and the tariff for all levels for power plants was set at the TL equivalent of 270 USD/tcm. This marked the end of subsidies from BOTAŞ and the shift to a cost-reflective tariff structure. Later, as a response to rapid fluctuations in the foreign exchange rate, BOTAŞ declared it would freeze the USD/TL exchange rate at 6.5. Starting from September 2018, the USD-based tariff was also abolished, and the tariff was set at 1,700 TL/tcm.

The tariff was updated to 1,600 TL/tcm in February 2020 and to 1,400 TL/tcm in July 2020, in line with the decrease in Brent oil prices. BOTAŞ has increased tariffs every month since the beginning of 2021. As of October 2021, BOTAŞ had increased its power plant tariff by 15% to 2,724 TL/tcm.

Graph 45

BOTAŞ Natural Gas Tariffs for Power Plants (2010 – 10M21, TL/tcm)



Natural gas prices were lower in 2020 compared to 2019 mainly due to the decrease in Brent oil prices. As Brent oil prices picked up in 2021 against a depreciating exchange rate, natural gas prices increased.

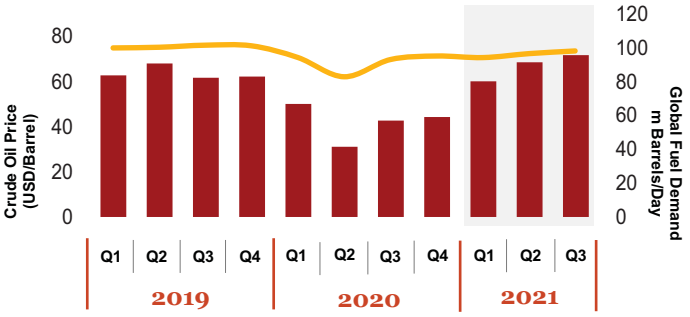
Natural gas supplied via Gazprom contracts constituted the bulk of natural gas supplied into Turkey until very recently as the change in global dynamics during 2020 led Turkey to rebalance its supply more in favour of LNG. Terms of contracts for a large portion of natural gas being supplied by Gazprom is due to be re-negotiated in 2021.

Source: BOTAŞ, OIES

BOTAŞ announced the latest price hike for natural gas in the beginning of October 2021 and introduced a 15% price increase for natural gas used in electricity consumption

Graph 46

Global Fuel Demand and Oil Prices (2019-2021)



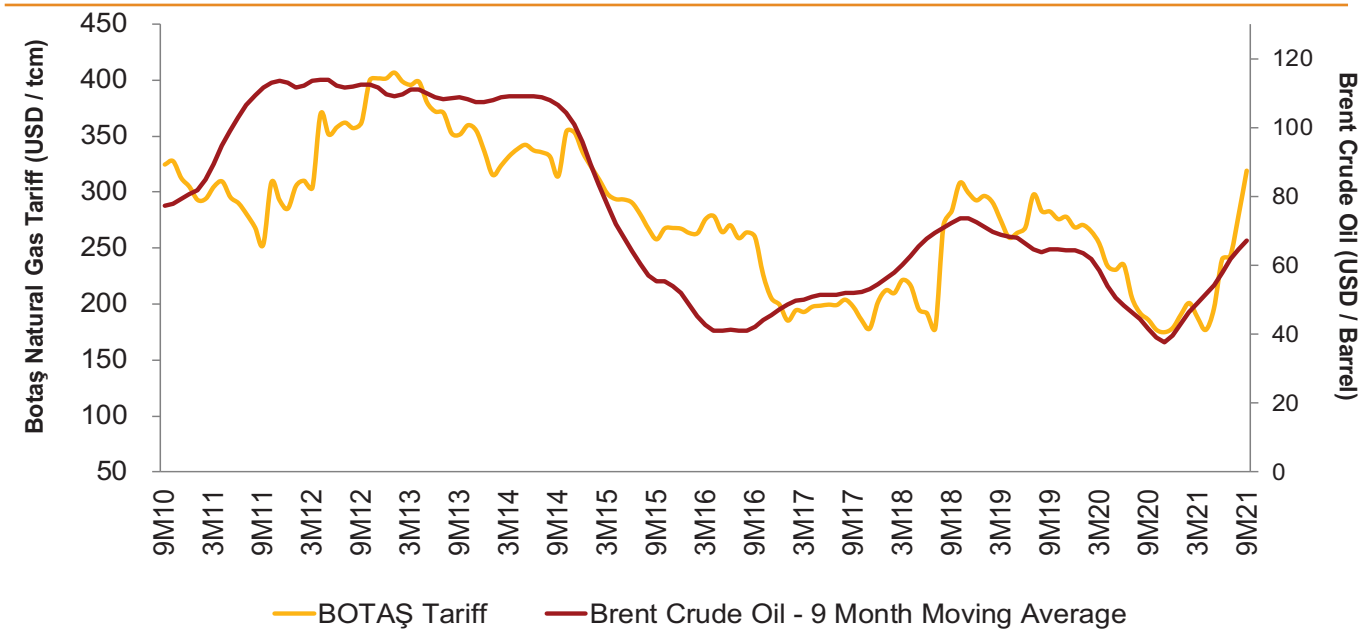
*The global demand for liquid fuels increased by **7.5%** in the first half of 2021 compared to the prior year, due especially to increasing demand from the transportation sector, offsetting the impact of Covid-19.*

The cost-reflective tariff structure set by BOTAŞ is expected to continue for the foreseeable future.

As a result of the current pricing methodology of BOTAŞ, the decrease in oil prices in the first half of 2020 created downward pressure on natural gas prices in the second half of the year due to the manner in which Gazprom contracts are structured. Similarly, the increase in oil prices starting from the second half of 2020 created upward pressure on natural gas prices in 2021.

Graph 47

BOTAŞ NG Tariffs for Power Plants and 9-Month Moving Average of Brent Oil Prices (2010-2021[1])



[1]Data as of September 2021

Source: BOTAŞ, World Bank

Turkey imports natural gas in three different ways: pipeline gas purchased with long-term contracts, liquefied natural gas (LNG) purchased with long-term contracts, and gas purchased from the spot market.

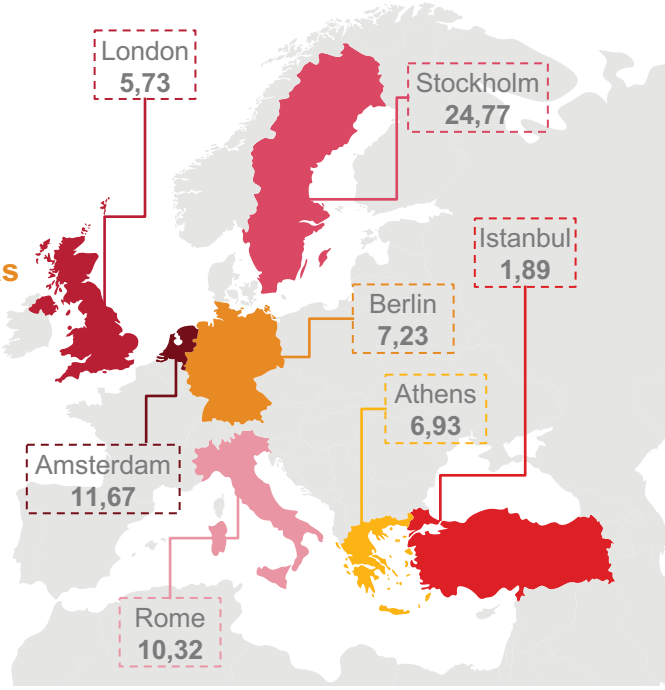
Natural gas prices determined in long-term agreements with Gazprom for Turkey are subject to a formula that incorporates the development of Brent oil and certain other petroleum products. The natural gas purchased through the pipeline is purchased with long-term agreements, but as crude oil and petroleum product prices increase over time, the price paid for natural gas also increases..

Due to its geographical proximity to major natural gas suppliers, commissioning of new lines and its integration into growing distribution networks, Turkey is in a strong position. On the other hand, as the pricing of natural gas contracts signed with Gazprom depend on the price of Brent oil based on a 9-month moving average, the change is reflected on natural gas prices with a lag. Therefore, the following reasons that caused a significant increase in natural gas prices in Europe have not significantly affected Dynamics in Turkey, so far.

Factors affecting the Europe price surge in natural gas

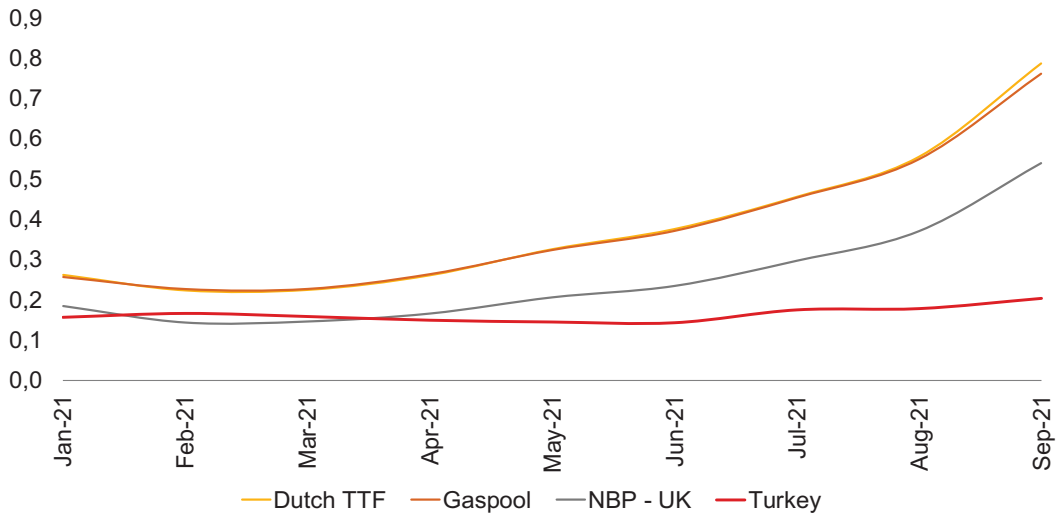
1. Insufficient supply despite the increase in global natural gas demand with the start of economic recovery
2. Fast depleting natural gas reserves due to harsh winter
3. Growing interest in natural gas, that is cleaner than coal and is preferred for environmental reasons
4. Europe's endeavor to decarbonize its energy resources by implementing the Energy Taxation Directive (ETD) – higher tax rates applied to certain fuel types

Household Energy Prices in Europe
(August 2021, TL/Sm³)



Graph 48

Natural Gas Prices (2021, EUR/Sm³)



Source: Bloomberg, Energie-Control, HEPI – Household Energy Price Index, BOTAŞ

The total volume of natural gas contracts in the country is equivalent to 59.9 bcm

Graph 49

Active Natural Gas Import Agreements by Country

Public Importer	Country	Line / Entry Point	Type	Volume (bcm/year)	Date of Agreement	Start Date	End Date
BOTAŞ	Russia	Turk Stream	Pipe gas	4,0	18.02.1998	1998	December 2021
BOTAŞ	Nigeria	M. Ereğlisi	LNG	1,3	20.09.2017	2011	October 2021
BOTAŞ	Algeria	M. Ereğlisi	LNG	4,4	14.04.1988	1994	October 2024
BOTAŞ	Russia	Blue Stream / Durusu	Pipe gas	16,0	15.12.1997	2003	December 2025
BOTAŞ	Iran	Gürbulak	Pipe gas	9,6	08.08.1996	2001	July 2026
BOTAŞ	Azerbaijan	TANAP	Pipe gas	6,0	25.10.2011	2018	June 2033
BOTAŞ (Spot)	Azerbaijan	Türkgözü	Pipe gas	6,0	19.08.2021	2022	December 2024

41.6 bcm of the **47.3 bcm** in natural gas contracts are long-term pipeline contracts, while the remaining **5.7 bcm** is from LNG contracts with Nigeria and Algeria.

In addition to these contracts, the country also has the option to import natural gas from the spot LNG market.

After the 15-year, 6.6 bcm/year agreement with Azerbaijan expired, BOTAS signed a three-year gas purchase contract with AGSC for Azeri gas imports from January 1, 2022 to December 31, 2024.

Graph 50

Private Importers

Private Importer	Country	Line / Entry Point	Type	Volume (bcm/year)	Date of Agreement	Start Date	End Date
Avrasya Gaz	Russia	Turk Stream	Pipe gas	0,50	31.10.2007	2009	December 2021
Bosphorus Gaz	Russia	Turk Stream	Pipe gas	0,75	22.05.2007	2009	December 2021
Enerco Enerji	Russia	Turk Stream	Pipe gas	2,50	September 2007	2009	December 2021
Shell Enerji	Russia	Turk Stream	Pipe gas	0,25	December 2007	2009	December 2021
Akfel Gaz	Russia	Turk Stream	Pipe gas	2,25	09.08.2012	2012	2043
Batı Hattı	Russia	Turk Stream	Pipe gas	1,00	2012	2013	2043
Bosphorus Gaz	Russia	Turk Stream	Pipe gas	1,75	01.01.2013	2013	2043
Kibar Enerji	Russia	Turk Stream	Pipe gas	1,00	09.08.2012	2013	2043

Around **10 bcm** of BOTAŞ import rights from the Western Russian pipeline have been transferred to private importers via an agreement between the two parties.

Around **4 bcm** of contracts are set to expire in 2021, while the remaining **6 bcm** will expire in 2043.

Source: BOTAŞ

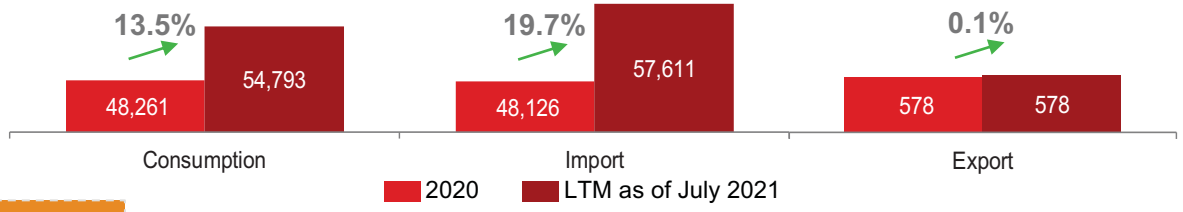
In 2020 and 2021, the focus of Turkey's natural gas imports moved from Russia to other countries such as Azerbaijan, as well as to LNG suppliers Algeria and Nigeria.

Table 14

Turkey's Natural Gas Import Routes in 2020

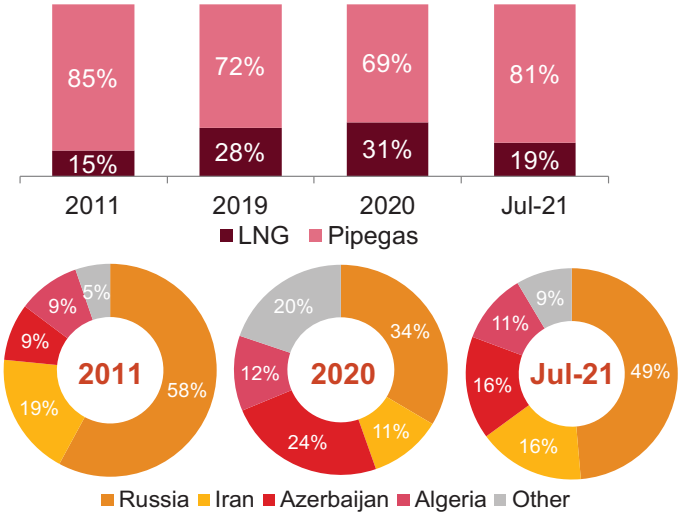
Entry Point	Gas Volume (bcm)	Share (%)
1. Malkoçlar	0.1	0.2
2. Kıyıköy	7.5	15.6
3. Durusu	8.6	17.9
4. Gürbulak	5.3	11.1
5. Türkgözü	7.0	13.8
6. Seyitgazi / Trakya	4.9	10.2
7. Dörtyol FSRU	1.3	2.7
8. Egegaz LNG	4.2	8.7
8. Etki FSRU	3.0	6.3
9. BOTAŞ LNG	6.6	13.7
Total	**48.5**	**100**

Despite a decrease in natural gas use globally, consumption in Turkey has increased in recent years. One of the reasons for the rise is greater utilization of electricity generation facilities that generate electricity using natural gas. Aside from that, an increase in natural gas consumption has been driven by the increase in the number of distribution company subscribers and colder winter temperatures compared to the same months of the previous year.



Graph 51

Imported Natural Gas by Type and Country[1]



LNG prices fell significantly during the Covid-19 pandemic, and this supported an increase of the LNG share of Turkey's imports. In the second half of the year, this trend reversed due to Turkey's take or pay obligations in its long-term natural gas supply contracts and the increase of LNG prices in global markets.

Turkey has been investing to increase LNG storage capabilities and trying to re-organize the supply side to support the activity in the LNG market. These efforts will have more impact if they are supported by the renegotiation of Turkey's obligations under current long-term pipe gas supply contracts.

[1]Data provided above for 2021 represents the combined imports for the first 7 months of 2021.

