

SECTOR OVERVIEW

November 2019

An aerial photograph of a wind farm situated on a mountain ridge. Several white wind turbines are visible, some with their blades blurred by motion. A dirt road winds through the green, grassy terrain. Mist or low clouds are rising from the valley, partially obscuring the base of the turbines and the surrounding landscape. In the background, more mountain peaks are visible under a clear sky. A large blue diagonal graphic element is on the left side of the image.

Energy

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Contents

I	Contents
II	List of Charts
II	List of Figures
II	List of Tables
4	ABBREVIATIONS
5	EXECUTIVE SUMMARY

The Electricity and Renewable Energy Sector

8	2.1. Installed Capacity Analysis
10	2.2. Electricity Generation Analysis
12	2.3. Analysis of Demand for Electricity
12	2.4. Electricity Price Analysis
15	2.5. Developments

The Natural Gas Sector

18	3.1. The Turkish Natural Gas Sector
18	3.2. Natural Gas Reserves and Production in Turkey
19	3.3. Natural Gas Consumption in Turkey
19	3.4. Natural Gas Trade in Turkey

The Oil Sector

22	4.1. Oil Reserves, Oil Production, Refineries and Refined Products in Turkey
22	4.2. Oil Consumption in Turkey
23	4.3. Petroleum Products Trade in Turkey
24	4.4. The Development of Oil Prices

Energy Efficiency

28	5.1. Energy Efficiency Legislation and Organizational Structure
29	5.2. Energy Efficiency Indicators
30	5.2.1. Per Capita Energy Consumption
30	5.2.2. Energy Intensity
31	5.2.3. Sectoral Energy Intensity
31	5.3. 2017-2023 National Energy Efficiency Action Plan

List of Charts, Figures and Tables

List of Charts

- 9 Chart 1. Breakdown of Installed Capacity by Resources (September 2019)
- 10 Chart 2. Breakdown of Gross Electricity Generation by Resources (2018)
- 13 Chart 3. The Development of Monthly Average MCP and SMP
- 13 Chart 4. The Development of MCP & Brent Crude Price & Henry Hub Natural Gas Unit Price
- 18 Chart 5. Top 10 Countries by Global Natural Gas Production
- 18 Chart 6. Top 10 Countries by Global Natural Gas Consumption
- 18 Chart 7. The Development of Annual Average Natural Gas Prices
- 19 Chart 8. Natural Gas Consumption in Turkey
- 21 Chart 9. Turkey's Crude Oil Imports and Production
- 23 Chart 10. Oil Imports from Iran and Monthly Change
- 24 Chart 11. The Development of Brent Crude Oil Prices
- 25 Chart 12. The Development of Gasoline and Diesel Fuel Prices in Turkey
- 30 Chart 13. Per Capita Primary Energy Consumption in Turkey
- 31 Chart 14. Energy Intensity in Turkey

List of Figures

- 19 Figure 1. The Natural Gas System in Turkey
- 28 Figure 2. Energy Efficiency Policy Documents and Legislation

List of Tables

- 11 Table 1. Electricity Generation and Shares by Source
- 12 Table 2. Electricity Demand by Month and Year-on-Year Growth Rates
- 22 Table 3. Capacities and 2018 Production Quantities of TÜPRAŞ Refineries
- 22 Table 4. Sales, Import and Export Quantities of Petroleum Products in 2018
- 23 Table 5. Domestic Sales of Petroleum Products in January-July 2018 and January-July 2019

Abbreviations

Bcm: Billion Cubic Meters
BDLH: Bunker Delivery License Holders
BO: Build-Operate
BOT: Build-Operate-Transfer
BOTAŞ: Petroleum Pipeline Corporation
BP: British Petroleum
BTU: British Thermal Unit
CBRT: Central Bank of the Republic of Turkey
CUSUM: Cumulative Sum Analysis
EEED: Energy Efficiency and Department of Environment
EIA: U.S. Energy Information Administration
EMRA: Energy Market Regulatory Authority
EİİAŞ: Energy Exchange İstanbul
EU: European Union
EÜAŞ: Electricity Generation Corporation
FSRU: Floating Storage and Regasification Unit
GDP: Gross Domestic Product
GPP: Geothermal Power Plant
GW: Gigawatt
GWh: Gigawatthour
HEPP: Hydroelectric Power Plant
IEA: International Energy Agency
Kcal: Kilocalorie
Kg: Kilogram
kW: Kilowatt
kWh: Kilowatthour
LNG: Liquefied Natural Gas
LPG: Liquefied Petroleum Gas
Lt: liter

M: Meter
M²: Square Meters
M³: Cubic Meters
Mcm: Million Cubic Meters
MCP: Market Clearing Price
MENR: Ministry of Energy and Natural Resources
MTOE: Million Tons of Oil Equivalent
MW: Megawatt
MWh: Megawatthour
NEEAP: National Energy Efficiency Action Plan
NPP: Nuclear Power Plant
ODEX: Energy Efficiency Index
OPEC: Organization of the Petroleum Exporting Countries
Sm³: Standard Cubic Meter
SMP: System Marginal Price
SPP: Solar Power Plant
TEİAŞ: Turkish Electricity Transmission Corporation
TOE: Tons of Oil Equivalent
TOOR: Transfer of Operating Rights
TPAO: Turkish Petroleum Corporation
TURKSTAT: Turkish Statistical Institute
TÜPRAŞ: Turkish Petroleum Refineries Corporation
TWh: Terawatthour
USA: United States of America
WPP: Wind Power Plant
YEK: Renewable Energy Law
YEKA: Renewable Energy Resource Area
YEKDEM: Renewable Energy Resources Support Mechanism

Executive Summary

As an indispensable input in the modern age, energy deserves close monitoring considering its nature, which has gradually becoming more complex. A multidimensional and multiaxial approach to the assessment of energy is required due to the diversity of resources that can potentially be used to generate power, the rapid advancements in technology used in the generation and distribution of power, the issue of resource supply simultaneously falling within the sphere of international relations and diplomacy, the negative environmental impacts of energy consumption and, most importantly, the huge unpredictable costs arisen even in the shortest energy deprivation. On the other hand, the interaction between different resources and the links which form the energy value chain enhances the dynamic obscurities in the process and reinforces the need for an integrated perspective. It could be claimed that it is imperative to cover - as much as possible - each of the technical, economic, financial, social, environmental and legal aspects to conduct a sound and accurate analysis of the energy sector.

The "Sectoral Outlook: Energy" report is drafted in consideration of the needs covered above with a view to presenting the matter in a most simplistic manner. This report briefly covers and presents a snapshot of the Turkish energy market, which has a strong legal basis but whose story of development has been a tumultuous and often painful one, following a fluctuating rather than a steady course of development, which is home to both large investors and small-scale actors, and which enjoys a certain depth in certain aspects.

The first version of this report published in 2018 (<http://www.tskb.com.tr/i/assets/document/pdf/sector-overview-energy-2018-12-low-resolution-final.pdf>) ended in the following: "... Costs and prices will be among the top items on the 2019 energy agenda of Turkey. Potential key items on the 2019 energy agenda also include the matter of ensuring financial sustainability for technically - and economically - feasible power plants among those that are exposed to market risk, the movements in oil prices and the entire financial burden that energy import imposes on the national economy, the developments affecting electricity and natural gas prices, and the systemic and

subsequent impacts caused by such developments."

It is no coincidence that the hot topics in the Turkish energy sector in the first 10 months of the year (restrictions on oil imports from Iran, a dramatic drop in power generation in natural gas power plants, the multitude of the problems faced by energy companies with respect to financial bottlenecks and restructuring debts, a significant slowdown in the growth of demand for electricity, increases in natural gas and electricity prices) are indeed matters outlined in the mentioned report. Strong legislation and robust policy documents are prerequisites for an efficient functioning of a market.

In a similar vein, financial sustainability and economical investments are the minimum requirements for the same market to sustain its existence. To that end, it would be no exaggeration to say that the energy sector will continue to feel the repercussions of the economic volatility that first emerged in the last quarter of 2018, and extended the recession well into the first three quarters of 2019.

The growth in demand for electricity and natural gas has, of late, lost its dynamism compared to the past. As far as electricity is concerned, the capacity increases have continued to come on stream for the last 3 or 4 years, but as growth in demand has receded, a considerable glut of excess supply has built up, leaving some power plants needing higher prices for economical generation than the current prices in the market. With determined efforts to curb inflation, the room for any additional increases in electricity prices is extremely limited.

In the oil sector, although prices are not set to increase in the base case scenario, such assumptions are rather in the air at the moment amid the risk of an escalation of tensions in the Gulf Region or Eastern Mediterranean. Given that Turkey does not stand as a decisive power in setting global oil prices (either in terms of supply or demand volume), there should always be measures on standby to mitigate the potential impacts of any emergency. Considering the economic developments in Turkey, the key areas of priority on the energy agenda in 2020 are expected to be of a similar nature to those of 2019.

The Electricity and Renewable Energy Sector



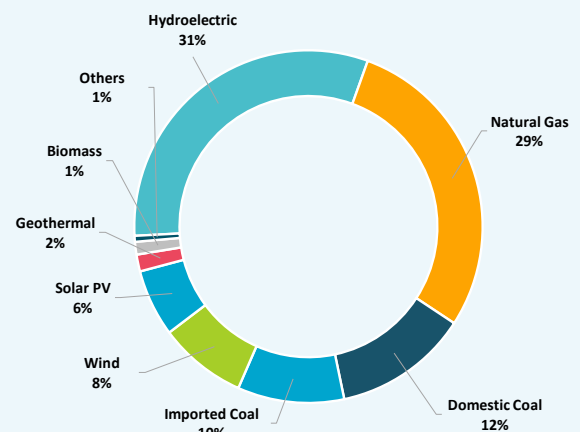
2.1. Installed Capacity Analysis

Turkey's total installed capacity had stood at around 5 gigawatts (GW) in the early 1980s but increased to 85.2 GW by the end of 2017, rising further to 88.5 GW at the end of 2018 and 90.7 GW as of the end of September 2019. This increase was mainly a result of the recent incentives granted to power plants in relation to renewable energy resources and domestic resources. As of September 2019, power plants using renewable energy accounted for 48% of Turkey's total installed capacity, with power plants using domestic resources comprising a 61% share. Unlicensed power plants had an installed capacity of 5.4 GW at the end of 2018, which had risen to 5.9 GW by the end of September 2019.



