



## Sector Overview

# Energy

January 2019



Industrial Development Bank of Turkey  
[www.tskb.com](http://www.tskb.com)

P: +90 212 334 50 50 F: +90 212 334 52 34

E: [info@tskb.com.tr](mailto:info@tskb.com.tr)    

## Prepared By

Aslı Hacımale | hacimalea@tskb.com.tr  
Can Hakyemez | hakyemez@tskb.com.tr  
Can Uz | uzc@tskb.com.tr  
Emel Gülap Tütüncü | gulape@tskb.com.tr  
Engin Saitoğlu | saitoglu@tskb.com.tr  
Dr. Kubilay Kavak | kavakk@escarus.com

This document was produced by Türkiye Sınai Kalkınma Bankası A.Ş. ("Industrial Development Bank of Turkey") ("TSKB") solely for information purposes and for the use of registered broker or dealer, whether the registered broker or dealer is acting as principal for its own account or as agent for others, or a bank acting in a broker or dealer capacity as permitted by U.S.A. law. This document shall not be reproduced under any circumstances and is not to be copied or made available to any person other than the recipient. It is produced and distributed in the Republic of Turkey. This document does not constitute an offer of, or an invitation by or on behalf of TSKB or any other company to any person, to buy or sell any security. The information contained herein has been obtained from published information and other sources which TSKB considers to be reliable. No liability or responsibility whatsoever is accepted by TSKB for the accuracy or completeness of any such information. All estimates, expressions of opinion and other subjective judgments contained herein are made as of the date of this document. TSKB may, from time to time, have a long or short position in any of the securities mentioned herein and may buy or sell those securities or options thereon either on their own account or on behalf of their clients. TSKB may, to the extent permitted by law, act upon or use the above material or the conclusions stated above or the research or analysis on which they are based before the material is published to recipients and from time to time provide investment banking, investment management or other services for or solicit to seek to obtain investment banking, or other securities business from, any entity referred to in this document.

Any customer wishing to effect transactions in any securities referred to herein or options thereon should do so only by contacting a representative of TSKB.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior consent of Türkiye Sınai Kalkınma Bankası A.Ş.

This document does not constitute an offer to sell, or an invitation to subscribe for or purchase, any of the offer shares in any jurisdiction to any person to whom it is unlawful to make such an offer or solicitation in such jurisdiction. The distribution of this document in certain jurisdictions may be restricted by law. Persons into whose possession this document comes are required by TSKB and the managers to inform themselves about and to observe any such restrictions. No person has been authorized to give any information or to make any representation except as contained in this publication.

In making an investment decision investors must rely on their own examination of the Company and the terms of the offering including the merits and risk involved.



# Contents

II	<b>Contents</b>	
III	<b>List of charts</b>	
III	<b>List of figures</b>	
III	<b>List of tables</b>	
IV	<b>ABBREVIATIONS</b>	
V	<b>EXECUTIVE SUMMARY</b>	
7	<b>INTRODUCTION</b>	
8	<b>MACROECONOMIC DEVELOPMENTS</b>	
11	<b>OVERVIEW</b>	
16	<b>ELECTRICITY SECTOR OUTLOOK</b>	
	1. Global Outlook for Electric Power	
18	2. Electricity Sector in Turkey	
	a. Structure of and Players in the Electricity Sector	
20	b. Wholesale Electricity Market	
	i. Bilateral Agreements	
	ii. Over-the-Counter Markets (OTC) and Futures and Options Market (VIOP)	
	iii. Eligible Consumers	
21	c. Analysis of the Demand for Electricity	
22	d. Electricity Generation Analysis	
	i. Installed Capacity	
	ii. Generation	
	iii. Unlicensed Generation	
	iv. Incentives for Thermal Power Plants	
	v. Renewable Energy Resources Support Mechanism (YEKDEM)	
	vi. Renewable Energy Resource Areas (YEKA)	
25	e. Electricity Price Analysis	
28	<b>NATURAL GAS SECTOR OUTLOOK</b>	
	1. Global Outlook for Natural Gas	
	a. Global Natural Gas Reserves	
30	b. Global Natural Gas Production	
	c. Global Natural Gas Consumption	
	d. Global Natural Gas Prices	
32	2. Natural Gas Sector Outlook in Turkey	
	a. Natural Gas Reserves and Production in Turkey	
	b. Natural Gas Consumption in Turkey	
33	c. Natural Gas Trade in Turkey	
34	d. Natural Gas Pipeline System in Turkey	
	e. Natural Gas Prices in Turkey	
36	<b>OIL SECTOR OUTLOOK</b>	
	1. Global Oil Reserves, Production, Trade and Consumption	
39	2. Oil Sector in Turkey	
	a. Oil Reserves, Oil Production, Refineries and Refinery Products in Turkey	
40	b. Oil Consumption in Turkey	
41	c. Trading of Oil and Petroleum Products in Turkey	
42	3. Development of Oil Prices	
	a. Development of Global Oil Prices	
	b. Price of Petroleum Products in Turkey	
44	<b>COAL OUTLOOK</b>	
	1. Global Coal Reserves, Production, Trade and Consumption	
46	2. Coal in Turkey	
48	<b>RENEWABLE ENERGY OUTLOOK</b>	
49	1. Development of Renewable Energy in Turkey	
50	a. Renewable Energy Resources Support Mechanism (YEKDEM)	
51	b. Renewable Energy Resource Areas (YEKA)	
52	c. Development of Unlicensed Power Plants	
53	2. Main Issues at Renewable Energy Plants	
56	<b>EXPECTATIONS AND TRENDS</b>	



# List of charts, figures, tables

## List of charts

- 8 Chart 1: Quarterly Growth, Annual
- 9 Chart 2. Sectoral Growth and Expectations, Annual
- 9 Chart 3. Energy Production, 12-Month Average, Annual Change
- 10 Chart 4. Inflation, Annual
- 10 Chart 5. Foreign Trade, 12-Month Cumulative
- 17 Chart 6. Total Global Electricity Generation
- 19 Chart 7. Private Sector Share in Electricity Generation
- 20 Chart 8. Monthly Development of Bilateral Agreements
- 20 Chart 9. Number of Meters by Eligible Consumers
- 21 Chart 10. Development of Electricity Demand in Turkey
- 22 Chart 11. Development of Turkey's Total Installed Capacity
- 23 Chart 12. Development of Turkey's Total Gross Electricity Generation
- 24 Chart 13. Installed Capacity (MW) of Power Plants Benefiting the Capacity Mechanism
- 25 Chart 14. MCP & SMP Growth
- 25 Chart 15. Development of MCP & Brent Crude Price & Henry Hub Natural Gas Unit Price
- 28 Chart 16. Proven Natural Gas Reserves and Shares of Top 10 Countries
- 30 Chart 17. Production Quantities by Countries with Highest Gas Production
- 30 Chart 18. Consumption Quantities by Countries with Highest Gas Consumption
- 31 Chart 19. Growth of Global Natural Gas Prices
- 32 Chart 20. Natural Gas Consumption in Turkey
- 34 Chart 21. Natural Gas Tariff and Henry Hub Spot Price for OIZs
- 36 Chart 22. Global Oil Reserves in 2017
- 38 Chart 23. Proven Oil Reserves and Estimated Remaining Production Life Cycles
- 38 Chart 24. Global Oil Production
- 39 Chart 25. Development of Turkey's Crude Oil Production and Imports
- 41 Chart 26. Development of Crude Oil Imports
- 41 Chart 27. Development of Brent and WTI Crude Oil Prices
- 45 Chart 28. Development of Global Coal Production and Consumption
- 50 Chart 29. Turkey's Renewable Energy Installed Capacity
- 51 Chart 30. Turkey's Renewable Energy Generation Indicators

## List of figures

- 18 Figure 1. Structure of the Electricity Market
- 33 Figure 2. Natural Gas Pipeline System in Turkey

## List of tables

- 19 Table 1. Distribution Areas and Investors
- 39 Table 2. Oil Refineries in Turkey and Features
- 39 Table 3. Production Growth at Tüpraş Oil Refineries
- 51 Table 4. Final List of YEK (Licensed Power Plants)
- 53 Table 5. Main Issues at Renewable Energy Plants



# Abbreviations

bcm: Billion Cubic Meters	SPP: Solar Power Plant
BIST: İstanbul Exchange	TEAŞ: Turkish Electricity Generation and Transmission Company
BO: Build-Operate	TEDAŞ: Turkish Electricity Distribution Company
BOT: Build-Operate-Transfer	TEİAŞ: Turkish Electricity Transmission Company
BOTAŞ: Petroleum Pipeline Corporation	TEK: Turkish Electricity Authority
BP: British Petroleum	TETAŞ: Turkish Electricity Trade and Contracting Company
BPP: Biomass Power Plant	TOOR: Transfer of Operating Rights
BTU: British Thermal Unit	TPAO: Turkish Petroleum Company
CAGR: Compound Annual Growth Rate	TRT: Turkish Radio and Television Corporation
CBRT: Central Bank of the Republic of Turkey	TurkStat: Turkish Statistical Institute
CIS: Commonwealth of Independent States	TWh: Terawatt-hour
CPI: Consumer Price Index	VAT: Value Added Tax
CTP: Continuous Trading Platform	VIOP: Futures and Options Market
ECT: Electricity Consumption Tax	WPP: Wind Power Plant
EIA: The U.S. Energy Information Administration	WTI: West Texas Intermediate
EML: Electricity Market Law	YEK: Renewable Energy Resource
EMRA: Energy Market Regulatory Authority	YEKA: Renewable Energy Resource Area
ENTSO-E: European Network of Transmission System Operators	YEKDEM: Renewable Energy Resources Support Mechanism
EXIST: Turkish Energy Exchange	YoY: Year-on-Year
EÜAŞ: Electricity Generation Company	
FSRU: Floating Storage and Regasification Unit	
GDP: Gross Domestic Product	
GPP: Geothermal Power Plant	
GTP: Gas Trading Platform	
GW: Gigawatt	
GWh: Gigawatt-hour	
HEPP: Hydroelectric Power Plant	
IEA: International Energy Agency	
İGDAŞ: İstanbul Gas Distribution Industry and Trade Inc.	
kW: Kilowatt	
kWh: Kilowatt-hour	
LNG: Liquefied Natural Gas	
mcm: Million Cubic Meters	
MCP: Market Clearing Price	
MENR: Ministry of Energy and Natural Resources	
MFSC: Market Financial Settlement Center	
mtoe: Million Tons of Oil Equivalent	
MW: Megawatt	
MWh: Megawatt-hour	
NGCC: Natural Gas Combined Cycle	
OPEC: Organisation of Petroleum Exporting Countries	
OTC: Over-the-Counter Market	
OIZ: Organized Industrial Zone	
PPA: Presidency of the Privatization Administration	
PMI: Purchasing Managers' Index	
SCT: Special Consumption Tax	
SDG: Sustainable Development Goals	
SMP: System Marginal Price	



## Executive Summary

The supply, trade and safe transmission of energy, as well as its offering to end users, have always been primary issues of a global proportion over the last couple of centuries. In recent years, the energy sector has played a key role not only in setting international policies and regional trends but also with respect to making and implementing economic decisions with global implications.

Directly impacting on all business lines and sectors including agriculture, transport, industry and services and inherently exhibiting a multi-layer and multidimensional structure, the energy sector has been closely monitored, reviewed and discussed in our country and the world alike.

Although industrial processes around the world close in on a new and more digital phase globally, the key role of energy in industrial production is not expected to undergo any fundamental change, in contrast with other inputs. The upward trend in trade has been driving exponential growth in regional and national transport and logistics operations, triggering the increase in energy demand. Another factor contributing to the increased demand for energy is the global rise in the average level of comfort in terms of multiple welfare indicators, as well as the extended access to basic services. As demand for energy increases, the capacity of suppliers to respond to such demand has also diversified and grown. State-of-the-art technology, unthinkable only a couple of decades ago, has already carved out a place in the energy market. The upshot of this is that value chains in the energy sector have grown more sophisticated, with interactions deepening on the back of an increased number of market players.

The Turkish energy market has also grown in mutual interaction and relation with these factors. As energy is one of the most traded commodities/services in the world, Turkey's energy pathway both extends in parallel with overall global trends while also being influenced by global and regional developments.

With its limited local capacity for oil and natural gas production, despite constantly growing demand, energy players in Turkey have gone to great efforts to offset this disadvantage through the roles Turkey has assumed and plans to assume in the regional trade equation. Turkey is located on the transition route for major pipelines and has taken key steps to emerge as a regional trading hub. On the other hand, changes in oil and gas prices, which are largely set in line with global developments, have a profound and deep impact on the Turkish energy markets.

The electricity sector has undergone a major shift following the steps towards liberalization, taken from the beginning of the 2000s, coping with some essential issues and gaining considerable depth in the process. Even so, it still needs to improve in certain areas in order to ensure the better functioning of the market. In particular, the individual goals of "building a fully-competitive market" and "supporting local and renewable resources" may not always bring complementary outcomes. This renders the consideration of multiple factors in policy design a must. When current conditions are considered, the leading factor, amongst the others, is economic.

A consideration of the economic developments in the second half of 2018 indicates that costs and prices will be two major items to come under the spotlight in 2019. The setting of prices in a manner that fulfills costs will be crucial in the healthy functioning of the energy markets and a trend of continued investment by energy market players. However, any rise in energy prices has a significant impact on consumer inflation, requiring a close monitoring of the impacts of potential increases against a conjuncture marked by the growing importance of anti-inflationary measures. The same applies to the taxation on fuel, notably oil. Furthermore, the quest for appropriate funding in new and ongoing energy investments will be another key issue in 2019 due to the movements in the exchange rate, with the depreciation of the local currency and higher interest costs.



# Introduction

This report is issued as one of TSKB's periodic Sectoral Outlook publications, and aims to assess the dynamics, developments and expectations in the energy sector, which supports a whole gamut of high added value sectors while bringing a close and direct impact on operations in those sectors.

The report analyzes the global energy dynamics and the components of the Turkish energy sector on the basis of the selected main items. Following the first chapters, which address the macroeconomic developments in Turkey as well as providing an overview of the Turkish energy sector, the report respectively delves into the sub-sectors of electricity, natural gas, oil, coal and renewable energy. The final part of the report offers a summary of conclusions in light of the results of the analysis and findings, in addition to a summary of the short-term expectations.



# Macroeconomic Developments

Gross domestic product (GDP) grew by 5.2% year-on-year in the second quarter of 2018. Rising beyond expectations in the first quarter of the year, GDP growth decreased to 6.2% by the end of first half. The period was marked by a slowdown in economic operations in order to focus on key trends and attain a balance in composition. Production-wise, the first quarter of 2018 saw a 1.5% decrease in the total added value in agriculture sector while the industrial and construction sectors grew by 4.3% and 0.8% respectively. The added value in the services sector, comprising trade, transport, accommodation and catering service operations, rose by 8% (a broad definition of the services sector indicates 7% growth).

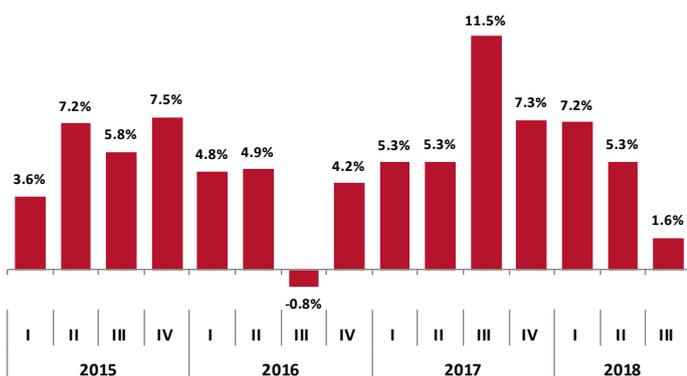
As far as demand is concerned, the growth in the second quarter was driven by special consumption expenditures once again. Final household consumption expenditures by resident households increased by 6.3% YoY in the second quarter of 2018 while general government final consumption expenditures and gross fixed capital formation expanded by 7.2% and 3.9%, respectively. The contribution from investments in growth remained limited at 1.2 percentage points, almost all of which can be attributed to construction investments. Goods and services exports increased by 4.5% YoY in the same period, with imports rising by 0.3%. Despite recording a fast rise in the first quarter, stocks suffered a steep fall in the second quarter, and the rapid decline in stocks negated about one third of the growth.

Leading indicators for the second half of the year indicate slackening economic activity and a rebalancing among growth components. The Purchasing Managers' Index (PMI) for the manufacturing industry declined to 44.3 in October, marking the seventh month of pessimism in the sector, signaling recession in the industry when it dropped to an average 47.4 in the second quarter of 2018, before further going down to 46.0 in the third quarter. On the other hand, exports benefited from the positive sentiment brought about by the stable global growth, a sustained increase in foreign demand and flexibility in market diversification in foreign markets. A breakdown of the PMI manufacturing index reveals that foreign orders received limited the decline in the headline figure.

In terms of domestic demand, the impact of deteriorating imports and weakening demand for loans is expected to be more noticeable in the second half. Inflation spreads through the item basket aggressively and comprehensively, and coupled with increasing interest rates and the weaker Lira, this is expected to suppress personal expenditures, chiefly for durable and semi-durable consumer goods. The long-term trend in the consumer confidence index continues to decline. A strong base effect in the third quarter will impose downside pressure on the potential value of GDP growth. On a more positive note, projections show that exports will remain strong thanks to competitive exchange rates, and the contribution of the tourism sector, which recorded progress far in excess of expectations in the third quarter, as well as net exports, will clearly be significant in the second half of the year. However, it is still probable that growth in 2018 will dip to 3.2%, following a noticeable deceleration in growth in the second half. GDP growth is expected to stand at around 2.0% in 2019, in line with projections set out in the recently-announced New Economic Program.

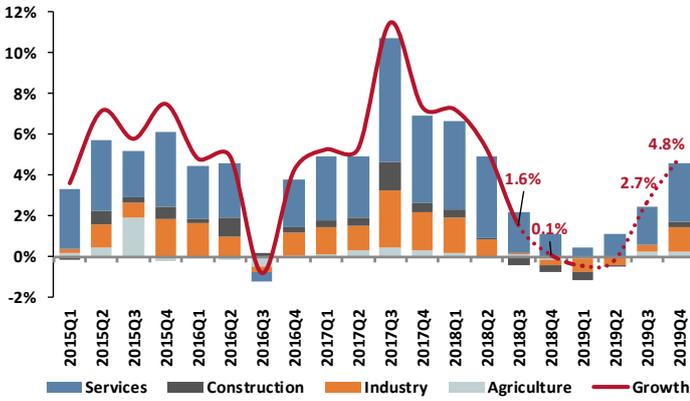
Industrial production slowed in June and rounded off the second quarter with an increase of 5.2% YoY. In July and August, the headline index rose

Chart 1: Quarterly Growth, Annual



Source: TurkStat, TSKB Economic Research

**Chart 2. Sectoral Growth and Expectations, Annual**



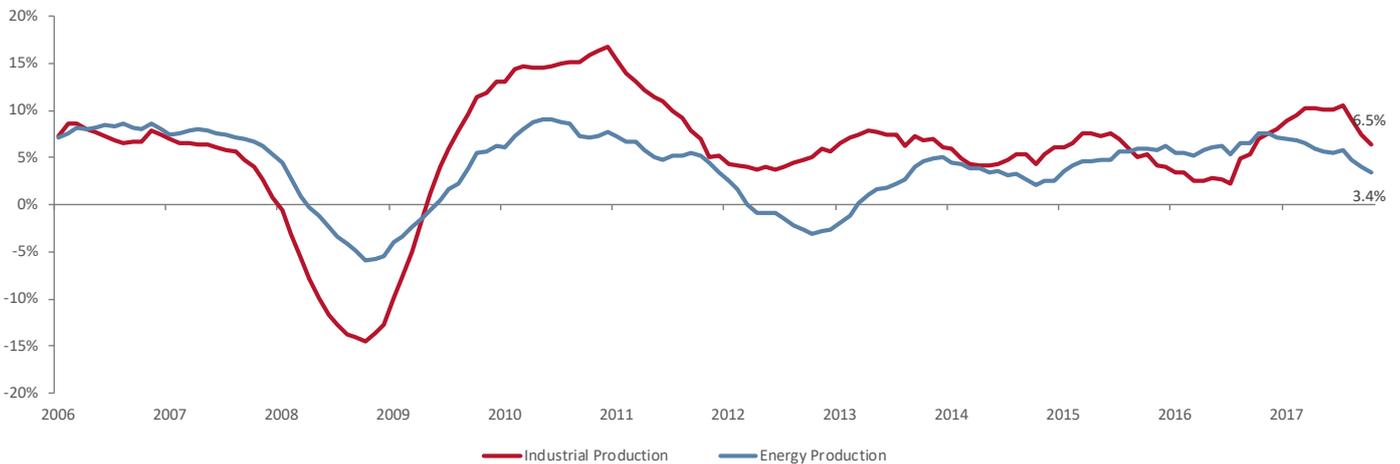
Source: TurkStat, TSKB Economic Research

by 5.9% and 1.6% respectively, YoY, and exceeded expectations in the third quarter despite the volatility in exchange rates and interest rates, as well as the recession trend in leading indicators. In September, the annualized main trend for industrial production stood at -2.7%, thus following a negative trend. September's figure could be taken as an indicator of a recession in production, chiefly in durable consumer goods, due to a high base effect (end of 2017 tax incentives), the stagnation in commercial loans and the slowdown in leading industrial indicators. Although the energy production index (adjusted for calendar effects) increased by 4.2% in July and by 4.6% in August, it fell steeply on a year-on-year basis. In September, energy generation edged down by 0.7% in line with

the slowdown in the industrial production index. In the last quarter, a slowdown in energy production is expected on the back of the slowdown in industrial production.