Source: BOTAŞ, EMRA

Improved storage, diversification of import sources and flexibility in the natural gas network help strengthen Turkey's position in negotiations with suppliers

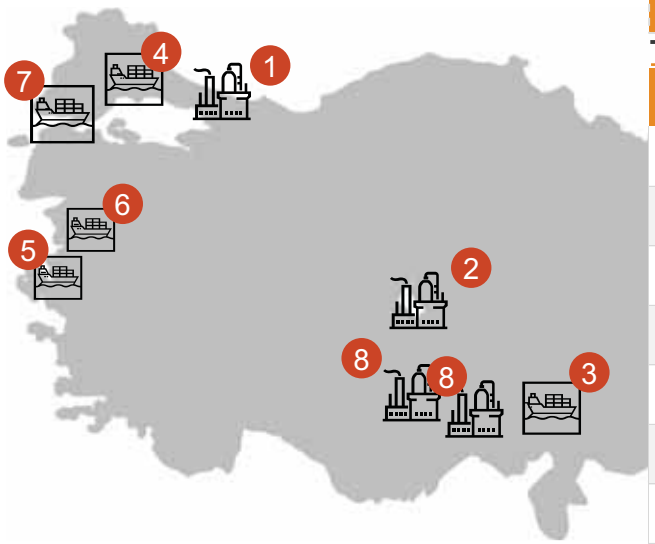


Table 15

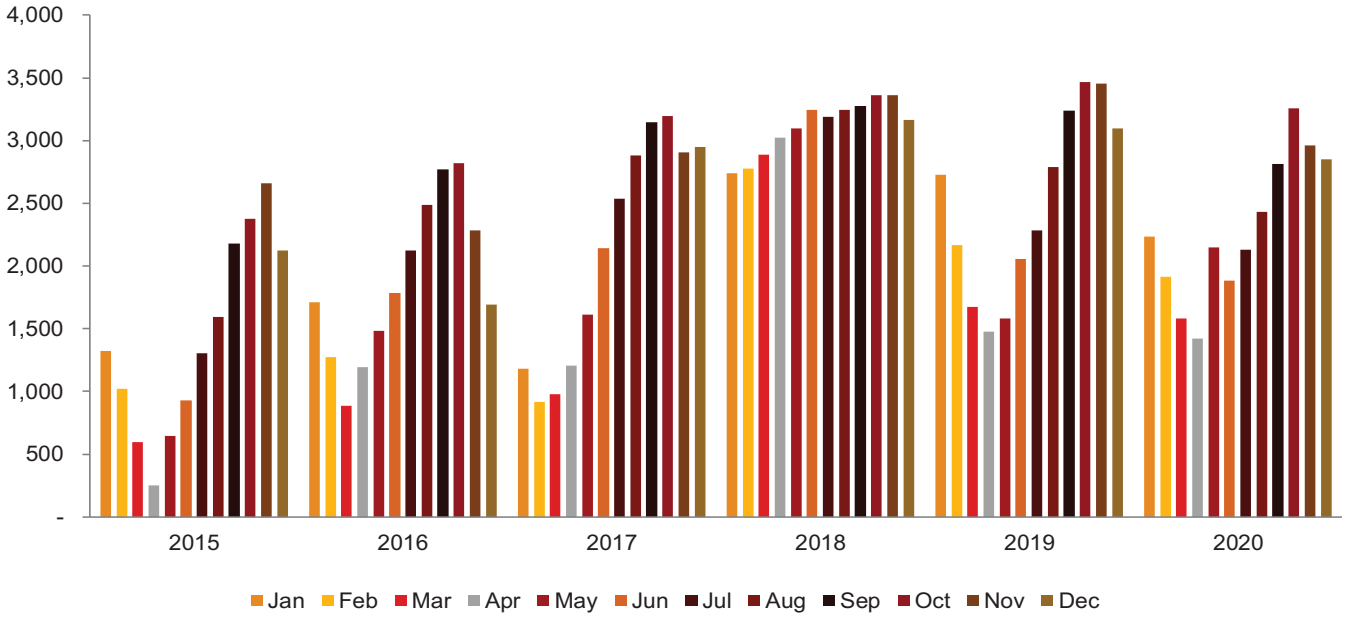
Turkey's Natural Gas Entry Points

No.	Facility Name	Current Capacity (bcm, 2020)	Planned Capacity (bcm, 2023)
1	Silivri Natural Gas Storage Facility	3.1	4.6
2	Lake Tuz Natural Gas Storage Facility	1.2	5.4
3	Hatay Dörtyol FSRU	0.3	0.3
4	Marmara Ereğlisi LNG Storage Facility	0.3	0.3
5	Egegaz Aliağa LNG	0.3	0.3
6	Etki Aliağa	0.1	0.1
7	Saros FSRU	n.a	n.a
8	Underground Storage Facilities in Tarsus	n.a	4.0

Graph 52

Natural Gas Stocks at the End of the Month (2015-2020, Million Sm^3)

Natural gas stocks amounted to 2.9 Million Sm3 in 2020. Following expansions planned in the Silivri and Lake Tuz storage facilities, total storage capacity in Turkey is expected to reach 10 bcm by 2023.



Source: EMRA, BOTAŞ

Turkey has made important natural resource discoveries in the Black Sea

Search for New Natural Resources

As part of Turkey's national strategy to achieve a sustainable energy supply, it has been drilling in the Black Sea and the Mediterranean Sea since the 1970s.

As a consequence of these exploration efforts, in the Black Sea region in August 2020 Turkey's drillship Fatih discovered a significant reserve of natural gas totalling 320 bcm in the Tuna-1 Field, which was renamed the Sakarya Gas Field. Furthermore, in October 2020 it was announced that an additional 85 billion cubic meters of natural gas had been discovered, in addition to the previous 320 billion cubic meters, bringing the total of the natural gas discovery to 405 billion cubic meters. In April 2021, Turkey's Türkiye Petrolleri Anonim Ortakliği (TPAO) began drilling the Amasra-1 well in the North Sakarya field. Subsequently, 135 billion cubic meters of gas was found at the Amasra-1 offshore well, bringing the total amount of deposits discovered over the past year to 540 billion cubic meters.

USD 12-13b (2019)
Annual Natural Gas Imports

0.4 bcm (2020)
Turkey's Annual Natural Gas Production

48 bcm (2020)
Turkey's Annual Consumption

540 bcm (2020)
Total Natural Gas Discovered

USD 65 bn
Total economic value of resources in the Sakarya field

Source: SETAV, GAZBİR, EİGM, Anadolu Agency, Fitch

The plan is for resources in the Sakarya Gas Field to be made available for consumption in 2023, via a 3-stage process.

Sakarya Gas Field Project Implementation Process

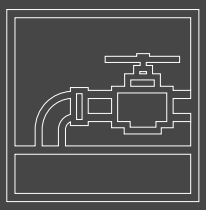
The project consists of 3 steps:

1.

Natural gas production facilities in the seabed

In the first phase of the project, 6 to 10 offshore wells will be connected to the seabed production system. In the second phase, more wells will be connected to the seabed production system. It is expected that the natural gas carrying capacity will be 10 and 40 million m3 per day in the first and second phases, respectively.
Parts of the production system will be manufactured by authorized and experienced companies in accordance with international standards, giving priority to local industry.

2.



2 pipelines to connect both facilities

A 155 km pipeline and cordon, buried about 1.5 m below the ground, will be installed from the marine production facility to the land facility. The pipelines will deliver to the onshore natural gas processing plant.

3.

Natural gas processing facility in Filyos Industrial Zone of Zonguldak, Çaycuma

The water and liquids in the gas will be separated, the particles will be filtered, the gas will be pressurized and then it will be sent to the distribution network.
The land facility is expected to remain in operation for approximately 30 years. As technology develops, updates and improvements will be made to further extend the lifetime.

Source: TPAO, Anadolu Agency

The award-winning natural gas discovery in the Black Sea is, in many ways, expected to have a positive impact on the Turkish economy, the job market and future possible natural gas discoveries, while being environmentally friendly

Features of Turkey’s gas discovery in the Black Sea:

- The largest natural gas discovery by Turkey, either on land or at sea, and by any country in the Black Sea to date
- The discovery is enough for 7-8 years of Turkey's gas needs
- The extracted gas will be ready for consumption in 2023
- Large enough to make Turkey more competitive in its gas import dealings
- Received "Discovery of the Year" award from Wood Mackenzie
- Sakarya field will be developed by TPAO alone, using domestic resources as much as possible

Potential Gas Discoveries in the Mediterranean

Turkey has launched a seismic surveying programme in the Mediterranean sea as part of a wider effort to renew exploratory interest in the country's offshore. As of June 2021, Turkey plans to continue drilling in the Mediterranean as the eight wells drilled there by TPAO so far have produced some positive signs but that any new drilling would have to wait until long-term maintenance work has been completed on TPAO's drill ship Yavuz.

Source: TPAO, Fitch, S&P Global

6.2

Coal Market

Turkish lignite reserves make up around 4% of the total lignite and sub-bituminous reserves in the world

The thermal quality of lignite reserves in Turkey is generally low. The **calorific values of lignite** range between **1,000 and 5,000 kcal/kg** while over **90%** of the reserves have a calorific value of **less than 3,000 kcal/kg**.

10.975 billion tons of proven **lignite and sub-bituminous reserves**

0.551 billion tons of **hard coal reserves**

in Turkey according to the **BP Statistical Review of World Energy 2020**.

19.3 billion tons of proven **lignite and sub-bituminous reserves**

1.5 billion tons of **hard coal reserves**

in Turkey according to **TKİ** and **TTK**.

The ownership of the mines is dispersed between **EÜAŞ**, **TKİ**, the **MTA** and the **private sector**.

As of the end of 2020, **2.1 billion tons** were held by **TKİ, while 17.2 billion tons** of reserves were held by **EÜAŞ**, **MTA,** and **private companies**.

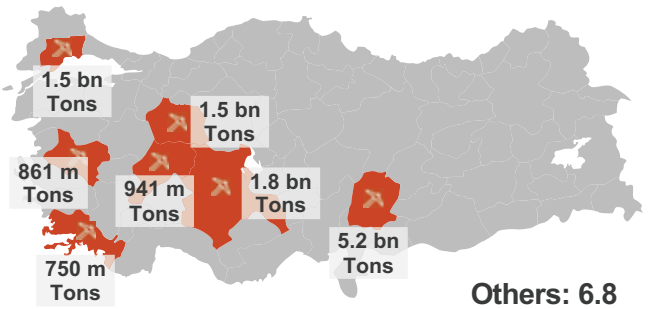
Lignite reserves in the country **increased** considerably in the **last decade,** with discoveries of **new reserves** made by MTA.

In the last 15 years, a total of **24 new coal fields** were discovered and **additional reserves** were found in **three existing fields**.

The total amount of **new lignite reserves** discovered in this period stands at **10.8 billion tons**.

Graph 53

Significant Lignite Reserves in Turkey



Source: Turkish Lignite Activity Report 2020, BP Statistical Review of World Energy

Hard coal reserves in Turkey are limited, and primarily located in the Zonguldak province

Hard Coal Reserves in Turkey and Calorific Values

Hard coal reserves in Turkey are located solely in Zonguldak Province in the Black Sea Region, and are scattered in **five different fields**.

The calorific value of hard coal reserves found in this region ranges between **5,450 and 7,250 kcal/kg**.

Total Proven Reserves

550 million tons of **hard coal reserves** can be found in Turkey according to the **BP Statistical Review of World Energy 2020**.

According to **TKİ** and **TKK,** Turkey has **734 million tons** of **total proven reserves** and **1.5 billion tons** of **estimated hard coal reserves** as of 2020.

Table 16

Significant Hard Coal Reserves in Turkey (2020, Mt)

	Non-Coking Coal	Semi Soft Coking Coal	Coking Coal			Total TTK
	Amasra	Armutçuk	Kozlu	Üzülmez	Karadon	Total TTK
Ready	0.4	2.0	2.7	0.3	2.2	7.6
Proven	401.6	6.7	62.8	132.9	129.2	733.1
Potential	158.9	14.4	40.5	94.3	159.2	467.3
Possible	58.8	7.9	48.0	74.0	117.0	305.7
Total	**619.6**	**31.1**	**154.0**	**301.6**	**407.5**	**1,513.7**

Source: Turkish Hard Coal Sector Report 2020

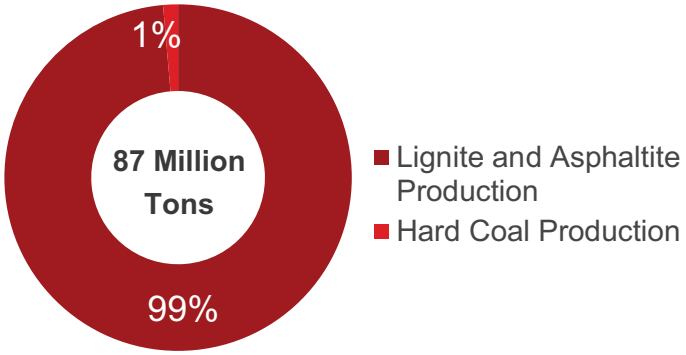
The production of hard coal declined between 2000 and 2018, while the production of lignite and asphaltite increased moderately

The types of coal mined in **Turkey** are **lignite, hard coal** and **asphaltite**. The **bulk of coal mined** is made up of **lignite** while the mining of **hard coal** and **asphaltite** remains at **modest levels**.

Until the beginning of the 2000s, TTK was the sole producer of hard coal. However, since then, the role of private companies has expanded. Private companies can undertake mining activities through royalty tenders.

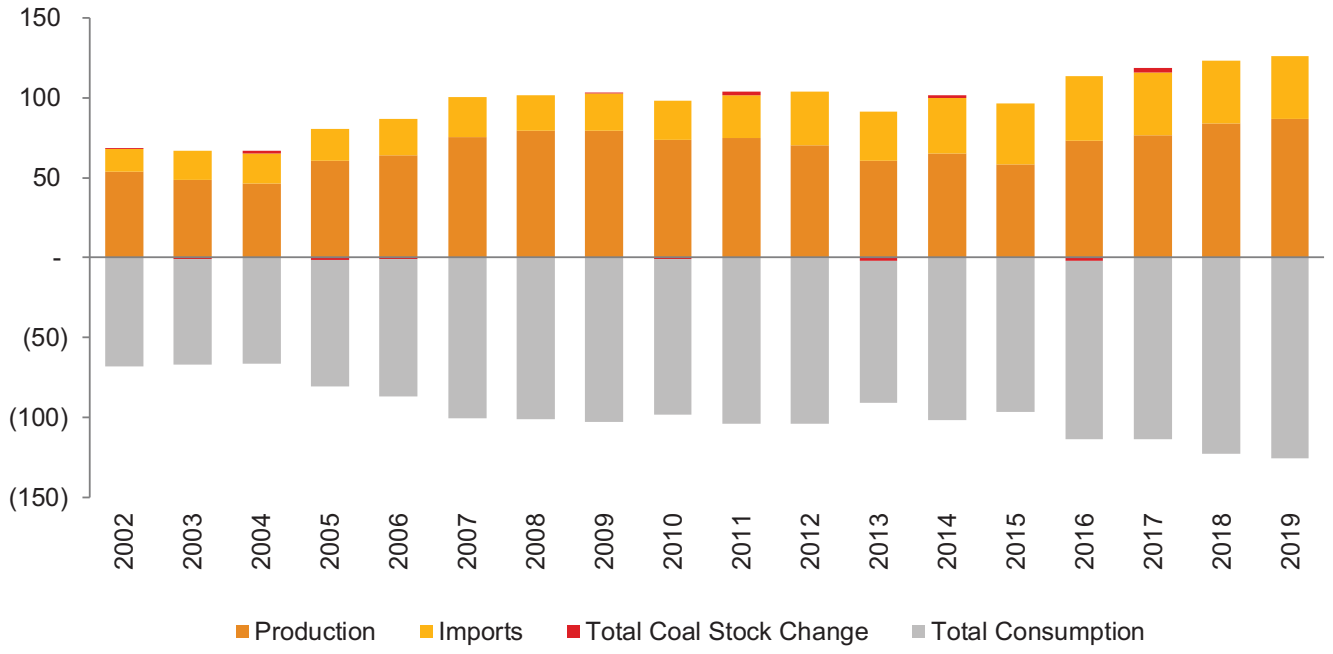
Graph 54

Coal Mining by Type (2019)



Graph 55

Balance of Coal Production and Consumption (2002-2019, Mt)



Source: MENR, Energy Balance Table 2019

Increasing the share of domestic coal in the energy mix is one of the main policies pursued by policy-makers

The **share of domestic coal** in total **installed capacity and electricity generation** has been decreasing in recent years. To curb the country's **dependence on energy imports**, the government has recently been taking steps to **limit imported coal** and increase the use **of domestic coal sources** (especially lignite).

In the **Electricity Market and Supply Security Strategy Paper** issued by the **Higher Planning Council**, the **utilization of almost all lignite and hard coal resources** in the country for electricity generation is set as a clear target for **2023**.

The **Ministry of Energy and Natural Resources** has been working on alternative ways to incentivize local coal production. **For this reason, Turkey set an additional tax of USD 15 per tonne on imported coal in 2016.** This tax was later changed to an **index-based mechanism** under which the tax was **USD 70 per tonne minus** the price of coal on the **ICE Rotterdam Future Index**.

Purchase guarantees are also being provided for **lignite-based power plants** in Turkey. **EÜAŞ** announced that it would provide purchase guarantees to coal plants working **fully or partially on domestic coal** until the end of **2024,** with the price set at **201.35 TL/MWh in 2018,** to be updated according to CPI, PPI and the USD/TL exchange rate. Each quarter's price has a cap of $55/MWh and a base of $50/MWh.

In 2021, EÜAŞ is expected to purchase more than 27.1 million MWh of electricity from power plants utilizing domestic coal, and 1.7 million MWh from those utilizing a mix of domestic and imported coal.

Source: EÜAŞ, EMRA, Enerji IQ

6.3

Turkey's Climate Change Agenda

ESG refers to three basic factors used to measure the sustainability and social impact of a company. These criteria help to better determine the future financial performance of companies.