The installed capacity increased by about 2.2 GW in the first nine months of 2019. This increase was mainly attributable to power plants using domestic resources to generate electricity. 1.1 GW of the increase in installed capacity originated from licensed domestic coal-fired power plants while solar power plants were responsible for 0.53 GW of the increase. Out of the remaining power plants that have been commissioned, hydroelectric power plants (HEPP) account for 165.7 MW of the increase with wind power plants accounting for 388.1 MW of the new capacity, while biomass, waste heat and geothermal power plants are responsible for 437.1 MW in total. In the same period, the installed capacity of natural gas-fired power plants decreased by 549.7 MW.

Chart 1. Breakdown of Installed Capacity by Resources (September 2019)



Source: TEİAŞ, TSKB Economic Research

The share of renewable power plants within Turkey's total installed capacity stood at 46% in 2017 but increased to 48% by the end of 2018 and 48.4% by the end of September 2019. Of the renewable power capacity, hydroelectric power accounted for 64.8%, wind comprised 16.8% and solar power made up 12.7% of the total renewables capacity, with a total installed capacity of 43.9 GW.

In the first 9 months of 2019, 567 licensed and unlicensed solar power plants have been commissioned in addition to 13 licensed and unlicensed wind power plants. During the same period, the total number of biomass power plants (BPP) and geothermal power plants (GPP) in Turkey increased to 236 and 52 respectively while the number of hydroelectric power plants had risen to 669.

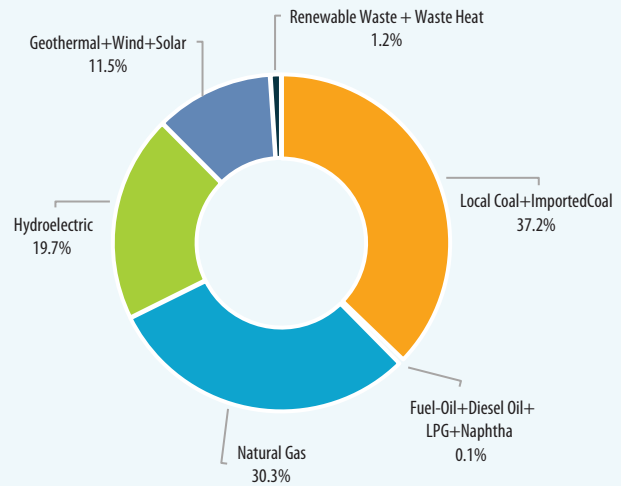
At the end of 2018, the share of independent generation companies in total installed capacity stood at 60.8%. Power plants belonging to the Electricity Generation Corporation (EÜAŞ), on the other hand, had a share of 20.9%. As of September 2019, independent generation companies were responsible for 66.5% of the total installed capacity, followed by EÜAŞ-owned power plants, which had a 21.6% share, transfer of operating rights (TOOR) power plants (3.8%), build-operate (BO) power plants (1.5%), build-operate-transfer (BOT) power plants (0.2%) and unlicensed power plants (6.5%).

Between 2010 and 2018, it was observed that the installed capacity grew more than electricity demand. A certain portion of the current excess may be attributed to the growth in renewable energy, which inevitably requires a reserve margin. However, the glut of excess generation capacity may cause some short-term problems for the entire system if the rate of growth in electricity demand remains as sluggish as it has been for the last 12 months.

2.2. Electricity Generation Analysis

Data from Turkish Electricity Transmission Corporation (TEİAŞ) indicate that Turkey's total gross electricity generation stood at 297.3 GW at the end of 2017 and rose by 2.5% in 2018 to reach 304.8 GW.

Chart 2. Breakdown of Gross Electricity Generation by Resources (2018)



Source: TEİAŞ, TSKB Economic Research

Renewable power plants were responsible for 32.4% of the total gross electricity generation in 2018. Coal-fired power plants, using either domestic or imported coal, accounted for 37.2% of total gross generation while natural gas-fired power plants provided 30.3% of gross electricity generation in 2018. The share of natural gas-fired power plants in gross electricity generation in 2018 declined to its lowest level since 2000, primarily as a result of the increases in gas prices in 2018 reducing the operational profitability of natural gas-fired power plants.

2018 was also a year when the share of hydroelectric power plants in total gross electricity generation remained low, being responsible for 19.7% of total gross electricity generation, the third lowest proportion since 2010. Their share of generation in 2018 was only slightly higher than the 16.4% in 2014 and 19.6% in 2017, years marked by relatively low rainfall.

Total gross electricity generation in the first 9 months of 2019 was 1.4% lower than that in the same period of 2018. Coal-fired power plants accounted for 36.1% of electricity generation between January and September 2018, but this proportion fell to 35.4% in the first 9 months of 2019.

The steepest drop was observed in the share of natural gas-fired power plants in electricity generation. Natural gas-fired power plants provided 30.4% of electricity generation in the first 9 months of 2018 but this share declined to 17% in the same period of 2019. However, the share of hydroelectric power has surged in 2019, from 20.8% in the first 9 months of 2018 to 32.5% in the same period this year.

Table 1. Electricity Generation and Shares by Source

Resource	2018-9 (GWh)	2019-9 (GWh)	2018-9 (%)	2019-9 (%)
Local Coal+Imported Coal	83,166	80,520	36.1	35.4
Natural Gas	70,178	38,604	30.4	17.0
Fuel-Oil+Diesel Oil+LPG+Naphtha	253	777	0.1	0.3
Hydroelectric	48,056	73,965	20.8	32.5
Geothermal+Wind+Solar	26,360	30,583	11.4	13.4
Renewable Wastes	2,670	2,994	1.2	1.3

Source: TEİAŞ, TSKB Economic Research

Unlicensed Generation

The upper limit for installed capacity at renewable power plants which are eligible to operate without a license was increased from 1 MW to 5 MW through a Presidential Decree in May 2019. The decree stipulates that the installed capacity be limited to the connection power in the connection agreement of the power consumption facility and that both generation and consumption take place at the same measurement point. The resolution also states that the retail single-time active power fee for the specific subscriber group announced by EMRA will apply to the surplus electricity generated from rooftop and facade solar power plants and other renewable power plants for a period of 10 years starting from the commissioning date of the plant.

The same practice is to apply to agricultural irrigation subscribers and the needs of drinking water facilities and wastewater treatment facilities, as well as the rooftop, facade and field renewable power plants established

by public agencies and institutions. However, the requirement that both generation and consumption take place at the same measurement point shall not be sought for the rooftop, facade and field renewable power plants established by public agencies and institutions to cater to the needs of multiple power consumption facilities, on the condition that this remains within the total connection power stated in the connection agreements of power consumption facility or facilities.

The new decree states that real and legal persons will be able to generate electricity without being required to obtain a license or establish a company, and will be able to feed their surplus electricity into the grid. The electricity fed into the grid will be covered by YEKDEM. Surplus electricity fed into the grid in each invoicing period after monthly offsetting at such power plants will be purchased by the delegated supply company for a period of 10 years.

2.3. Analysis of Demand for Electricity

The total demand for electricity in Turkey between 2000 and 2018 increased consistently every year with the exception of 2001 and 2009, indicating that demand for electricity in Turkey is closely associated with the rate of growth in the country's gross domestic product (GDP). Turkey's total electricity demand stood at 296.7 terawatt-hours (TWh) in 2017, and increased by 2.5% to 304.2 TWh in 2018. A monthly breakdown of the figures found year-on-year declines in the months of August, October, November and December.

In parallel with economic developments, the slowdown in the year-on-year rate of growth in electricity demand continued for the first 4 months of 2019, before shifting to positive growth in May. However, decreases of 0.7%, 3.5%, 1.4% and 1.1% were observed in June, July, August and September, respectively. A comparison of the first 9 months of 2018 and 2019 shows a year-on-year decline of 1.66% as of the end of September 2019.

Table 2. Electricity Demand by Month and Year-on-Year Growth Rates

Month	2017 (TWh)	2018 (TWh)	2019 (TWh)	2018 (%)	2019 (%)
January	25.59	26.58	25.74	3.9	-3.2
February	22.88	23.63	23.20	3.3	-1.8
March	24.06	25.06	24.63	4.2	-1.7
April	22.43	23.93	23.42	6.7	-2.1
May	23.34	24.33	24.60	4.2	1.1
June	22.86	24.20	24.04	5.9	-0.7
July	28.38	29.56	28.52	4.1	-3.5
August	28.10	27.92	27.51	-0.6	-1.4
September	24.47	25.41	25.12	3.8	-1.1
October	23.89	23.75	-	-0.6	-
November	24.57	24.07	-	-2.0	-
December	26.13	25.73	-	-1.5	-
Total	296.70	304.17	226.78	2.5	-1.7¹

Source: TEİAŞ, TSKB Economic Research

2.4. Electricity Price Analysis

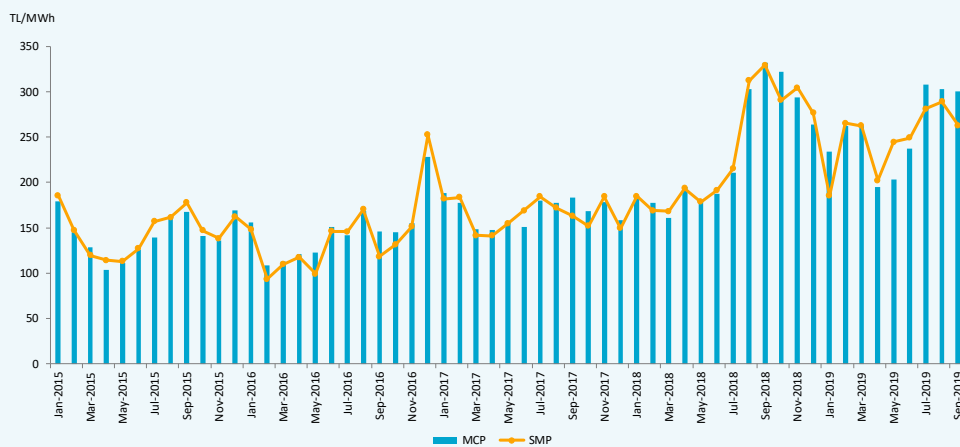
The electricity price in Turkey is formulated for each hour over a supply curve as well as price-quantity pairs listed in ascending order and combined in a single bid. After the demand curve is formulated similarly, the intersection of supply and demand curves would indicate the Market Clearing Price (MCP) for the hour concerned. The price in the balancing market, on the other hand, depends on whether there is an energy deficit or an energy surplus within the system.