Annual inflation stood at 25.2% in October. The annual rate of change in the core (C) index stood at 23.3%, close to the core index. The steep rise in prices of basic goods under the strong impact of the ongoing increase in food prices and of exchange rate pass-through disrupted the pricing behavior in general. In addition, energy prices rose by more than 15% in the wake of price increases in the last three months, lifting the annual rate of energy inflation to 29.4%. This increase was mainly due to the surge in electricity (45%) and natural gas (26%) prices as well as in fuel prices (44%), which increased as a result of the special consumption tax (SCT) regulations. The dramatic shift in exchange rates and the high level of volatility have increased cost-push pressures, thus raising the tendency of economic entities to increase prices. In the same period, domestic producer price index increased by 0.9% month-on-month and by 45% year-on-year. The fall in the value of the Turkish Lira was the main reason behind the surge observed across the board in the sub-groups of producer prices. For instance, the annual rate of inflation in the manufacturing industry reached 42.6% in this period. In addition, energy costs increased by a monthly rate of 5.4% in

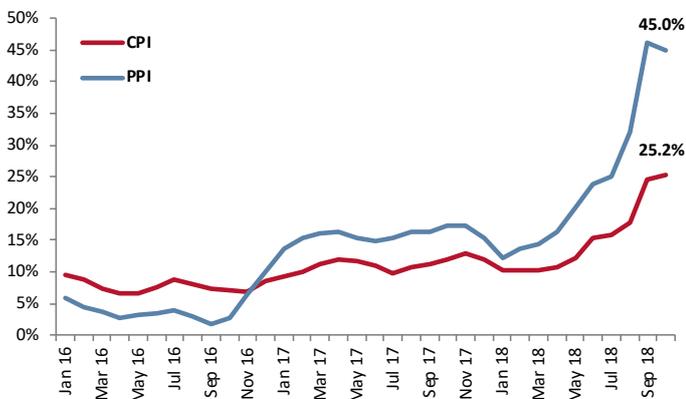
**Chart 3. Energy Production, 12-Month Average, Annual Change**



Source: TurkStat, TSKB Economic Research

October, marking an eye-watering annual increase of 81.6%. The rate of consumer price inflation is expected to exceed 25% by the end of 2018 with the inflation rate set to fall to 19% by the end of 2019.

Chart 4. Inflation, Annual



Source: TurkStat, TSKB Economic Research

Despite the current geopolitical risks, tightening global financial conditions and a backdrop of discourse on trade wars, global growth was remarkably stable throughout 2018, with the year-end outlook remaining positive. The main factors which could risk global growth include increasing commodity and energy prices, protectionist rhetoric surrounding foreign trade and a pace of shrinkage in the (still ample) global liquidity that exceeded general market expectations. Currently, consumer and core inflation rates continue to remain at moderate levels globally. However, in parallel with the fall in unemployment in developed countries, a possible acceleration in wages is a major risk factor that could lead to inflationary pressures in those countries, which could trigger a faster tightening in monetary policies. Bond yields have recently been climbing rapidly in the US, with the increase in risk-free interest rates weakening global risk appetite. In brief, geopolitical uncertainties, sagging capital inflows into developing countries and the protectionist rhetoric on foreign trade have all been affecting the outlook in developing countries lately.

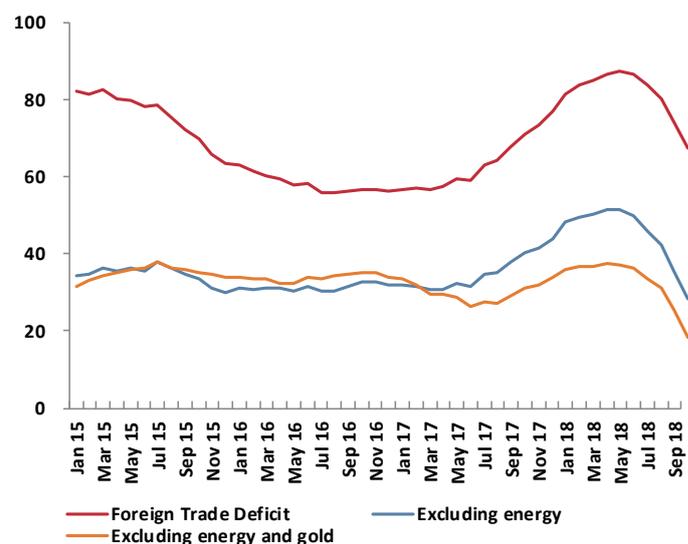
The positive outlook for exports was a key factor driving growth performances in the first half of 2018. Exports grew by 7% YoY between January and September on the back of stronger than expected growth in global economies and specifically the recovery in EU economies, while the growth in imports fell to 3.1%. Turkey's annualized

total exports and imports rose to USD 163.4 billion and USD 240.7 billion, respectively. Sustained growth and development has gradually increased dependence on energy imports in Turkey; the main item for energy (mineral fuels) was responsible for a USD 42.5 billion portion of total imports. Following the increase in oil prices, the share of energy in imports stood at about 18%.

Imports weakened in the wake of the weakening in economic activity, a phenomenon expected to continue in the coming months. Therefore, the contracting trend in the foreign trade deficit and the increase in tourism receipts are expected to offer a positive contribution in reducing the current account deficit. TSKB projects a current account deficit of USD 40.6 billion for 2018 and USD 34 billion for 2019.

In conclusion, it is observed that the Turkish economy maintains its moderate growth, but has enjoyed a strong export performance since 2017, when both growth and foreign trade data were positive. The Turkish economy is going through a period of striking a balance, with the main risk factors for 2019 being inflation, exchange rate volatility and global commodity prices.

Chart 5. Foreign Trade, 12-Month Cumulative



Source: TurkStat, TSKB Economic Research



## Overview

Since the time oil became a common source of energy about a century ago, energy has become a key matter of economics, politics and international relations not only in industrialized countries but also in those developing countries which hold natural reserves. Today, the global energy equation is a dominant issue for any country; on one hand, new energy resources and recently-discovered energy reserves affect multiple regions in the world, while on the other the entire world has grown more dependent on energy with energy having evolved into an indispensable part of modern life.

It is clear that the capacity, the approach to production and the use of energy have a direct impact on the development of civilization. In the last three decades, 1.3 billion people have started to use electricity and hundreds of millions of people have gained access to modern energy resources for heating and cooking purposes. As industrial processes have grown more complex throughout the world, transport and logistics operations have expanded exponentially in line with increasing global trade. Efforts to reduce poverty have resulted in an increased level of comfort worldwide while per capita energy consumption has surged in parallel with the widespread use of utilities, services and products such as clean potable water, sewerage, basic healthcare services, modern agricultural machinery and electric household appliances, which are the fundamental requirements for a basic standard of welfare.

Prospective trends, which have radically changed lifestyles in the last 30 years, continue to have an impact, bringing along an essential quest in the global energy system. The rapid increase in the world's population and the global rise of the middle class has precipitated a rise in the demand for consumer goods as well as the need for energy. Despite some striking developments in energy efficiency in certain countries, global energy demand has exhibited a stable growth pattern.

Rapid urbanization, another dynamic that deserves attention, requires new solutions both

technologically and financially in order to offer high-quality energy services. Statistics published by the United Nations indicate that the world population has expanded by 43% in the space of just 28 years to reach 7.6 billion in 2018, up from the 5.3 billion in 1990. More than half of the world's population (about 55%) currently reside in cities, and the urban population is expected to continue to increase in the upcoming years. The components of sustainable urbanization, which are discussed more generally in line with these projections, are rather related to a sustainable energy supply.

Advancements in material technology, the search for horizontal and vertical integration of the value chain and the pace of digitalization in all sectors on the back of the rise of technology all impact the cost of different forms of energy, their market position and system integration processes while changing the dominant trends in the energy market as well. In recent years, clean energy technologies have become increasingly competitive and carved a niche for themselves in energy supply through accelerated efforts.

The dissemination of clean energy technologies - and renewable resources in this context - reinforces political efforts for the realization of global sustainable development goals and while phasing out the use of environmentally damaging fossil fuels. Developments in clean energy and the reduced costs have spurred a tendency towards small-scale modular production equipment. In addition, efforts towards cleaner production, transmission and use of conventional resources such as oil and coal have also been stepped up in order to provide a reliable and timely response to the rapidly increasing energy demand.

Distributed systems, micro-scale electric power plants and the combined heat and power systems that increase total energy yield have become more widespread and brought with them a need for smart grids, a need that will become more pronounced as electric vehicles gain popularity, even if they have not yet fully emerged as a game changer

in the vehicle market. An increase in the number of electric vehicles may set the stage for radical changes in energy systems and markets and thus slow the rate of growth in demand for oil.

Energy efficiency is a key item on the energy policy agenda, especially in developed countries. According to data released from the International Energy Agency (IEA), 13% of the total of USD 1.8 trillion in energy investments were focused on energy efficiency (about USD 235 billion), marking a 3% YoY increase. As well as the higher costs they bring, tools, equipment, processes and practices which do not meet energy efficiency criteria may even be subject to additional taxes.

These all make it a priority to offer more competitive, efficient and consumer-focused services in all stages of the value chain, from generation to the delivery of electric power.

In the global natural gas trade, the share of liquefied natural gas (LNG) is expected to rise. While the growth in demand in the global natural gas market has stalled in recent years, trade in LNG trade has increased continuously, a trend that is expected to contribute to the establishment of more competitive natural gas markets. This process is expected to be marked by fundamental changes in the conventional natural gas trade contracts, primarily on the provisions introducing destination restrictions. Similarly, investments in storage are likely to remain a priority.

The global energy system is deeply influenced by a combination of factors including but not limited to the remarkable surge in shale gas and shale oil production during the last decade, the leap in LNG trade, the recently-commissioned pipeline projects as well as those under construction, the reinforced electric interconnections, the exponential rise in technological advancements, the overall growth in the global economy despite the short-term fluctuations, and the associated increase in energy demand.

The vulnerability of fault lines on ancient energy routes, the mining and energy initiatives being taken by Asian countries – which will soon be the largest energy consumers – in various parts of the world, chiefly in Africa, and the frequently-renewed and differentiated energy trade agreements all

serve as signs of a geographical shift. Energy has moved beyond being a commodity that is merely traded and evolved into a key element of geopolitical attitudes. Major global players view and treat energy not as a "sub-heading" in their foreign policy approaches, but rather as a direct "policy axis".

Turkey has electricity interconnections with all of its neighbors with an ever-deepening electricity market supported by strong and detailed energy legislation, diversified resources, and an increasing number of private sector players, along with a growing gas trade through new pipelines, LNG units and storage facilities and an increasing refining capacity through new investments. Turkey's energy market has developed in interaction with the changes in the global energy system.



Exposed to geopolitical vulnerabilities mentioned above due to its sensitive location, Turkey not only focuses on the functioning of the domestic markets on free and competitive terms but also sets new attitudes in accordance with the changing regional conditions. Major issues in Turkey's geographical vicinity with direct implications on internal energy markets include the civil war in Syria, developments in the north of Iraq, the U.S. embargo on Iran over nuclear disputes, new alliances forged within the context of oil and gas exploration in the Eastern Mediterranean, tensions between Saudi Arabia and Qatar - both major players in the global oil and gas markets - and Russia's planned projects for gas exports to Europe.

Turkey's energy market is influenced by all of these political factors either directly or indirectly but has been able to maintain a dynamic structure throughout the last decade. The liberalization in the sector is becoming deeper, as indicated by developments such as the fall in the public sector's share in electricity generation to below 20%, the eligible consumer limit in electricity market

being reduced to 2,000 kWh/year, thus raising the theoretical openness in the retail market to over 95%, the growing maturity of the day-ahead and intra-day markets, the smooth functioning of the balancing power market, and the establishment of the Turkish Energy Exchange (EXIST) in a manner which contributes to the setting of reference prices.

Positive developments with respect to renewable energy include the Renewable Energy Resources Support Mechanism (YEKDEM), which was launched to ensure stable income generation in renewable energy power plants; the achieved capacity under unlicensed production; the rapid increase in the number of small-scale production plants; and the tenders for Renewable Energy Resource Area (YEKA), which aim to benefit from economies of scale and promote the production of local equipment.

Other major developments in the electricity sector include the regulation drafted to promote electricity generation using domestic resources and support power plants working with domestic coal; the feed-



in tariff and capacity mechanism aimed at ensuring supply and system security; and the infrastructure work for the construction of nuclear power plants posing minimized risks.

Key subjects regarding the natural gas market include the Organized Natural Gas Wholesale Market, which has been launched to boost competitiveness; the pricing system tailored for consumer groups and the related removal of subsidies for power plants; capacity increases in natural gas storage facilities; floating storage and regasification unit (FSRU) investments; the 33% increase in the number of eligible consumer numbers in the last 5 years following the decline in limits; and the distribution investments aimed to making natural gas available throughout the country.

Turkey is still dependent on oil and natural gas imports. Oil and gas constitute a greater portion of Turkey's energy imports, which increase the need for foreign savings and causing an economic vulnerability. Turkey's energy imports comprise a significant proportion of the country's total imports (between 14% and 25%). The monetary value of

energy imports has fluctuated at a level very close to the current account deficit in the last 15 years. It is clear that Turkey's current account balance would improve radically if the country did not rely on imports for its energy. Therefore, oil and natural gas exploration operations are critically important for Turkey. In recent years, there has been an accelerated effort for oil and gas exploration while there have been increased efforts to increase total refining capacity, and investments completed to that end. This increased refining capacity not only strengthens domestic competition but is also capable of strengthening Turkey's position in regional energy trade.

Turkey's fuel market continues to grow despite high non-market cost elements. Fuel consumption is projected to maintain its growth in line with the expansion in the vehicle park and mobility around the country, despite the decrease in unit passenger-km and tonne-km values based on changes in vehicle fleets.

Although the energy efficiency programs supported with strong financial instruments in developed countries have not been replicated in Turkey to



the desired extent, it is evident that Turkey has achieved a degree of progress to that end within the framework of the sectoral energy intensity index. Key milestones for this progress include the energy efficiency loans extended by banks since 2009, national campaigns and projects run, programs targeting the industrial sector and the new building standards. Issued at the beginning of 2018, the National Energy Efficiency Action Plan offers a robust and promising framework on this field. However, no meaningful progress has been achieved when it comes to implementing the action plan.

There has always been a strong historical association between Turkey's GDP growth and its demand for energy and electricity. Although the relationship between the growth of electricity demand and GDP growth has weakened recently, there is still a positive correlation. It is estimated that the rate of growth of electricity demand in Turkey slowed in 2018 when compared to past years, in line with

the economic developments. Similarly, demand is projected to grow 2019, depending on the level of economic recovery. It is probable that growth in energy demand will pick up in the medium and long run, but perform within a specific range depending upon saturation and improvements in energy efficiency, as has been seen in developed countries, and will not be as high as it was in the past.

It is possible to adopt different perspectives and different indicators to closely analyze the energy sector, which is inherently multi-layered and multi-dimensional and is specifically relevant to domestic and foreign political and economic developments, and which directly impacts multiple sectors. This report presents an overview of developments regarding various aspects of energy and addresses the technical and legislative aspects of the Turkish energy sector as well as offering assessments on the functioning of energy markets.

# Overview of the Electricity Sector

## 1. Electric Power in the World

Global electricity generation in the World recorded an average growth rate of 3.0% between 1985 and 2017, developing in parallel with global economic trends. As presented in Chart 6, electricity generation had recorded a limited growth compared to previous years and even declined during the 1992-1993 European Exchange Rate Mechanism (ERM) crisis and the global financial crises in 2001 and 2009. The total global electricity generation stood at 9,866.3 terawatt-hours (TWh) in 1985 but reached 25,551.3 TWh in 2017.

Electricity is a secondary energy resource that is generated by primary energy resources. As well as fossil fuels (coal, oil, natural gas), nuclear and renewable energy resources (hydro, wind, solar, geothermal, biomass, etc.) are used to generate electricity. According to the British Petroleum (BP) Statistical Review (2018), coal had the largest share in total global electricity generation in 2017 with a 38.1% share, followed by natural gas (23.2%) and hydroelectric power (15.9%).



### 2017 WORLD TOP3 IN ELECTRICITY GENERATION



**38.1%** COAL



**23.2%** NATURAL GAS

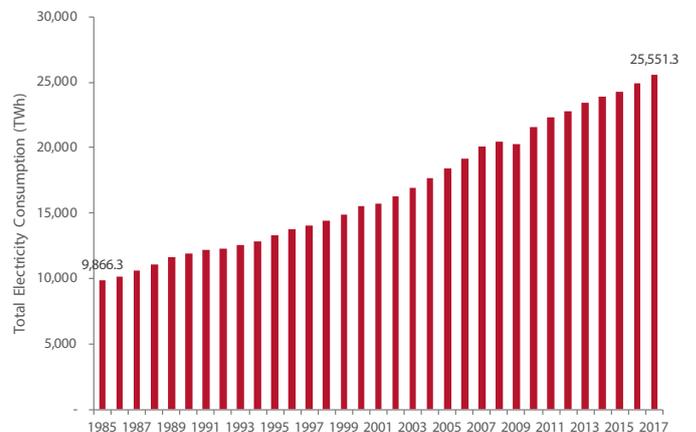


**5.9%** HYDROELECTRIC



The International Energy Agency (IEA) Global Energy & CO<sub>2</sub> Status Report (2017) shows that the global demand for electricity grew by 3.1% in 2017. The growth in electricity demand in developing countries was in parallel with their rising economic growth. In 2017, China and India - which both attained 7% economic growth – between them accounted for 70% of the 2017 growth in the global power demand.

**Chart 6. Total Global Electricity Generation**



Source: BP Statistical Review (2018), TSKB Economic Research

## 2. Electricity Sector in Turkey

The Turkish electricity sector has been developed in a manner aimed at contributing to economic growth and national prosperity with an approach centered on the principle of supply security. For a long time, power services in Turkey had been delivered by a public enterprise operating within a vertically integrated structure. In the 1990s, electricity generation and distribution operations were separated, followed by attempts to include private sector companies in the investment and operation phases, with various models employed to that end. In the early 2000s, a number of legal regulations were put into effect and resolute liberalization steps were taken, triggering an evolution in the electricity sector into the current competitive, multi-player model where operations are separated.

### a. Structure of the Electricity Sector and Participants

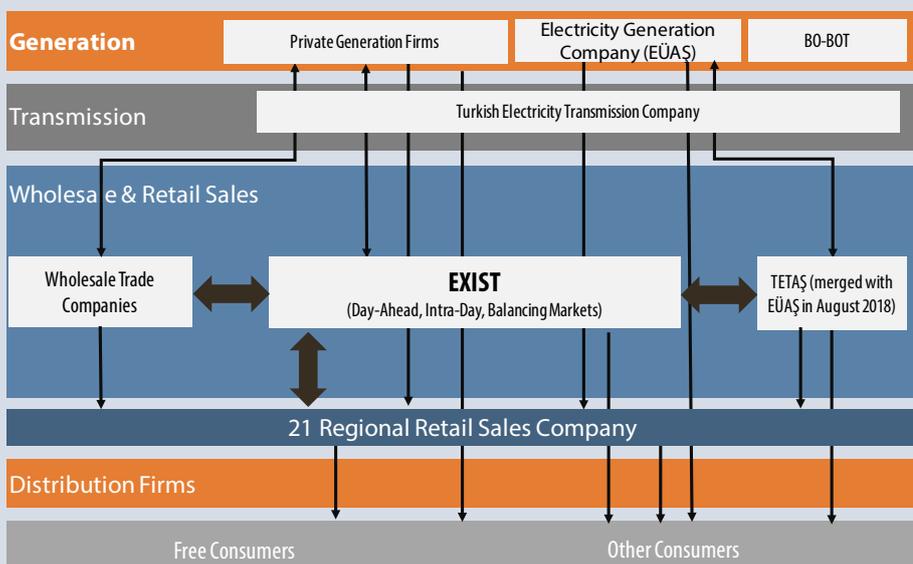
The liberalization process in the electricity sector started with the establishment of the Energy Market Regulatory Authority (EMRA) in 2001 and took a new turn with the most recent regulation in 2013. On September 1, 2015, EXIST was established within the framework of the Electricity Market Law No. 6446 in order to operate the organized wholesale electricity market and manage the market transactions defined as market financial settlement transactions.