E

Environmental

- Energy efficiency
- Use of renewable resources
- Global warming and climate change
- Depletion of natural resources
- Air quality, carbon and greenhouse gas emissions
- Soil quality and fertility
- Deforestation
- Water quality and consumption
- Biodiversity
- Clean technology investments
- Waste and environmentally hazardous materials (environmental pollution)

S

Social

- Diversity and inclusion
- Human rights
- Data security and privacy
- Access to healthcare
- Wage equality
- Employee training and development
- Employee rights (compensation and benefits)
- Child labour
- Local community relations
- Business ethics
- Digitalization

G

Governance

- Board structure (ratio of women, ethnic diversity, age group differences)
- Administrator responsibilities
- Enterprise risk management
- Supply chain management
- Board observation of climate issues
- Business code of conduct
- Competitive behaviour
- Anti-corruption (bribery)
- Tax transparency
- Determining company purpose (scope in accordance with priorities and strategy), balancing the needs of stakeholders, deciding how to measure success
- Reporting of purposeful, meaningful and measurable information (with consistent, complete, accurately defined data about the brand that supports accountability by explaining calculation methodologies and processes)
- Creating common understanding with new value measures, and encouraging adoption thereof
- Independent assurance

2030 global demand forecast[1]

50% more energy

40% more water

35% more food

Source: UNFCCC, [1] PwC Net Zero by 2030

Sustainability and ESG provide comprehensive insights into how companies can add elements to their existing value bridge. The multiple impact ensured by ESG enables companies to approach their full potential value.

Increasing credibility, searching for purpose within society, awareness, scrutiny, activism and sensitivity to issues such as the environment, health and human and animal rights cause changes in people's behaviour, decision-making, expectations and purchasing models. With changing investor preferences and needs, access to capital on favourable terms will increasingly depend on companies' ESG performance and future outlook. ESG is also included in priority criteria for institutional investors, along with operational strength and risk return.

ESG is increasingly a focus of private equity and corporate clients. Regulatory and supervisory bodies, customers, investors, shareholders and other stakeholders, employees and suppliers require companies to demonstrate that they can operate in a sustainable way. Likewise, citizens have expectations of their governments regarding ESG.

Increased sales due to the effect of ESG on customers, operations and supply chains have been an indicator for industry transformation in the last decade. Analysing the effects of ESG on the value chain reveals that some industries have made important shifts. For instance, the move away from internal combustion engines in the automotive sector, the choice to use renewable energy sources in electricity production and the transformation to less harmful electronic cigarette production in the tobacco sector have all led to an increase in turnover. Sectors that are expected to participate in this trend more in the near future include chemicals, food, aviation, clothing, manufacturing, entertainment, retail, health and services. These opportunities affect not only company behaviour but also investor habits. Companies that reflect a sustainable transition plan will create value at an unprecedented scale. States have also started to follow this trend, with 73 countries including the UK and France committed to national net zero carbon emissions by 2050.

To Join ESG Transformation

- Include non-financial KPIs in compensation policies
- Add green and sustainable instruments to your investment portfolio
- Include ESG risks and benefits in valuation and modelling
- Provide ESG integration at product and service level

Source: Furman, J, R Shadbegianand J Stock (2015), "The cost of delaying action to stem climate change: A meta-analysis",

ESG Compliance comes with a variety of benefits

A high ESG score has a significant effect on a company's valuation, and higher ESG ratings are associated with higher returns. ESG-compliant companies have a higher terminal value growth rate than their peers. Stocks of leading ESG companies are less volatile and subject to lower systematic risk (Beta factor), thus having lower capital costs than peer companies. They also achieve higher free cash flow as they show better operational performance.

Growth
- Brand development, recognition and customer acquisition
- Reducing the risk of future downtime
- Access to new markets and revenue streams

Cost reduction and productivity increase
- Focus on resource efficiency, lower energy consumption, less water intake and fuel consumption, elimination of paper
- Retaining employees and attracting new talent
- Supply chain flexibility

Less regulatory intervention
- Greater strategic freedom due to better compliance with regulatory requirements
- Earning government support

Reduced cost of capital
- Increasing the range of financing available for a business and accessing more favourable financing terms
- Lower cost of capital due to reduced risk exposure

Investment and asset optimization
- Increased return on investment in the long run by allocating better capital
- Avoiding unrecoverable investments caused by long-term environmental problems
- Strategic resilience
- Valuation premiums in line with changing investor/consumer preferences

The Effect of ESG on Valuations

90% of the studies conducted show that good sustainability standards reduce the cost of capital.

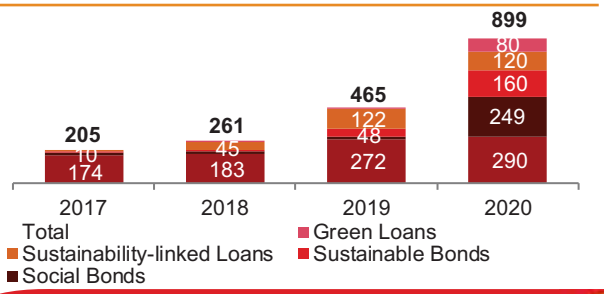
88% of the studies show that robust ESG practices result in better operational performance.

80% of the studies conducted show that stock prices are positively affected by sustainability practices.

63% of the studies found that god ESG performance positively affects the return on equity.

Graph 56

Issues in the global sustainable borrowing market (billion USD)



ESG and Sustainable Finance

Sustainability and climate-integrated portfolios can provide better risk-adjusted returns to investors. Sustainable investment is believed to be the strongest foundation for forward-looking customer portfolios, due to the increasing impact of sustainability on investment returns.

Source: PwC Analysis, Taskforce for Climate Related Financial Disclosure (TCFD), McKinsey; Five ways that ESG creates value, PwC Market Research Centre
Sustainable Bond Insights - BloombergNEF , Bloomberg L., Statista, Climate Bond Initiative - Green Bond Market Summary

Investors and regulators in Turkey are also closely following developments in the ESG space and reacting collaboratively to ensure effective adoption of ESG principles

Sustainability and ESG Efforts in Turkey

Sustainability Principles Compliance Framework

The Capital Markets Board of Turkey has enacted this regulation to ensure that Turkish companies make greater efforts to switch to more sustainable methods. Due to its "comply and explain" principle, this framework pushes companies to be more responsible and transparent regarding their ESG-related processes and efforts to shift to these processes. This regulation provides companies with a detailed plan for explaining how they are adapting their processes to sustainable methodologies and, if they are not complying with the principles, the reasons they are not complying.

BIST Sustainability Index

BIST Sustainability Index has been created to motivate and set an example to all public companies in Turkey to shift their focus and processes to sustainable and ESG-compliant methods. It also serves the purpose of creating a platform for institutional investors to be involved with companies who are high performers in the ESG and sustainability issues. As of 2020, 61 companies are listed in this index.

Zero Waste

A collaborative effort targeted to personal, institutional and municipal levels, sifiratik.gov.tr initiative is aiming to decrease the amount of waste produced and discharged to the waters of Turkey. It's primary goal is to raise awareness to all levels of business and government to decrease discarding industrial waste to the seas surrounding Turkey. This way, it aspires to increase efficiency and motivation of individuals and businesses to perform at a better rate.

Sustainable Green Buildings Ordinance

The Sustainable Green Buildings Ordinance aims to raise awareness on a prominent issue in the modern world: high-efficiency, low-energy buildings that generate and use their own energy supply. This regulation aims to initiate certificates that will be awarded to buildings and to the contractors that build these buildings utilizing sustainable methodologies. Residential waste is also an important factor in determining how sustainable and ESG-compliant these buildings are.

United Nations Global Compact

United Nations Global Compact is the world's largest corporate sustainability initiative that assists organizations to align their strategies and operations with universal principles on **human rights**, **labour**, **environment**, and **anti-corruption**.

Globally **18,270** participants, including **companies**, **NGO's**, **cities**, **SME's**, **public sector organizations** and **foundations** participated and supports the "Ten Principles" of the UN Global Compact.

As of August 2021, the number of participants that express their intent to implement those principles reached to **318** in Turkey.

The first company from Turkey, **Akfen Holding,** participated on 02.07.2002 and was followed by **Koç Holding** (05.04.2006) and **Eczacıbaşı Holding** (26.05.2006).

Source: Ministry of Environment and Urbanization, Capital Markets Board of Turkey

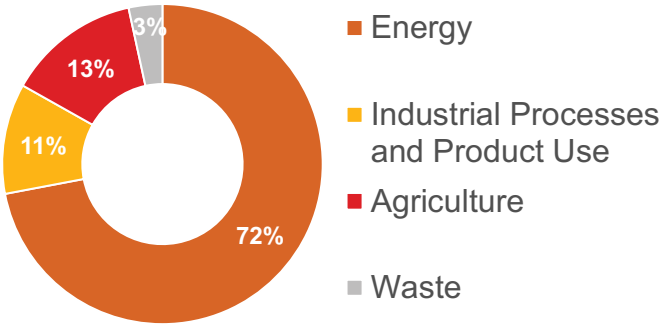
Despite the significant increase in greenhouse gas emissions in Turkey in the last decade, total emissions decreased by 3.2% in 2019. The country's total emissions make up a small fraction of total global emissions, accounting for around 1% of the global total in 2019.

The annual carbon emissions released into the atmosphere from Turkey amounted to 506 million tons of CO_2 equivalent (CO_2e) in 2019, up from 220 million tons of CO_2e in 1990.

The energy sector is responsible for an overwhelming share of the carbon emissions in the country, accounting for 72% in 2019. Industrial processes and agricultural activities stand out as two other major causes of carbon emissions.

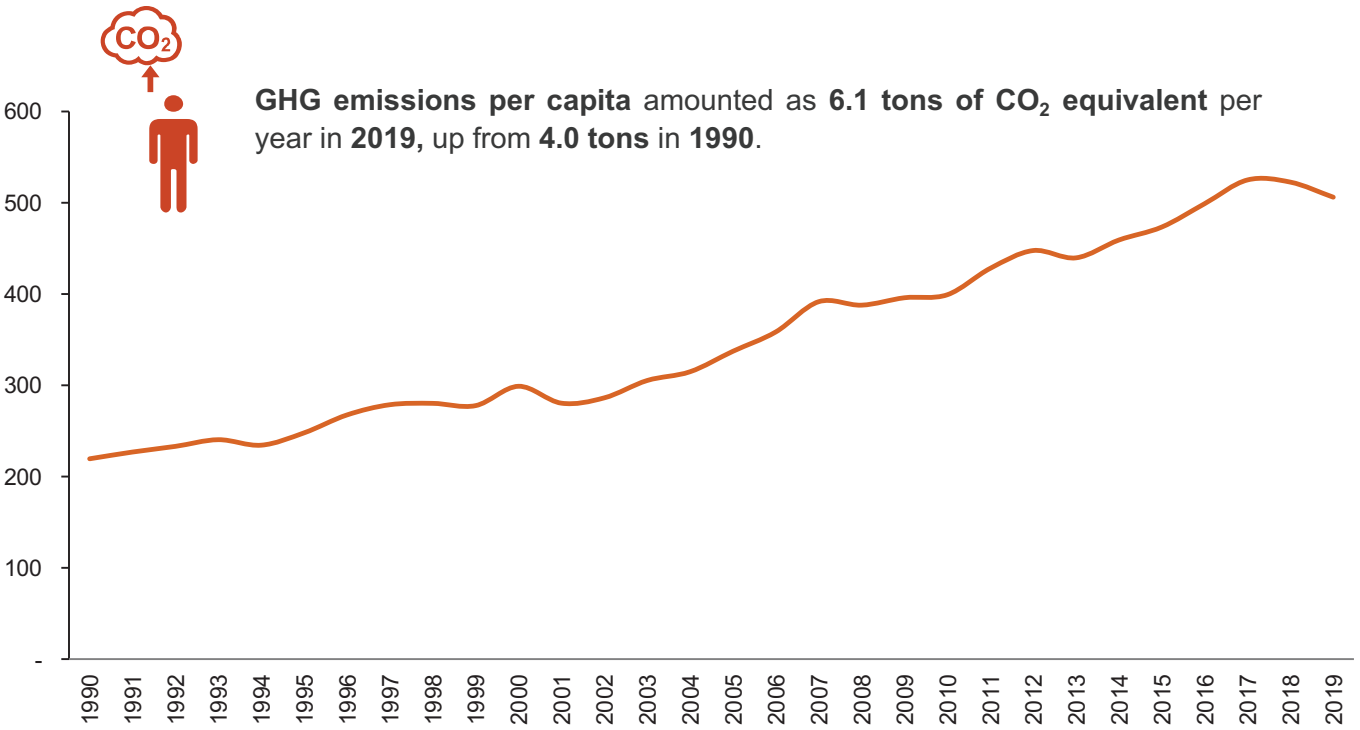
Graph 57

Carbon Emissions by Sector (2019, %)



Graph 58

Greenhouse Gas Emissions in Turkey (1990-2019, m Tons)



Source: Türkstat

The Paris Climate Agreement aims to bring all nations in the world together to combat climate change. As of 6 October 2021, the Paris Climate Agreement was ratified by the Turkish Parliament.

The agreement reached at the **Paris Conference** in late 2015 marked an important turning point for the global climate change regime, as nearly all the countries in the world took part. The agreement came into force in November 2016. **55 countries that together account for more than 55% of global GHG (greenhouse gas) emissions** ratified the agreement.

The Paris Agreement differs from previous climate change agreements in that the mitigation pledges of participating countries are decided upon by each country based on **national circumstances, capabilities and priorities,** with a view to **limiting the global average temperature increase to 2° Celsius**. The agreement commitment covers the period **between 2020 and 2030**. The pledges of individual countries are referred to as **Intended Nationally Determined Contributions (INDC).**

Turkey's involvement in climate talks

Participation in the agreement marks a turning point for Turkey as it is the **first time** the country has taken on a **climate change mitigation commitment**. Turkey submitted its INDC document on **30 September 2015** and officially signed the agreement on **22 April 2016**.

There were certain points in Paris Climate Agreement Turkey wanted to re-negotiate and Turkey's proposals were opened to discussion. Parties recently reached a mutual agreement on those points. As of 6 October 2021, the Paris Climate Agreement was ratified by the Turkish Parliament.

Source: UNFCCC

The evolution of the global climate change regime will influence Turkey's local coal ambitions

The planned expansion of the coal market and coal-fired electricity generation in the country in the coming years is projected to be an integral part of a large increase in CO_2 emissions. Turkey aims to guarantee its access to climate change financing before it ratifies the agreement. However, even if the agreement is ratified and comes into force, it is important that the country's current pledge not be so ambitious that it is a stumbling block for the domestic coal industry and the country's coal-fired power generation.

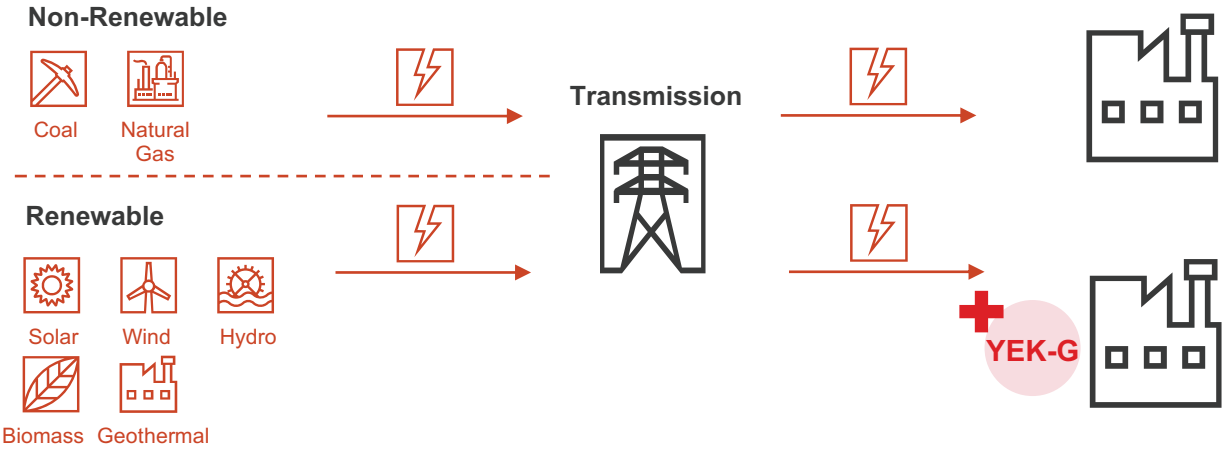
If there are new developments in global climate change governance, there is a chance the country's coal industry will be adversely affected.

Currently, Turkey does not impose a carbon tax on thermal power plants, but it is moving forward with plans to provide carbon certificates that can be traded internationally. In 2021, Turkey initiated the YEK-G system, a platform for trading green certificates.

Given the increase of global concern regarding climate change and growing local opposition to coal investments, adoption of a carbon pricing mechanism may be a possibility in the medium term. Depending on the price level, a carbon pricing mechanism has the potential to have significant impact on electricity prices in the country.

An important step towards promoting share of renewable energy and reducing carbon emissions, The Green Certificate Market in Turkey started in June 2021

YEK-G system, out of which the certificates will be generated, started on 6/1/2021. EXIST is operating in the capacity of market regulator. System users are required to have production (supply side) and supply licences (demand side). Any existing bilateral agreement between a production facility and supply company need to be notified to EXIST. System users are able to exchange certificates through continuous trading method in which bids are matched immediately after they are included in the trade book.



Green Certificate (YEK-G Certificate)

1. Every 1 MWh electricity production will correspond to a YEK-G Certificate.
2. YEK-G Certificate Documentation will be valid only 12 months after electricity produced.
3. Certificate will tell the source of electricity generated and inform about the environmental impact

Green Tariff (YETA)

Green tariff was introduced by EMRA in August 2020 in order to be able to provide a tariff option to consumers (who are not eligible and/or prefer not use eligibility right) to commit to use renewable energy as part of their environmental sensitivity. YETA and YEK-G are integral in the way that consumption of YETA consumers will need to be confirmed via certificates from YEK-G system. ***The price of electricity is around 10 US¢/kwh for the first quarter of 2021 (0.75 TL/kwh).YETA has been launched prior to introduction YEK-G system. Interest in YETA is expected to pick up with the commissioning of YEK-G market.***

2 Main Advantages of The YEK-G Certificates

Sustainability

YEK-G certificates will be able to be used in the sustainability reports as a direct way of expressing carbon emission levels attained. YEK-G certificates will be issued in compliance with EU standards and provide exporters with a tax exemption solution like the one the EU would normally apply based on carbon emissions.