¹The growth rate comparing the total of the first 9 months in 2019 with the total of the first 9 months in 2018.

If there is an energy deficit, the maximum hourly bid price in the system is taken as the system marginal price. When there is a surplus, the minimum bid price accepted is taken as the System Marginal Price (SMP).

There was very little change in monthly electricity prices between 2015 and the second half of 2018 until August 2018 when prices started rise, mainly attributable to the 49.5% increase in prices of natural gas as imposed by Petroleum Pipeline Corporation (BOTAS) in August 2018. An analysis of monthly average MCP finds that the monthly average price for the period between January 2015 and July 2018 was TL 157.60 /MWh while the average price between August 2018 and September 2019 stood at TL 272.90 /MWh.

Chart 3. The Development of Monthly Average MCP and SMP

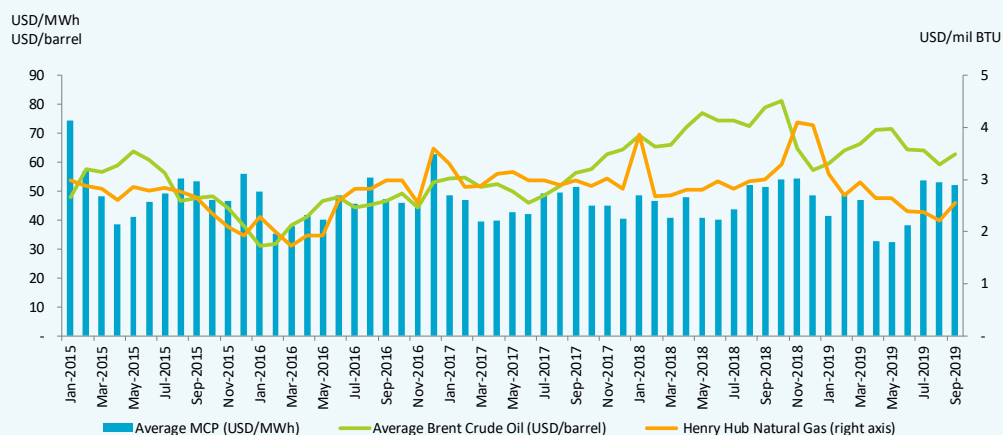


Source: Energy Exchange İstanbul (EPIAŞ), TSKB Economic Research

Although electricity prices depend on power plant availability, the weather and economic and geopolitical factors, they react instantly to any changes in commodity prices. As Turkey is a country that procures a large proportion of its energy raw materials through imports, electricity prices progress directly in parallel

with commodity prices. In April and May 2019, however, the MCP and the price of Brent Crude followed divergent paths. This could have been a result of a combination of the increase in the amount of electricity generated at hydro-electric power plants in April and May and the decline in electricity consumption.

Chart 4. The Development of MCP & Brent Crude Price & Henry Hub Natural Gas Unit Price



Source: EPIAŞ, Central Bank of the Republic of Turkey (CBRT), U.S. Energy Information Administration (EIA), TSKB Economic Research

YEKDEM and YEKA

Pursuant to the Renewable Energy Law (YEK), wind, solar, geothermal, biomass, wave, current and tidal power plants as well as hydropower plants with a canal or river or reservoir area of less than 15 km² may benefit from YEKDEM payments for 10 years. It was publicly announced during 2018 that YEKDEM would not be continued under the same conditions after December 31, 2020.² As of 2019, 777 licensed renewable power plants with a total installed capacity of 20,922 MW are covered by this mechanism, of which 60.2% are hydro-electric power plants with wind farms comprising 31% of the capacity. There has not been any additional and clear statement regarding what regulation will take effect after 2020.

Under the recent YEKA process which it launched, the Ministry of Energy and Natural Resources holds tenders to transfer certain areas to investors for electricity generation from renewable energy resources on the condition that domestically made equipment is used in such generation operations. The first tender was awarded in 2017 for the Karapınar YEKA-1 solar power plant, with an installed capacity of 1,000 MW. The first YEKA tender in March 2017 was awarded to the joint venture between Kalyon and the South Korean Hanwha, with their winning bid of a feed-in tariff of USD 69.9/MWh. However, Hanwha decided to withdraw from the joint venture in January 2019 due to financial issues.

In July, a New Omnibus Bill adopted in the Grand National Assembly of Turkey extended the term of commissioning in YEKA projects by 36 months, thereby providing Kalyon the opportunity to find a new partner. In October, Kalyon Enerji found China Electronics Technology Group Corporation (CETC) as a partner for the construction of a 500 MW solar module factory.

The first 1,000 MW wind farm YEKA tender was held in 2017 and was awarded to the Siemens-Türkerler-Kalyon joint venture, which had submitted a bid of USD 34.8/MWh. Siemens Gamesa Renewable Energy is planning to start nacelle production by the end of November.

YEKA tenders continued in 2018 as well. On June 21, 2018, a tender for a 1,200 MW offshore wind farm project was announced but postponed due to a lack of sufficient demand. Furthermore, it was announced in 2018 that January 2019 would be the deadline for applications in Turkey's second largest solar power plant tender. This tender incorporated three separate biddings, one for 500 MW of installed capacity in Viranşehir, Şanlıurfa, one for 200 MW in Erzin, Hatay and one for 300 MW in Bor, Niğde. However, in January 2019 it was announced that the tender was canceled.

The YEKA-2 wind farm tenders were held on May 30, 2019. The tenders covered wind farms with an installed capacity of 250 MW in Balıkesir, Çanakkale, Aydın and Muğla. Enercon and EnerjiSA were each awarded two of these tenders. Enercon won the tender for the Muğla wind farm with a bid of USD 40.0 /MWh and the Balıkesir tender with a bid of USD 35.3 /MWh. EnerjiSA, on the other hand, was awarded the Aydın tender with a bid of USD 45.6 /MWh and the Çanakkale tender with a bid of USD 36.7 /MWh.

Now the Ministry of Energy and Natural Resources has held three successful YEKA tenders in the last two years, the YEKA SPP-2 tender is expected to be held in the form of smaller tenders in the first quarter of 2020. According to the Minister of Energy and Natural Resources, the details of YEKA tenders with small scales will be announced in the last quarter of 2019.

²Renewable power plants joining YEKDEM before December 31, 2020 can benefit YEKDEM for 10 years under the same conditions.

2.5. Developments

In 2018 and 2019, certain legislative amendments and improvements in the electricity generation and renewable energy sectors were introduced. These included developments on nuclear power plants, market launch and development of the electricity capacity mechanism, developments on Renewable Energy Resource Area (YEKA) and Renewable Energy Resources Support Mechanism (YEKDEM) and legislative amendments regarding unlicensed generation.

Turkey has been pursuing a goal to establish a nuclear power plant for about 50 years, and in 2010 an agreement was signed with the Russian Federation for the construction of the Akkuyu Nuclear Power Plant to realize this goal. Work on the Akkuyu Nuclear Power Plant has gained significant momentum in the last two years. The foundations for the reactor of the Akkuyu Nuclear Power Plant were laid in April 2018. The unit is expected to be commissioned in 2023 at an estimated cost of around USD 20 billion. Work on the plant's second reactor got underway in 2019, with Rosatom obtaining the construction license in September 2019. The Sinop Nuclear Power Plant was another nuclear power project in the planning phase, but the feasibility studies presented by Japanese companies were not deemed reasonable in terms of the project schedule or the costs, and work on the project was shelved in September 2019.

The electricity capacity mechanism for natural gas and coal-fired power plants, which was published in the Official Gazette in January 2018, entered force as an incentive mechanism required for supply and system security. In 2018, 29 eligible gas and coal-fired power plants received incentives worth TL 1,407 million in total. The regulation promulgated in November 2018 introduced a number of amendments to the terms and conditions of the electricity capacity mechanism, allowing eligible hydroelectric power plants to benefit from the mechanism.



Capacity Mechanism for 2019

Following the amendment introduced in November 2018, the number of power plants covered by the electricity capacity mechanism rose to 43, with the total amount of planned payments reaching TL 2 billion.