In this new period, starting with the establishment of EXIST, financial settlement transactions started to be undertaken within EXIST. The new intra-day market launched by EXIST allowed intra-day projections to be made for renewable power plants that generate electricity on an irregular basis.

The process of privatization of electricity generation and distribution operations was completed in 2018, setting the stage for the establishment of a competitive environment following the liberalization of end users, with the exception of transmission operations, which still rest with the public sector. EXIST has started to run the day-ahead and intra-day markets since their thereof from the Market Financial Settlement Center (MFSC), which had been operating them previously. The Turkish Electricity Transmission Company (TEİAŞ), the current system operator, is responsible for operating the balancing power market and the ancillary services market. EMRA, on the other hand, is responsible for regulating and auditing all operations, not only in the electricity market but also in other energy markets. In addition, it is responsible for all licensing procedures in the abovementioned markets.

Players in the electricity market are summarized in Figure 1. The role of EXIST, also referred to as the market operator, includes performing the financial settlement transactions in relation to generation and consumption in the electricity market, managing organized markets, recording trade transactions, and ensuring the setting of reliable reference prices.

Figure 1. Structure of the Electricity Market



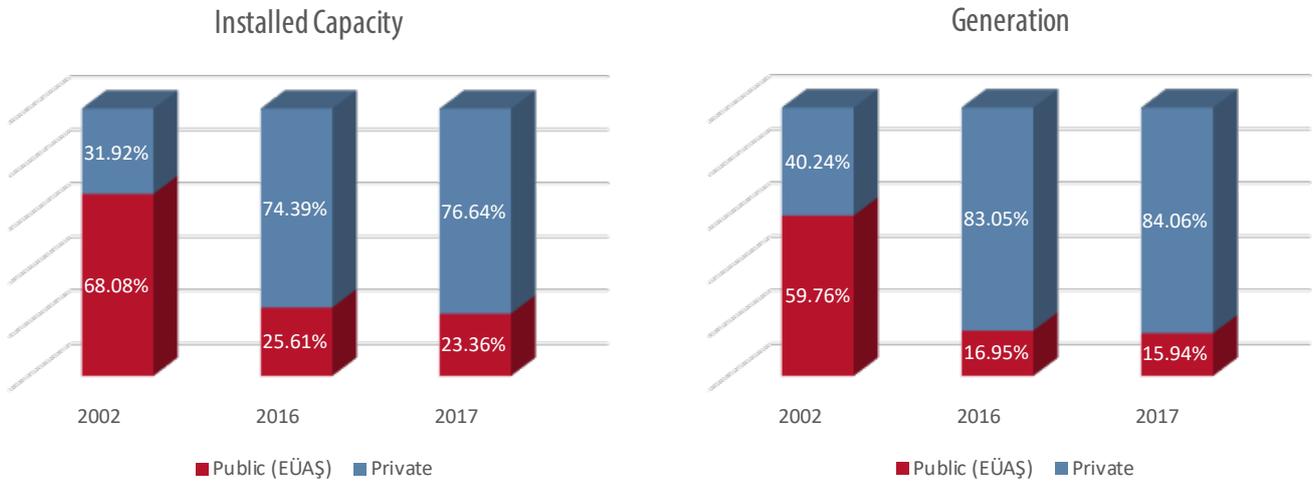
Source: TSKB Economic Research

The electricity generation sub-sector is composed of plants owned by Electricity Generation Company (EÜAŞ) as well as Build-Operate/Build-Operate-Transfer (BO/BOT) power plants and private sector power plants. EÜAŞ's share in Turkey's total installed capacity was around 68% in the early 2000s but declined to 23% by the end of 2017 following the privatization of power plants. Furthermore, EÜAŞ's share in Turkey's total electricity generation had fallen from around 60% in 2002 to 16% by the end of 2017.

Starting from the end of the 1990s, power plants under the scope of BOT and Transfer of Operating Rights (TOOR) with an installed capacity of approximately 3,000 megawatts (MW) were gradually commissioned.

and to the distribution grid, is also responsible for maintaining system balance and the balancing power market. Under the transmission license it holds, TEİAŞ delivers operations at central units as well as load

Chart 7. Share of the Private Sector in Electricity Generation



Source: TEİAŞ, TSKB Economic Research

The private sector's operation period of some of these power plants has been completed, and the operation period of the remaining plants will be completed in the coming years. Although an increase in public sector share is to be expected as these power plants are transferred back to EÜAŞ, it could be also be claimed that the private sector's share in the electricity portfolio will not decrease since new investments undertaken by private companies will be commissioned and the power plants transferred to EÜAŞ will be privatized.

TEİAŞ, the system operator responsible for the transmission of the generated electricity to consumers

dispatch units throughout the country in line with the new market structure. The Turkish electricity system has been synchronized with the European Network of Transmission System Operators (ENTSO-E) since September 18, 2010.

After the Turkish Electricity Distribution Company (TEDAŞ) was inducted into the privatization program in 2004, electricity distribution and sales operations were divided into 21 separate distribution areas. Electricity distribution services are now delivered by 21 private distribution companies in Turkey following the award of privatization tenders between 2008 and 2013.

Table 1. Distribution Areas and Investors

No	Distribution Area	Investor	No	Distribution Area	Investor
1	Dicle	İş-Kaya	12	Uludağ	Limak
2	Vangölü	Türkerler	13	Trakya	İC İçtaş
3	Aras	Çalık-Kiler	14	AYEDAŞ	EnerjiSA
4	Çoruh	Aksa	15	Sakarya	Akenerji-Cez
5	Fırat	Aksa	16	Osmangazi	Zorlu
6	Çamlıbel	Cengiz-Kolin-Limak	17	Boğaziçi	Cengiz-Kolin
7	Toroslar	EnerjiSA	18	Kayseri and Vicinity	Kayseri Metropolitan Municipality
8	Meram	Alarko-Cengiz	19	Aydem	Bereket
9	Başkent	EnerjiSA	20	Akedaş	Arsan İşkur Kipaş
10	Akdeniz	Cengiz-Kolin	21	Yeşilirmak	Çalık
11	Gediz	Elsa-Tümaş-Karaçay			

Source: EMRA, TSKB Economic Research

Previously, distribution companies used to be responsible for electricity supply in their own area as well. Due to the changes in implementations over time, the electricity supply duty was separated from the distribution companies and given to the supply companies. Electricity distribution companies were stripped of their right to sell electricity to consumers, with the supplier companies now selling the electricity to customers. Supplier companies, on the other hand, are divided into two categories in terms of their roles - commissioned electricity supplier companies (who can sell electricity to all consumers holding various licenses) and electricity supplier companies (which can only sell electricity to eligible consumers).

## b. Wholesale Electricity Market

The wholesale electricity market represents the sale of electricity and/or capacity for resale in accordance with Law No. 6446. The wholesale electricity market is divided into two: physical and non-physical electricity trade. The physical electricity trade is composed of bilateral agreements, spot markets and real-time markets.

### i. Bilateral Agreements

The Turkish electricity market is based on bilateral agreements, with other organized markets complementing the bilateral agreements. Bilateral agreements are agreements concluded freely against price risk without being regulated. Bilateral agreements covered an average of 262,732 gigawatt-hours (GWh) between 2012 and 2017. The total for the first three quarters of 2018 stood at 194,197 GWh. The quantity has declined of late as bilateral agreements have not become less popular due to the increase in electricity prices in recent months.

### ii. Over-the-Counter Market (OTC) and Futures and Options Market (VIOP)

All transaction platforms within the electricity sector, excluding the stock exchange and organized markets, are referred to as "over-the-counter market" (OTC). The OTC market supports the development and transparency of an unorganized structured market which does not have any standardized product. Although OTC markets had enjoyed considerable

Chart 8. Monthly Development of Bilateral Agreements

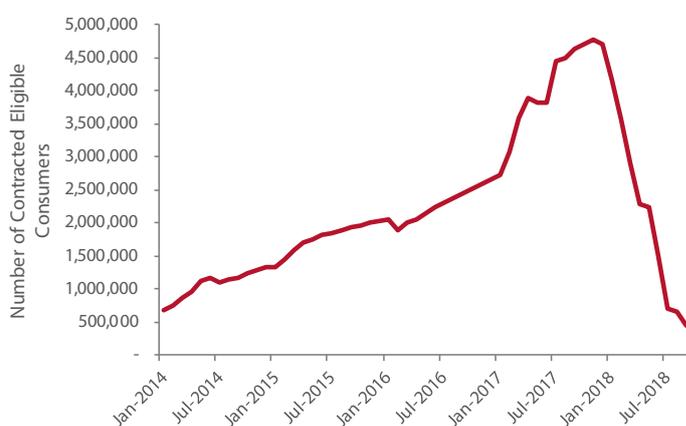


Source: EXIST, TSKB Economic Research

weight until 2015, they started to lose importance after the introduction of VIOP, which brings all market participants together under a single contract.

Energy futures contracts, which have been employed since 2011 in order to eliminate the price risk and gain protection from speculations and arbitrage movements, are managed by the Istanbul Stock Exchange (BIST). Such transactions are grouped into two - "Base Load Electricity Futures Contracts" and "Quarterly and Annual Base Load Electricity Futures Contracts". The minimum transaction amount for every transaction is set as 100 kWh. Despite commanding a high volume in 2015, VIOP contracts have been losing transaction volume in recent years. The main reasons for this include the increase in

Chart 9. Number of Meters by Eligible Consumers



Source: EXIST, TSKB Economic Research

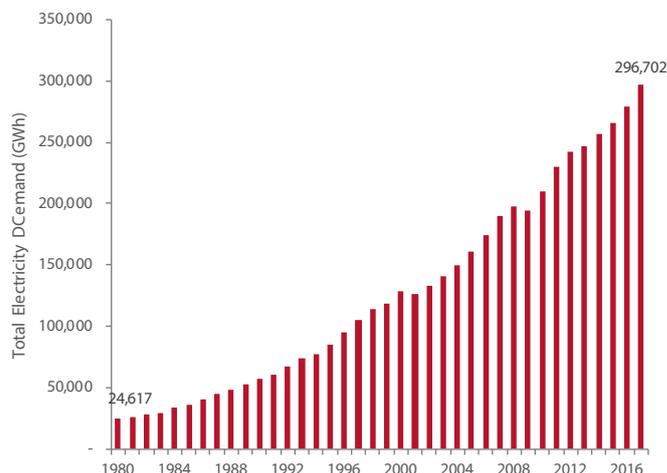
short-term and intra-day trade volumes, as well as the uncertainty surrounding electricity and gas prices.

### iii. Eligible Consumers

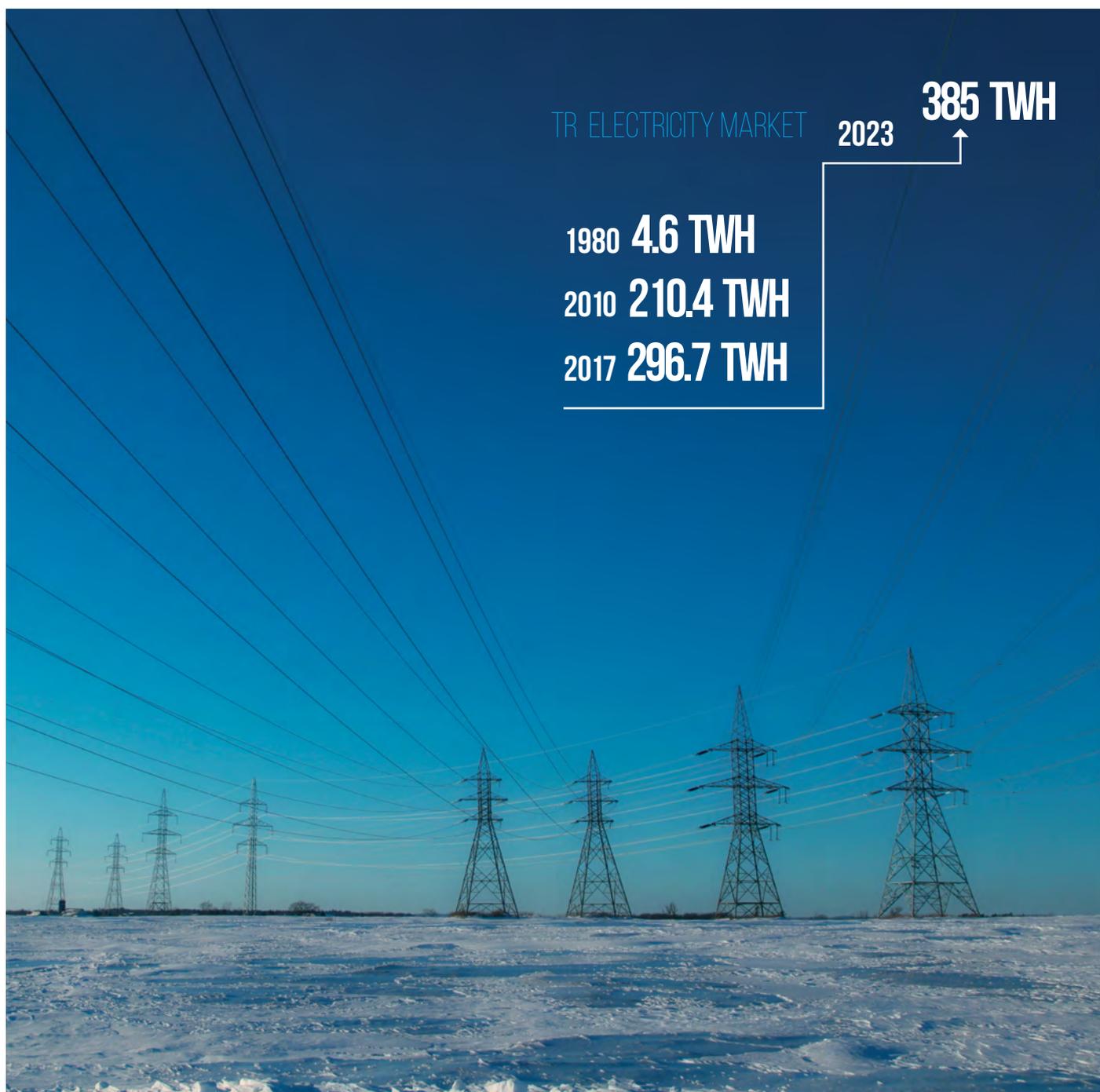
Introduced into the literature under the Electricity Market Law (EML), the concept of the "eligible consumer" includes real or legal persons that have

an annual electricity consumption exceeding the consumption limit set by EMRA each year. The threshold required for being an eligible consumer had been an annual 9 million kWh in 2003, before it was gradually lowered by EMRA to just 2,000 kWh annually for 2018. The number of eligible consumers who had subscription contracts with supplier companies reached 4.76 million in November 2017, but has fallen significantly since then despite a reduction in the threshold required for being an eligible consumer in 2018. The increase in tariffs has not kept pace with the increase in costs for supplier companies, thereby wiping away any advantage these companies could gain from selling electricity to eligible consumers. Since 2017, therefore, supplier

Chart 10. Development of Electricity Demand in Turkey



Source: TEİAŞ, TSKB Economic Research



companies have been cancelling the bilateral agreements they had concluded with eligible consumers. As supplier companies are unable to find electricity on the market at their desired prices, they have been cancelling the contracts preferred for being economical and reviewing their portfolios.

### c. Electricity Demand Analysis

With the exception of 2001 and 2009, demand for electricity in Turkey grew every year between 1980 and 2017, indicating that demand for electricity in Turkey is closely related with the country's GDP growth rate. Demand for electricity has multiplied from just 24.6 TWh in 1980 to 210.4 TWh in 2010 and 296.7 TWh in 2017, when Turkey's total electricity demand rose by 6.2% YoY. Demand for electricity is projected to reach around 385 TWh by 2023.

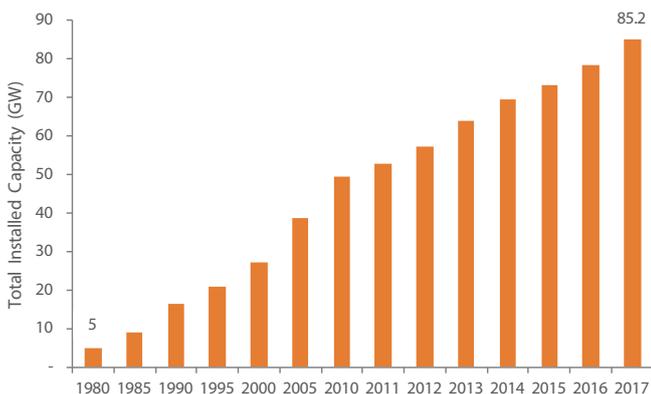
### d. Electricity Generation Analysis

Major investments have been undertaken in order to meet the rapid growth in electricity demand that has been seen since the 1980s. This has resulted in a considerable increase in Turkey's total installed capacity as well as its electricity generation.

#### i. Installed Capacity

Turkey's total installed capacity stood at around 5 Gigawatts (GW) in the early 1980s and reached 85.2 GW at the end of 2017. The substantial rise in Turkey's total installed capacity continues with the increase in the incentives given to power plants generating electricity from renewable energy and domestic resources in recent years.

Chart 11. Development of Turkey's Total Installed Capacity



Source: TEİAŞ, TSKB Economic Research

Turkey's total installed capacity grew by approximately 3 GW starting from the end of 2017 and reached 88.18 GW by the end of the first ten months of 2018. The total installed capacity of licensed and unlicensed solar power plants increased by 1,503 MW while the capacity of hydroelectric power plants increased by 975 MW in the ten-month period. Hydroelectric power plants comprise 28,248 MW of the total installed capacity, followed by natural gas power plants (26,568 MW), imported and domestic coal power plants (18,997 MW), wind farms (6,883 MW) and solar power plants (4,924 MW). The 2015-2019 Strategic Plan prepared by the Ministry of Energy and Natural Resources (MENR) aims to attain an installed capacity of 32,000 MW in hydroelectric power plants, 10,000 MW in wind farms and 3,000 MW in solar power plants by 2019. The goal set for solar power plants, therefore, already appears to have been fulfilled. For 2023, the goal is to increase the total installed capacity to 100,000 MW, with 20% being provided by wind energy and 5% by solar power plants. As of August 2018, the share of renewable energy in total

**TURKEY'S TOTAL INSTALLED CAPACITY**

**88.18 GW**

- 28,248 MW

HYDROELECTRIC
- 26,568 MW

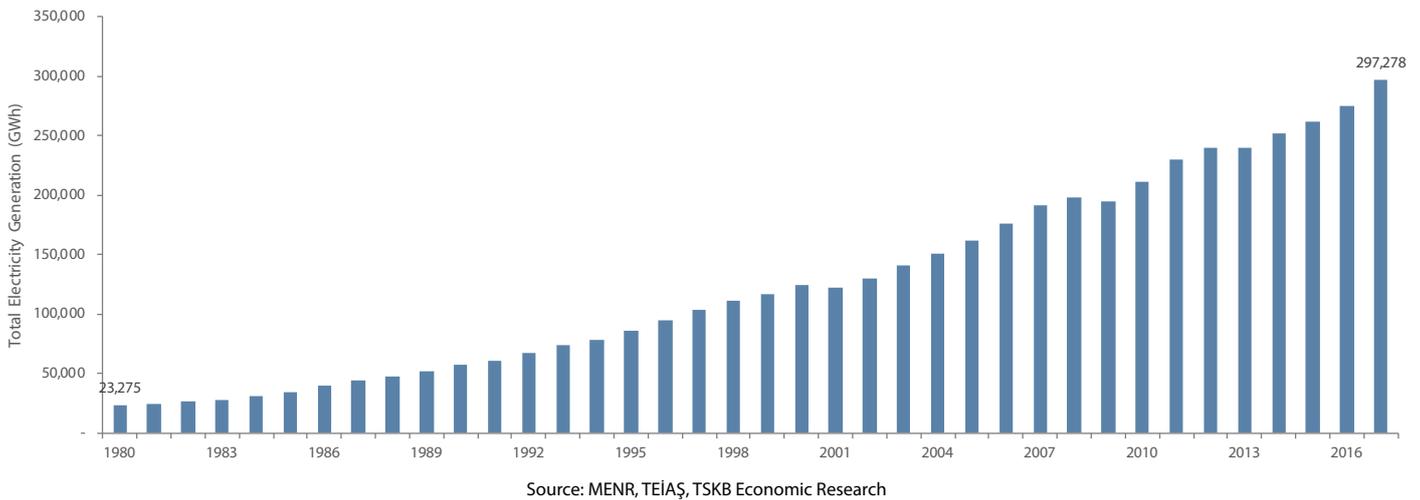
NATURAL GAS
- 18,998 MW

IMPORTED & DOMESTIC COAL
- 6,883 MW

WIND
- 4,924 MW

SOLAR

Chart 12. Development of Turkey's Total Gross Electricity Generation



installed capacity stood at around 47%, with this share expected to exceed 50% in the medium run.

As of October 2018, private generation companies accounted for 60.9% of the total installed capacity, followed by EÜAŞ power plants (22.5%), TOOR power plants (2.3%), BO power plants (6.9%), BOT power plants (1.5%) and unlicensed power plants, with a 5.9% share. An analysis of the top 10 firms in terms of installed capacity for licensed electricity finds EÜAŞ commands the most capacity with 22.63% of the total, followed by ENKA Group, EnerjiSA and Eren Holding.