Revenue for Renewable Assets

Companies generating electricity using renewable resources will be able to generate additional income through the issuance and trade of YEK-G certificates

Source: EMRA

The green tariff (YETA) enacted by EMRA on 1 August 2020 will ensure that renewable energy is indirectly supported by the private sector

Renewable energy installed capacity, which contributed 52% of the total installed capacity as of April 2021, will be promoted with the introduction of this policy. Consumers who want to use energy within the scope of YETA will be able to buy electricity based on renewable sources from their supplier companies.

YETA users will only buy electricity generated from renewable energy resources. YETA is only available for electricity generated by licensed renewable power plants. Consumers can also request a green energy certificate from their suppliers. The renewable energy source guarantee certificate (YEK-G certificate) will be provided to consumers to prove that the energy used by them is generated from these sources. Thus, companies will be able to prove the source of the electricity they provide to their consumers by creating a YEK-G certificate for each megawatt-hour of electricity they generate.

With the introduction of the YEK-G regulation on 1 June, the YEKA period has truly begun.

Consumers will be able to switch to YETA by applying to the company from which they receive energy. The request to switch to YETA can only be made twice in each calendar year. EMRA will issue a certificate for consumers who are using YETA, enabling them to prove their tariffs. According to the latest published tariff in April 2021, YETA's active energy cost is higher than regular tariffs by 35.50% for industrial subscribers, 24.94% for commercial subscribers and 88.39% for household subscribers.

Table 17

Energy Costs Based on Tariffs,
(July 2021, kr/kWh)

	Active Energy Cost	Active Energy Cost of Green Tariff
Industrial	64.8683	92.6227
Commercial	70.6347	92.6227
Household	47.4253	92.6227

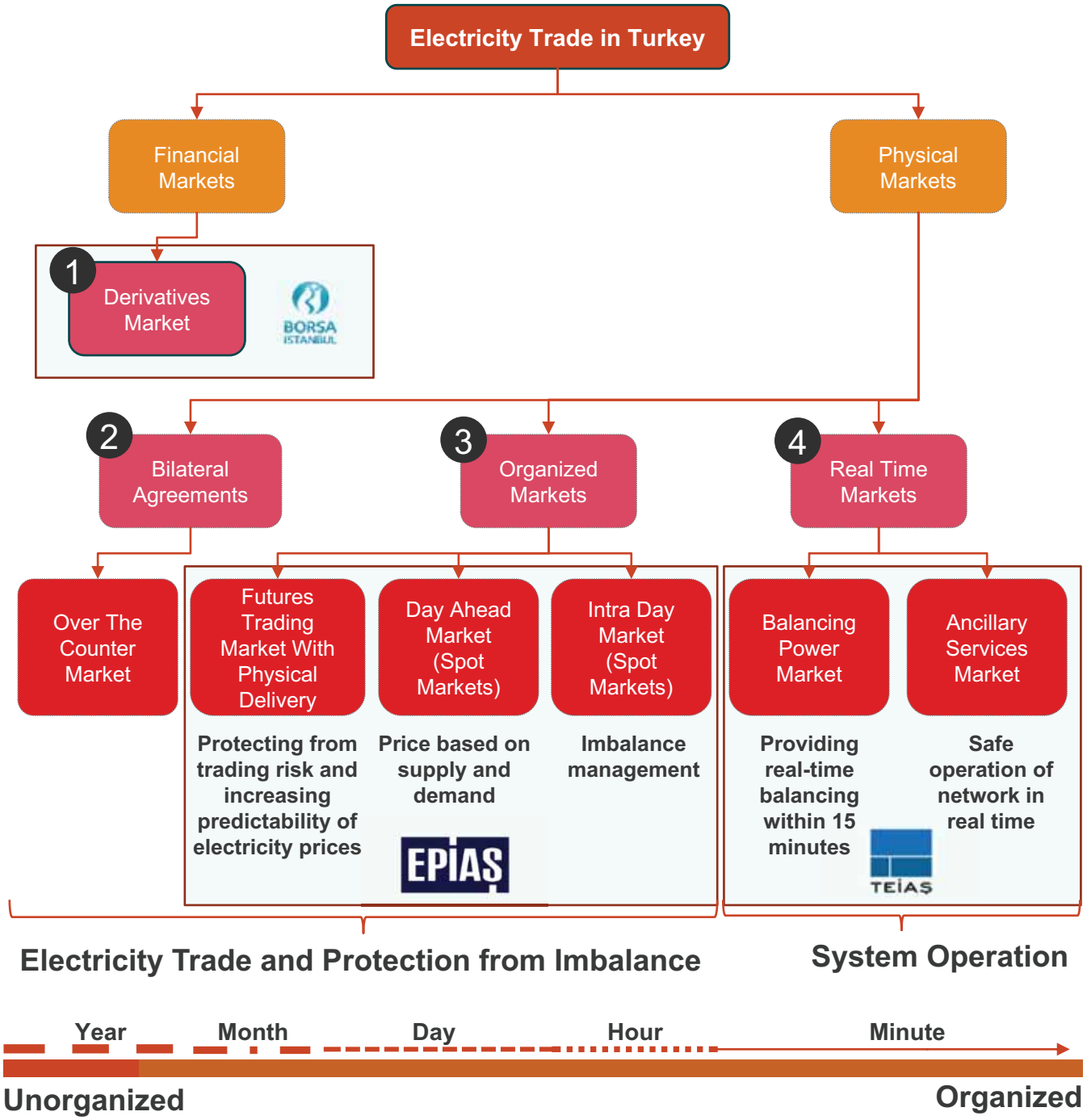
Even though the tariffs are more expensive, consumers may prefer YETA to protect the environment by using renewable energy with zero-emissions. The MENR argues that YETA can be considered a social responsibility project where consumers support the use of renewable energy by using the green tariff. Furthermore, using YETA may benefit the reputations of firms, which will be a significant factor for both domestic and foreign markets. The MENR is planning on channelling these motivations into the development of renewable energy in Turkey.

Source: EMRA

7

Electricity Price & Electricity Trade

Electricity is traded in Turkey in several types of markets



Source: EPİAŞ

Organized spot markets are used to determine the market price of a given commodity. The intra-day and day-ahead markets are used to determine spot prices for electricity

3 Organized Spot Markets

The day-ahead market and intra-day markets are two electricity spot markets operated by EPİAŞ. Participation in these markets is not obligatory. Participants have to sign the Day-Ahead Market Participation Agreement and deposit the required guarantee. Participants offer bids that include price and quantity in order to buy or sell electricity from the day-ahead market for each hour of the following day.

The market clearing price (DAMP) and the traded volume are determined for each hour by matching the bids of buyers and sellers. After the day-ahead market closes, participants may supply their needs through the intra-day market

The main difference between intra-day and day-ahead trading is the pricing of the markets:

Intra-Day Market **Day-Ahead Market**

The intra-day market is a continuous market where orders are immediately executed if there is a matching offer in the opposite direction. Due to its nature, prices fluctuate throughout the day. The day-ahead market determines a uniform market price and clearing volume for all transactions for each hour of the next day.

The day-ahead market has three main purposes:

1. Setting a **reference price** for the electricity market
2. Serving as a **platform** for market participants to conduct electricity **trading and balancing**
3. Facilitating system operation by **providing a balanced** market **one day ahead**.

The supply side can adjust the amount of **generation**, while the **demand side** can fine-tune their **consumption** according to the reference price of electricity.

Day-ahead market features:

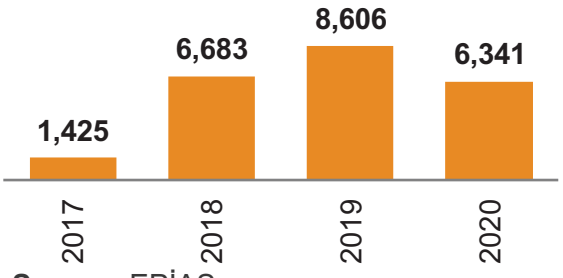
1. Participation in the market is **portfolio-based** and each participant is **obligated to balance** their portfolio
2. **Price** is determined for **each hour** of the following day
3. When bidding, the unit used for quantity is lot[1] while TL is used for the price.

The optimization algorithm used to determine the hourly market prices in the day-ahead market was changed in 2016. The new optimization software was domestically developed by EPİAŞ.

With the new domestic software, the needs of the market can be met more efficiently.

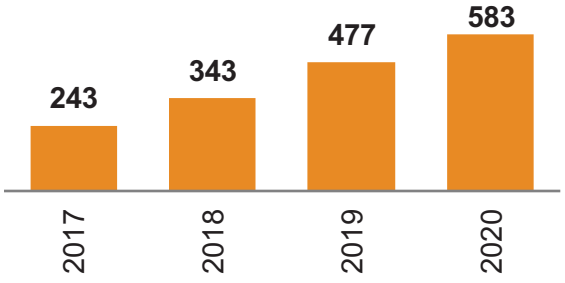
Graph 59

Number of Total Offers in the Intra Day Market (2017-2020, k)



Graph 60

Number of Average Monthly Participants in the Intra Day Market (2017-2020)



Source: EPİAŞ

[1] Lot: 1 MWh/10.

Physical Electricity Markets

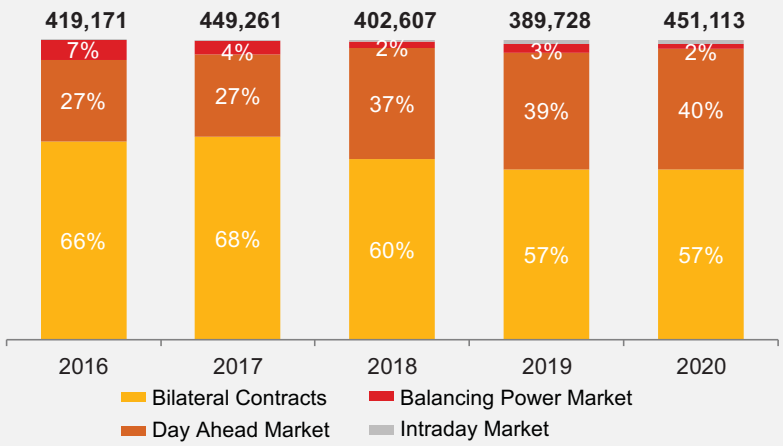
Bilateral agreements allow suppliers and consumers to come to prior agreement on electricity purchase prices.

With the decrease in price predictability in recent years, specifically exchange rate hikes in 2018, the number of bilateral agreements has declined. Many generation facilities began to incur significant losses when selling under predetermined long-term contracts and decided to terminate their contracts, as the termination costs were lower than the losses incurred from these agreements. Buyers whose contracts were terminated had to resort to spot markets. The change in market prices caused losses for both parties, and it resulted in a sharp decrease in the volume of bilateral agreements in the market.

The share of bilateral agreements in the market has decreased more after 2018, as the share of organized spot markets that cover the day-ahead market and intra-day market increased. Although, it is seen that the share of bilateral agreements continued to consist a large part of overall market , it is understood that most agreements are short-termed.

Graph 61

Distribution of the Electricity Market
(MWh, 2016-2020)



Source: EPİAŞ

[1] Lot: 1 MWh/10.

In order to address the problem of unpredictability in the market, which hinders bilateral trading, EPİAŞ launched a newly organized electricity market that makes forward electricity trading with physical delivery possible.

The Power Futures Market (PFM) was launched on 1 June 2021 as an addition to the existing markets, and it offers long-term, physical delivery. In the new futures market participants may trade directly with EPİAŞ, which removes counterparty risks commonly observed in bilateral agreements. EPİAŞ also provides a daily index price which helps with signalling in the market.

In organized spot markets, market participants can balance their portfolios and perform physical optimization. In the power futures market, participants have the opportunity to hedge against price risk and see price expectations for the future (price discovery). Therefore, spot and power futures markets respond to different needs of market participants and complement each other in this regard.

EPİAŞ eliminates counterparty risk in over-the-counter markets by providing a platform that brings the demand side and the supply side together without them meeting physically, and offers assurance to both parties. The most significant feature distinguishing PFM from other markets is the central counterparty role that EPİAŞ undertakes.

PFM contracts are different from bilateral agreements:

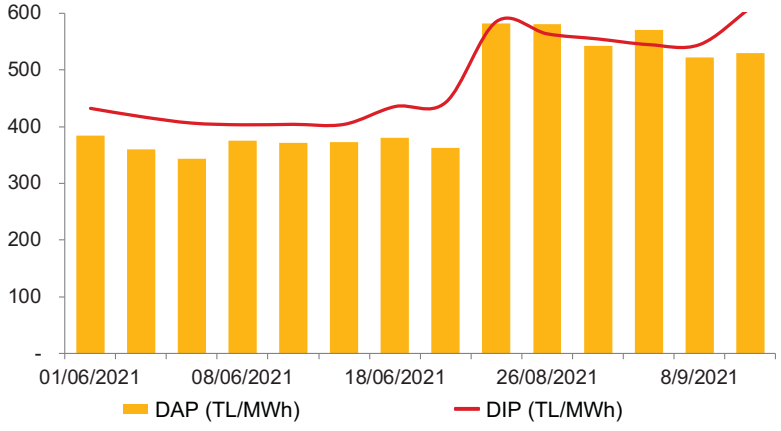
- The contracts are standard
- PFM contracts are traded in organized markets
- EPİAŞ provides central counterparty service to parties; there is no counterparty risk and physical delivery and payments are guaranteed
- PFM contracts can be exchanged continuously until the delivery period
- PFM contracts are subject to regulation

At the end of each session, for contracts traded the daily index price (DIP) calculated and published through matches in each session's contract, is published. Thus, a price signal contributes to supply security for market participants.

Currently, only futures contracts with August as the delivery month are traded in the power futures market. The difference between the day-ahead market price and the daily index price is 34 TL/MWh on average.

Graph 62

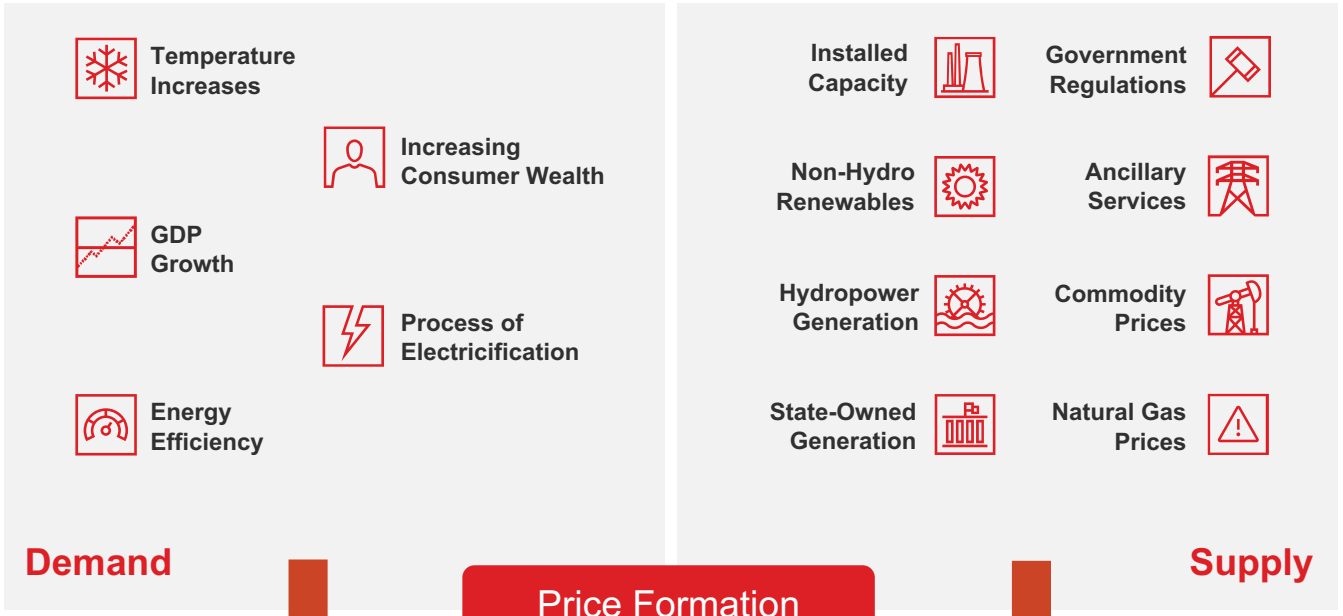
Day Ahead Prices and Daily Index Price (TL/MWh)



Source: EPİAŞ

[1] Lot: 1 MWh/10.