One co-generation plant with an installed capacity of 56 MW, 11 natural gas-fired power plants with a total installed capacity of 9,479 MW and 21 coal-fired power plants with a total installed capacity of 12,936 MW have

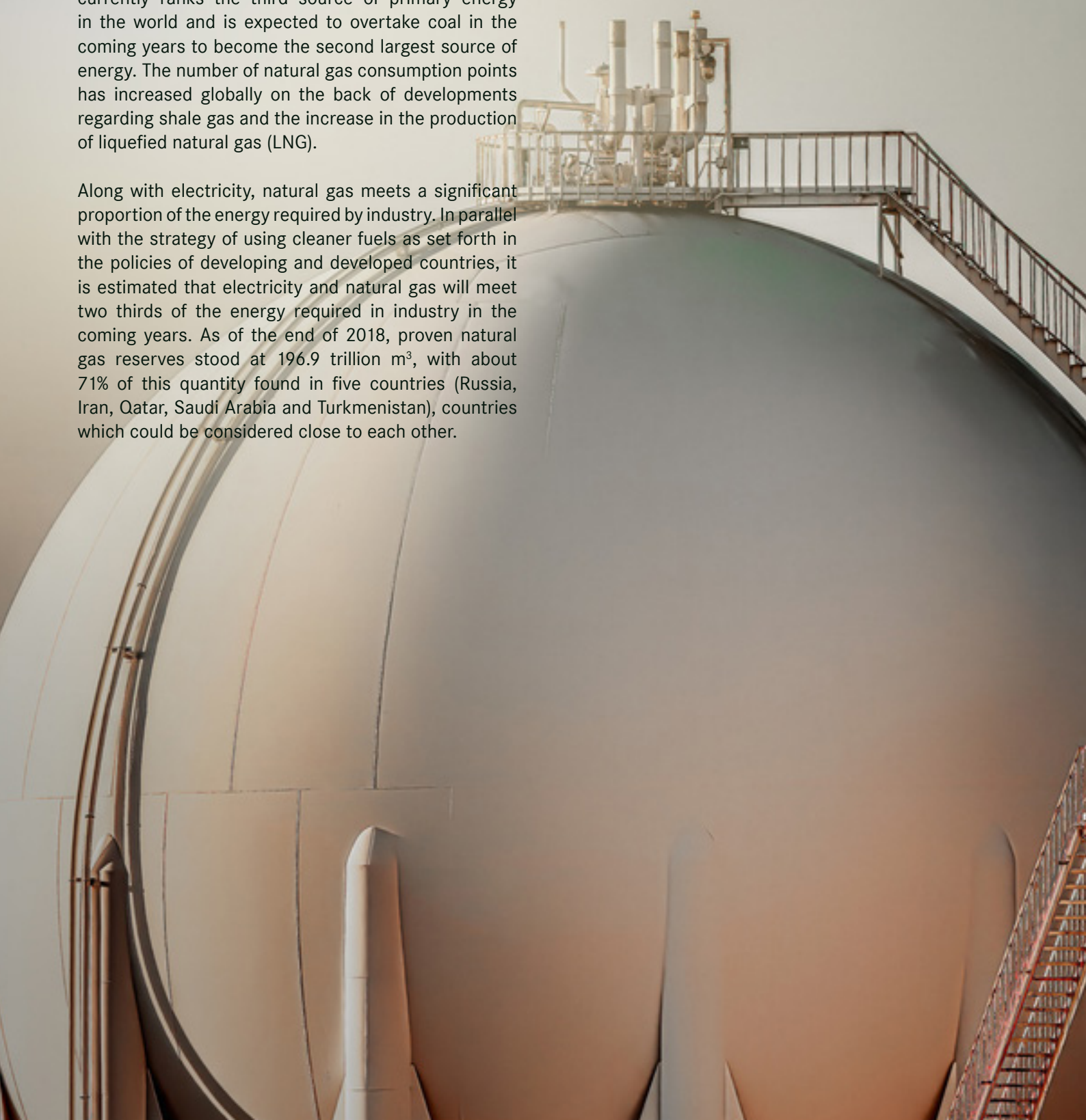
benefited from the capacity mechanism as of 2019. In addition, 10 hydroelectric power plants with a total installed capacity of 1,666 MW have been added to list of plants covered by the mechanism in 2019.

As of the end of September, coal-fired power plants receive TL 66,994 /MW while hydroelectric power plants and natural gas-fired power plants are paid TL 58,936 /MW and TL 50,516 /MW respectively.

The Natural Gas Sector

According to global energy consumption forecasts, natural gas will be the only fossil fuel to see an increase in consumption between now and 2040. Natural gas currently ranks the third source of primary energy in the world and is expected to overtake coal in the coming years to become the second largest source of energy. The number of natural gas consumption points has increased globally on the back of developments regarding shale gas and the increase in the production of liquefied natural gas (LNG).

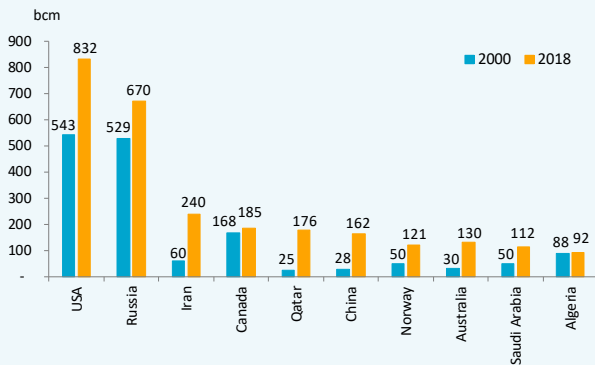
Along with electricity, natural gas meets a significant proportion of the energy required by industry. In parallel with the strategy of using cleaner fuels as set forth in the policies of developing and developed countries, it is estimated that electricity and natural gas will meet two thirds of the energy required in industry in the coming years. As of the end of 2018, proven natural gas reserves stood at 196.9 trillion m³, with about 71% of this quantity found in five countries (Russia, Iran, Qatar, Saudi Arabia and Turkmenistan), countries which could be considered close to each other.





In 2018, Russia and the USA produced about 37% of world's natural gas, as in 2017. With the inclusion of Iran, Qatar and Canada, the total natural gas production in these 5 countries constitutes more than half of global production. In 2018, natural gas production rose by 5.2%, or by 190 billion cubic meters (bcm) year-on-year to reach approximately 3,868 bcm.

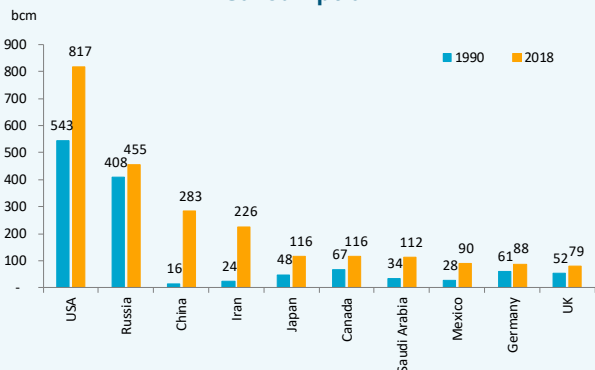
Chart 5. Top 10 Countries by Global Natural Gas Production



Source: British Petroleum (BP), TSKB Economic Research

Global natural gas consumption data for 2018 finds that the USA and Russia were responsible for 32% of the total consumption of 3,850 bcm. Total natural gas consumption grew by about 195 bcm year on year, with the greatest contribution to the growth coming from China and the United States of America (USA), adding around 43 bcm and 78 bcm, respectively.

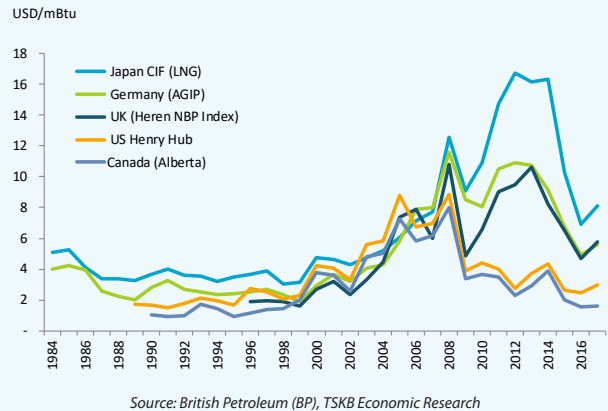
Chart 6. Top 10 Countries by Global Natural Gas Consumption



Source: British Petroleum (BP), TSKB Economic Research

Natural gas prices are directly influenced by oil prices. Prices of natural gas and LNG increased globally during 2018.

Chart 7. The Development of Annual Average Natural Gas Prices



3.1. The Turkish Natural Gas Sector

Turkey's natural gas consumption decreased by about 8.4% year-on-year to 49.3 bcm in 2018. Increases in natural gas tariffs as well as economic recession in the second half of 2018 were the main reasons for the decline in natural gas consumption.

Natural gas has become available for an increasing number of regions in Turkey, with Artvin, Şırnak and Hakkâri provinces being connected to natural gas supplies by the end of 2018, meaning all 81 of Turkey's provinces are now part of the gas supply network. Turkey's daily gas consumption record was broken on January 8, 2019, with consumption reaching 245 million cubic meters (mcm) of gas. The cuts in gas supply that were a feature of past years were prevented, thanks to the increase in the daily supply capacity to 310 mcm.

3.2. Natural Gas Reserves and Production in Turkey

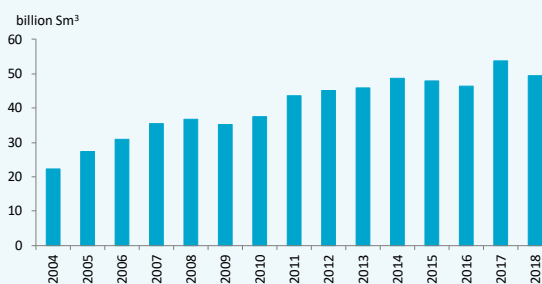
Despite being surrounded by countries home to large natural gas reserves, Turkey has reserves of only 18.5 bcm with low gas production, meeting less than 1% of the country's annual consumption. A total of 969 mcm of gas was produced in Turkey in 2008. Production later continuously declined until 2018, when production increased by 21% year-on-year to 428 mcm.