## ii. Generation

TEİAŞ and MENR data shows that Turkey's total gross electricity generation stood at 274.4 TWh at the end of 2016 before rising to 297.3 TWh in 2017. Electricity imports dropped by 56.9% and electricity exports grew by 127.3% in the same period.

By comparison, in 1980, Turkey's total gross electricity generation was just 23.3 TWh. The compounded annual growth rate (CAGR) of Turkey's total electricity generation between 1980 and 2017 was 7.1%.

In the first ten months of 2018, total gross electricity generation stood at 251.1 TWh, with electricity generation increasing by 1.9% YoY. In the first ten months of the year, coal-fired power plants (using imported and domestic coal) accounted for 36.6% of the total gross electricity generation, followed by natural gas power plants (30.5% of the total). In the same period, EÜAŞ power plants generated 15.2% of electricity whereas the share of TOOR power plants

was 2.8%. In the first ten months of 2018, 82% of electricity was generated by licensed and unlicensed private power plants. These trends are expected to have been similar in the rest of the year.

A comparison of installed capacity and electricity demand growth since 1980 on a periodic basis shows that the growth in installed capacity outpaced the growth in electricity demand between 2010 and 2017. Periodic analysis also indicates that any excessive growth in capacity will be followed by a balancing in the following period. Some of the current excess can be attributed to the growth in renewable energy, which inevitably requires a reserve margin. However, excess generation capacity may cause some short-term issues for the entire system if the rate of growth in demand remains low.

Turkey's 2023 targets include continued diversification of the electricity portfolio and the commissioning of the first unit at the planned Akkuyu Nuclear Power Plant.

## iii. Unlicensed Generation

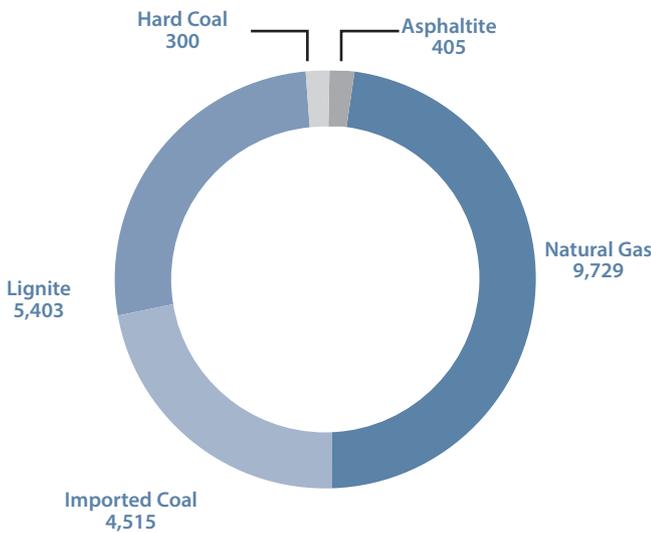
In 2011, power plants having an installed capacity of less than 1 MW were granted the right to engage in unlicensed generation. The main reason for the establishment of such small-scale power plants was to support internal consumption and feed the remaining electricity into the grid. Before 2011, it was renewable energy power plants which chiefly filed applications to sell the excess portion of their generation under the YEKDEM system for 10 years through the commissioned distribution company, which held a retail sales license and was located in the same area as the plant.

The fact that the YEKDEM system will expire by the end of 2020, with no clear decision regarding the status of unlicensed generation plants to be commissioned after 2020, places a major question mark over the future of unlicensed generation plants.

#### iv. Incentives for Thermal Power Plants

Investments in base load power plants, which need to be in a state of permanent readiness to ensure supply security, are a matter of priority. Such investments benefit from incentives such as exemption from value-added tax (VAT), customs duty exemption, corporate income tax exemption, access to lending at preferential interest rates and support with insurance premiums. Furthermore, the minimum capital ratio for companies during the pre-license applications for domestic coal-fired power plants is 1%, while the same ratio is 5% in license applications. Such plants also benefit from an 85% reduction in their forestry permit fees for the first 10 years of the investment and operating period.

Chart 13. Installed Capacity (MW) of Power Plants Benefiting the Capacity Mechanism



Source: EMRA, TSKB Economic Research

Domestic coal-fired power plants benefit a constant price guarantee. Pursuant to the "Resolution on Procedures and Principles of Electricity Supply by Private Companies Operating Domestic Coal-Fired Generation Plants", the Turkish Electricity Trade and Contracting Company (TETAŞ) purchased 6 billion kWh of energy from domestic coal-fired power plants in 2016 and 18 billion kWh of energy in 2017 at a price of TL 185/megawatt-hour (TL/MWh). The

guaranteed purchasing price for half of the coal-fired electricity is valid for a period of 7 years (until the end of 2024) and the purchasing fee reached TL 201.35/MWh in the first quarter of 2018, following the increase in the PPI/CPI inflation. For the rest of 2018, the guarantee has continued by applying PPI/CPI onto the first quarter price.

The capacity mechanism for natural gas and domestic coal-fired power plants, which was published in the Official Gazette of January 20, 2018, warrants attention as an incentive mechanism required for supply and system security. This incentive applies to 28 power plants with a total installed capacity of 20,352 MW and which corresponded to an amount of TL 1,407 million in 2018. The incentive is calculated in consideration of the association between the fixed and variable costs of power plants and the Market Clearing Price (MCP). Natural gas power plants with a total installed capacity of 9,729 MW and coal-fired power plants with a total installed capacity of 10,623 MW benefited from this incentive in the first ten months of 2018. Moreover, power plants running on imported coal which are joining the capacity mechanism may benefit from monthly payments if they generate electricity using domestic coal.

#### v. Renewable Energy Resources Support Mechanism (YEKDEM)

Pursuant to the Law No. 5346 on the Use of Renewable Energy Resources (YEK) for Electricity Generation, wind, solar, geothermal, biomass, wave, current and tidal power plants as well as hydroelectric power plants of either the canal or river-type, or which have reservoir area of less than fifteen square kilometers may benefit from the YEKDEM scheme for a period of 10 years. Power plants commissioned, or to be commissioned between May 18, 2005, the effective date of the YEK Law, and December 31, 2020 are included, or will be included, in the YEKDEM scheme.

YEKDEM unit prices are at at USD 73/MWh for hydroelectric and wind power plants, USD 105/MWh for geothermal power plants and USD 133/MWh for biomass and solar power plants. Furthermore, in line with the provisions set out in the regulation on the use of domestically produced components at power plants, the abovementioned prices may be added to the unit prices included in the Table in Annex-II of YEK Law for a period of five years with respect to the ratio of domestically produced components.

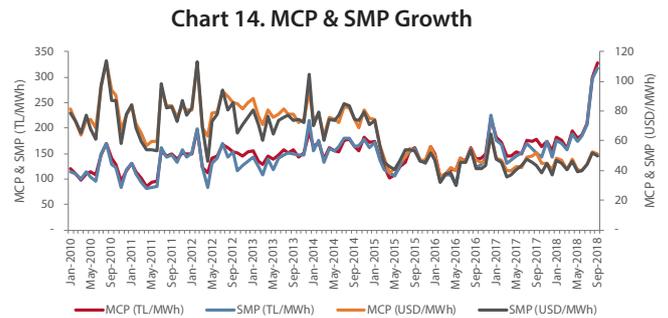
## vi. Renewable Energy Resource Areas (YEKA)

Under the recently launched YEKA process, the MENR holds tenders to transfer certain areas to investors for electricity generation from renewable energy resources on the condition that the relevant equipment is manufactured domestically.

Defined as large-scale resource areas to be established on public and treasury immovable property and on privately-owned immovable property, the YEKA process allows large plots of public land to be allocated to the construction of power plants.

## e. Electricity Price Analysis

Electricity prices in Turkey are 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 indicate the MCP for the hour concerned. The price in the balancing market depends on whether there is an energy deficit or an energy surplus within the system. If there is an energy deficit, the maximum hourly bid price in the system is taken as the System Marginal Price (SMP). If there is a surplus, the minimum bid price accepted is set as the SMP.

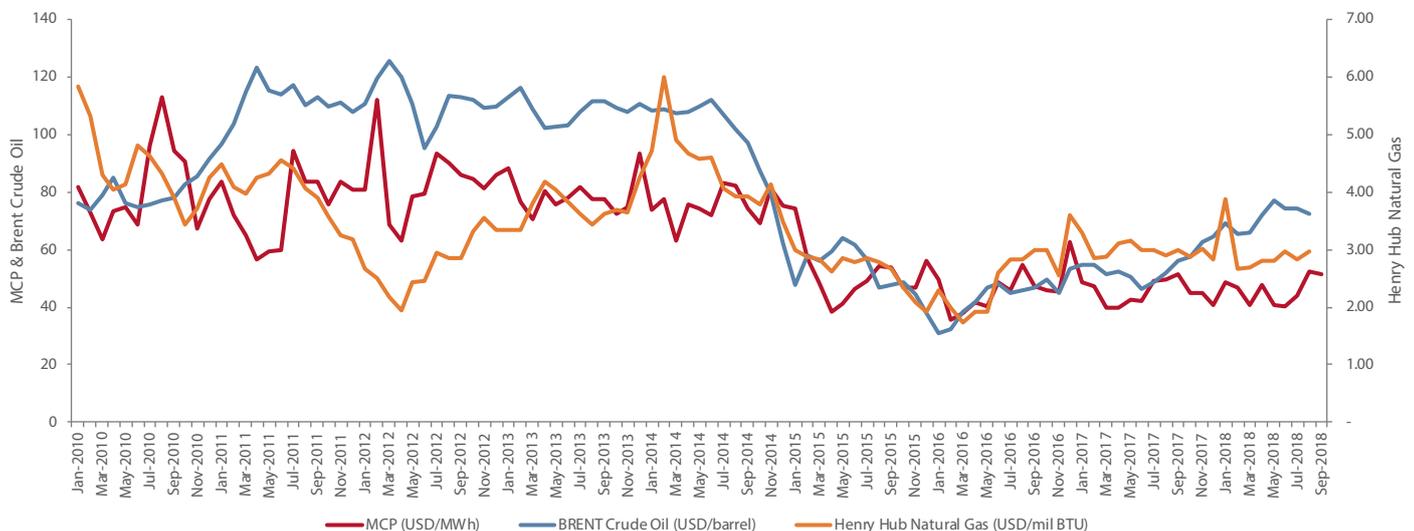


Source: EXIST, CBRT, TSKB Economic Research

An analysis of monthly average TL-denominated MCP and SMP values in the last eight years indicates that limited change in pricing until the last three months, when there has been a significant increase. This increase is mainly attributable to the increase in the Petroleum Pipeline Corporation (BOTAŞ) price of natural gas, which is the raw material for natural gas power plants. Although electricity prices depend on power plant availability, prevailing weather and economic and geopolitical factors, they react instantly to any changes in commodity prices. While USD-denominated prices did not exhibit such a movement, the recent depreciation of TL against the USD precipitated a sharp shift in the TL-denominated prices in the last three months.

As Turkey is a country that imports most of its energy raw materials, electricity prices move directly in parallel with commodity prices. The USD-denominated MCP embarked on a downward trend following the fall in oil prices and related natural gas prices in 2014. The recent increase in commodity prices influenced MCP prices, which tend to increase on an FX-denominated basis.

Chart 15. Movements in MCP & Brent Crude Price & Henry Hub Natural Gas Unit Price



Source: EXIST, CBRT, United States Energy Information Administration, TSKB Economic Research

# Impact of Sectoral Developments and Exchange Rate Movements on Electricity Prices

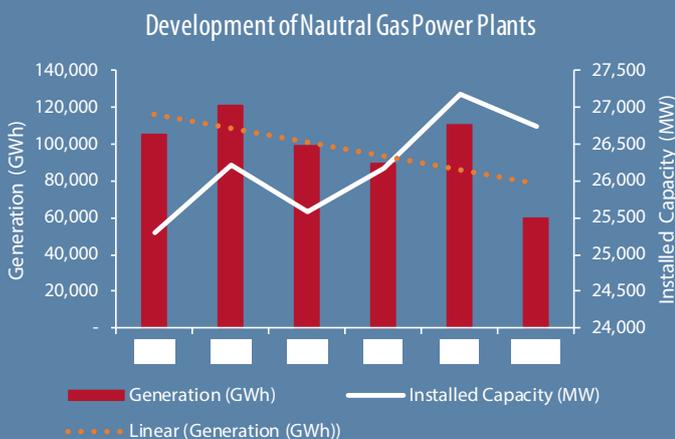
The share of electricity generated by natural gas fired power plants have varied between 31% and 38% over the last couple of years. High efficiency natural gas power plants continued to generate electricity as the natural gas power plants were needed within the scope of supply security, especially in the winter and summer months when demand is higher. According to TEİAŞ capacity projections, the share of natural gas power plants in total installed capacity in 2022 is targeted at approximately 27% in a scenario where all investments are commissioned.

upward shift in demand, the absolute spark spread would be expected to decline. Therefore, NGCC plants, specifically low-efficiency plants whose online period has been shortened, have tended to be taken off the national grid.

Risks have started to arise for such plants where there are active investment loans. This is something which has the attention of sector representatives, investors and financial institutions, with respect to the restructuring of funds concerning such investments.

Through the reducing of impacts of unique features of the Turkish electricity market over market price, it was aimed to ensure a transition to a market structure in which costs are accurately reflected. To that end, subsidy impacts have been decreased after the BOTAŞ tariffs imposed on power plants were updated in a way to reflect costs. Between January and July 2018, BOTAŞ started to apply a gradual pricing mechanism. This was later abolished in 2018, and the tariff was reduced to an initial TL 1,700 and then TL 1,550, corresponding to the TL equivalence of USD 270 per 1,000 cubic meters.

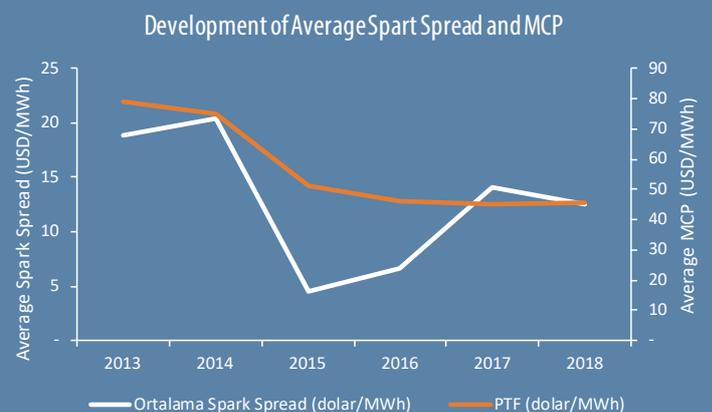
This change marked an important step towards market liberalization, ended BOTAŞ subsidies on natural gas prices and enabled a transition to a tariff structure which reflected costs. In addition, due to the rapid volatility in exchange rates, BOTAŞ announced that the USD rate could be fixed at a certain value so power plants could calculate costs over an accurate price.



Source: TEİAŞ, TSKB Economic Research<sup>1</sup>

Long-term average electricity prices have embarked on a declining trend in line with capacity increases and declining fuel costs. The electricity price set in the day-ahead market has started to stay under the marginal costs of high-efficient natural gas power plants.

By definition, the spark spread is the difference between the unit electricity price and the natural gas cost used for electricity generation. Due to the increase in exchange rate sensitive natural gas prices and due to the decline in the electricity price combined with a installed capacity increasing at a rate in excess of the growth in electricity demand, the spark spread averages of natural gas combined cycle (NGCC) power plants have exhibited a downward trend. The fall in the spark spread, which is calculated on an hourly basis, has reduced the duration that power plants are online. If the reserve capacity maintains such levels and there is no

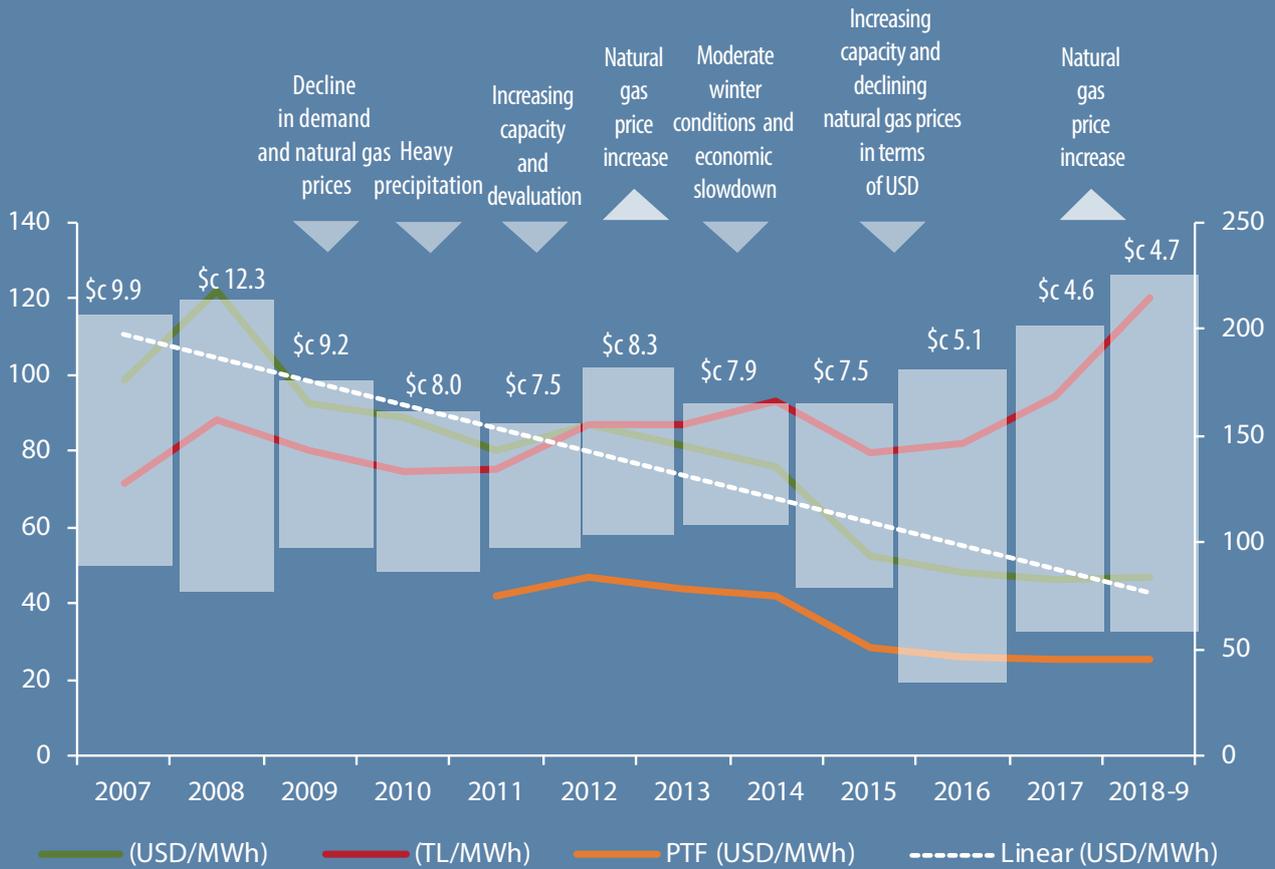


Source: TEİAŞ, TSKB Economic Research<sup>1</sup>

<sup>1</sup> Average Spark Spread on an annual basis was calculated for NGCC plants operating with 60% efficiency.

In Turkey, the MCP is formed on an hourly basis at the intersection of supply and demand, as in other free markets. Today, demand sets the supply while the price is set by natural gas power plants that operate as marginal plants most of the time. In this structure, where the marginal plant sets the profit margin for lower cost plants, natural gas price and the prevailing exchange rate have a direct impact on the price. Basically, the price takes account of oil and natural gas prices, exchange rates and the supply-demand balance. If the current demand curve is maintained, any possible delays or cancellations in the project inventory list and any restrictions on the commissioning of power plants may lead to a reduction in reserve capacity.

An increase in marginal plant costs and an upside adjustment in market prices is a possibility, due to imminent cuts in reserve capacity. In addition, any increase in oil prices or exchange rates could lead to an additional upward impact on the system electricity price.