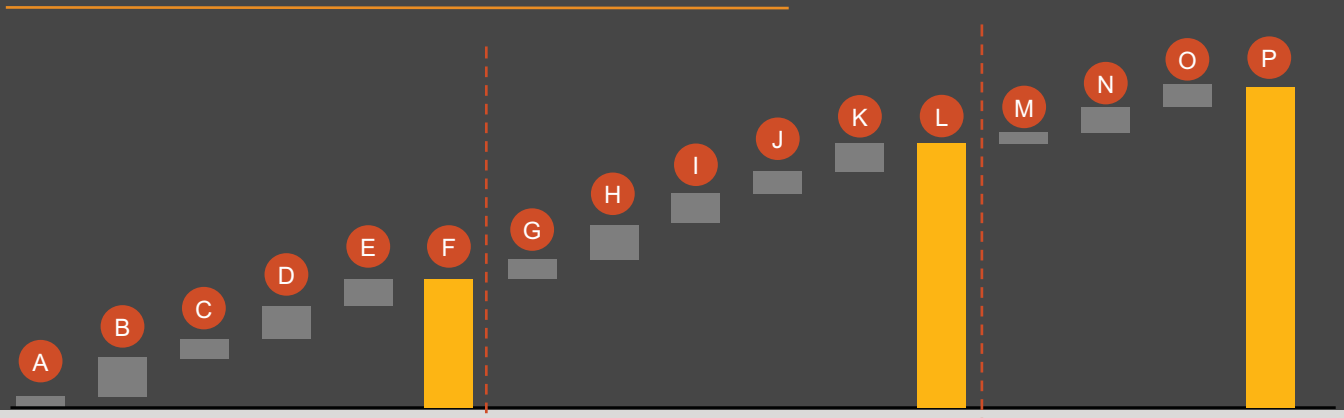
The complexity of the electricity market creates challenges when attempting to attribute price changes to only one factor. Changes in demand and supply parameters can have either positive or negative effects on the DAMP



Temperature Increase in Summer[1]	↑	↓ Increased Renewable Energy Generation
Temperature Increase in Winter[1]	↓	↓ Increased Base-load Reservoir HPP Generation
Increased GDP Growth	↑	↑ Commodity Price Increases
Energy Efficiency Increases	↓	↑ Natural Gas Supply Crises
Per Capita Energy Consumption	↑	↑ State Companies' Cost Reflectiveness
Electricification of Industry	↑	↓ Ancillary Services Market
Consumption Support Mechanisms	↑	↑ Thermal Power Plants' Failure and Maintenance Periods
		↓ Installed Capacity Increases

[1] Deviation from seasonal averages

The retail tariff is based on the cost of electricity, funds paid to the renewable support scheme, and taxes



Cost of Electricity

- **A:** Cost of the electricity to be procured through bilateral deals with EÜAŞ,
- **B:** Cost of electricity obtained from the organized markets (day-ahead, intra-day, balancing power),
- **C:** Cost of electricity obtained through bilateral contracts,
- **D:** Cost of electricity supplied from micro-cogeneration facilities,
- **E:** Renewable Energy Support Mechanism unit cost,
- **F = Cost of Electricity.**

Active Energy Cost

- **G:** Gross profit margin calculated as a percentage of F (2.38%),
- **H:** EPİAŞ fees,
- **I:** System Imbalance Revenue Item,
- **J:** Energy Procurement Correction Component,
- **K:** OPEX,
- **L: Active Energy Cost.**

Final Electricity Tariff Applied to Consumers

- **M:** Distribution service cost specified in the national tariff,
- **N:** TRT Fund, Energy Fund and the municipality consumption tax (MCT), calculated as a percentage of the active energy cost,[1]
- **O:** Value added tax,
- **P: Final electricity tariff applied to consumers.**

[1]TRT-2%, Energy Fund-1% MCT-1% for industrial customers and 5% for other customer groups

Sample Tariff Calculation

Energy Type: Low Voltage
Consumer Type: Residential
Consumption: 100 kWh

L = Active Energy Cost **=** 100 x 0.474253[2] **= 47.42**
M = Distribution Costs **=** 100 x 26.5120[3] **= 26.51**
N = Funds = L x (2% + 1% + 5%) **=** 47.42 x 8% **= 3.79**
O = (L + M + N) x VAT (18%) = 77.73 x 18% **= 13.99**

P = Final Electricity Tariff Applied = L + M + M + O = 91.71

[2] Electricity tariff for residential [3]Distribution tariff for residential as of July 2021

The YEKDEM unit cost is charged to end users based on the rate of consumption

- Cost of electricity procured through bilateral deals with EÜAŞ
- Cost of electricty obtained from the organized markets
- Cost of electricity obtained through bilateral contracts
- Costs of electricity supplied from micro-cogeneration facilities
- **Renewable Energy Support Mechanism unit cost**
- Gross profit margin calculated as as a percentage of electricity cost
- EPİAŞ fees
- System Imbalance Revenue Item
- Energy Procurement Correction Component
- OPEX
- Distribution service cost
- Funds
- VAT

Electricity generation facilities subject to YEKDEM sell electricity at market price and EPİAŞ reimburses the companies for the difference between YEKDEM FiT and market price. These costs arising from price differences are obtained from the relevant retail, distribution or wholesale companies that serve end users.

In this manner, YEKDEM costs are covered by all end users through procurement companies, as these costs are added to the retail tariff as a cost item. YEKDEM costs are shared proportionally among procurement companies based on the electricity volume sold to all domestic end users.

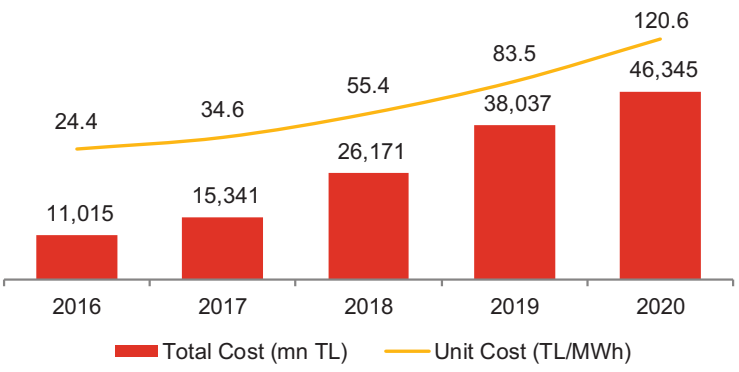
YEKDEM Unit Cost

The unit cost of YEKDEM is calculated by deducting the **Day-ahead market costs**[1] from the **Total YEKDEM costs**[2] and dividing the result by total consumption.

As of 2020, YEKDEM unit cost had increased by 44.4% compared to 2019 and amounted to **120.6 TL/MWh**. The rapid increase was mainly driven by the increase in the share of renewable energy in electricity generation.

Graph 63

Total and Unit Cost of YEKDEM (2016-2020)



Source: EPİAŞ, EMRA

[1]Total YEKDEM costs = Electricity generation of renewable energy facilities subject to YEKDEM x Feed-In Tariff
[2]Day ahead market costs = Electricity generation of renewable energy facilities subject to YEKDEM x DAMP

A retail margin is added to the total amount associated with direct electricity procurement cost items

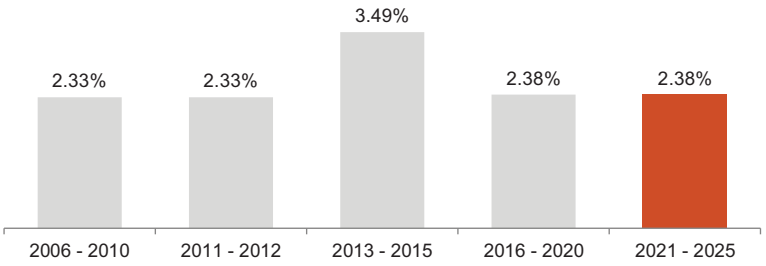
- Cost of electricity procured through bilateral deals with EÜAŞ
- Cost of electricty obtained from the organized markets
- Cost of electricity obtained through bilateral contracts
- Costs of electricity supplied from micro-cogeneration facilities
- Renewable Energy Support Mechanism unit cost
- **Gross profit margin calculated as as a percentage of electricity cost**
- **EPİAŞ fees**
- System Imbalance Revenue Item
- Energy Procurement Correction Component
- OPEX
- Distribution service cost
- Funds
- VAT

Retail Margin

The retail company adds a certain margin to the costs of the electricity it purchases, and this margin constitutes the retail company's share. The margin is reflected on the invoice and charged to end consumers. Electricity costs to which the gross profit margin is added include YEKDEM costs. EMRA has determined the current gross profit margin is **2.38%**.

Graph 64

Regulated Retail Margin (2006-2025, %)



EPİAŞ Fees

EPİAŞ fees are the costs applied to procurement companies by EPİAŞ, which is the operator of the organized electricity market. These costs include:

- Retroactive correction factor
- Market operating fee
- Share of receivables not paid on time
- Transmission surcharge
- Difference fund
- Other items determined by EMRA.

Source: EPİAŞ, EMRA

System imbalance revenues are reflected in the electricity invoices of end consumers

- Cost of electricity procured through bilateral deals with EÜAŞ
- Cost of electricty obtained from the organized markets
- Cost of electricity obtained through bilateral contracts
- Costs of electricity supplied from micro-cogeneration facilities
- Renewable Energy Support Mechanism unit cost
- Gross profit margin calculated as as a percentage of electricity cost
- EPİAŞ fees
- **System Imbalance revenue Item**
- Energy Procurement Correction Component
- OPEX
- Distribution service cost
- Funds
- VAT

System Imbalance Revenue Item

Energy generation facilities are obligated to submit their hourly generation plans to the market operator and are held responsible for the imbalances they cause in the system. Facilities that have a positive imbalance sell electricity to the system, whereas facilities with negative imbalances buy electricity from the system.
Where there are energy imbalances in the electricity market, energy generation facilities with high availability can commence production and sell electricity to the market at a price determined by EÜAŞ. These companies earn system imbalance revenues and the costs of the electricity sold by these companies are charged to end consumers.

Positive Imbalance ➡ Sell to the System

FDPP[1] < Actual

(FDPP-Actual) * min (DAMP, BPMP[2]) * 0.97

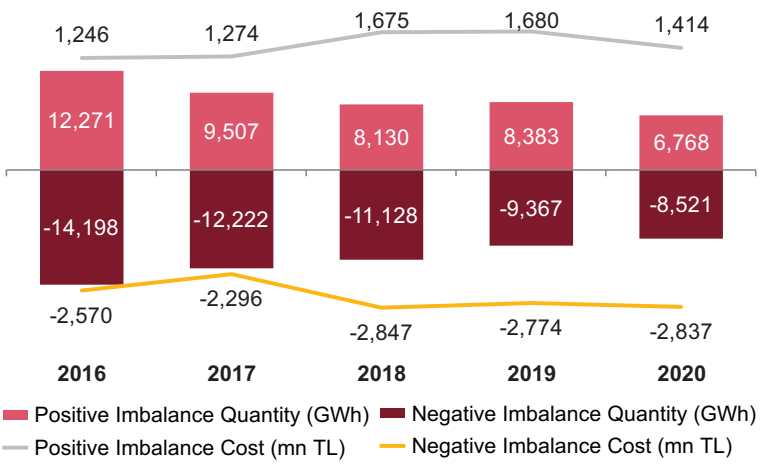
Negative Imbalance ➡ Buy from the System

FDPP[1] > Actual

(Actual-FDPP) * max (DAMP, BPMP[2]) * 1.03

Graph 65

System Imbalance Quantity and Cost (2006-2025)



Source: EPİAŞ, EMRA

[1]Final Daily Production Program
[2]Balancing Power Market Price

Retail tariffs have sharply increased between the second half of 2018 mainly driven by exchange rate hikes

Analysing national electricity tariffs over the long term shows that tariffs have increased following actions taken to liberalize the electricity market. As a result of these increases, retail companies were able to compete with national tariffs, and the number of customers using their eligible consumer rights increased significantly.

Electricity retail firms mostly supply the demand of eligible consumers via bilateral agreements with third parties. However, following the increase of DAMP in TL terms due to the appreciation of the USD against the TL in 2018 , a significant portion of bilateral agreements were unilaterally dissolved. As these agreements were terminated after exchange rate hikes in 2018, most of the retail companies had to buy electricity from the day-ahead market and their costs increased greatly. As a result, the majority of eligible consumers returned to using the national electricity tariffs.

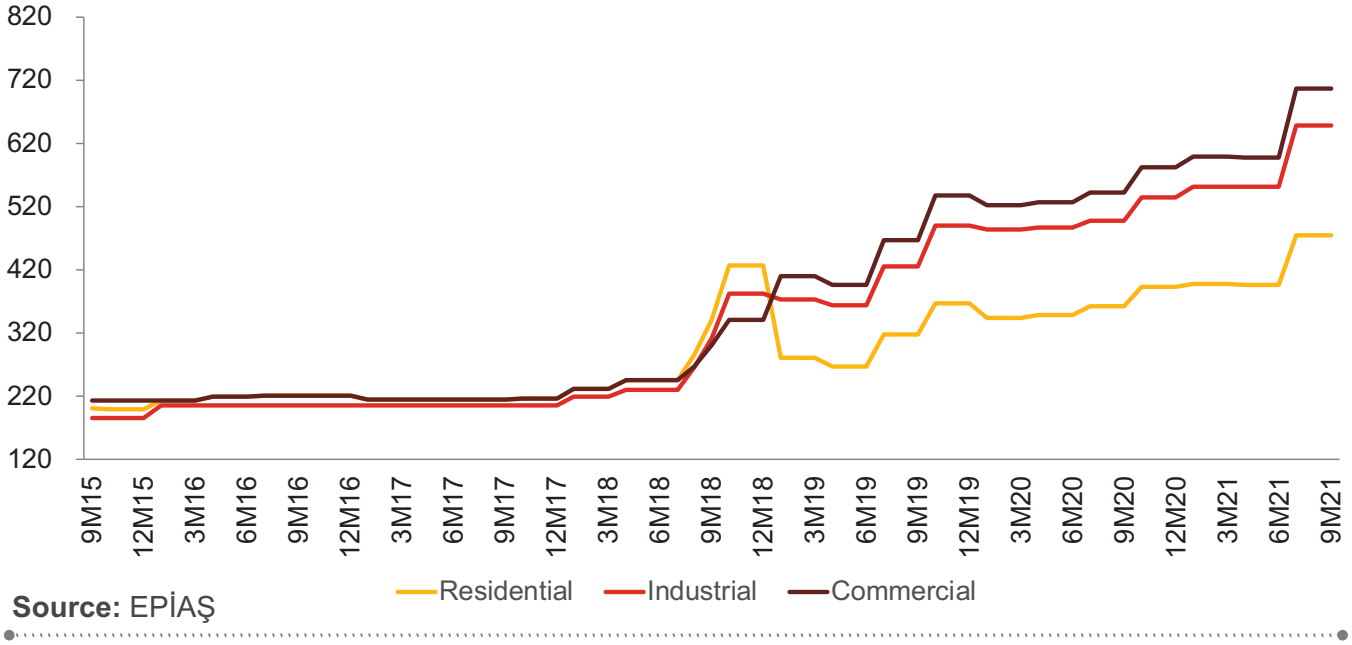
With the increasing tariffs, the percentage held by retail companies and the level of liberalization in the market is expected to increase.

The introduction of the last resort tariff was largely responsible for large industrial enterprises becoming unable to purchase from the national electricity tariff and resorting to supplying electricity from retail electricity vendors through bilateral agreements. This resulted in the share of retail companies increasing. The increase in the retail tariffs of commercial users also impacted this development.

Retail tariffs increased moderately compared to the increase in the last periods in the first quarter of 2021, and remained the same in the second quarter for all consumer segments. The latest retail tariffs were announced in July 2021 with increases of 19.5% for residential, 17.6% for industrial and 18.1% for commercial customer segments.