3.3. Natural Gas Consumption in Turkey

Turkey recorded its highest natural gas consumption in 2017, before decreasing by 8.4% year-on-year to 49.3 bcm in 2018 – the steepest fall ever recorded. Consumption of natural gas declined in all areas of the economy, except for the services sector. The foci of consumption chiefly bringing along the decline in consumption were electricity generation/conversion-cycle plants with a decrease of about 2.4 bcm and industrial facilities with a decrease of 1.4 bcm.

Household gas consumption stood at 12.7 bcm, marking a year-on-year decrease of 6.0%.

Chart 8. Natural Gas Consumption in Turkey



Source: EMRA, TSKB Economic Research

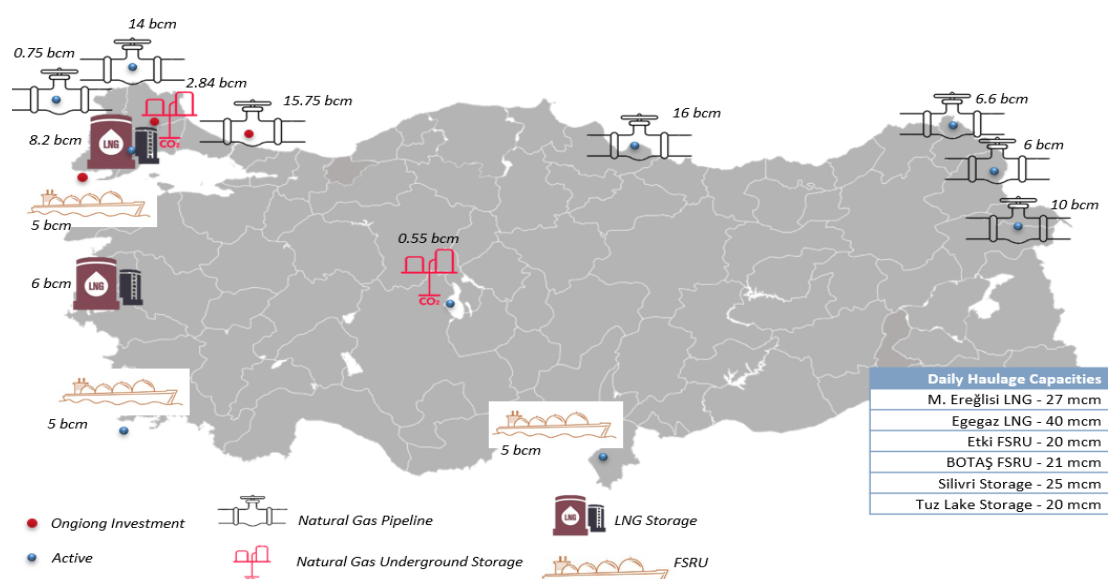
3.4. Natural Gas Trade in Turkey

As Turkey has failed to develop in terms of natural gas resources, Turkey must meet most of its gas consumption through imports. In 2018, 50.4 billion standard cubic meters (Sm³) of gas were imported, marking a year-on-year decrease of 9%. Exports to Greece increased by 7% compared to 2017, to reach 673 million Sm³.

Underground storage activities play a key role in assuring the continuity of gas supply and ensuring supply security. Such activities have improved in recent years, attaining a capacity of around 3.4 bcm. The increase in LNG storage facilities and underground storage have helped ensure short-term and medium-term supply security.

Commissioning Turkey's first floating LNG storage and regasification unit (FSRU) in 2017, Etki Port Operations replaced its former FSRU with a new vessel, TURQUOISE, in July 2019, doubling the daily supply capacity from 14 mcm to 28 mcm.

Figure 1. The Natural Gas System in Turkey



Source: EMRA, TSKB Economic Research

The share of LNG in Turkey's gas imports has been increasing each year, and increased by 5% year-on-year in 2018 to reach 11.3 billion m³. The fact that LNG imports increased in a year when natural gas consumption plunged is a clear indication that LNG will play a key role in both global and Turkish trade in the future. After the share of LNG in Turkey's gas imports rose to 22.5%, Turkey ranked the third in Europe in terms of LNG imports behind Spain and France.

Although Turkey's imports from Russia decreased by 5.1 bcm year on year, Turkey's dependence on imports from Russia, which has a share of 47% in total imports, continues. In 2018, the quantity of natural gas imported from Iran also declined by 1.4 bcm to 7.9 bcm. In the same period, Azerbaijan stood out as the only country from which Turkey's gas imports increased. Gas imports from Azerbaijan rose by 1 bcm to 7.5 bcm in 2018, the highest volume of natural gas ever exported from Azerbaijan to Turkey.

When it comes to LNG imports, the amount of gas purchased from Nigeria and Algeria under BOTAS contracts was close to the amounts purchased in previous years. LNG spot imports grew by 7% year-on-year to reach 5.1 bcm. About 3 bcm of LNG spot imports originated from Qatar.

FSRU (Floating Storage Regasification Unit)

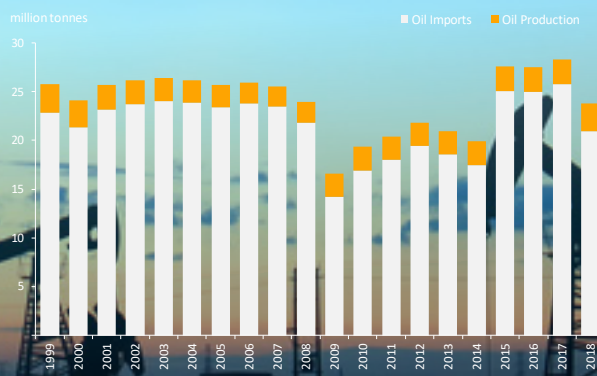
LNG is an alternative to pipeline supply in natural gas consumption. The number of FSRUs in the world has been on the rise due to the increasing use of LNG each year, the high construction costs associated with on-shore terminals and the long-time spans required for construction of such terminals. When necessary, FSRUs can be disconnected from the shore they are fixed to and operate in another region. FSRUs are a preferred alternative for investors given their flexibility, and can be deployed in other regions when prices are not at their desired level.



The Oil Sector

Oil plays a major role in Turkey's supply of energy products as well as its final energy consumption. Oil and petroleum products constitute 30% of Turkey's supply of energy products and account for an average 35% of Turkey's final energy consumption. Turkey's crude oil production has increased over the years but the growth in demand has been higher, with domestic oil production thus meeting only a low proportion of demand. Turkey meets more than 90% of oil needs through imports as its natural resources are limited. This is considered to have been one of the key reasons for the rise in Turkey's foreign trade deficit. Work on oil and natural gas exploration projects has recently gained momentum, specifically in the Mediterranean and the Black Sea. Government officials have stated that production is expected to increase in the wake of newly developed technologies amid new exploration and discovery efforts.

Chart 9. Turkey's Crude Oil Imports and Production



Source: General Directorate of Mining and Petroleum Affairs, TurkStat,
TSKB Economic Research

4.1. Oil Reserves, Oil Production, Refineries and Refined Products in Turkey

In 2018, Turkey's producible oil reserves stood at 366 million barrels, mainly located in the southeast of the country. If no new oil fields are discovered, the remaining recoverable crude oil reserves will be depleted over a period of 18 years at the current levels of production. The Turkish Petroleum Corporation (TPAO), the oil and gas exploration and production company, is responsible for about 50% of oil exploration efforts and 75% of oil production in Turkey. In 2018, a total of 107 wells were drilled, comprising 51 exploratory wells and 56 production wells.

Turkey's crude oil production stood at approximately 2.8 million tonnes in 2018, constituting 0.1% of global crude oil production. In 2018, total refinery production fell by 13.6% year-on-year to 25 million tonnes. In 2018, Turkish Petroleum Refineries Corporation (TÜPRAŞ)

continued to operate four oil refineries located in İzmir, İzmit, Kırıkkale and Batman, to produce 37 different products.

Commissioned in October 2018, the STAR Refinery is expected to reduce Turkey's external dependence in terms of petroleum products and provide a positive contribution to the current account balance. As of 2019, the STAR Refinery had a refining capacity of 10 million tonnes and was producing naphtha, xylene and reformate, which are raw materials for the petrochemical industry, as well as diesel, jet fuel, liquefied petroleum gas (LPG) and petroleum coke - all major items contributing to the current account deficit.

In parallel with the commissioning of the STAR Refinery, total production of petroleum products surged by 39.2% year-on-year in the first 7 months of 2019 to 18.7 million tonnes, from 13.4 million tonnes in the same period of 2018. In the same period, total imports of petroleum products increased by 17.7% and total exports surged by 77.0%.

Table 3. Capacities and 2018 Production Quantities of TÜPRAŞ Refineries

Oil Refinery	2018 Production Quantity (million tonnes)	Refining Capacity (million tonnes)
TÜPRAŞ İzmit	10.0	11.3
TÜPRAŞ İzmir	9.4	11.9
TÜPRAŞ Kırıkkale	4.4	5.4
TÜPRAŞ Batman	0.9	1.4

Source: TÜPRAŞ, TSKB Economic Research

4.2. Oil Consumption in Turkey

Consumption of oil and oil products followed an upward trend until 2017, but decreased in 2018 with the fall extending into January-July 2019.

Table 4. Sales, Import and Export Quantities of Petroleum Products in 2018

Product Type	2018 Domestic Sales (Consumption) (tonnes)			2018 Total Supply (Refinery Production + Imports) (tonnes)	2018 Total Demand (Domestic Sales + Imports) (tonnes)
	Refinery Sales	Fuel Sales by Distributors	Bunker Sales by Distributor and BDLH ³		
Gasoline Types	2,252	2,326,856	812	4,684,112	4,769,778
Diesel Types	-	23,196,298	380,586	23,041,237	23,722,846
Fuel Oil Types	76,209	283,710	-	614,758	595,749
Aviation Fuels	128,572	-	1,152,103	5,26,978	5,155,584
Marine	-	-	43,805	1,776,331	1,829,355
Total	207,034	25,806,864	1,577,306	35,384,416	36,073,313

Source: EMRA, TSKB Economic Research

³BDLH stands for Bunker Delivery License Holders.