Source: TEİAŞ, TSKB Economic Research

# Overview of the Natural Gas Sector

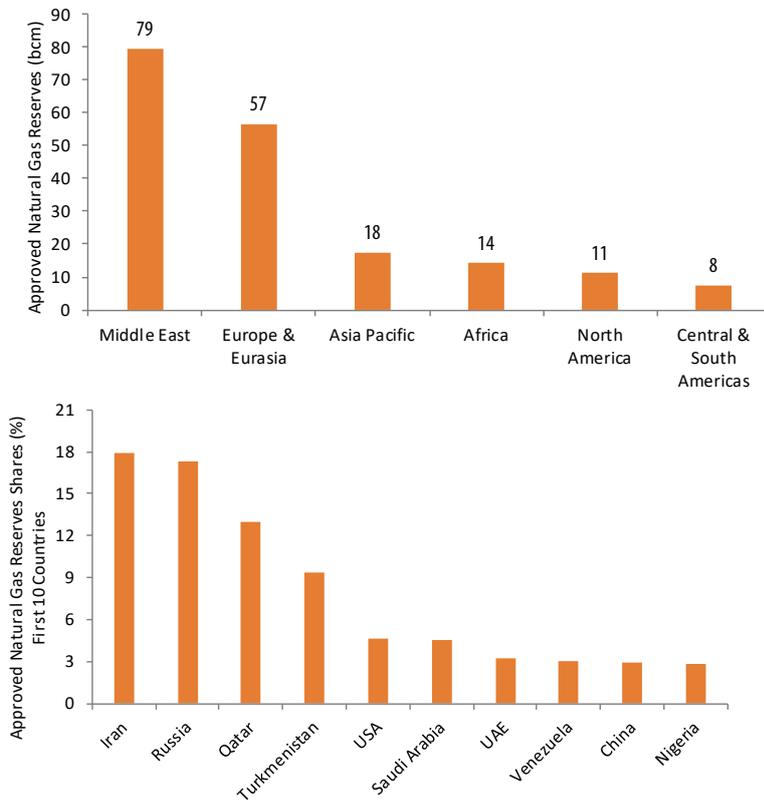
## 1. Global Overview of the Natural Gas sector

Natural gas is one of the fossil fuels with a significant share in the global primary energy consumption. In 2017, 23.4% of the global primary energy consumption was supplied by natural gas-based fuels. In long-term projections, it is envisaged that natural gas, whose use has become widespread throughout the world since the 1990s, is the only fossil fuel whose share is likely to increase.

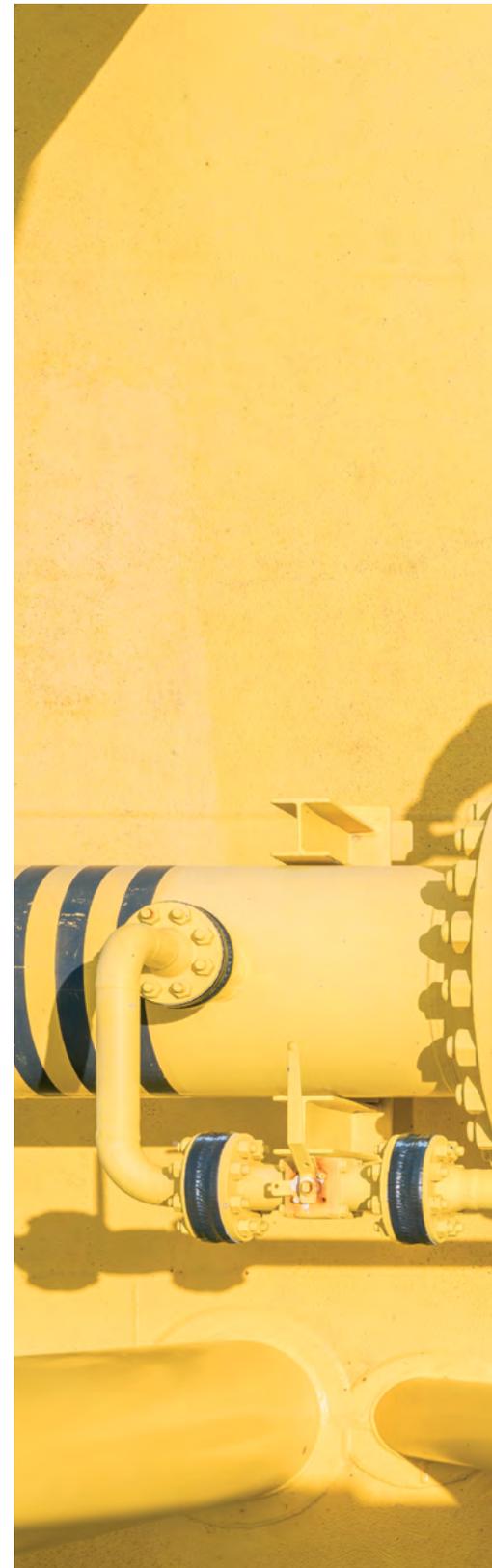
### a. Global Natural Gas Reserves

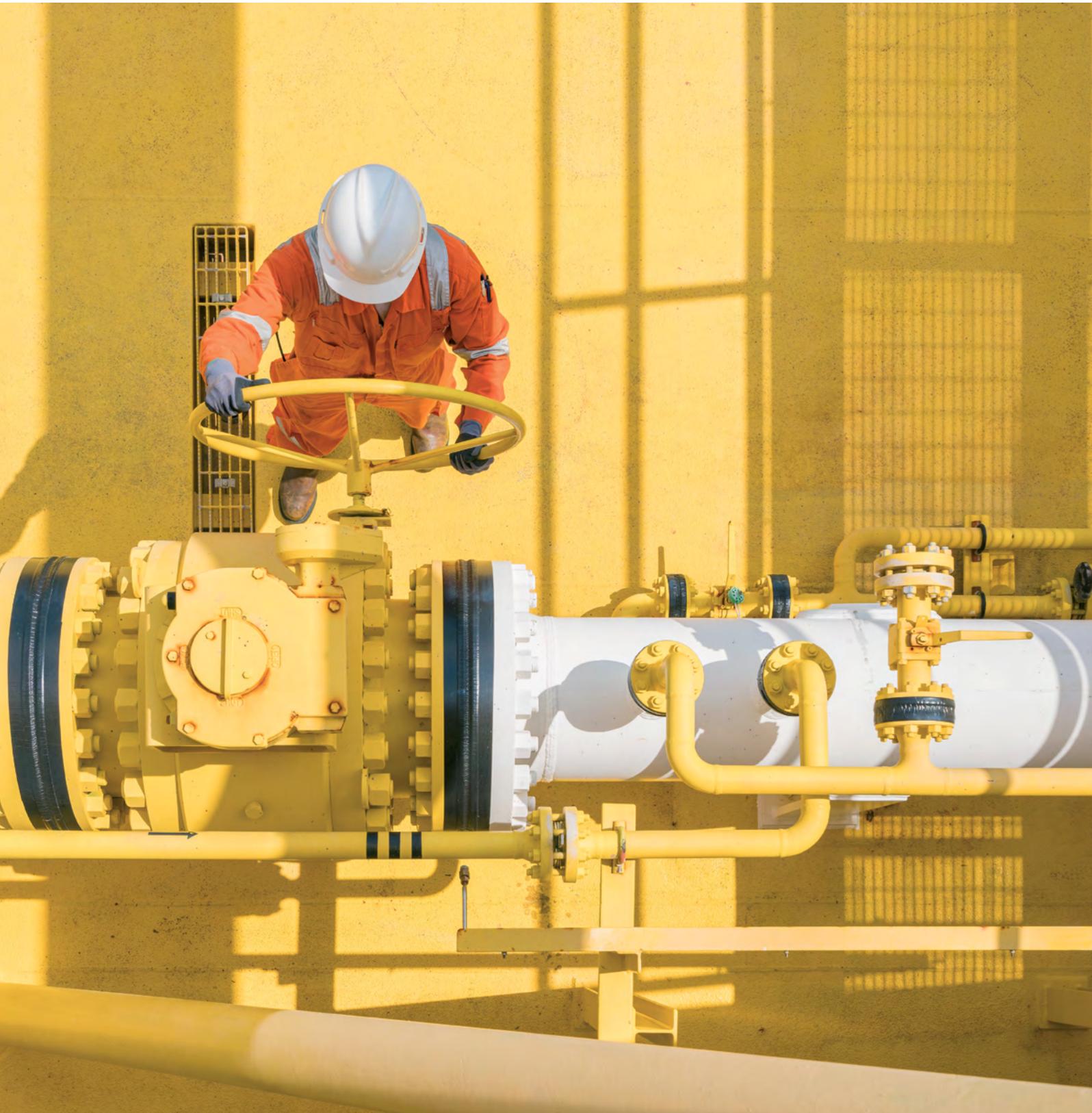
As of the end of 2017, proven natural gas reserves amounted to 193.5 trillion cubic meters. About 58% of this quantity was located in four countries (Russia, Iran, Qatar and Turkmenistan) – countries which could be considered close to each other.

Chart 16. Proven Natural Gas Reserves and Shares of top 10 Countries



Source: BP Statistical Review of World Energy (June 2018), TSKB Economic Research

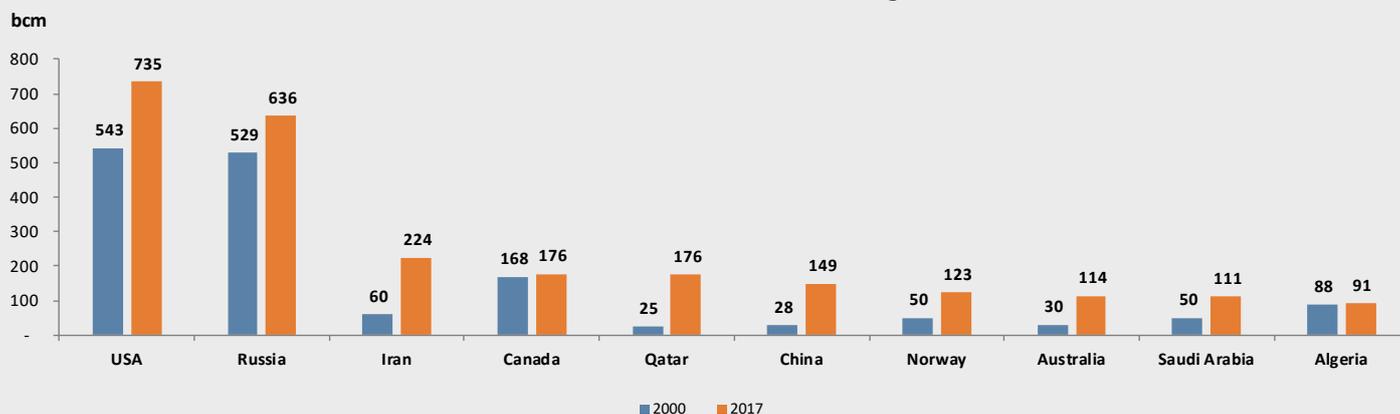




## b. Global Natural Gas Production

In 2017, natural gas production rose by 130.6 billion cubic meters (bcm), representing an increase of 3.68% YoY, to reach almost 3,680 bcm. Russia and the USA produced about 37% of the world's natural gas in 2017. With the addition of Iran and Qatar, total natural gas production in these four countries constituted almost half of the global natural gas production. Qatar has recently started liquefying its natural gas (transforming it into LNG) and transports it to other countries through the Strait of Hormuz. Russia and Iran, on the other hand, mainly export their natural gas by pipeline.

Chart 17. Production Quantities of Countries with the Highest Gas Production



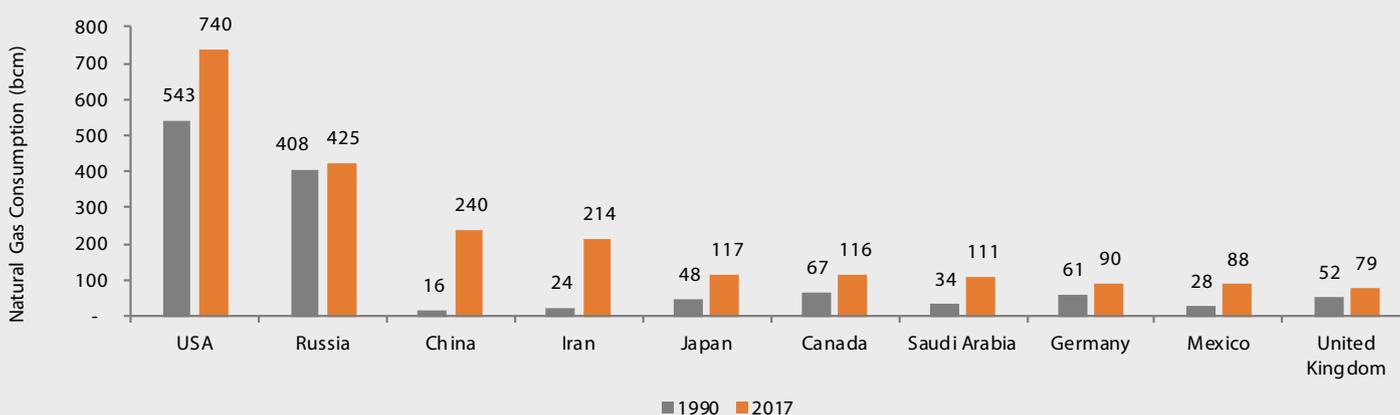
Source: BP Statistical Review of World Energy (June 2018), TSKB Economic Research

## c. Global Natural Gas Consumption

Global natural gas consumption data for 2017 finds that the USA and Russia accounted for 32% of the world's total consumption of approximately 3,7 bcm. Total consumption increased by 96 bcm compared to 2016. China contributed significantly to the growth in consumption, with an increase of approximately 31 bcm in line with the cleaner energy policies being pursued. By region, Europe (including Turkey) accounted for the highest amount of natural gas. In 2017, the continent produced about 242 bcm of natural gas and consumed about 532 bcm, with 290 bcm of its natural gas requirement being imported.

LNG consumption rose by 35 million tonnes YoY to reach a total of 293 million tonnes in 2017. The increase in the share of LNG in natural gas consumption is largely attributable to the liquefaction facilities commissioned in the US and Australia and the capacity increases following the rehabilitation work in existing liquefaction facilities. Assuming that the number of countries importing LNG continues to increase and regasification capacity continues to rise, the share of LNG in both total natural gas consumption and resource allocation is expected to grow further.

Chart 18. Consumption Quantities by Countries with Highest Gas Consumption



Source: BP Statistical Review of World Energy (June 2018), TSKB Economic Research

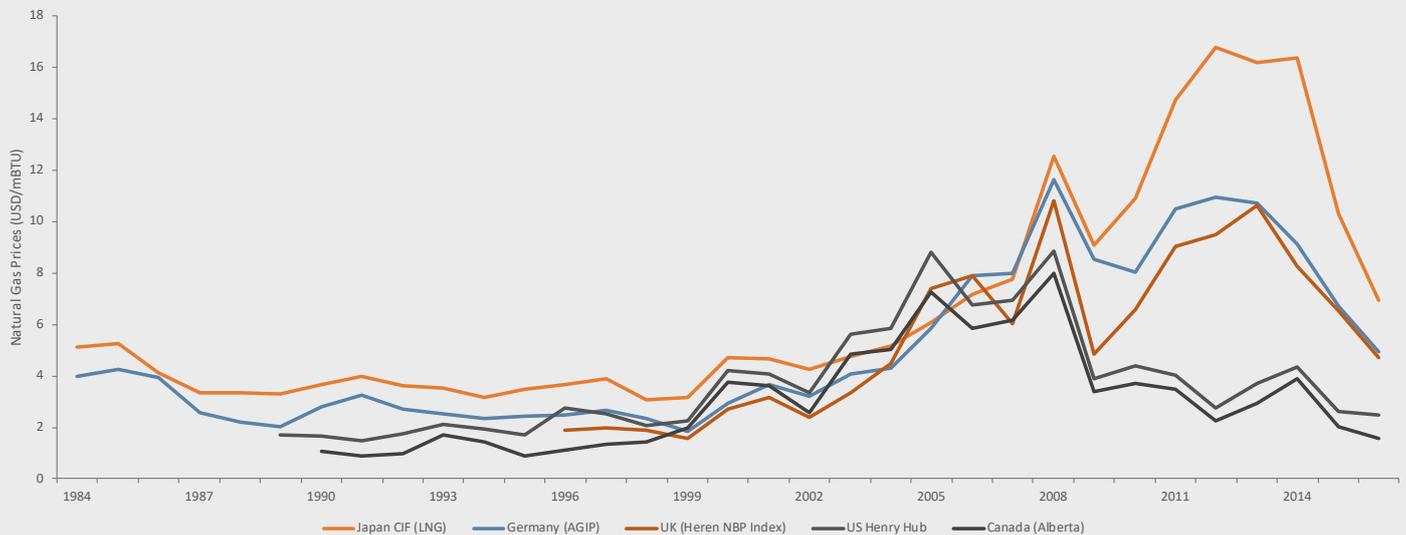
## d. Global Natural Gas Prices

There is a strong link between natural gas and oil prices. In 2017, natural gas and LNG prices increased globally. After spiking in the wake of the nuclear accident in Fukushima, LNG prices fell constantly in the post-2014 period, dropping to unprecedentedly low levels in 2016 – completely confounding estimates. In 2017, prices increased by about 17%.

In the past, natural gas prices in the U.S. and Canada have generally remained lower than prices in the European market. The most significant reason for this, taking the role of other factors into account as well, is that the use of natural gas has a longer history in North America, and the basic infrastructure was established much earlier. Natural gas prices in the U.S. were deeply affected after the discovery and production of shale gas in 2008, with prices being markedly suppressed starting from 2009.

In the medium run, prices in the European market are expected to decline compared to current prices under the impact of additional natural gas supplies from the U.S.

Chart 19. Growth of Global Natural Gas Prices



Source: BP Statistical Review of World Energy (June 2018), TSKB Economic Research



## 2. The Natural Gas Sector in Turkey

Turkey's natural gas consumption has grown in direct proportion to its population, industrialization and urbanization patterns. Turkey's own domestic gas production mostly meets less 2% of its consumption, and only 0.66% in 2017. Natural gas production amounted to 969 million cubic meters (mcm) in 2008 but declined to 354 mcm by 2017. In other words, Turkey's dependence on gas imports surged to 99.44%. Turkey has so far produced natural gas in 7 provinces with the Tekirdağ province accounting for more than 50% of the total domestic gas production in 2017, followed by Istanbul (23.7%) and Kırklareli (14.8%). In 2013, about 98% of gas imports originated from five countries, although the share of these five countries in imports dropped to 91.3% in 2017. Turkey imports most of its natural gas from Russia (51.9% of the total), Iran (16.7%), Azerbaijan (11.8%), Algeria (8.4%) and Nigeria (2.4%).

Turkey has achieved a great leap in terms of natural gas distribution in recent years. Before 2001, gas was only distributed in 6 provinces; but at the end of 2017, gas distribution services were available in all of Turkey's provinces except for Artvin, Şırnak and Hakkâri. Under the "100-Day Goal" announced on August 3, 2018, it was publicly stated that the Artvin and Şırnak provinces would be provided with access to gas. The number of natural gas users (subscribers) has exceeded 14 million, implying that 63 million out of the 83 million people living in Turkey use natural gas.

### a. Natural Gas Reserves and Production in Turkey

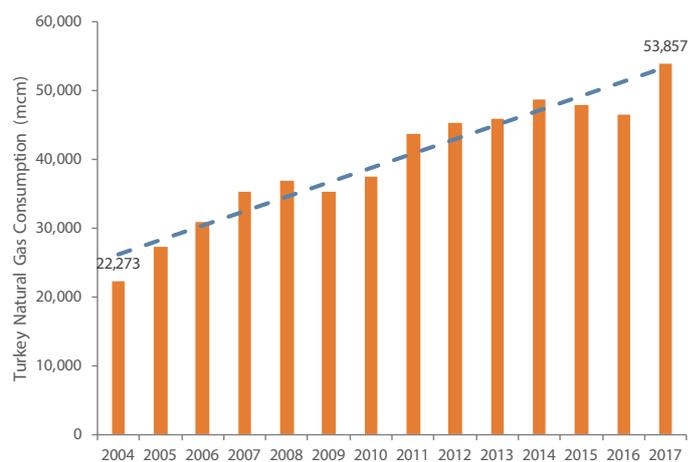
Despite being surrounded by countries with large natural gas reserves, Turkey has a reserve of about 18.5 bcm and a low level of domestic gas production, thus falling short of meeting even 1% of its annual consumption. A total of 969 mcm of gas was produced in Turkey in 2008, but production has continuously declined since then, and it stood at 354 mcm in 2017.

### b. Natural Gas Consumption in Turkey

A total of 53.9 bcm of natural gas was consumed in Turkey in 2017, representing an approximate

increase of 15% YoY – the highest level of consumption in the history of Turkey. A key reason for this increase was the fact that natural gas power plants have had to work at a higher than expected rate, in order to make up for the shortfall in hydro-electric power, with generation from hydro-electric power plants being much lower than the average in 2017. This role that natural gas assumes in electricity generation brings up the matter of launching different mechanisms.

Chart 20. Natural Gas Consumption in Turkey



Source: EMRA Natural Gas Market Sector Report (2017), TSKB Economic Research

Increased access to natural gas led to 20.5 bcm of natural gas consumption in the conversion sector (heat and power plants) in 2017. Consumption in the energy sector, mainly in oil refineries, stood at 2 bcm while consumption in industry rose by 6% YoY to reach about 13.4 bcm. The largest increase in industrial consumption was in the iron and steel sector (18%) in which the total natural gas consumption in 2017 amounted to 1.5 bcm. Household gas consumption stood at 13.5 bcm, marking a YoY increase of 15.5%.