Graph 66

Retail Electricity Tariffs (2015-9M21, TL/MWh)



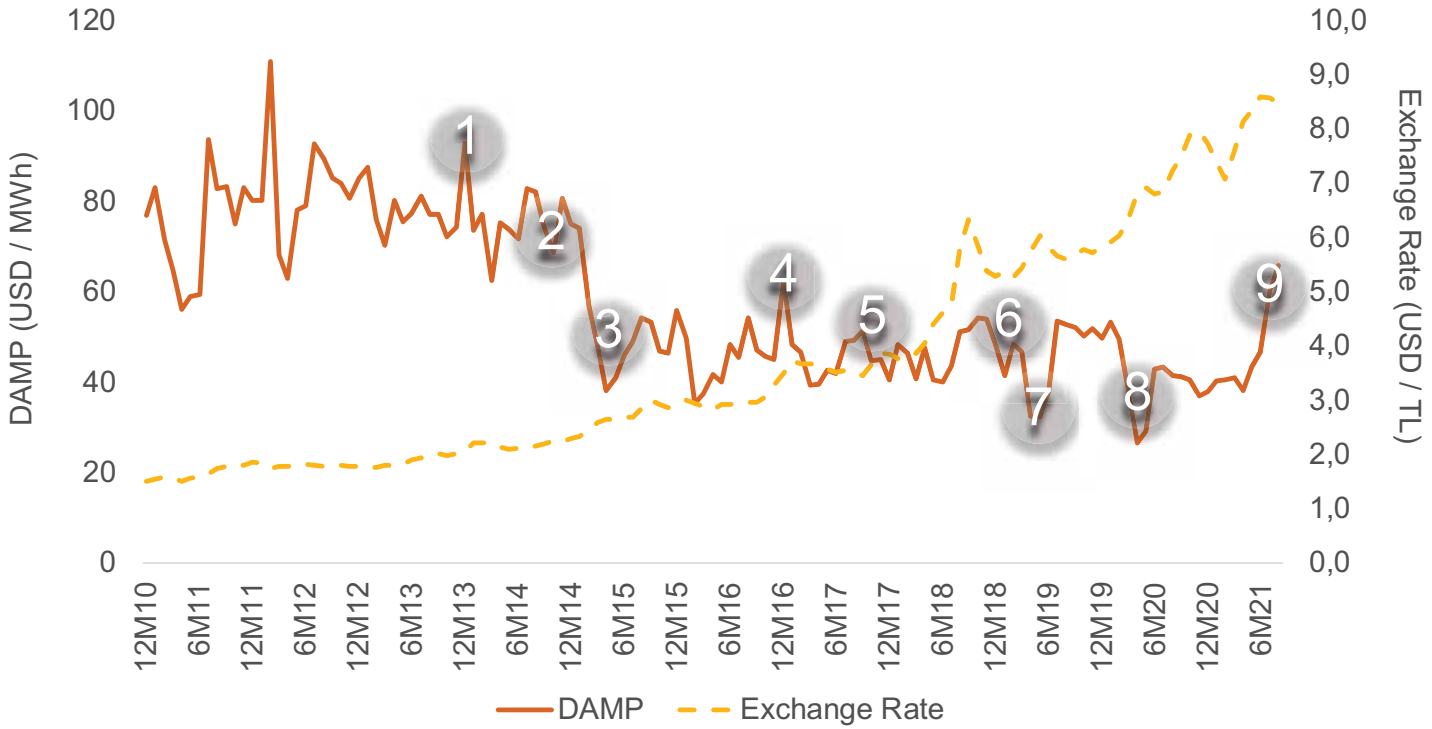
Source: EPİAŞ

Several key factors have played a role in the changing DAMP over the years

1. High rainfall & increased capacity & Depreciation of TL
2. Increased effect of low hydro generation offset by depreciation in FX rate
3. Excess supply and decreased oil prices, increased price competitiveness of CCGTs
4. Curtailment of the NG supply led to low generation
5. Low rainfall caused a decrease in hydropower generation
6. BOTAŞ increased NG tariffs by 49.5% in TL terms during the currency crisis. DAMP in USD terms remained stable
7. Unusually high hydro capacity factors and an excessive amount of generation from state-owned generation assets
8. Great demand loss due to the Covid-19 outbreak
9. Post Covid-19 demand increase, severe drought and decreased hydropower generation due to low rainfall levels, impact of rising brent oil prices on Gazprom contracts and increasing natural gas and coal prices in Europe

Graph 67

Evolution of DAMP in USD Terms, (2010-9M21)



Source: EPİAŞ

8

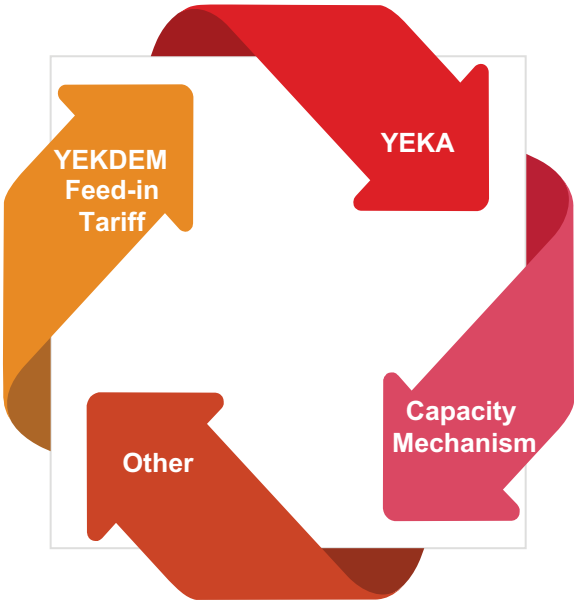
Investment Incentives

Turkish government has introduced several incentives for investors in Turkish electricity industry. Most of these incentives have first been introduced and then materialized within the last ten 10 year period.

Incentives for Electricity Industry

Alongside the industry specific incentive programmes which have been discussed, there are also several tax incentives for investors looking to engage in electricity generation in Turkey.

Industry Specific Incentives



Dynamics of **YEKA** nad **FiT under YEKDEM** have been discussed in the previous sections of this document. Capacity mechanism has been in place since early 2018 in order to support the financial sustainability of large capacity power plants running on natural gas and coal as well as certain HPPs. Plants included in capacity mechanism support command significant installed capacities and are deemed to be power plants of critical importance from a perspective of uninterrupted electricity supply and grid quality. The total support provided through the capacity system to as many as **52** power plants was **TL 2.2 billion** in 2020.

As well as there have been other types of operational and financial incentives to investors in electricity industry, the above three have been the most widespread available and used so far.

Investment Incentive Scheme

Investment Incentive Scheme which first started in 2012 revolves around four main sub-systems of incentive mechanism as illustrated below.

Regional and **general** incentives apply to energy investors as they do to other applicants in other industries.

VAT exemption on imported machinery & equipment, as well as corporate tax reduction and social security premium support turn out to be most significant contributors to energy project return expectations, when recognised as part of the investment Project, out of all other incentives provided.

Regional Aims to decrease regional differences and increase development of industries across the whole country	✓ *VAT Exemption* ✓ *Customs Duty Exemption* ✓ *Tax Reduction* ✓ *Social Security Premium Support* ✓ *Income W/holding Tax Allowance* ✓ *Interest Support* ✓ *Land Allocation* ✓ *VAT Refund*
Prioritized Aims to support certain investments in particular areas with 5th region incentives	
Strategic Aims to support value added investments that can help decrease current account deficit	
General Applies to all other investments that do not fit specific slsection criteria	✓ *VAT Exemption* ✓ *Customs Duty Exemption*

Source: TEİAŞ, EMRA, MENR

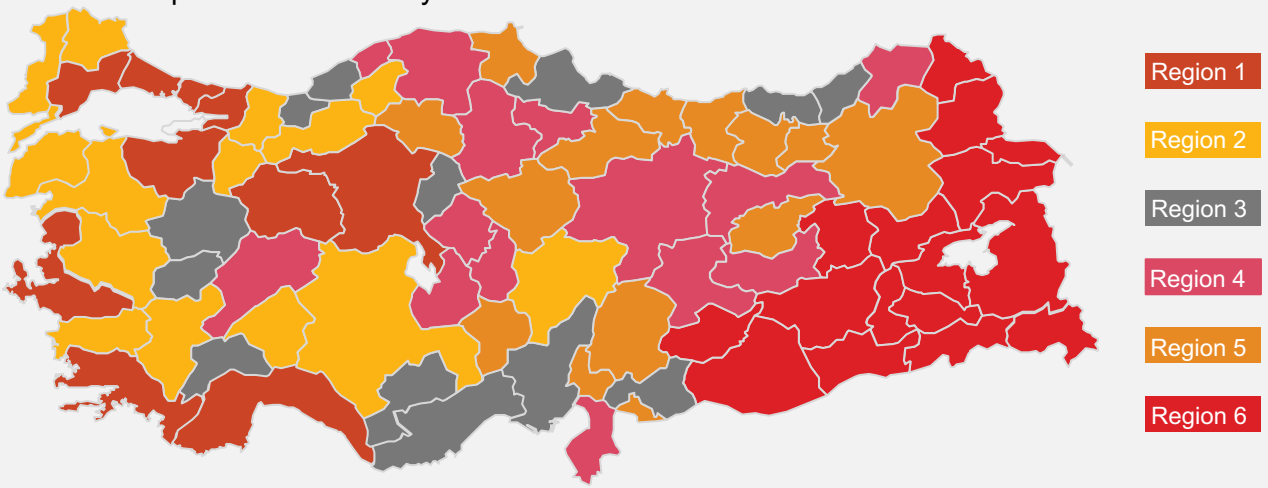
Investment Incentives Scheme provided incentives for almost a hundred thousand projects altogether supporting an additional employment of around 3 million people, since 2012

Details of the Investment Incentives Scheme

- direct savings to investments with high added value,
- increase production and employment,
- encourage regional and large-scale investments with high research and development content and strategic investments,
- increase international direct investments,
- reduce regional development disparities, determine the procedures and principles for supporting investments in clustering; environmental protection and research and development activities.

1 Regional and sector-based investments:

The program aims to reduce the development gap between the provinces and to increase the production of the provinces and to increase their export potential. Hence, developed regions are provided with fewer support options than lesser developed regions. Turkey is separated into six regions based on the development level of the districts/cities in these regions. The first three zones represent more developed regions, respectively, whereas the last three include relatively less developed zones in Turkey.



2 Prioritized Investments:

There are as many as 29 prioritized investment areas that fall into the scope of that investment incentives group.

- Manufacturing of electric vehicles
- Energy Efficiency Projects
- Local Coal based Power Plants
- Manufacturing of Wind Power Plant Equipments
- Nuclear Power Plants

Out of 29 areas, 5 areas are specific to energy investments. For all investments in that group 5th region incentives apply, as long as proposed investments are not in 6th region.

Source: TEİAŞ, EMRA, MENR

Details of the Investment Incentives Scheme (Cont.d)

3 Strategic Investments:

The main purpose of promoting strategic investments is to expand the production of intermediate goods or products, especially for which the domestic production capacity is less than that of actual demand met by foreign imports.

A strategic investment should altogether qualify following criteria to be eligible for incentives:

- The minimum fixed amount of the investment should exceed at least TL50 m.
- Total imports related to the investment good should exceed USD50 m in the latest year.
- Expected added value to be provided by the potential investment should be minimum 40%.
- The total domestic production capacity of the final good to be produced should be less than the imported amounts.

4 General Investments:

Incentives included in this group are the most easily attainable package available to almost all investors. The main incentives are usually customs duty and VAT exemption on the purchase of machinery and equipment goods.

For the investments in the 6th region, the general incentives also inclue income withholding tax support. A general investment should altogether qualify following criteria:

- The minimum investment expenditure should be at least TL1 m or the first two regions out of six regions and the remaining TRY500k for the other regions.

Table 18

The incentives under Investment Incentives Program are summarized below for each type of incentive category:

Incentives	Customs Duty Exemption	VAT Exemption	Reduced rate CIT	SS Employer	Land Allocation	Interest Support	Income w/h tax	SS employee	VAT refund
General Investment	✓	✓		✓			✓		
1st Region	✓	✓	✓	✓	✓				✓
2nd Region	✓	✓	✓	✓	✓				✓
3rd Region	✓	✓	✓	✓	✓	✓			✓
4th Region	✓	✓	✓	✓	✓	✓			✓
5th Region	✓	✓	✓	✓	✓	✓			✓
6th Region	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strategic	✓	✓	✓	✓	✓	✓	6th region	6th region	✓
Prioritized	✓	✓	✓	✓	✓	✓	6th region	6th region	✓

Source: MENR

Most natural gas power plant investments as well as solar power plant investments that are for modernization purposes and below 240 kw installed capacity (rooftop) are not eligible for general and regional incentives under Investment Incentives Scheme

Other Incentives

Energy Efficiency Projects

MENR provides funding incentives that amount up to 30% of total investment budget for energy efficiency projects with a total spending budget below TL 5m (maximum TL 1.5m grant).

Energy efficiency projects with the following criteria can also be considered as part of 5th region under Investment Incentives Scheme:

- Projects targeting existing industrial facilities with an energy consumption of 500 tons of oil equivalent
- Projects that target to achieve at least 15% efficiency
- Investment projects where minerals are used for electricity generation
- Power plant investments where waste heat out of an industrial facility is used for electricity generation

Commitment Support

Consumers utilizing commitment support within the scope of MENR commit to decrease next three years' energy consumption at least by 10%. As long as they can deliver on that commitment, consumers are rewarded with a cash grant up to 30% of energy expenses, with a maximum limit of TL 1m.

Source: MENR

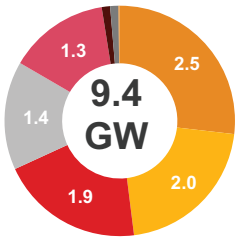
9

Local Equipment Capacity

Turkey ranks 5th on the list of leading producers of strategic wind turbine components in Europe according to Wind Europe's latest report, Wind Energy and Economic Recovery in Europe

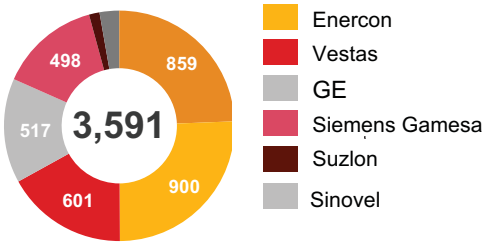
Wind Turbine Brands in Turkey (December 2020)

Table 19



Installed Capacity

Table 20



Wind Turbine Units

A recent report by the Turkish Wind Energy Association (TÜREB) said İzmir is estimated to have the capacity to produce 15 billion euros worth of wind turbines by 2023.

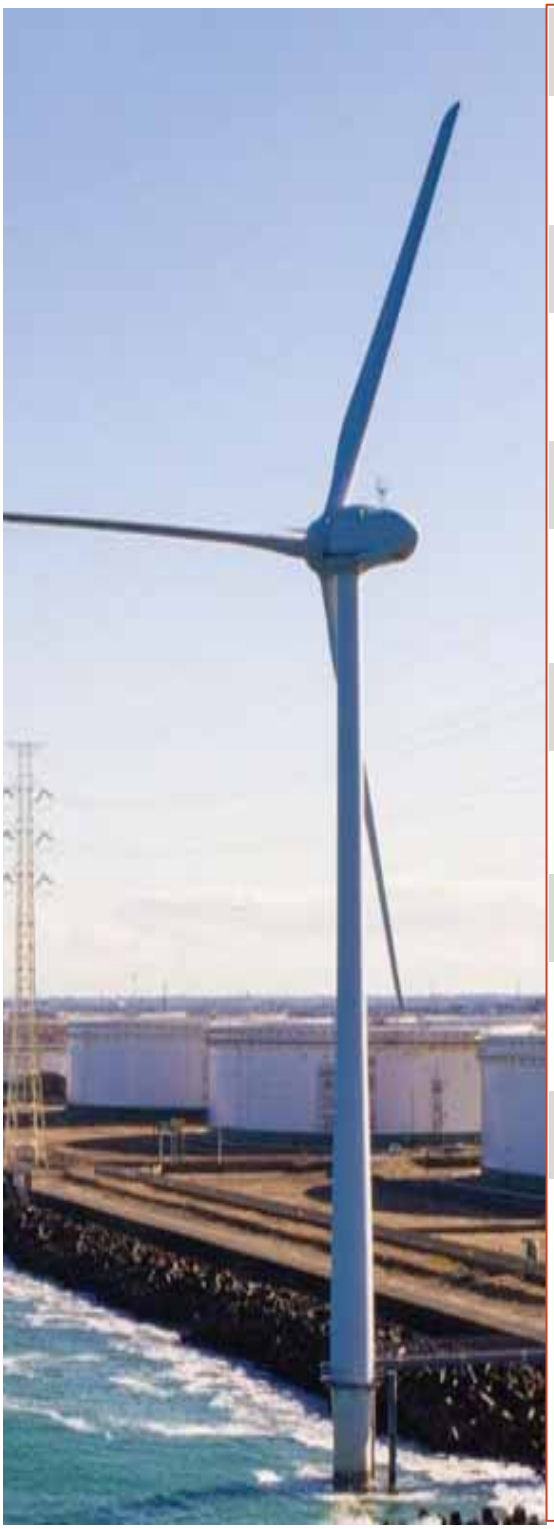
Turkey has 12 operational facilities, making it the fifth-largest wind turbine component producer in Europe. Of these 12 facilities, six produce towers, four produce blades and two produce castings. Turkey currently operates a total of 198 wind energy power plants.

İzmir is taking the lead in Turkey's wind industry, and also as the wind energy capital of the surrounding geography in Eastern Europe.

Source: Publicly Available Sources (2020-2021), TÜREB, Wind Europe (2020), Wind Energy Market Intelligence Database

Turkey's wind turbine manufacturing industry is rapidly expanding due to the increase in wind turbine installations, policy promoting renewables and new regulations on local equipment incentives

Domestic & International Producers of Wind Turbine Components in Turkey



Blade Manufacturers

AERO Rüzgar Endüstrisi A.Ş. | soyut Wind | LM WIND POWER a GE Renewable Energy business | ENERCON ENERGY FOR THE WORLD | tpi COMPOSITES

Generator Manufacturers

GAMAK | ENERCON ENERGY FOR THE WORLD | ATES WELDING & COATING

Turbine Manufacturers

İSTA BREEZE WIND TURBINES | soyut Wind

Gear & Gearbox Manufacturers

libet | dirinler

Fastener Manufacturers

KALELİLER Bağlantı Elemanları | BERDAN CİVATA

Tower Manufacturers

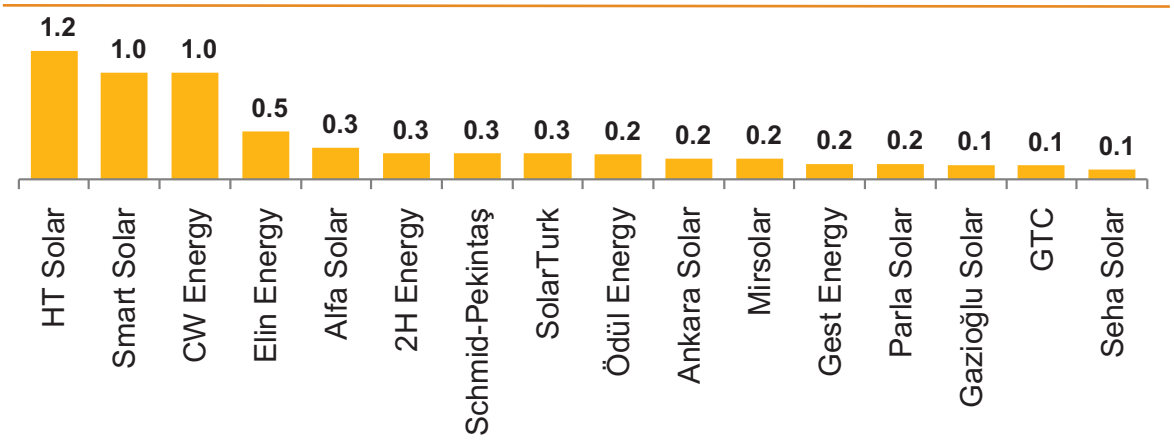
TEMSAN TÜRKİYE ELEKTROMEKANİK SANAYİ A.Ş. | ATEŞÇELİK | AERO Rüzgar Endüstrisi A.Ş. | cimtas | ÇİLTUĞ | Gesbey | CS WIND

Source: Publicly Available Sources (2020-2021), TÜREB

There are several panel manufacturers in Turkey supplying local demand while also exporting some of their production.