Total domestic sales of petroleum products decreased by 3.6% year-on-year in January-July 2019 to 16.6 million tonnes.

Table 5. Domestic Sales of Petroleum Products in January-July 2018 and January-July 2019

Domestic Sales (Consumption) (tonnes)		
Product Type	January-July 2018	January-July 2019
Gasoline Types	1,353,275	1,366,760
Diesel Types	14,625,834	13,738,818
Fuel Oil Types	225,781	238,974
Aviation Fuels	784,068	699,511
Marine Fuels	28,826	26,878
Kerosene	1,677	1,360
Other Products	164,322	488,332
Total	17,183,783	16,560,633

Source: EMRA, TSKB Economic Research

4.3. Petroleum Products Trade in Turkey

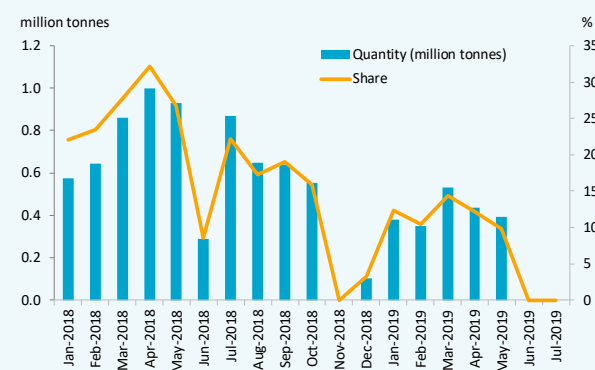
In the three years preceding 2018, Turkey's crude oil production averaged 2.5 million tonnes per year, while the country's average crude oil imports exceeded 25 million tonnes in the same three years. In 2018, about 20.9 million tonnes of crude oil were imported. The US sanctions against Iran were considered to be a key factor behind the fall in crude oil imports in 2018. Turkey continued to import crude oil from Iran in 2018, but it dropped from 930 million tonnes to 287 million tonnes after the US statement in May 2018 that it was going to impose an embargo against Iran.

Iranian oil constituted 27% of Turkey's crude oil imports in 2017, but this proportion declined to 18.4% in 2018. The share of Iranian oil in Turkey's crude oil imports in the first 7 months of 2019 averaged 7.8%. Iran was the largest supplier of crude oil to Turkey in 2018, but fell to the number 3 spot in May 2019.

As a result of global developments, activities in the oil sector in Turkey remained slower in 2018 than in previous years. On July 2, 2019, the Organization of the Petroleum Exporting Countries (OPEC) and non-OPEC countries led by Russia agreed on a 9-month extension of the decision to curb daily oil production. Stipulating a daily production cut of 1.2 million barrels, the decision

will remain in force until March 2020. However, Turkey's petroleum products exports increased from 732,473 tonnes in July 2018 to 1,035,700 tonnes in July 2019. The commissioning of the STAR Refinery in October 2018 was a major factor behind the increase. The STAR Refinery started exporting petroleum products in January 2019, and accounted for 15.5% of exports as of July 2019.

Chart 10. Oil Imports from Iran and Monthly Change



Source: EMRA, TSKB Economic Research

4.4. The Development of Oil Prices

Having hovered near USD 30 /barrel in 2016, oil prices climbed to USD 50-60 /barrel in 2017. In the third quarter of 2018, the price of benchmark Brent crude oil surged to USD 80 /barrel before receding to about USD 60 /barrel in November on the back of plans by Saudi Arabia and Russia to increase production and higher U.S. oil stocks. The price of benchmark Brent crude oil stood at USD 63 /barrel as of September 2019.

Oil prices are acutely affected by global political developments. The ongoing economic and political tensions in Venezuela, the U.S. sanctions against Iran, and the position to be taken by Saudi Arabia - dubbed the central bank of oil - as well as Gulf countries acting together with Saudi Arabia have all had a decisive impact on oil prices. In addition, any changes in U.S. oil inventories also impacts the direction of oil prices. Key producers such as Russia and Saudi Arabia are expected to have a bearing on market supply while supplies of U.S. shale oil are anticipated to influence movements in oil prices in the coming period.

In its October 2019 "Commodity Report", the World Bank estimated that oil prices would stand at USD 57.8 /barrel in 2019 on a real term basis, and the movement of oil prices in the first half of 2019 supported these estimates. Prices are likely to tend downward on the back of receding global demand, provided there is no disruption to supply security in the second half of 2019.

Chart 11. The Development of Brent Crude Oil Prices



Source: International Energy Agency (IEA), TSKB Economic Research



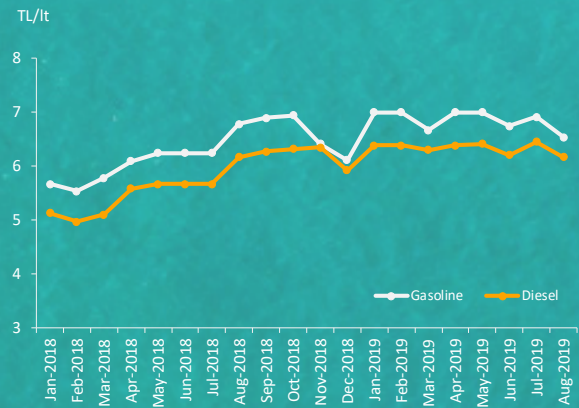
Prices of Petroleum Products in Turkey

Changes in crude oil prices are impacted by exchange rate volatility and taxes. As with Brent Crude prices, both diesel and gasoline prices followed an overall upward trend in the first half of 2018 and an overall downward trend in the second half of 2018 in international markets. Throughout 2018, diesel fuel and gasoline prices fluctuated in our country in line with prices in international markets.

In 2018, the average dealer sales price, excluding tax, stood at TL 3.06 per liter of 95 octane unleaded gasoline, and TL 3.25 per liter of diesel. In the breakdown of the final price for diesel products, 42.95% is tax, 46.66% is the product cost and 10.39% is the gross profit margin and income share for companies operating in the market. For the final price for gasoline products, the breakdown is 50.78% tax, 39.31% being the product cost and 9.91% consisting of the gross profit margin and income share for companies operating in the market.

Although product prices for gasoline and diesel are about same, the final price of gasoline is higher as it carries a higher tax burden.