In 2017, 55.25 bcm of gas was imported, marking a YoY increase of 19.2%. The difference between the imported amount and consumption arose from the increase in the amount stored - in 2017, the amount of gas stored underground was approximately 1.25 bcm more than in the previous year (1.7 bcm in 2016 and 2.95 bcm in 2017). It is officially stated that Turkey works to a goal of storing an amount that corresponds to about 20% of its consumption. To that end, investments are underway to increase storage capacity at fully-funded facilities.

### c. The Natural Gas Trade in Turkey

There are two ways of transporting natural gas into Turkey. The first is the transportation of natural gas in gas form through pipelines. The second involves liquefying natural gas, transporting it in tankers in LNG form and then storing it in LNG tanks or FSRUs (floating LNG storage and regasification units). After reception at storage terminals, LNG may be converted into gas and fed into a pipeline, or be transported in liquid form via road tankers and used in bulk at consumption points where there is no access to a pipeline. In 2017, about 650 mcm of LNG imports (6.2% of the total of 10.5 bcm that was imported) was delivered to consumers via road tankers. In parallel with global trends, the share of LNG in Turkey's gas imports has been increasing each year and reached about 19.5% of the total in 2017. Turkey ranks second in Europe behind Spain in terms of LNG imports.

In terms of countries supplying gas to Turkey, dependence on Russia still continues despite the latter's gradually increasing amount but decreasing share in Turkey's total gas imports. In 2017, pipeline imports from Russia constituted about 52% (28.7 bcm) of total imports. Gas imports from Iran amounted to 9.25 bcm – an all-time high. In 2017, gas imports from Azerbaijan amounted to 6.54 bcm under a contract with an annual limit of 6.6 bcm. Launched in June 2018, TANAP project will make an additional 6 bcm of Azeri gas available for use in Turkey and 10 bcm of gas available for transfer to Europe via Turkey.

Regarding LNG imports, the amount of gas purchased from Nigeria and Algeria under BOTAS contracts approached the amounts purchased in previous years. LNG spot imports grew by 90% YoY to reach 4.8 bcm. A total of 1.6 bcm in LNG spot imports originated from Qatar.

Turkey's gas imports have been rising steadily since 2000. Some slowdown in the rate of growth in gas consumption is possible in the short term, but gas imports will continue to increase in the medium run. Although it appears probable that the share of natural gas used for electricity generation will fall, the rise in the demand for natural gas is expected to continue going forward, due to factors such as expansion of the grid, an increasing population, urbanization and industrialization.

At the beginning of the liberalization process, which was initiated in 2001 with the enactment of the Natural Gas Market Law, the limit for eligible consumers was set at 15 million cubic meters. This limit was gradually decreased to 75,000 cubic meters. Eligible consumers exceeding this limit in gas consumption are free to choose the supplier of their choice. The number of eligible consumers has expanded by 33% in the last 5 years.

The "Continuous Trade Platform" was launched in September 2018, ushering in a new era where pricing of natural gas is realized in the free market. The platform is operated by EXIST and allows transactions to be performed by wholesale, import

Figure 2. Natural Gas Pipeline System in Turkey



Source: EMRA

and export license holders. This provides an objective, transparent and non-discriminatory basis for third party access. EXIST takes the weighted average of transaction values performed each day, calculates the reference prices and issues public announcements on a daily basis. The establishment of the platform marked the completion of a major phase in terms of improving regional energy trade.

#### d. The Natural Gas Pipeline System in Turkey

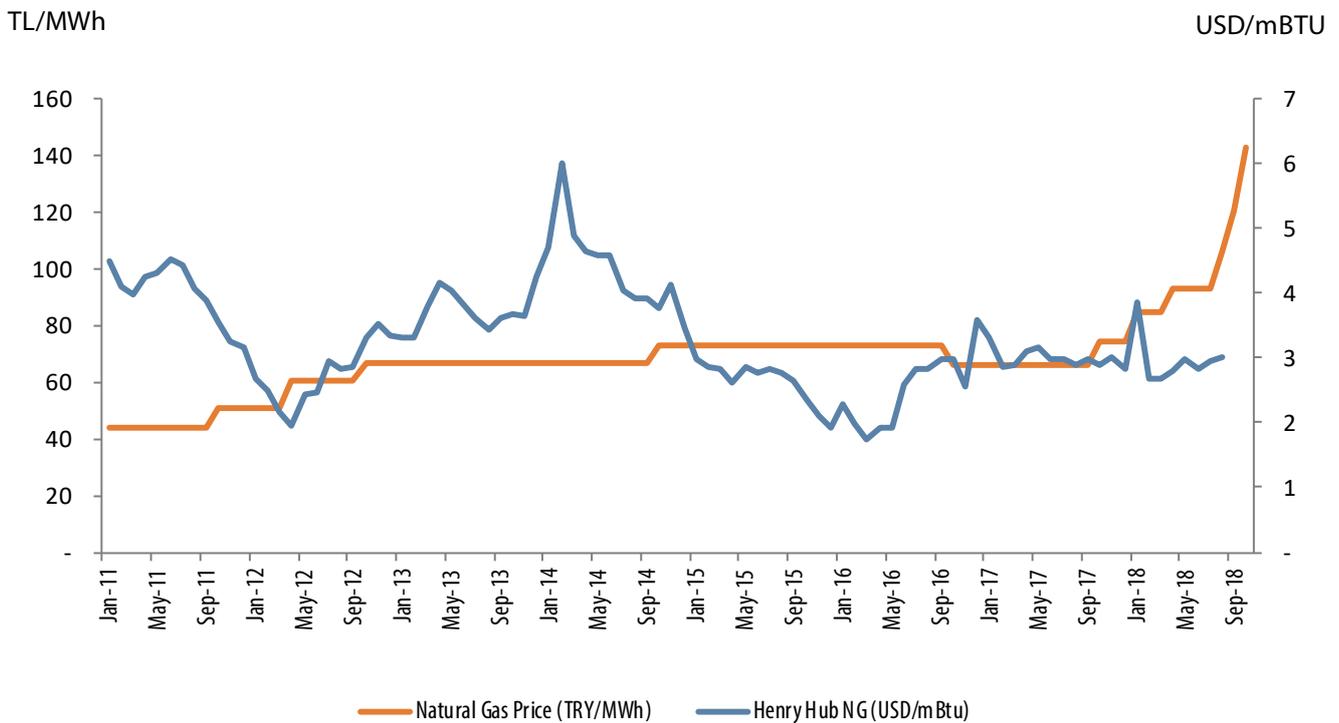
The natural gas main transmission grid is fed by four international pipelines (West Line-Kırklareli, Blue Stream-Samsun, Eastern Anatolian-Ağrı, Baku-Tbilisi-Erzurum Pipeline-Ardahan). Furthermore, the grid incorporates four LNG terminals including two FSRUs as well as two Underground Natural Gas Storage Facilities. A line introduced back in 2007 introduced a pipeline connection between Turkey and Greece, paving the way for exports to Greece. In 2017, over 0.6 bcm of natural gas was exported to Greece.

#### e. Natural Gas Prices in Turkey

Natural gas prices in Turkey are calculated in parallel with the prices in BOTAŞ's long-term contracts and the exchange rate movements. In the absence of a free natural gas market in the past, the tariffs BOTAŞ imposed on eligible consumers and distribution companies were considered as the reference prices within the wholesale network.

The global decline in gas prices since 2014, tougher domestic competition and the price markdown after the final award favoring Turkey in the arbitration case against Iran have all left Turkey in the position of being a country offering one of the most attractive and advantageous retail prices in Europe. Nevertheless, there was a marked increase in the TL-denominated natural gas prices in the second half of 2018.

Chart 21. Natural Gas Tariff for Organized Industrial Zones and Henry Hub Spot Price



Source: BOTAŞ, EIA (Monthly Natural Gas Spot Prices), TSKB Economic Research

# A New Natural Gas Framework

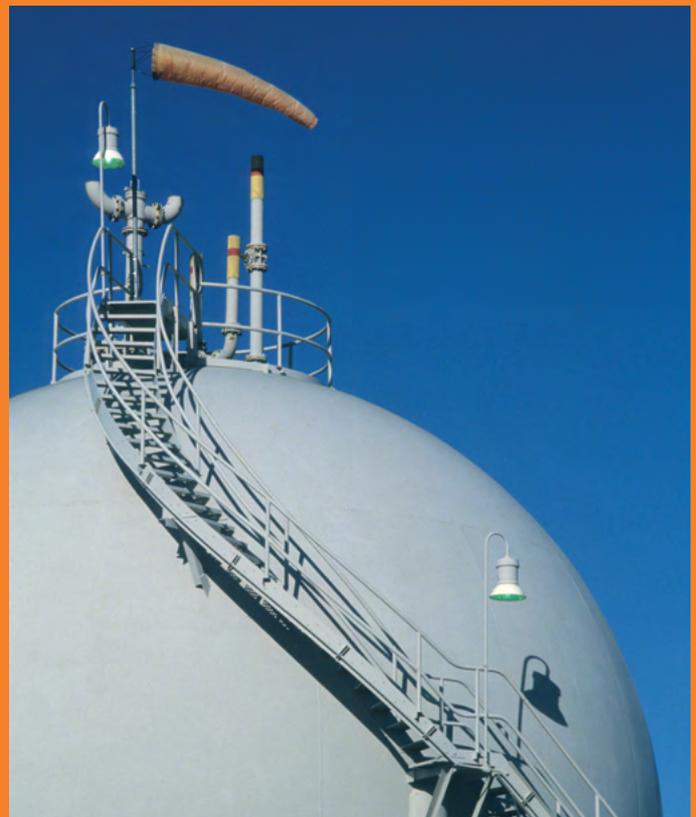
Most European countries have systems in place for the transportation and storage of a specific volume of natural gas which is in excess of the annual demand for gas. Such infrastructure has enabled the formation of a flexible market in addition to alternative supply channels. European countries, including Turkey, are dependent on gas imports and 162 bcm of pipeline gas was imported from Russia in 2017. This corresponds to more than 75% of the natural gas or LNG volume the European countries import from non-European sources (excluding Turkey). Such an extensive dependence on Russia for gas has added new urgency to the debates about energy security within the continent and accelerated FSRU installations.

Turkey has long been developing plans to avail itself of the opportunities offered by its geographical location offers and has taken on the mission of acting as a bridge for natural gas transmissions to Europe. This is also a policy pursued by Turkey in its relations with other countries. In recent years, the construction project for a 185-km pipeline extending from Northern Iraq to Mardin was launched, but has attained only limited progress so far amid mounting political uncertainty and deteriorating relations in the region. An agreement signed with Turkmenistan in 1999 aimed at transporting Turkmen gas to Europe via Turkey. However, the efforts to launch the pipeline project, which included plans to transport Turkmen gas via the Caspian Sea, failed due to opposition from Russia and Iran, two major gas exporters bordering the Caspian Sea.

In 2017, Turkmenistan cut off natural gas supplies to Iran due to the country's payment arrears. However, with a lack of alternative countries to sell gas to (apart from China), Turkmenistan becomes a victim of its geographical restraints, forcing Turkmen gas to be priced below the market price, resulting in Turkmenistan - a country with the fourth largest gas reserves in the world – not to benefit such abundance of natural gas as it should be. Turkmenistan did enjoy some relief when countries bordering the Caspian Sea agreed on a solution regarding the status of the Caspian Sea, a constant source of tensions and disputes over the last 25 years, and there is now hope that Turkmen

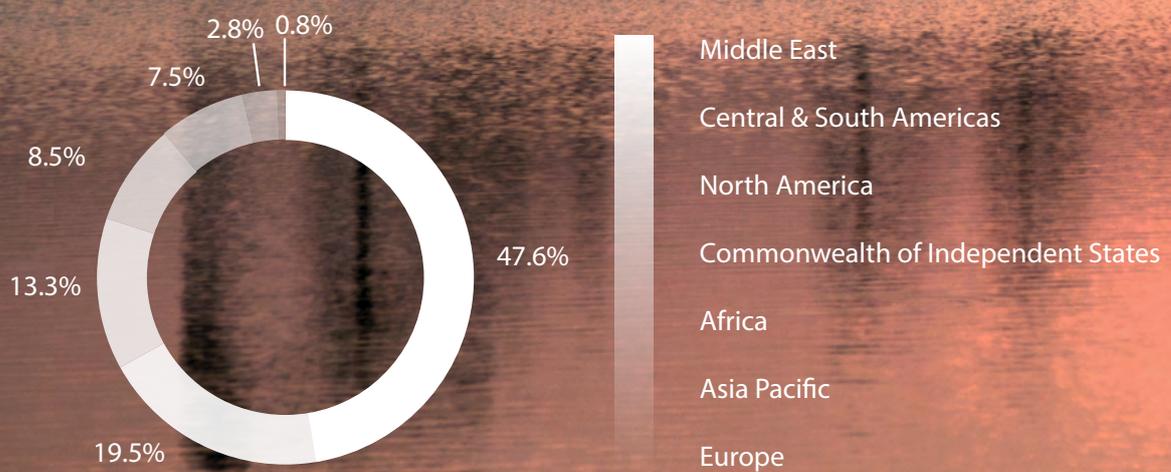
gas may be transported to Western markets in the near future. This also has significant implications for Turkey's energy policy. There were efforts to transport Israeli gas to Europe via Turkey, but Israel later attempted to transport its gas via Greece or Egypt amid rising tensions in relations between Turkey and Israel.

In order to ensure its own supply security, and in line with its goal of transporting excess gas, Turkey intends to increase the capacity of its existing LNG terminals and commission new FSRUs. Turkey, a country with scant gas resources and even more limited production, is expected to make use of strong projects as a means of benefiting from its advantageous geographical location for both producers and consumers. There are many significant items on the energy agenda going forward, including but not limited to the global excess supply of LNG, an increase in liquefaction capacities, a decrease in LNG prices owing to a slowdown in global economic growth, all taking LNG prices to levels close to natural gas prices. Having such possibilities on the table, Turkey is expected to maintain its interest in pipeline projects, which are always safer.

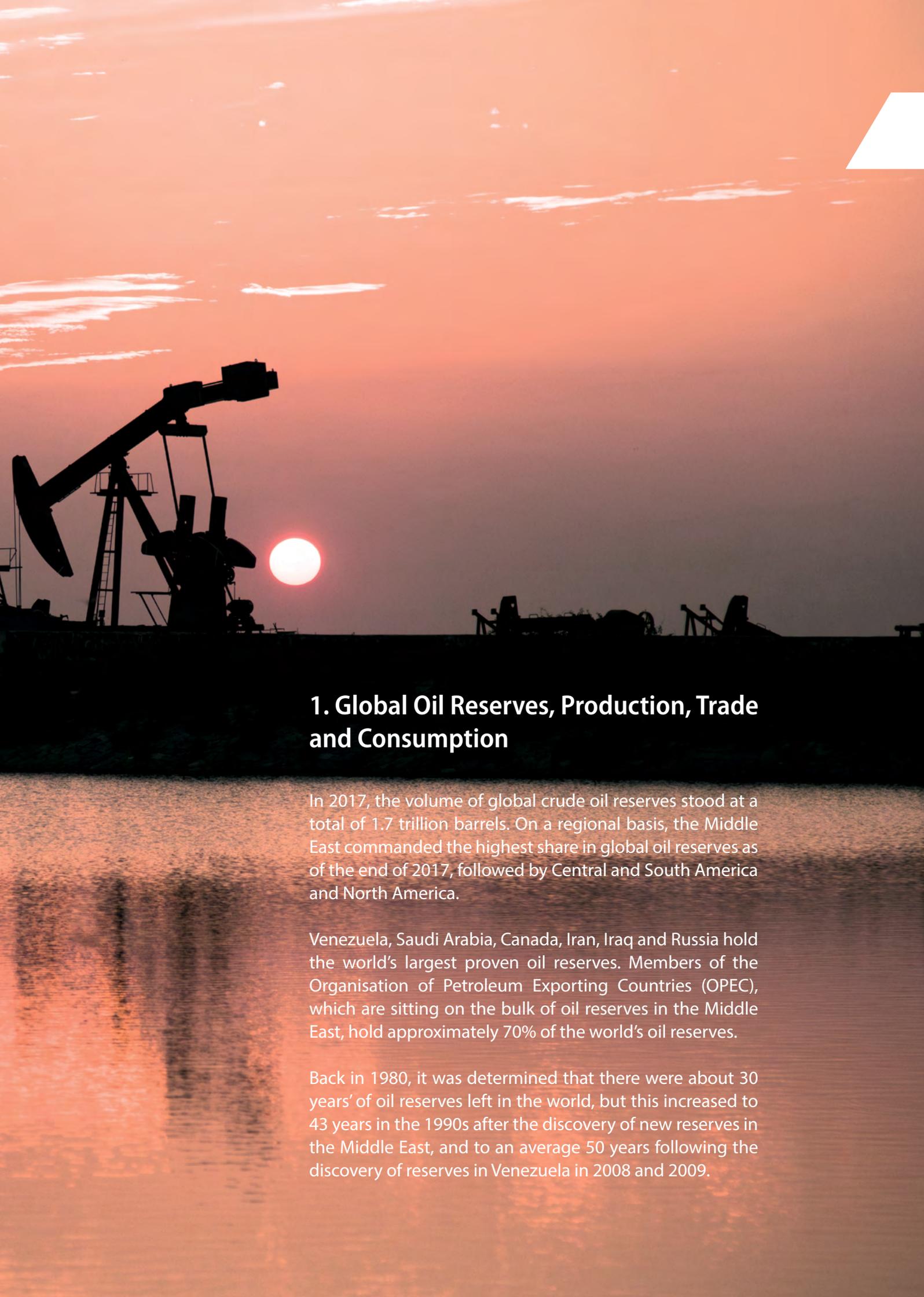


# Overview of the Oil Sector

Chart 22. Global Oil Reserves in 2017



Source: BP Statistical Review of World Energy (June 2018), TSKB Economic Research

The background image shows a sunset over a body of water. In the foreground, the silhouettes of several oil pumpjacks are visible against the bright orange and red sky. The sun is a large, glowing orb on the horizon, and its light reflects on the water's surface. The overall scene is industrial and atmospheric.

## 1. Global Oil Reserves, Production, Trade and Consumption

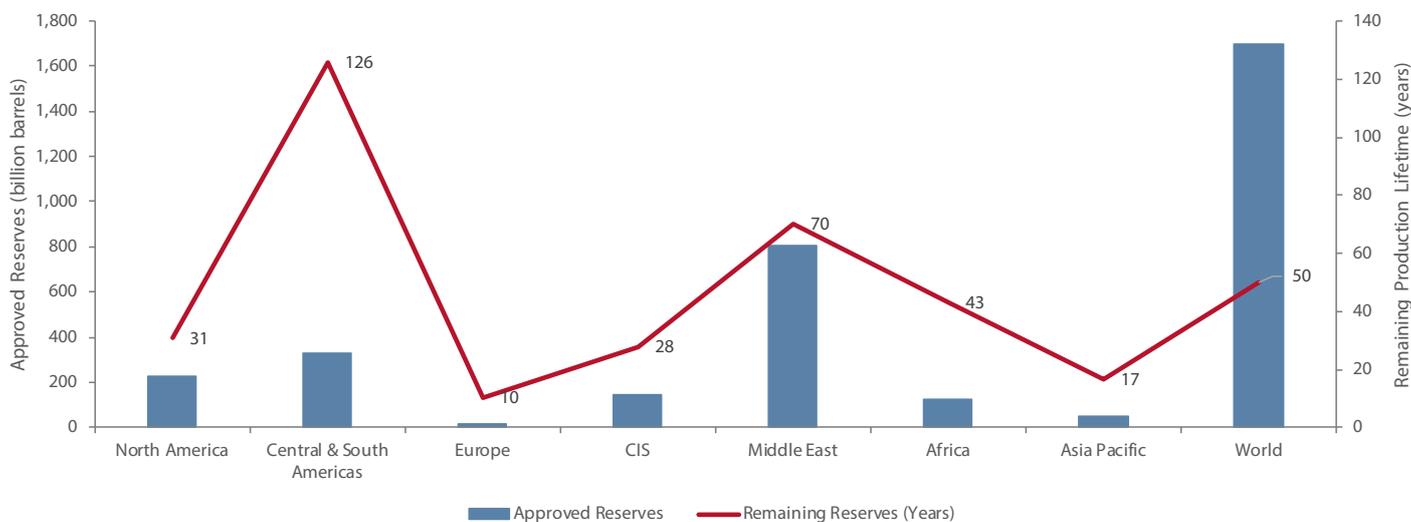
In 2017, the volume of global crude oil reserves stood at a total of 1.7 trillion barrels. On a regional basis, the Middle East commanded the highest share in global oil reserves as of the end of 2017, followed by Central and South America and North America.

Venezuela, Saudi Arabia, Canada, Iran, Iraq and Russia hold the world's largest proven oil reserves. Members of the Organisation of Petroleum Exporting Countries (OPEC), which are sitting on the bulk of oil reserves in the Middle East, hold approximately 70% of the world's oil reserves.

Back in 1980, it was determined that there were about 30 years' of oil reserves left in the world, but this increased to 43 years in the 1990s after the discovery of new reserves in the Middle East, and to an average 50 years following the discovery of reserves in Venezuela in 2008 and 2009.