Graph 68

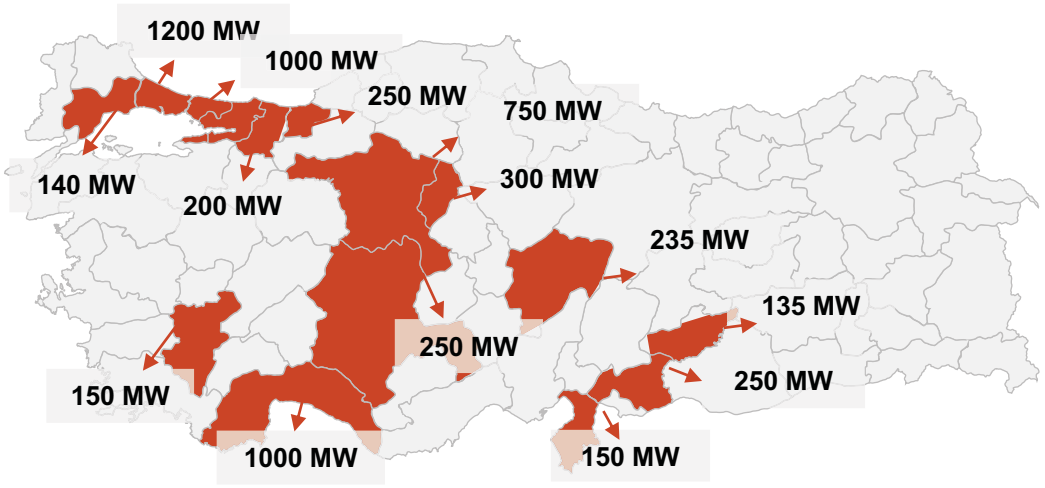
Production Capacity of 16 PV Panel Manufacturers in Turkey (2020, MW/Year)



Companies in Turkey control a total of 6 GW of annual PV panel production capacity. Half of the production capacity is controlled by 3 companies.

HT Solar is a subsidiary of Chinese company HT SAAE, and it develops, sells, and installs aerospace photovoltaic products in China and internationally. CW Energy and Smart Energy are companies founded in Turkey based on local experience and know-how. Investors in Turkey use panels manufactured by local producers as well as imported equipment, depending on project specifications and design.

PV Panel Production Capacities by provinces (2020)



Source: Publicly Available Sources (2020)

Kalyon Solar Technologies Factory is the first integrated solar panel production centre in Turkey to gather all stages of solar panel production, including R&D.

Kalyon Karapınar SPP

In its first stage, Kalyon Solar Technologies Factory produced domestic panels with a total capacity of 271 MW. It has already become Turkey's largest solar power plant. Upon completion of the first phase of investment it will be one of the largest integrated solar power plants in Europe and the fifth largest in the world, with a capacity of 1,000 MW.

Name	Description
Investment Location	Konya
Name	Kalyon Karapınar SPP
Start Date	2020
Completion Date	2022 (Estimated)
Facility Size	20 million m^2
Total Investment	TL 1.4 Billion

According to Kalyon Group, The solar plant will cover an area equal to 2,600 football fields and use 3.5 million panels, and will meet the annual energy needs of 2.0 million people. According to Kalyon, the share of domestic content it produces will top 70%, and Kalyon will also use the electricity from the solar power plant as it gradually expands.

In the first stage, the factory will employ 1,400 people. Its R&D centre covers an area of 2,500 square meters and will employ 100 researchers.

Source: Publicly Available Sources (2021)

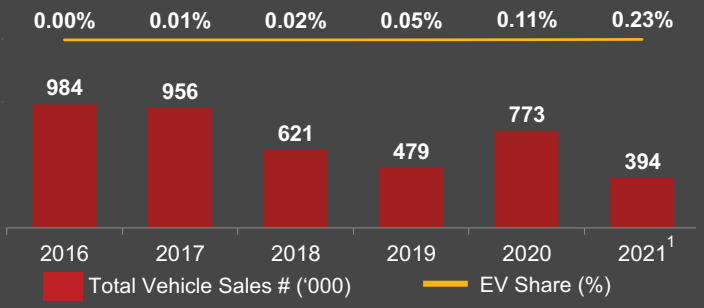
10

Other Market Developments

Turkey has a limited EV fleet compared with the number of fleets in developed markets. The share of EVs in total vehicle sales still lags behind the global average. Despite Covid-19 and the decrease in total vehicle sales, EV sales continued to increase in most of the developed markets in 2020.

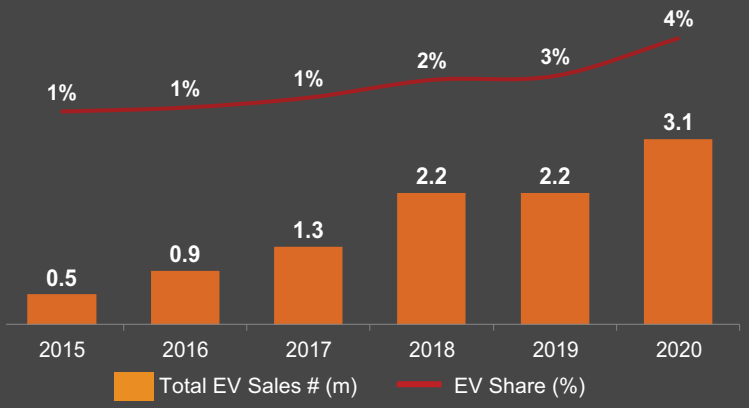
Graph 69

Total Vehicle Sales in Turkey ('000)



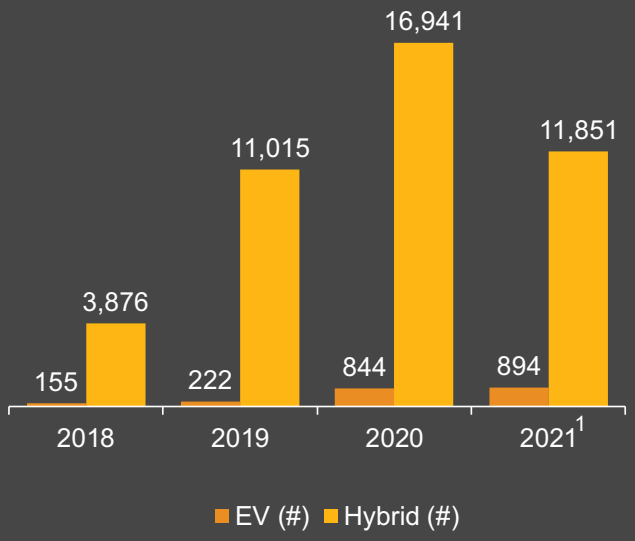
Graph 70

Global EV Sales (%)



Graph 71

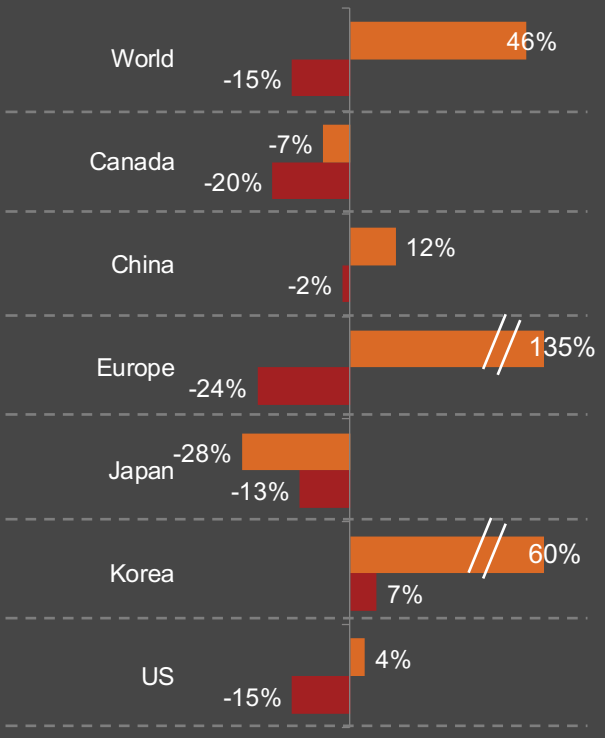
Number of Vehicle Sales by Type in Turkey EV and Hybrid (2018-2021)



Total number of EVs and hybrid vehicles sold in Turkey since 2015 are less than 50 thousand.

Graph 72

Change in Vehicle Sales, (2020 vs. 2019)



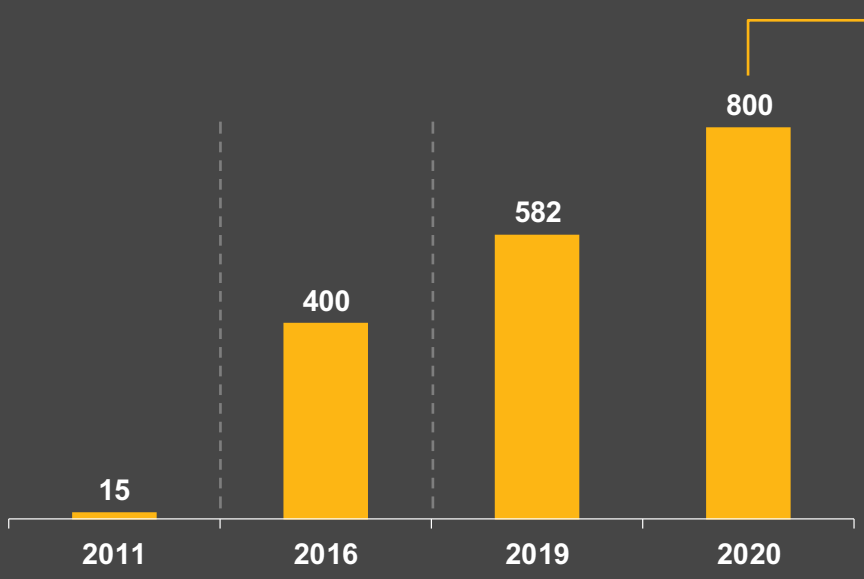
[1]Data as of June 2021

Source: Turkish Electric & Hybrid Vehicles Association (TEHAD), International European Agency (IEA)

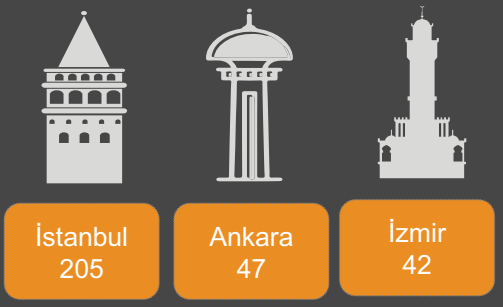
One of the main triggers for the acquisition of EVs is accessible individual or common charging stations

Graph 73

Number of Public Charging Stations in Turkey (2011-2020)



Top Three Cities with Highest Amount of Stations

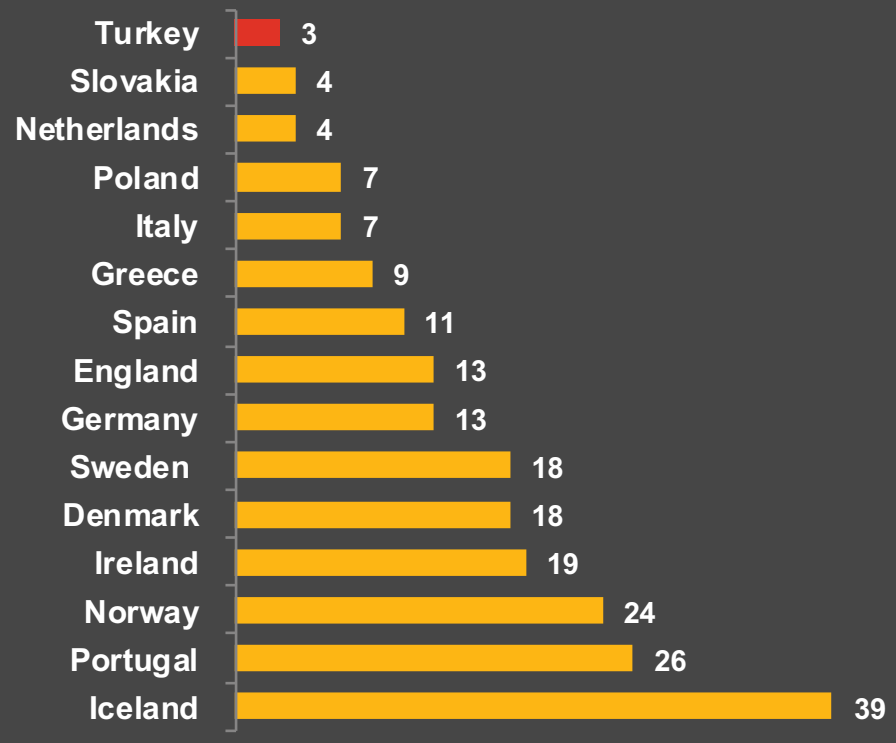


Station Operators in Turkey[1]

These two operators jointly control the approximately 1,052 wide charging stations across Turkey as of August 2021.

Graph 74

Number of Charging points per vehicle in Europe (2020)



According to data compiled by the EAFO, public charging infrastructure capacity in Turkey lags behind comparable countries.

With regard to the number of charging points per vehicle, Turkey lags behind almost all other European countries.

Source: Turkish Electric & Hybrid Vehicles Association (TEHAD), European Alternative Fuel Observatory, (EAFO 2020), Public websites of ZES and Eşarj companies

[1]Data as of August 2021

TOGG's introduction to the local market is expected to contribute to help increase number of EVs in Turkey

Turkey's Automobile Joint Venture Group (TOGG) will invest TL 22 billion[1] into the development of a new domestically produced electric vehicle.

Based in Bursa, TOGG is expected to provide additional 4.300 employment opportunities after starting operations.

The local automobile will receive wide support from the Turkish government, with initiatives including:

- Development of the necessary electric vehicle infrastructure,
- A purchase guarantee for 30,000 electric vehicles,
- Exemption from VAT and custom taxes.

Production of the first electric vehicle is expected to be completed by 2022. The company aims to produce the vehicle from 51% domestic parts in the first model, and to increase the domestic part rate to 69% in the second and third models.

Name	Description
Investment Location	Gemlik, Bursa
Investment Start Date	18/07/2020
Targeted Production Start	2022
Mid-term Production Target (10 years(	1 million units / 5 models
Production Capacity	175,000 Vehicles/Year
Shareholders	Anadolu Group, BMC, Kök Group, TurkcelL, Zorlu Holding, TOBB

[1]Refers to the fixed investment estimated in the President's Decree published on December 26, 2019.

Source: TEHAD

Integration of EVs into Turkey's vehicle fleet will bring about several benefits

Economic growth

New jobs

Increased efficiency & energy savings

Potential to increase share of renewables

General Measures to Support EV Integration

Support local manufacturing capabilities to promote production of EVs and EV components domestically

Provide the legislative framework and tax incentives to ensure rapid adoption of EVs and enable affordable and accessible service networks

Plan grid investments carefully to support integration of the EVs, discover and introduce new tariffs for EV charging and other means to promote EV ownership

Recent Other EV Related Developments in Turkey

Aspilsan started the investment of Turkey's first Li-Ion battery pack production facility in Kayseri, in the second half of 2020. The facility is expected to cover an area of approximately 25,000 sqm and produce 21 million battery cells per year.

Ford Otosan announced in March 2021, that it will make a 2 billion EUR worth investment in its Kocaeli facility to manufacture commercial EVs and batteries, first of its kind in the way of being an integrated facility for EV manufacturing in Turkey, starting from 2023.

TEMSA announced in 2021 that they started to produce Li-Ion battery packs for the EVs it is manufacturing and exporting out of its facilities in Adana. TEMSA commits to be able to meet half of total bus volume with electric vehicles by 2025.

Bosch Car Service collaborated with Zorlu Energy Solutions (ZES) in 2020 to expand its service range with electric vehicles. In this context, parties aim to jointly establish electric vehicle charging stations whereby EV owners can charge their vehicles and also procure other services Bosch Car Service can offer.

Source: Turkish Electric & Hybrid Vehicles Association (TEHAD), Shura Energy Transition Center / Integrating Electric Vehicles into Turkey's distribution grids

New Ordinance Governing the Minimum Required EV Charger Units in Closed Parking Lots

The amendment in the Parking Regulation from the Ministry of Environment and Urbanization, the regulation determining the location and number of electric car charging stations, was published in the Official Gazette and entered into force on 25 March 2021.

Accordingly, the following changes were made:

1) In applications for building permits for new buildings with mandatory parking lots of 20 spaces or more, at least **5%** of the compulsory parking spaces, and not less than 1, shall be electrically powered and include a charging unit that meets the relevant standards required for these vehicles.

2) At least **10%** of parking lots in new districts, general car parks and car parks of shopping malls must meet the needs of electric vehicles (including charging units) and meet the relevant standards. At least one of the charging units installed in shopping malls larger than thirty thousand square meters, and at least two in shopping malls larger than seventy thousand square meters, must have fast charging capacity and meet the relevant standards.

Based on the latest version of the special consumption tax rates published in the Official Gazette on 2 February 2021 by presidential decree, the special consumption tax rates for regular and hybrid vehicles will not have significant differences. On the other hand, the special consumption tax rates applied to electric vehicles increased by 3X, ranging from 7% to 60% based on vehicle engine power.