Chart 12. The Development of Gasoline and Diesel Fuel Prices in Turkey



Source: EMRA, TSKB Economic Research

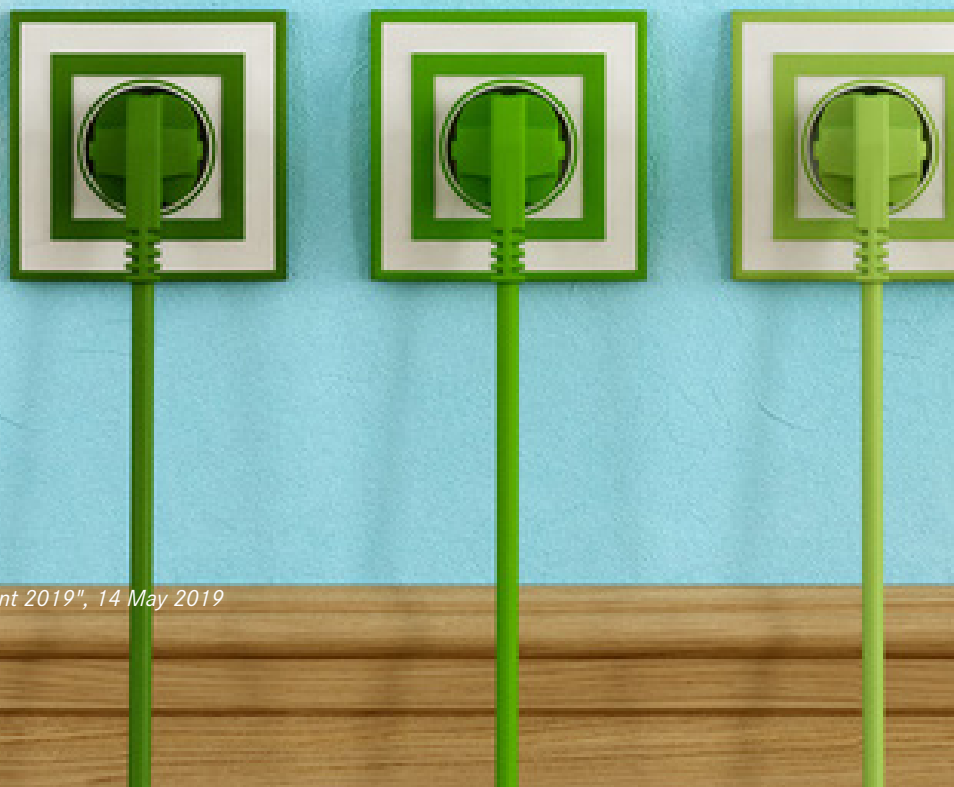


Energy Efficiency

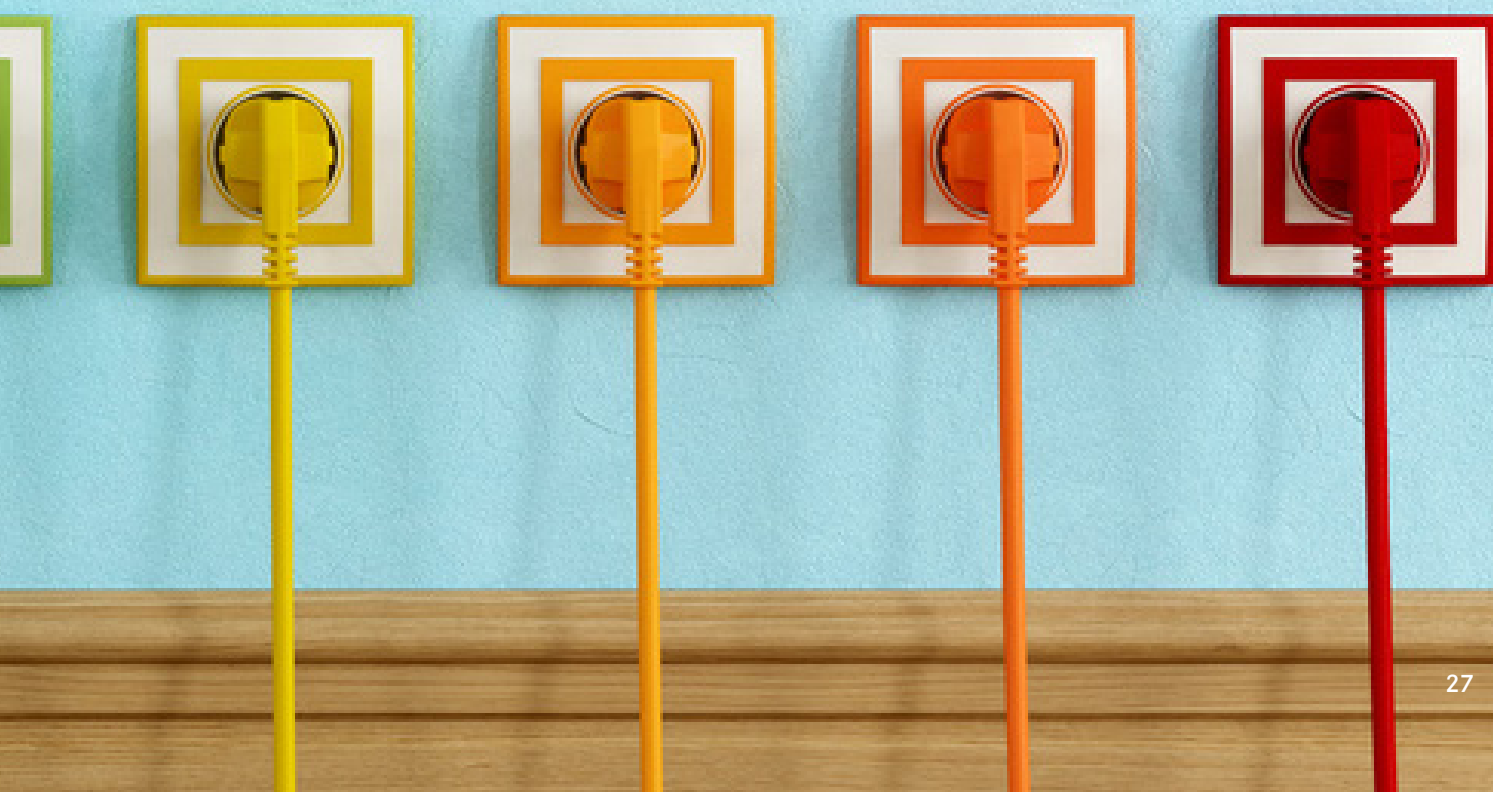
Energy efficiency is a key item on the energy policy agenda, specifically in developed countries. According to IEA figures, about 13% (about USD 235 billion) of the USD 1.8 trillion invested in the energy sector in 2017 was focused on energy efficiency, marking a 3% year-on-year increase.

Investments in energy globally continued at a similar pace in 2018, with USD 1.85 trillion spent, of which USD 240 billion was invested in energy efficiency.⁴ In the construction sector, which has a significant share in energy efficiency investments, some decline in energy investments was observed during the year as a result of the stagnation in the sector in 2018.

It is possible that tools, equipment, processes and practices which do not meet the energy efficiency criteria will have to face increased costs and even additional taxes.



⁴International Energy Agency, "World Energy Investment 2019", 14 May 2019



5.1. Energy Efficiency Legislation and Organizational Structure

The Turkish Energy Efficiency Law, which entered force in 2007, targets the efficient use of energy, the prevention of waste, a reduced burden of energy costs on the economy and improved efficiency in the use of energy and energy resources to protect the environment. A series of regulations and bylaws have been published to ensure the smooth implementation of the Energy Efficiency Law following its enactment. The said regulations and bylaws include the Regulation on Improving Energy Efficiency in Transportation, the Regulation on Energy Performance in Buildings, and the Regulation on Improving Efficiency in the Use of Energy Resources and Energy.

The Regulation on Improving Energy Efficiency in Transportation originally entered force on June 9, 2008 and was updated on May 2, 2019. It prescribes the measures that should be taken to improve energy efficiency in transportation.

The Regulation on Improving Efficiency in the Use of Energy Resources and Energy originally entered force

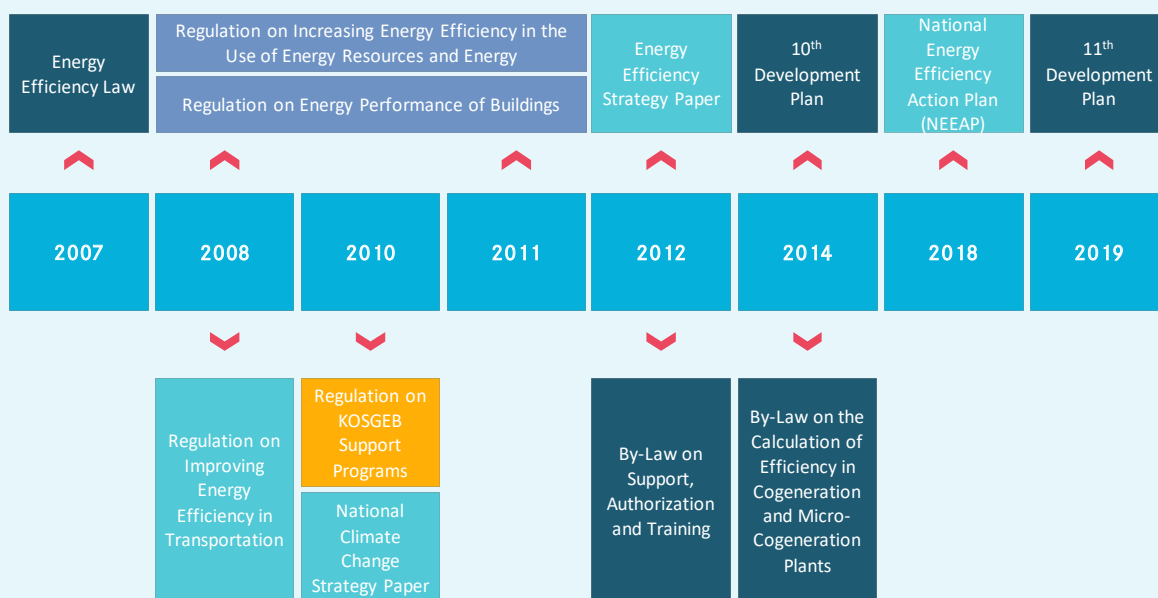
on October 25, 2008 and was amended on October 27, 2011 in the Official Gazette. It sets out principles and procedures on energy management and measures to improve efficiency, on supporting efficiency-boosting projects in industrial businesses and on voluntary agreements.

The Regulation on Energy Performance in Buildings entered force upon its promulgation in the Official Gazette dated December 5, 2008. The Regulation aims to set out the principles and procedures on the efficient and effective use of energy and energy resources in buildings, reducing energy waste and protecting the environment.

The Energy Efficiency Strategy Paper published by the High Planning Council in the Official Gazette of February 25, 2012 aims to reduce energy intensity in the 2012-2023 period by a minimum of 20% when compared to 2011 values and to lower energy losses. The Strategy Paper specifies on a sub-sectoral basis the strategic goals, the action to be taken and the responsible agencies, as well as the deadlines and durations for each action.

Energy efficiency was referred to under the sections on manufacturing industry, energy, logistics and transport in the 10th Development Plan covering the period

Figure 2. Energy Efficiency Policy Documents and Legislation



Source: MENR, TSKB Economic Research

2014-2018. Furthermore, it was defined separately as a major heading in the "Priority Transformation Programs". The initial work for the National Energy Efficiency Action Plan (NEEAP) covering the 2017-2023 period started in 2015 as part of Turkey's efforts to harmonize its standards with the European Union (EU). The plan was published as Resolution No. 2017/50 by the High Planning Council in the Official Gazette dated January 2, 2018. The NEEAP is handled in greater detail in the later sections of the report. The importance placed on energy efficiency has also been emphasized in the 11th Development Plan in terms of attaining the goals set out under NEEAP.

The Energy Efficiency and Department of Environment (EEED) was established in early 2019. The EEED was established to manage the energy efficiency and environment-related services of the Ministry of Energy and Natural Resources regarding legislation, strategy, national and international cooperation, training, surveys, efforts to raise awareness, advisory, monitoring, planning, evaluation, support and management.