North America and the Middle East are responsible for the highest levels of oil production. The majority of the increase in oil production between 2000 to 2017 was supplied by the Middle East, the Commonwealth of Independent States (CIS) and North America. IEA data indicates that global oil production stood at 92.4 million barrels/day in 2016 and projects this will increase to 101.9 million barrels/day by 2040.

Chart 23. Proven Oil Reserves to Estimated Remaining Production

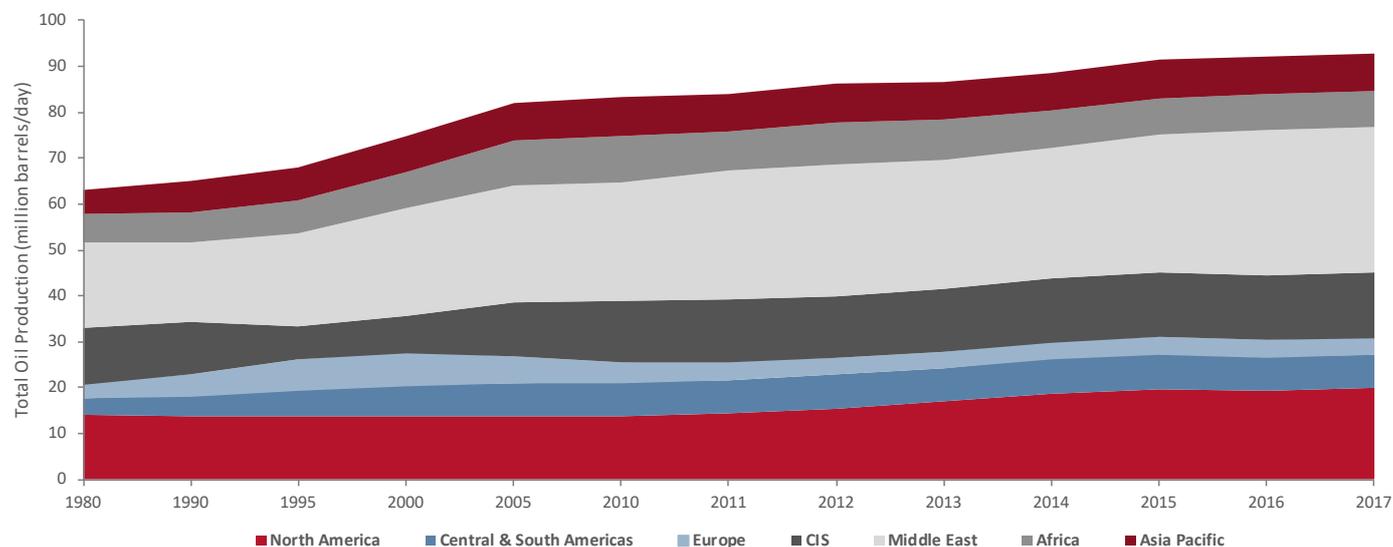


In 2017, oil consumption stood at 98.2 million barrels/day, following a CAGR of about 1.3% in oil consumption since 1980. The share of 10 highest oil consuming countries within total consumption stood at around 60%.<sup>2</sup> Considering the GDP size of these countries, it shows that they are among the largest economies in the world. Data provided by the U.S. Energy Information Administration (EIA) indicates that the transport sector accounted for 43% of oil consumption in 2016, followed by the petrochemicals and industrial sectors (19% of the total), and buildings and electricity generation (14%), with the remainder consumed in other sectors such as aviation. IEA scenarios project that by 2040, the composition of oil consumption will remain broadly constant, but with an annual growth rate will be around 0.4%.

Looking at the average cost of producing one barrel of oil, countries in the Middle East including Kuwait, Saudi Arabia, Iraq and Iran are able to produce at the lowest cost while it is most expensive in the U.S., Venezuela, Norway and Mexico.

New investments for oil production will continue between 2018 and 2030. The production cost per barrel of oil to be produced in new oil fields will vary on a regional basis. Estimates indicate that the cost of oil production will be between USD 20 to 65 per barrel following new investments.

Chart 24. Global Oil Production



Source: BP Statistical Review of World Energy (June 2018), TSKB Economic Research

<sup>2</sup> BP Statistical Review of World Energy (June 2018)

## 2. Oil Sector in Turkey

Oil constitutes 30% of Turkey's total primary energy supply and an average of 35% of Turkey's final energy consumption. Turkey's crude oil production stands at around 2.5 million tonnes per annum while the annual crude oil imports amount to an excess of 25 million tons on average in the last 3 years. More than 90% of oil needs is covered through imports. Turkey's energy imports (natural gas and oil) are so significant due to the country's limited natural resources, a fact emerging as a key factor contributing to the increase in foreign trade deficit.

Oil and natural gas exploration projects in the Black Sea and the Mediterranean will be stepped up with the help of the recently-purchased drilling vessel. In addition, government officials announced that if the exploratory work in the Thrace region strikes significant oil reserves, these will be extracted by the private sector.

### a. Oil Reserves, Oil Production, Refineries and Refinery Products in Turkey

Calculations for 2017 show that Turkey's producible oil reserves stood at 324 million barrels, providing approximately 18 years of reserves for the remaining producible crude oil reserve. Reserves are mostly located to the southeastern region of the country. The Turkish Petroleum Company (TPAO), the oil and gas exploration and production company, carries out about 75% of the oil production in Turkey.

In 2017, 17.9 million barrels of oil (49,171 barrels/day) were produced in Turkey. Turkey's oil production constitutes 0.1% of global oil production. As resources are limited, the sector is highly dependent on imports.

Turkey imported an average of 95% of its oil from five countries between 2014 and 2017, a proportion that fell to 93% in the first nine months of 2018.

Iran's share in Turkey's crude oil imports was 48% in the first nine months of 2017 but dropped to 41% in the first nine months of 2018. Iran's share in Turkey's

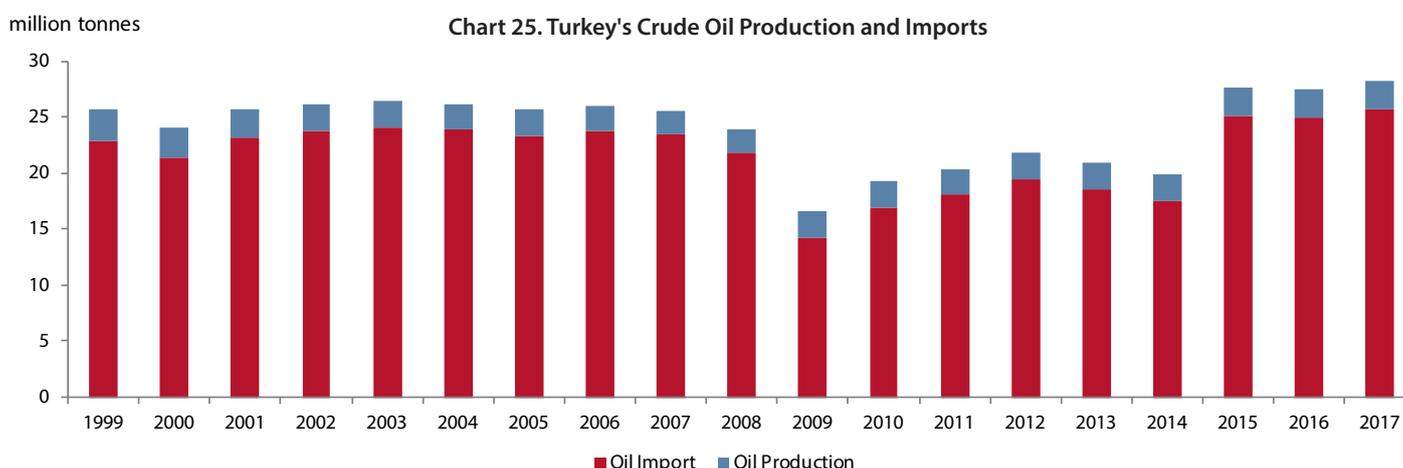
**Table 2. Oil Refineries in Turkey and Features**

Oil Refinery	Capacity Utilization Rates	Refining Capacity (million tonnes)	Refinery Sales Quantity (million tonnes)
İzmit	107.4%	11.0	14.8
İzmir	106.3%	11.0	10.4
Kırıkkale	101.3%	5.0	4.4
Batman	92.5%	1.1	0.8
Total		28.1	30.4

**Table 3. Production Growth at Tüpraş Oil Refineries**

Production at Tüpraş Oil Refineries (x1,000 tonnes)	2015	2016	2017
Diesel	8.2	9.4	9.6
Gasoline/Naphtha	5.8	6.1	6.1
Jet Fuel/Gas Oil	5.1	4.6	4.9
Bitumen	2.9	3.4	3.5
Fuel-oil	2.9	2.0	2.1
Other	2.3	2.5	2.7
Total	27.3	27.9	28.9

Source: TÜPRAŞ Annual Reports, TSKB Economic Research



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

<sup>3</sup>TPAO Sectoral Report (2017)

total imports of "crude oil and petroleum products" declined to 22% from 30% after TÜPRAŞ reduced purchases with effect from May 2018, when the U.S. declared sanctions against Iran. The course of the process will continue to depend on political developments.

TPAO operates via four oil refineries located in İzmir, İzmit, Kırıkkale and Batman. The İzmit and İzmir refineries account for the lion's share portion (more than 80%) of refinery production. TÜPRAŞ refines crude oil to produce 37 different petroleum products, including diesel fuel, gasoline, naphtha, jet fuel, bitumen, fuel-oil and LPG.

Diesel is the most commonly consumed petroleum product in Turkey. Although the amount of crude oil processed in Turkish refineries has increased by one third since 2001, the refineries have not been able to meet the demand for diesel in Turkey. To make up for this deficit, refineries and wholesale suppliers import diesel. In 2017, diesel imports amounted to about 13.5 million tons, over half the 24.2 million tonnes of diesel consumed.

TÜPRAŞ refineries have recently been working at 100% capacity, or even beyond their nameplate capacities due to the impact of the efficiency increase obtained through the fuel-oil project.

## **b. Oil Consumption in Turkey**

Turkey's oil consumption is mainly based on imported oil. Calculations show that the daily oil consumption grew at an average annual rate of 3.3% from 1980 to 2017. Increasing demand in the transportation, petrochemicals and industrial sectors have been the primary drivers of the increase in consumption. About 10% of the demand is met by domestic resources, with the remaining 90% imported. In 2017, Turkey imported 65% of crude oil and petroleum products it consumed, mainly from Iran, Russia and Iraq.

A sectoral breakdown of Turkey's oil consumption in the last 2 years highlights that the transportation sector accounted for 64% of the total consumption (chiefly in road transport), followed by the petrochemicals sector (16% of total consumption), agriculture and households (10%) and the industrial sector (10%).



The transportation sector has been the main driver of the increase in oil consumption, while of oil's share in electricity generation has been gradually decreasing. The share of oil in global electricity generation declined from 11.5% in 1990 to 3.5% in 2017, while dropping to just 0.2% in Turkey in the same period. Oil was replaced with natural gas and renewable energy resources in electricity generation, both globally and in Turkey during period.

### c. Trading of Oil and Petroleum Products in Turkey

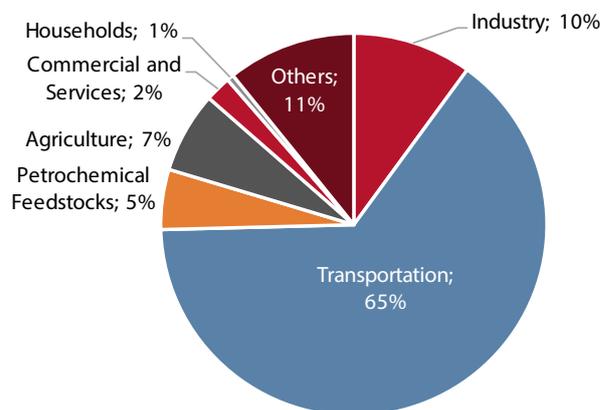
Crude oil imports have not been publicly announced in terms of their financial value since 2011, but a progression of imported volumes by year is provided in Chart 25.

Crude oil imports made up about 60% of total oil imports in 2017 with Iran, Russia and Iraq having the highest share in Turkey's total oil imports. Imports from these three countries constitute 62% of total oil imports.

Before the sanctions against Iran were announced in November, oil prices increased to USD 86 per barrel on the assumption that there could be supply constraints in the market once Iranian crude was off limits. Subsequently, in a significant development, the U.S. surprised observers by granting oil trade exemptions to eight countries (China, India, South Korea, Turkey, Italy, Greece, Japan and Taiwan) for a period of six months. In addition to the exemption, high stock levels of the U.S. and the expected negative effect on global demand brought about by tensions between the US and China for the coming period set the stage for a fall in oil prices to USD 60 per barrel.

The foundation of the STAR Refinery in Aliğa, İzmir was laid in 2011. The refinery has a crude oil processing capacity of about 10 million tonnes. The refinery aims to produce 1.6 million tonnes of naphtha, 1.6 million tonnes of jet fuel, 4.5 million tonnes of low-sulphur diesel, 700,000 tonnes of petroleum coke, 420,000 tonnes of mixed xylene, 480,000 tonnes of reformat, 160,000 tonnes of phosphor and 260,000 tonnes of

Chart 26. Sectoral Breakdown of Oil Consumption (2017)

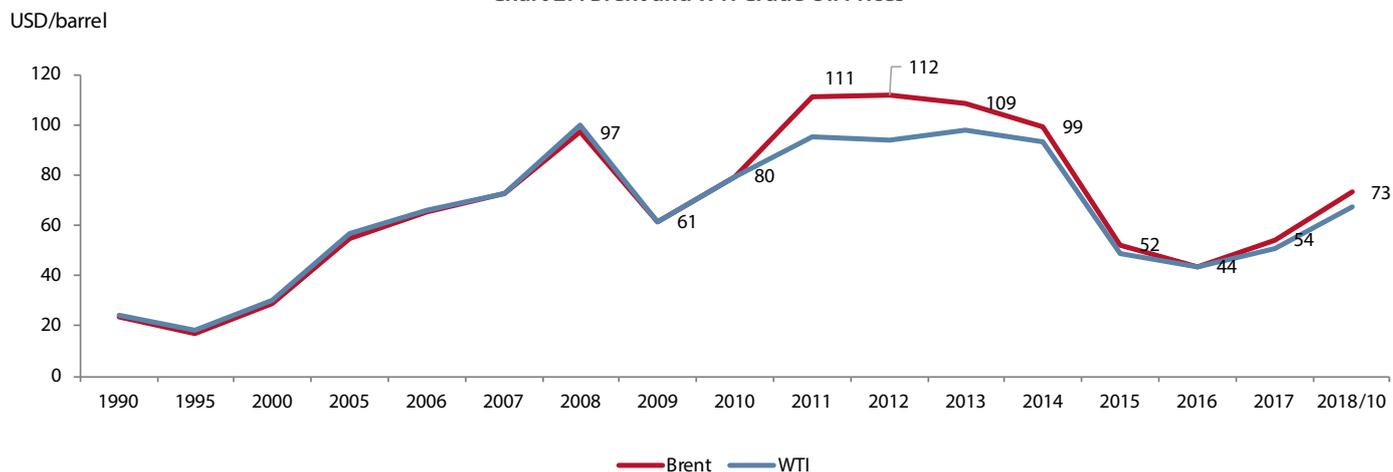


Source: MENR Energy Balance Table (2017), TSKB Economic Research

LPG. The STAR Refinery is expected to reduce Turkey's external dependence on petroleum products and provide a positive contribution to the current account balance.

The state oil company of Azerbaijan, SOCAR, which also owns Petkim, plans to establish a second petrochemical plant in the upcoming years. Feasibility studies for the investment are planned to be completed in 2019. The completion of the investment may take up to 5 years and the investment amount is expected to reach about USD 2-2.5 billion.

Chart 27. Brent and WTI Crude Oil Prices



Source: EIA, TSKB Economic Research

### 3. Developments in Oil Prices

Oil prices are influenced by a myriad of factors, specifically in terms of supply and demand. The most significant factors are listed below:

- Reserves, stocks and production of oil producing countries,
- Joint decisions to increase/ reduce production taken by organizations of petroleum exporting countries (such as OPEC),
- Progress of new investments and of current production by shale oil producers,
- Economic growth rates globally, chiefly in oil consuming countries,
- Investment costs required to discover and process new oil wells,
- Political developments, embargoes and trade wars concerning oil producing countries,
- Legal regulations which impact oil production and trade,
- Rates of increase in the share of electric vehicles in transport sector, a major industry for oil consumption,
- Development of technologies which will save resources in the transport and manufacturing sectors,
- Climate change and low carbon policies.

In the past, oil prices have tended to increase at times when oil producing countries faced political and economic crises (such as the Iranian Revolution of 1979, the Iraq-Kuwait War of 1990, the September 11 attacks of 2001 and the Libyan Crisis of 2011), considering that there could be a risk of stagnation or interruption of oil supplies. However, oil prices have tended to decrease at times of economic recession, the supply of shale oil and oil by OPEC's largest producers increases, or when the value of the USD becomes stronger against other major currencies.

#### a. Developments in Global Oil Prices

Although Brent crude only has a 1% share in the global oil sector, it is the most commonly used indicative price and serves as a benchmark. Brent represents a thicker quality than in the past, but is still an ideal oil type for refining. Brent crude is rendered more attractive by the fact that the oil fields close to the UK and Norway are located on maritime routes. Another type of oil serving as a benchmark is the West Texas Intermediate (WTI) in the U.S., renowned for its low sulphur content.

The post-2014 supply surplus in the global oil sector has whittled away since 2016. Political turmoil in various countries has exerted upside pressure on pricing. Oil prices, which had stood at USD 30 per barrel in 2016, rose to USD 50-60 per barrel in 2017. In the third quarter of 2018, the price of benchmark Brent crude oil surged to USD 80 per barrel before receding to about USD 60 per barrel in November under the impact of production increase goals by Saudi Arabia and Russia and the increase in U.S. oil stocks.

Oil prices in global markets are expected to be influenced by recent political developments. Ongoing economic and political tensions in Venezuela, the imposition of U.S. sanctions on Iran and the position to be taken by Saudi Arabia - known as the "central bank of oil", as well as Gulf states liaising with Saudi Arabia in 2019 will all have a decisive impact on price levels. In addition, any indicators regarding any increase or decrease in U.S. oil stocks will influence the direction of oil prices.

The rise of the use of alternative systems and resources in transportation, including electric vehicles and mass rail transportation systems will play a key role in limiting the increase in oil demand in the medium-long run. The economic growth rates in chief oil producing countries will also be decisive on the demand side and influence prices.

Key producers such as Russia and Saudi Arabia are expected to shape production quantity and market supply while the U.S. shale oil is set to influence the direction of oil prices in the coming period. In its October 2018 "Commodity Report", the World Bank set out its projection that oil prices would average USD 66 per barrel in 2019 on a real basis and drop to USD 60 per barrel by 2030. However, it is worth cautioning that, as with all projections, the accuracy of this projection depends on political developments.

#### b. Price of Petroleum Products in Turkey

Prices of petroleum products in Turkey are impacted by changes in the crude oil prices, exchange rate volatility and taxation. As far as gasoline and diesel fuel are concerned, the final sales price is mostly composed of taxes. According to figures in the 2017 Oil Sector Report prepared by EMRA, tax accounted for 60% of final diesel prices and 54% of gasoline prices in 2017.

Despite having similar product prices, the final price of gasoline is higher as the tax burden on gasoline is higher. The Council of Ministers resolution taken on May 17, 2018 guaranteed that end users would not be affected by increases in fuel prices arising from exchange rate fluctuations. The method employed to that end was to apply subsidies on SCT to protect end users from the impact of increases in the product costs of fuel. It is assumed that this will be a temporary measure taken to protect end users from price volatility in the short run. Considering the overall economic conditions, it is thought that the reinstatement of the former system, which requires a proportional increase in the SCT, is now inevitable.

# Oil Prices - Iran and Venezuela

The deepening political crisis enveloping Venezuela in 2018 and the US decision to withdraw from the Iran nuclear deal (and the related embargo launched against Iran in November) have increased the likelihood that oil prices will climb to 2014 levels.

Venezuela has the largest proven oil reserves in the world. Iran, on the other hand, ranks third behind Saudi Arabia. The BP Statistical Review of World Energy (2018) finds that Venezuela was home to 17.9% of the world's total proven oil reserves with 9.3% of the world's oil reserves located in Iran. Although these two countries hold 27.2% of proven oil reserves, they only account for approximately 7.7% of the world's crude oil production (Iran - 5.4%, Venezuela - 2.3%).

This share had stood at 9% in the early 2000s but has decreased gradually since then. However, even under such circumstances, how would a decrease in production by these two countries affect oil prices?

The OPEC Secretary-General Mohammad Barkindo, speaking at the "Oil & Money Conference" in London in the first week of October, said the oil market remained balanced and well supplied, and the supply cuts in Venezuela and Iran would be overcome with the support from other countries. In June, OPEC countries and Russia reached a deal to restore crude oil production to pre-November 2016 levels.