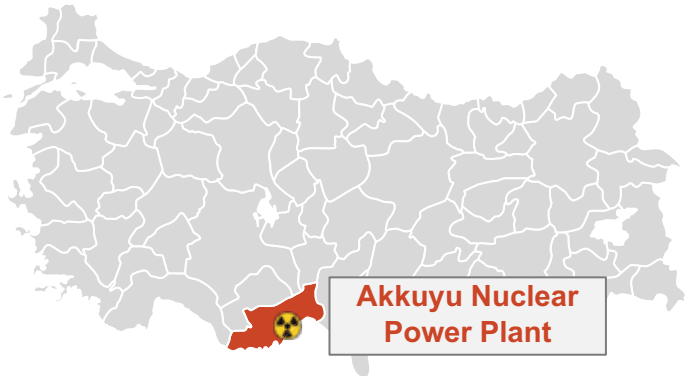
Source: Official Gazette

Turkey's nuclear power ambitions remain high, and nuclear energy has been on the country's radar since the 1960s

The introduction of nuclear energy into the energy mix has been among the central aims of Turkish energy policy in the last decades.

The **Atomic Energy Commission,** which was established in 1956, was renamed to the **Turkish Atomic Energy Authority (TAEK)** in 1982. The institution remains as the main body responsible for **regulation of the nuclear energy market**.

After several unsuccessful attempts at launching a nuclear power plant, the process was restarted in 2006. The Law on the Construction and Operation of Nuclear Power Plants and Energy Sale was enacted in 2007, and companies were invited to submit bids for the construction of a nuclear power plant in Akkuyu.



Main Goals of the Nuclear Energy Initiative:

1) Commissioning the **first unit of the Akkuyu NPP in 2023**

2) Increasing the **share of nuclear energy in electricity generation to 10%**

3) Forming an **independent regulatory authority** for the management of the nuclear energy sector

4) Incentivizing the establishment of **nuclear energy programs** in universities

5) Increasing the level of collaboration with the **European Organization for Nuclear Research (CERN)**

6) Increasing the **know-how of Turkish firms** regarding the construction of nuclear power plants

7) Exploring and developing **domestic uranium** and **thorium resources** to be used in nuclear power plants

Source: TAEK

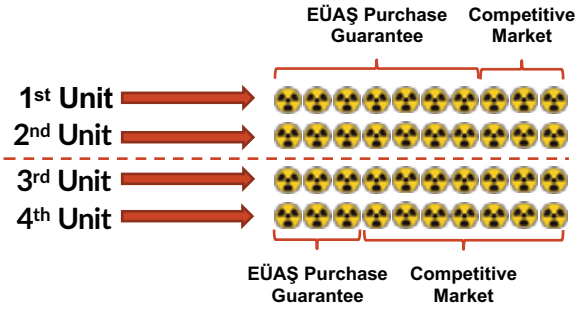
The commissioning of Akkuyu remains in the government's vision for 2023

After the tender for Akkuyu was cancelled due to lack of competition in 2009, the government decided to engage in direct talks with the Russian government. As a result of these talks, an intergovernmental agreement for the construction of a **4,800 MW** nuclear power plant in Akkuyu was signed between the two countries. Based on this agreement, the construction of the Akkuyu power plant is expected to be completed by **2023**.

Prior to the Akkuyu signing, Turkey signed another contract with a French-Japanese consortium in 2013 for the construction of a **4,480 MW** power plant in Sinop. Even though it was initially announced that the project would be commissioned in 2027, uncertainties exist regarding progress. Given recent developments, it is not likely that commissioning will occur in the foreseeable future.

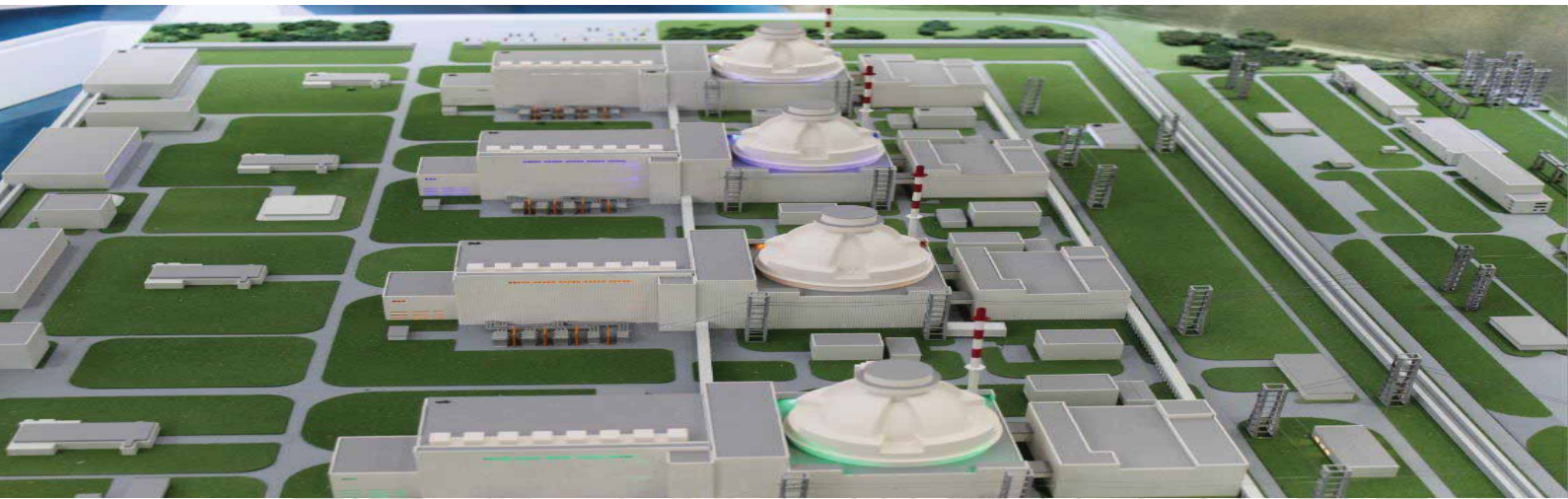
Source: EÜAŞ

Purchase Guarantees for Akkuyu



According to the international agreement between Turkey and Russia, TETAŞ (now EÜAŞ) is set to buy **70% of the generation from the first two units and 30% of that of the third and fourth units** of the Akkuyu Power Plant at a price of **123.5 USD/MWh** for a period of **15 years** following the commissioning of each unit.

Akkuyu Nuclear Power Plant will be Turkey's first nuclear power plant (NSG). Dönmez stated that construction was ongoing on the plant, and that the first reactor would come online in 2023, with the remaining three reactors to be commissioned at one-year intervals, that is, in 2024, 2025 and 2026.



The first public initiative in Turkey to promote and introduce hydrogen as an alternative energy source took place in early 2020 under the sponsorship of MENR. The Natural Gas Distribution Companies Association of Turkey (GAZBİR) leads the efforts to combine hydrogen supplies with natural gas distribution networks.

Mainly due to underlying cost and availability, the economics of green hydrogen are currently challenging. In the long run, this is expected to change. Along with falling energy production costs of renewable resources, economies of scale and technological advances, the cost of green hydrogen production will decrease over time and it will become more economical. Markets with abundant, low-cost renewable resources are attractive for hydrogen production. The greatest reductions in production costs are expected in regions with access to low-cost renewable energy plants such as some parts of the Middle East, Australia, Chile and North Africa. Dropping CAPEX requirements, declining levelized costs of energy and increasing utilization levels achieved with large-scale hydrogen projects have caused green hydrogen production costs to start to fall.

Hydrogen is a fundamental part of the global energy transition. According to the Hydrogen Council, more than 30 countries had a hydrogen strategy as of the beginning of 2021, and more than USD 70 billion in public funding for hydrogen projects was committed to by governments around the world.

By 2030:
- Hydrogen demand will grow moderately through niche applications across sectors
- Demand growth will accelerate
- New alliances will be formed through cross-sector collaborations
- Production costs will decrease around 50%
- Export and import hubs will develop around the world with new players in renewable-rich regions.

Enhanced the 45Q tax credit that rewards the storage of CO2 in geological storage sites

Incentivised the conversion of CO2 to other products, including through combination with hydrogen, refuelling stations and enable operators to participate in generating credits from low-carbon hydrogen in California

Approved the National Innovation Programme for Hydrogen and Fuel Cell Technologies for another ten years with EUR 1.4 billion of funding, including subsidies for publicly accessible hydrogen refuelling stations, fuel cell vehicles and micro co-generation purchases, to be complemented by EUR 2 billion of private investment.

Published a government-approved hydrogen roadmap in 2018, with specific targets set for 2030 and 2050

Associated EUR 50 million regional investment plan for power-to-gas.

Published a hydrogen roadmap in the Dutch Climate Agreement.

Spearheaded the first meetings of the Pentalateral Energy Forum of Belgium, the Netherlands, Luxembourg, France, Germany and Austria in support of cooperation on hydrogen in north-west Europe

Updated its Strategic Roadmap to implement the Basic Hydrogen Strategy, including new targets for hydrogen and fuel cell costs and deployment, and firing hydrogen carriers in power plants.

Targeted to build 80 hydrogen refuelling stations by 2021

Announced targets of 5.000 fuel cell electric vehicles by 2020 recommitted to the 2015 target of 1 million FCEVs by 2030, 1.000 refuelling stations.

Exempted FCEVs (and battery electric vehicles) from vehicle and vessel tax.

Source: IEA (2020), MENR, PwC, Mc Kinsey

Hybrid generation plants are created by combining electricity generation plants that use different technologies. The main purpose of these plants is to generate electricity with maximum efficiency. As a result of decreasing internal consumption/increasing electricity generation, sales of electricity from hybrid power plants to the market are expected to increase in the future

Eight new definitions were added to the Electricity Market License Regulation with the Official Gazette dated 8 March 2020, including combined renewable energy generation plants and supportive electricity generation plants. The main changes in the Electricity Market License Regulation and the Documentation and Support of Electricity Generation from Renewable Energy Sources Regulation are as follows:

1. Combined electricity generation plants refers to renewable energy power plants that are connected to the network from the same point.
2. Supportive electricity generation plants are a type of facility where another source is used for the thermal conversion process.
3. For combined renewable energy generation plants, the lowest price defined in YEKDEM will be applied for net electricity generated from these plants. For supportive electricity generation plants, if all supportive generation is from renewable energy sources, the main source will be considered in the YEKDEM tariff.
4. The YEKDEM period will not be affected by new hybrid plants, this period will be determined as per the main plant.
5. All power plants including those already operational and new installations will be in the scope of this regulation.
6. According to the regulation, no new license application is needed for supportive generation power plants. If power plants that already own generation licenses or pre-licenses are converted to combined renewable energy generation plants, their total installed capacity cannot exceed the electricity capacity that was confirmed beforehand.
7. The hybrid plant regulation came into force on July 1, 2020.

For geothermal power plants, hybrid generation facilities will be able to provide additional income to meet the geothermal plant's internal consumption needs, which may cause reductions in electricity sales of around 20%. Therefore, geothermal power plants can meet their internal consumption needs using other renewable energy sources and increase their electricity generation from the same source.

Recent Developments in Turkey:

Kalehan Energy Group has built the Lower Kaleköy hydropower plant (HPP), which is the first hybrid power plant in Turkey that combines hydro (500 MW) and solar (80 MW). The plant was constructed by a consortium led by GE Renewable Energy Hydro Solutions. Lower Kaleköy HPP will be the sixth-largest HPP in Turkey in the private sector.

Also, Zorlu Energy plans to establish a hybrid power plant, adding a solar photovoltaic plant to its Alasehir geothermal power plant (45 MW) in Manisa. Zorlu Energy plans to launch an initial public offering for its renewables.

Source: Official Gazette

Turkey published ordinance on Electric Storage Methods and Their Regulations in May 9, 2021

Policy Measures Listed in the Action Plan

1
Energy Storage Related to the Licensed Generation Plant

The maximum capacity of the electricity storage facility must be 20% of the licensed power plant capacity, while the pumped storage capacity can be equal to the hydropower plant capacity. The storage capacity cannot be used before the commissioning of the power plant. Stored electricity cannot benefit from purchase guarantees or incentives.

2
Energy Storage Related to the Consumption Point

The minimum consumption point capacity must be 50 kW. The energy storage facility can be attached to the consumption facility that provides the surplus electricity that is not sold. The energy storage facility must be associated with that consumption facility only.

3
Independent Energy Storage Facility

Independent electric storage facilities have to meet standard regulations, must acquire a supplier license and must attain a capacity of at least 2 MW in their facilities. It is possible to establish more than one storage facility under the same supply license. The energy supplied to the grid by these storage facilities is taken into account in the settlement amount.

These facilities can also participate in the ancillary services and balancing power market if they meet the relevant conditions.

4
Energy Storage Facility of Network Operators

The storage facilities installed by distribution operators can have capacities of up to 10 MW, and those installed by transmission operators can have capacities of up to 50 MW per transformer.

Expected Impact: The introduction of storage facilities will help the transmission system with balancing. The feasibility of independent storage facilities is low in the mid-term due to high costs/low gross margin due to peak/off-peak price differences.

Source: EMRA, Official Gazette

Glossary of Terms and Abbreviations

Name	Description
%	Percent
1H19	First Half of 2019
1H20	First Half of 2020
1Q20	First Quarter of 2020
bcm	Billion Cubic Meters
BIST	Borsa Istanbul
bn	Billion
BOO	Build-Operate-Own
BOT	Build-Operate-Transfer
BOTAŞ	Petroleum Pipeline Corporation
BP	The British Petroleum Company
BPM	Balancing Power Market
BPP	Biothermal Power Plant
c.	Circa
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CBRT	Central Bank of the Republic of Turkey
CCGT	Combined Cycle Power Plant
CERN	European Organization for Nuclear Research
Co2	Carbon Dioxide
COD	Commercial Operation Date
Covid-19	Coronavirus Disease 2019
CPI	Consumer Price Index
DAMP	Day-Ahead Market Prices
DSI	State Hydraulic Works
DSO	Distribution System Operator
EFET	European Federation of Energy Traders
EİGM	General Directorate of Energy Affairs
EML	Electricity Market Law
EMRA	Energy Market Regulatory Authority
ENTSO-E	European Network of Transmission System Operators
EPİAŞ	Energy Exchange İstanbul
ESG	Environmental, Social and Corporate Governance
ETS	Emissions Trading System
EU	European Union
EÜAŞ	Electricity Generation Company

Glossary of Terms and Abbreviations

Name	Description
EV	Electric Vehicle
FDPP	Final Daily Production Program
FiT	Feed-in-Tariff
FSRU	Floating Storage Regasification Unit
GAZBİR	Natural Gas Distribution Companies Association of Turkey
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GJ	Gigajoules
GPP	Geothermal Power Plant
GUNDER	International Solar Energy Society – Turkey Section
GW	Gigawatts
HEPI	Household Energy Price Index
HPP	Hydro Power Plant
HZ	Hertz
ICE	Intercontinental Exchange
IDM	Intra-Day Market
IEA	International Energy Agency
INDC	Intended Nationally Determined Contribution
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
IRR	Internal Rate of Return
kcal	Kilocalorie
km	Kilometers
kTEP	Tonne of Oil Equivalent
kWh	Kilowatt Hours
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LTM	Last Twelve Months
m	Million
MCT	Municipality Consumption Tax
MENR	Ministry of Energy and Natural Resources
MIGEM	General Directorate of Mining Affairs
MMS	Market Management Systems
MRV	Measurement, Reporting and Verification
Mt	Million Tons
MTA	General Directorate of Mineral Research and Exploitation
MVA	Megavolt Amperes

Glossary of Terms and Abbreviations

Name	Description
MW	Megawatts
MWh	Megawatt Hours
NEEAP	National Energy Efficiency Action Plan
n.a	Not Available
NG	Natural Gas
NGO	Non-Governmental Organisation
No.	Number
NPP	Nuclear Power Plant
OECD	Organization for Economic Co-operation and Development
OIES	Oxford Institute for Energy Studies
OPEC	Organization of the Petroleum Exporting Countries
OPEX	Operational Expenses
OTC	Over the Counter
OTSP	Organized Wholesale Gas Trading Platform
PFC	Primary Frequency Control
PMR	Partnership for Market Readiness
PMUM	Electricity Market Financial Reconciliation Centre
PPA	Purchase Price Agreement
PwC	PwC: Audit and Assurance, Consulting and Tax Services
RAB	Regulatory Asset Base
R&D	Research & Development
SETAV	Foundation for Political, Economic and Social Research
SFC	Secondary Frequency Control
SME	Small and Medium Sized Enterprises
SPP	Solar Power Plant
TAEK	Turkish Atomic Energy Authority
tcm	Thousand Cubic Meters
TEAŞ	Turkish Electricity and Transmission Company
TEDAŞ	Turkish Electricity Distribution Company
TEHAD	Turkish Electric & Hybrid Vehicles Association
TEİAŞ	Turkish Electricity Transmission Company
TEK	Turkish Electricity Administration
TETAŞ	Turkish Electricity Trading and Contracting Company
TKI	Turkey Directorate General of Coal Enterprises
TL	Turkish Lira
TOR	Transfer Operating Rights
TRT	Turkish Radio and Television Corporation

Glossary of Terms and Abbreviations

Name	Description
TPAO	Turkish Petroleum Corporation
TPP	Thermal Power Plant
TSO	Transmission System Operator
TTK	Turkish Hard Coal Enterprises
TUIK	Turkish Statistical Institute (TURKSTAT)
TurkDEX	Turkish Derivatives Exchange
TW	Terawatts
TWh	Terawatt Hours
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollars
VAT	Value-Added Tax
VIOP	Futures & Options Market
WACC	Weighted Average Cost of Capital
WHO	World Health Organization
WPP	Wind Power Plant
WTO	World Trade Organization
YEKA	Renewable Energy Resource Areas
YEKDEM	Renewable Energy Supporting Mechanism
YEK-G	Renewable Energy Resource Guarantee Certificate
YETA	Green Tariffs

Thank you

pwc

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