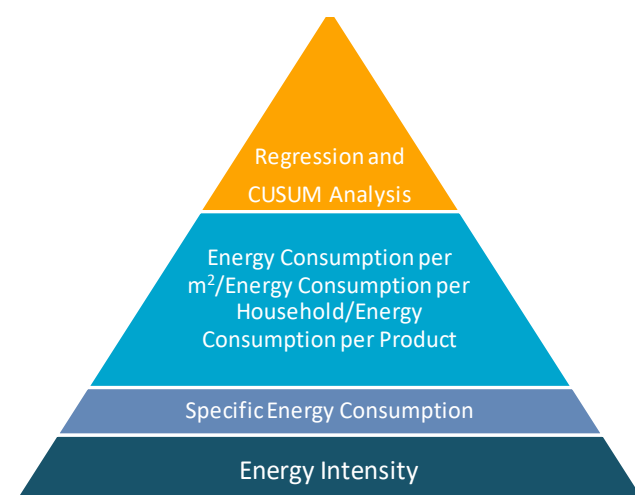
Energy Efficiency in the 11th Development Plan

Energy efficiency is referred to in the 11th Development Plan (2019-2023) published in the Official Gazette dated July 23, 2019. The Plan states that energy efficiency will be supported in multiple sectors including but not limited to energy, manufacturing industry, machinery and electrical equipment, textiles and ready wear, logistics and transport. The Development Plan aims to not only support energy efficiency projects but also facilitate the establishment of legislation and technical infrastructure for energy efficient practices.

The Presidential Circular No. 2019 / 18 on Energy Savings in Public Buildings was promulgated in the Official Gazette No. 30860 dated August 16, 2019 as part of the efforts to implement energy efficiency projects in public buildings as provided in Article 492 of the Development Plan. The Circular states that those public buildings that are obliged to appoint an energy manager pursuant to the Energy Efficiency Law are expected to achieve a minimum energy saving of 15% by the end of 2023. The "Savings Goal for Public Buildings and Practical Guidelines" was published on September 20, 2019 under the coordination of the Ministry of Energy and Natural Resources in order to realize the savings goal for 2020-2023, identify the energy efficiency measures to be implemented, monitor practices at public agencies and institutions to this end and attain maximum savings. The rates of realization for energy savings goals in public buildings will be reported by the Ministry of Energy and Natural Resources to the Presidency of the Republic.

5.2. Energy Efficiency Indicators

Various benchmarking methods and indicators are employed in defining the energy efficiency positions of countries, sectors and firms against with respect to one another. The main energy efficiency indicators used include energy intensity (toe per USD 1,000), specific energy consumption (toe-kcal-kWh)/(m²-kg-m²-m³-tonnes-unit), regression analysis, and energy efficiency index (ODEX). In measuring energy efficiency in buildings, various energy efficiency indicators such as energy consumption per household and energy consumption per square meter of the household (kWh/m²) can be employed.

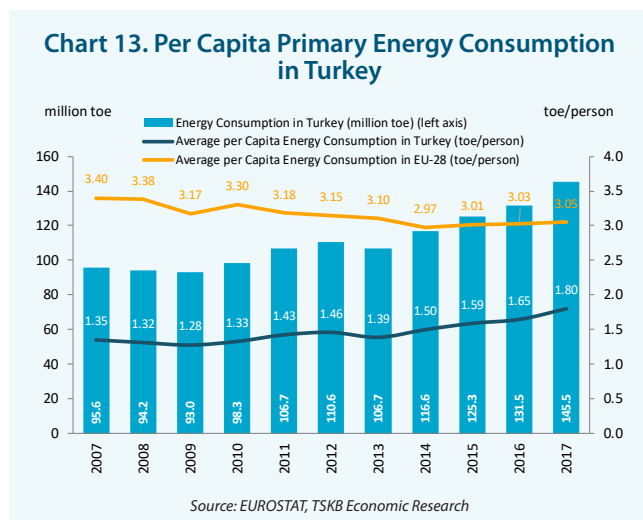


In transport, the indicators used include energy consumption per tonne kilometer (freight transport), energy consumption per person kilometer (passenger transport) and energy consumption per vehicle (miles/gallon or lt/100 km).

Although each benchmarking method has its own technical issues, the scales addressed by each indicator vary. For instance, energy intensity is the most efficient indicator in benchmarking among countries owing to its macro aspect. However, specific energy consumption provides more significant results when benchmarking within sectors. Furthermore, CUSUM and regression analysis are the most convenient methods for internal benchmarking at a company level.

5.2.1. Per Capita Energy Consumption

Considering the importance and priority of energy in daily life, per capita energy consumption may, to a certain extent, be regarded as an indicator of the level of development and welfare of a country. High per capita energy consumption is usually indicative of a high level of welfare in the relevant country.



However, while comparing per capita energy consumption between countries, certain parameters of the respective countries such as its demographic structure, geographical location and climate should be taken into account.

For instance, per capita energy consumption may rise in a country as its population decreases. This is a misleading situation called the base load effect. On the other hand, factors driving higher energy consumption can include heating in cold regions, cooling in hot regions and the need for long-distance transportation and logistics in countries with a large land mass. Each of these parameters have an impact on per capita energy consumption.

Despite an increasing population, Turkey's per capita primary energy consumption has also increased over the years. However, Turkey's per capita energy consumption (1.80 toe) is still lower than in many developed countries; in 2017, per capita energy consumption in major European economies stood at 3.78 toe in the Netherlands, 3.61 toe in Germany, 3.59 toe in France, 2.82 toe in the United Kingdom, 2.52 toe in Spain and 2.46 toe in Italy, while the average per capita energy consumption in the EU-28 stood at 3.05 toe, while in Japan, another leading economy in the world, the figure was 3.42 toe.⁵

5.2.2. Energy Intensity

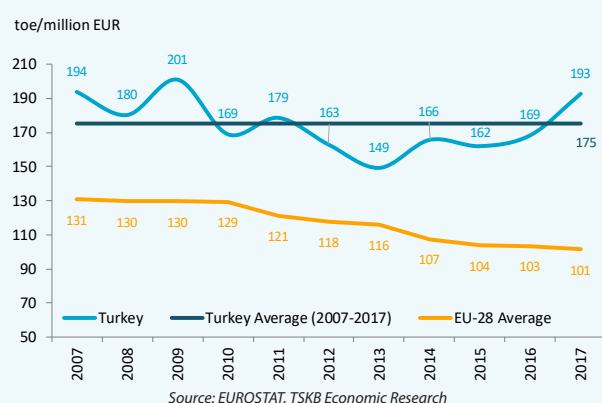
Energy intensity is the measure of the amount of energy consumed to create one unit of economic output and is used as another indicator of energy efficiency in benchmarking among countries. As changes in this indicator may result from the depth of changes or mobility in a given country's industrial composition, it may not always be appropriate to consider this indicator exclusively.

The ideal scenario in calculating energy intensity occurs when GDP rises but energy consumption remains low. In other words, a country with a low energy intensity ratio (TOE/GDP) would be positively singled out in an assessment of energy efficiency. From a global point of view, Turkey is outperformed by industrialized countries such as Japan, the United Kingdom, Germany, France, Italy and the Netherlands in terms of energy intensity. The energy intensity in EU countries has positively decreased by years while Turkey's energy intensity has followed a more volatile pattern. Although the countries joining the European Union between 2007 and 2017 with a relatively poor

⁵World Bank Statistics (2015).

energy performance had a negative impact on the average energy intensity in the EU-28, the energy intensity of the bloc as a whole has decreased on average. Two main reasons are put forward to explain why Turkey has failed to achieve similarly significant progress over the same period. The first of these is the slowdown in GDP growth, specifically in recent years, and the volatility in the indicative exchange rate, while the second is the failure to launch Turkey's energy efficiency policies to the desired level.

Chart 14. Energy Intensity in Turkey



5.2.3. Sectoral Energy Intensity

An analysis of Turkey's energy intensity from a sectoral perspective finds that the energy intensity in the manufacturing industry is considerably higher than it is in the transport, services and agricultural sectors. Turkey's annual average energy savings between 2001 and 2016 stood at 2.6 mtoe. Energy savings have maintained an upward trend over the years. Turkey had achieved an improvement to 42.5 mtoe as of the end of 2016, with the transportation sector leading this improvement by 24.9 mtoe.

The transportation sector was followed by manufacturing industry, with 9.8 mtoe of savings, and the housing sector, with 7.7 mtoe of savings. The improvements in energy efficiency is partly a result of government policies, while the rest of the savings have occurred naturally in the process. It would be reasonable to assume that the improvements in manufacturing industry have mostly arisen from process and equipment renewals. Almost all modern and state-of-the-art production technologies, including

electric motors and other equipment, have brought with them much higher levels of efficiency. In buildings, renovations and retrofits offer a definite impact on improvements. New electrical devices consuming less energy have also played a more important role in energy efficiency. To this end, there is still more to be addressed to tap the potential savings.

The improvement in the transportation sector is basically attributable to the changes in vehicle fleets. The government introduced an incentive program supporting the gradual elimination of old fuel-hungry vehicles. Although the rate of switching to more fuel-efficient vehicles still remains somewhat limited in Turkey, the current situation is far better than that in 2000. Rail transport has specifically enjoyed a remarkable improvement. The growth of energy efficiency in transport will continue in the near future.

5.3. 2017-2023 National Energy Efficiency Action Plan

Drafted under the coordination efforts of the Ministry of Energy and Natural Resources, the National Energy Efficiency Action Plan (2017-2023) entered force upon promulgation in the Official Gazette dated January 2, 2018.

The NEEAP will be implemented between 2017 and 2023 and comprises 55 actions under a total of 6 categories; namely buildings and services, energy, transport, industry and technology, agriculture and horizontal matters. The Plan aims to implement these actions to reduce Turkey's primary energy consumption by 14% by 2023 in the base case scenario. The Plan aims to achieve cumulative savings of 23.9 mtoe by 2023 through an USD 10.9 billion of investments. The Plan is expected to yield total financial savings of USD 8.4 billion expected between 2017 and 2023.

The summary report on the 2017-2018 Progress of the National Energy Efficiency Action Plan, which was published by the EEED in May 2019, indicates that a total of USD 1.35 billion was invested in energy efficiency in Turkey in 2017 and 2018, yielding 900,000 toe of energy savings. The report also points out that the activities under 18 of the specified actions could not be completed in 2017 or 2018, contrary to the Action Plan.

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