On November 30, 2016, OPEC and non-OPEC countries reached an agreement in Vienna to cut total crude oil production by 1.76 million barrels/day.<sup>4</sup> According to IEA's Oil Market Report, dated September 13, 2018, OPEC's crude oil production had risen to 32.63 million barrels per day following increases in crude oil production in Libya, Iraq, Nigeria and Saudi Arabia in August. The report also states that the additional production from these four countries could make up for the significant decline in Iran and the slight decrease in Venezuela.<sup>5</sup>

In the wake of the imposition of sanctions against Iran, Saudi Arabia declared that it could step in and increase production to a level that would compensate Iran's contribution to global oil market. More importantly, it was clearly seen before sanctions took effect that China and India, two countries accounting for about 18% of global oil consumption in 2017, would adopt a different stance to the U.S. when it came to importing oil from Iran. Nonetheless, a combination of political turmoil and economic crisis, coupled with reduced oil production in

Venezuela, has stoked expectations that oil prices will remain near their current levels in the coming period.

It is generally agreed that the global economy would be shaken if oil price rises beyond USD 100 per barrel. Such a surge in oil prices, combined with global economic developments, may result in a reduction in demand for oil. Likewise, the European economy, Chinese economy and emerging markets (including Turkey) - all oil importers - may incur more costs. Taking into account an imminent decline in the rate of growth of global oil consumption in the medium run, the reduction in oil production in Venezuela and Iran could be offset by increased production in larger oil countries and a decrease in oil consumption.

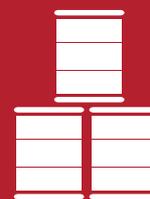
Turkey, a net oil importer, was negatively affected by the near 50% increase in the price of Brent crude oil between October 2017 and October 2018. However, Brent crude prices later declined to around USD 60 per barrel in November, having a positive impact on the nation's economy.

Finally, the deal reached between the U.S. and China during the G20 summit in Argentina led to an increase in oil prices. If oil prices remain at their current levels in the short run, the costs of energy in Turkey - including natural gas and electricity - will eventually rise.

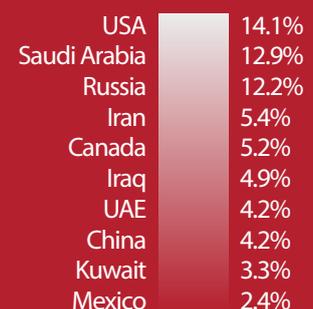
<sup>4</sup> OPEC Monthly Report (December 2016).

<sup>5</sup> International Energy Agency Oil Market Report (September 13, 2018).

## The World's Top 10 Holders of Proved Crude Oil Reserves



## Top 10 Oil Producing Countries in 2017



# Overview of the coal sector



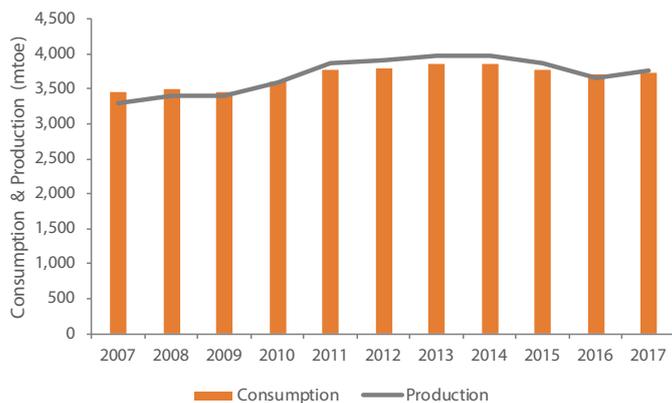


# 1.Global Coal Reserves, Production, Trade and Consumption

One of the oldest fuels on earth, coal is a reliable fossil fuel that can be extracted at low cost. Coal is also popular as a fuel because of its production in many countries around the world and its common trade. Coal is mainly classified into two as hard coal (anthracite) and brown coal (sub-bituminous coal and lignite) in the consideration of its calorific value, volatile constituents, fixed carbon, coking and caking features.

According to the BP 2018 Statistical Review of World Energy, out of the proven coal reserves for 2017, 323.6 billion tonnes of coal (31.3%) is located in European-Eurasian countries, 424.2 billion tonnes of coal (41.0%) in Asia-Pacific countries, 258.7 billion tonnes of coal (25.0%) in North American countries, 14.4 billion tonnes of coal (1.4%) in African-Eastern Mediterranean countries and 14.0 billion tonnes of coal (1.4%) in Central and South American countries. The report also states that the U.S. is host to the largest coal reserves in the world. It is followed by Russia, Australia, China and India. Between them, these five countries account for around 77% of the world's total coal reserves.

Chart 28. Development of Global Coal Production and Consumption



Source: BP Statistical Review of World Energy (June 2018), TSKB Economic Research

There are proven coal reserves in more than 80 countries around the world. Total coal production in 2017 stood at 3,768.6 million tonnes of oil equivalent (mtoe). The CAGR in global coal production was realized at 1.2% between 2007 and 2016, with a growth rate of 2.9% in 2017. The CAGR in global coal consumption between 2007 and 2017 stood at 0.8%.

Global coal production increased by 105.1 mtoe in 2017, with China accounting for 56 mtoe of this increase and the USA accounting for 23 mtoe. The growth in consumption of coal was less than the growth in coal production. Global coal consumption

Taking into consideration the proven reserves and production, global proven reserves have the capacity to meet 134 years of production based on 2017 figures. Ranking countries by their proven reserves, Russia has 391 years of capacity, followed by the USA with a capacity of 357 years and Australia with a capacity of 301 years, but with China only having enough coal to last 39 years at its current rate of production.

## 2. Coal in Turkey

The MENR stated that Turkey is globally considered to have a medium level of lignite resources and a low level of hard coal, in terms of reserves and production quantity. Although Turkey accounts for 0.6% of global coal production, it is a net importer, as its consumption is higher.

Data from BP Statistical Review of World Energy (June 2018) shows that Turkey produced 20.8 mtoe of coal and consumed 44.6 mtoe of coal in 2017. Accordingly, Turkey has a proven coal reserves of 11,353 million tonnes – enough to last 115 years at current production rates, as of 2017.

Coal is indispensable for electricity generation and steel production in both developed and developing countries. It plays a key role in Turkey's short-term and medium-term development and energy plans. Coal production is also supported by government funds within the framework of goals to make better use of domestic resources. Production has continued to rise due to royalty tenders and the increases in consumption at thermal power plants.

Almost all coal in Turkey is classified as lignite. Hard coal is only produced in Zonguldak. The total hard coal reserves in the Zonguldak Basin amount to 1.30 billion tonnes, with 506 million tonnes of proven reserves. In the early 1980s, 80% of the total hard coal consumption in Turkey was met through domestic resources. Since then, there has been a drop due to the increase in hard coal use in the manufacturing industry and the growth in the number and capacities of hard coal-fired power plants, and the proportion of coal produced in Turkey that was hard coal dropped to 3.3% by 2017.<sup>7</sup>

TEİAŞ statistics from September 2018 indicate that, as of end September, the installed capacity at coal-fired power plants was 18,997 MW, corresponding to 21.6% of total installed capacity. The total installed capacity of coal-fired power plants working with domestic coal stood at 10,204 MW (11.6% of Turkey's total installed capacity) with coal-fired power plants operating with imported coal having a total capacity of 8,794 MW (10%). In the first eight months of 2018, 48.6 TWh of electricity was generated at coal-fired power plants, and its share in total electricity generation stood at 21.5%.

As set out in various policy documents starting with the 10th Development Plan and reiterated within the framework of the "New Economic Program" and "2019 Annual Program of the Presidency", electricity generation from domestic resources is a priority item in Turkey's energy policy. In recent years, feed-in tariffs granted to domestic coal-fired power plants as well as payments under the capacity mechanism,

<sup>7</sup> MENR Hard Coal Sector Report (2017)

which was launched in 2018, are both contributing to electricity generation at coal-fired power plants. For many years, energy imports have been the main cause of the current account deficit, and there has been a quest to reduce external dependency in energy, resulting in the promotion of domestic coal. In October 2018, the Minister of Energy and Natural Resources Fatih Dönmez stated that 7 new coal fields would be commissioned; a total of about 19 million tonnes of additional coal would be produced, with 3 million tonnes of hard coal and 15.6 million tonnes of lignite per year, substituting TL 7.5 billion of coal imports per year with domestic coal once the coal fields started production.





# Overview of the Renewable Energy sector





## 1. Development of Renewable Energy in Turkey

Hydropower made up 41% of Turkey's installed capacity of 27.3 GW in 2000. However, despite the high level of hydro-electric generation, other renewable resources only had a negligible presence in the Turkish electricity generation portfolio back then. In the early 2000s, dependence on fossil resources for electricity generation and, in particular, the supply security concerns raised within the context of natural gas power plants accelerated efforts to make use of all domestic resources, especially renewable resources, for electricity generation. Electricity generation from renewable energy was supported through the legislation enacted in 2005 and which has been updated since then. Assuming a more active role in the electricity sector following market liberalization, the private sector has also taken a keen interest in renewable energy plants. Supported by these developments, Turkey's installed capacity in renewable energy increased unrelentingly between 2000 and 2016 to reach 40.8 GW by the end of September 2018. Nonetheless, the increase in the share of renewable energy in total installed capacity has been limited, only reaching 46%, since investments in natural gas and coal-powered plants have also increased in parallel with the rapid growth in demand for electricity.

As can be inferred from the developments in installed capacity in renewable energy, hydro-electric power plants have commanded the largest share among renewable energy resources. However, wind and solar power plants become less costly and more common thanks to advancing energy technologies, and have seen rapid growth in recent years.

The installed capacity at wind power plants rose from 146 MW in 2007 to 6,782 MW as of September 2018. Following the introduction of YEKDEM, private sector investments have mainly focused on İzmir, Balıkesir, Manisa, Hatay and Çanakkale.

According to the Geothermal Power Plant Investors Association, the global installed capacity of geothermal power plants stood at 14,060 MW. Turkey ranks the fourth globally in terms of geothermal installed capacity, which stood at 100 MW in 2007 but achieved a great leap forward - especially in 2015 - and stood at 1,163 MW as of September 2018.

The installed capacity at solar power plants, including unlicensed power plant investments, has reached 4,850 MW, with most of the increase recorded over the last four years. Of this capacity, 2,588 MW was commissioned in 2017 alone. As of September 2018, 98% of the solar power plants in Turkey were unlicensed power plants with an installed capacity of less than 1 MW. All licensed and

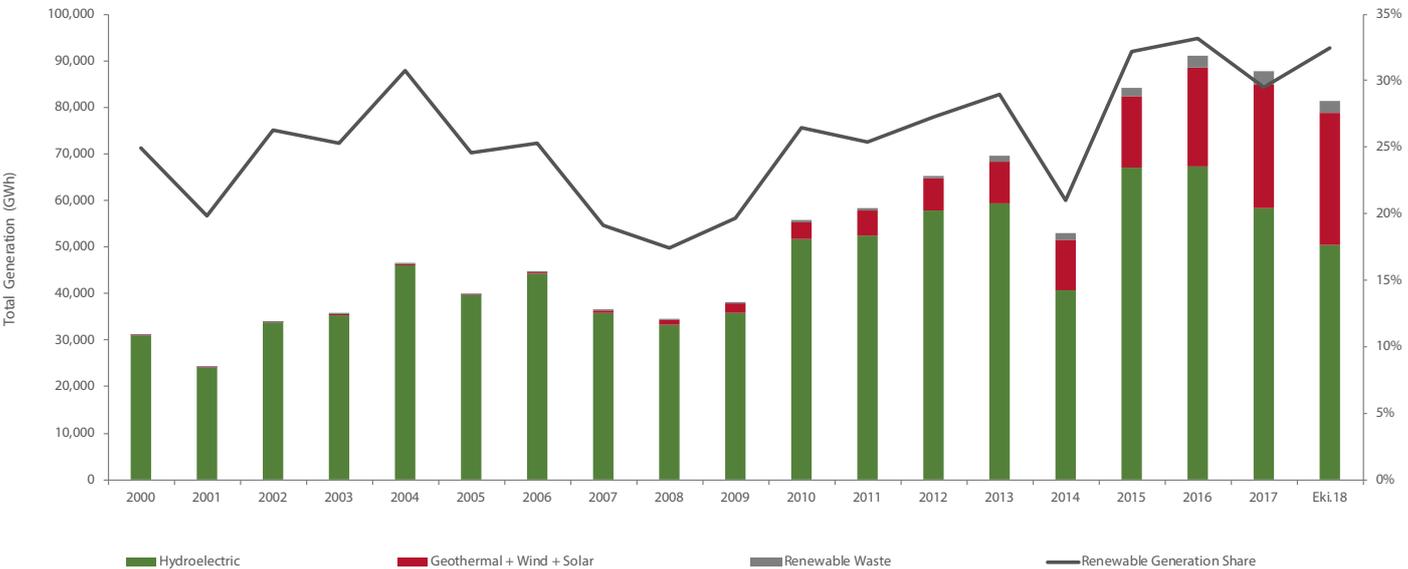
unlicensed power plants are able to benefit from the feed-in tariffs under YEKDEM. This advantage has allowed unlicensed solar power plants to gain a larger share of renewable energy plants than other power plants.

The share of generation at renewable energy plants within the installed capacity has been rising. In 2000, 25% of Turkey's total generation was provided by renewable energy plants, a proportion that had risen to 33% by the end of August 2018.

**a. Renewable Energy Resources Support Mechanism (YEKDEM)**

YEKDEM was launched in order to promote the establishment of renewable energy plants and has been fundamentally supported by two basic laws and various secondary legislation. It is designed in a way to offer certain advantages for renewable energy plants. A major advantage of this is that renewable energy plants have the right to sell electricity at USD-denominated feed-in tariffs for 10 years after commissioning under the Renewable Energy Law. Furthermore, if domestically produced equipment is used in power plant installation, a feed-in tariff is applied for the first 5 years, and incentives for the use of domestically produced equipment in proportion to the locality rate is granted, according to the type of equipment used.

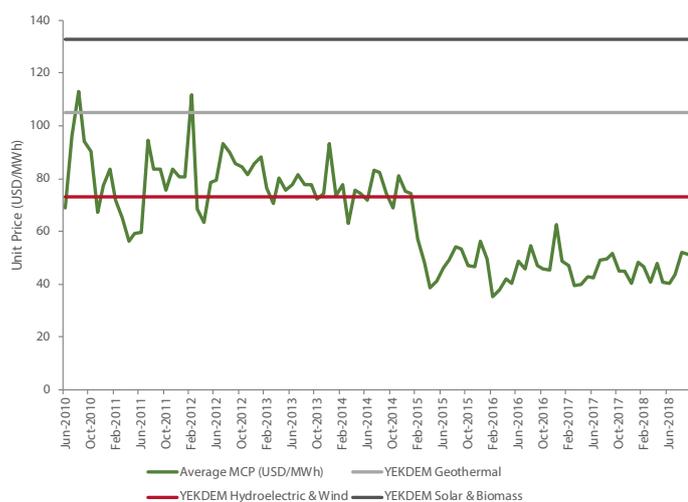
Chart 29. Turkey's Renewable Energy Generation Indicators



Source: TEİAŞ, TSKB Economic Research

As the following chart indicates, YEKDEM unit prices have always been higher than the MCP for solar power plants and biomass power plants. The same applies to geothermal power plants, except in certain months of the year. YEKDEM unit prices for hydro-electric power plants and wind farms have also become highly advantageous after the Turkish Lira started depreciating against the USD after 2015.

Chart 30. Arithmetic Mean for MCP and Development of YEKDEM Unit Prices



Source: EXIST, TEİAŞ, CBRT, TSKB Economic Research

As YEKDEM unit prices are higher than market prices, YEKDEM applications swelled in number, especially since 2015. In 2014, only 93 licensed power plants were included in the Final YEK list, but the number surged to 708 in 2018. Of the licensed power plants included in the Final YEK list for the year of 2018, which have a total installed capacity of 19,266 MW, 447 power plants were hydro-electric power plants and 151 were wind farms.

Table 4. Final YEK List in 2018 (Licensed Power Plants)

Final YEK List (MW)	2011	2012	2013	2014	2015	2016	2017	2018
Hydroelectric	21	930	217	598	2,218	9,561	11,096	11,706
Wind	469	685	76	825	2,775	4,320	5,239	6,200
Biomass	45	73	101	147	193	204	300	349
Geothermal	72	72	140	228	390	599	752	997
Solar	-	-	-	-	-	-	13	14
Total	607	1,760	534	1,798	5,575	14,684	17,400	19,266

Source: EMRA, TSKB Economic Research

The commissioning of private sector investments continued until 2015 thanks to the system price advantage. Due to the depreciation of the Turkish Lira against foreign currencies, which started from 2015, YEKDEM tariffs proved more attractive, and the number of renewable energy plants seeking to benefit from USD-denominated feed-in tariffs under YEKDEM increased over the same period.

The feed-in tariff under YEKDEM applies to power plants that will be commissioned by the end of 2020. It was previously announced that the YEKDEM mechanism would be abolished by the end of 2020. There have been no additional clear statements on what regulation will take effect after 2020.

## b. Renewable Energy Resource Areas (YEKA)

Under the recent YEKA process launched by the MENR, tenders are held to transfer certain areas to investors for electricity generation from renewable energy resources on the condition that domestically produced equipment is used in such generation operations.

In September 2015, Karapınar was declared as a YEKA. A tender was subsequently held by the MENR for the installation of a 1,000 MW solar power plant and a solar panel factory with a capacity to manufacture an annual minimum of 500 MW photovoltaic modules in the Karapınar Energy Specialized Industrial Zone. The electricity generated at the power plant is subject to a 15-year feed-in tariff. The tender was awarded in March 2017 to the JV consisting of Kalyon and Hanwha, Kalyon's South Korean partner, over a price support bid of 6.99 USD cents/kWh.

Another tender for a wind farm held in 2017 with a 15-year feed-in tariff was awarded to the Siemens-Türkerler-Kalyon Joint Venture, which offered the lowest bid (3.48 USD cents/kWh). The successful bidder plans to establish a wind turbine manufacturing plant which has a minimum manufacturing capacity of 150 turbines/year or 400 MW/year at one single shift and will be commissioned within 21 months at most. A locality rate of at least 65% has been set for the turbines.

It is considered that the submission of bids lower than YEKDEM prices in YEKA tenders reflected the expectations in the period when those tenders were held. YEKA projects have lower profit margins than investments under YEKDEM, and their potential market impacts will be monitored closely. Furthermore, new YEKA tenders are expected to be held for solar power plants and offshore wind farms in the near future.

On June 21, the MENR issued a call for tender for a 1,200-MW offshore wind farm, setting the ceiling price at 8.0 USD cents/kWh. Saros and Gelibolu are the potential locations for the plant. Tender specifications indicate that a contract for generating 50 TWh of electricity will be concluded with the successful bidder. Moreover, the investor will be obliged to file a pre-license application to set up a factory with a generation capacity of 840 MW. About 60% of the turbines are planned to be domestically produced with 80% of the engineers employed under the project to be Turkish nationals.

The deadline for applications for the YEKA-2 Solar Power Plant (SPP), Turkey's second largest solar power tender, is the last week of January 2019. Power plants will be completed in 5 years with a minimum locality rate of 60%. The total connection capacity for the solar power plants to be installed will be 1,000 MW, with 500 MW out of the 1,000 MW planned to be located in the Şanlıurfa-Viranşehir YEKA, 200 MW in the Hatay-Erzin YEKA and 300 MW in the Niğde-Bor YEKA. The SPP to be installed in Niğde-Bor YEKA will incorporate a lithium-ion energy storage system with a minimum capacity of 30 MW/90 MWh (AC).

In early November, the MENR announced that it would hold tenders for wind farms to be established in Balıkesir, Çanakkale, Aydın and Muğla, each with

a capacity of 250 MW. The deadline for bids is March 7, 2019 and the ceiling price at the baseline is set at 5.50 USD cents/kWh. The duration for purchasing electricity under the feed-in tariffs will be 15 years starting from the date when the relevant YEKA License Agreements is signed.

Government officials announced that new tenders will be held for solar YEKA investments with a minimum installed capacity of 50 MW on a provincial basis and with locations extending from Kars to İzmir in a manner to follow the solar movement.

### c. Development of Unlicensed Power Plants

Surplus electricity generated at a renewable energy plant with an installed capacity of less than one MW is availed of under YEKDEM through the distribution company that holds a retail sales license and is commissioned in the area where the plant is located. No sales restraints apply to surplus electricity. However, there needs to be constant consumption at any consumption facility that is related to a generation plant within the framework of subscription.

Government officials declared that roof and facade installations would specifically be supported for solar power generation, and unlicensed generation investments would only be sustained to meet domestic demand.



## 2. Main Issues in Renewable Energy Plants

As is the case with other types of power plants, renewable energy plants may face various problems during the phases of project design, permit and license processes, provision of funding, construction, mounting and installation, provisional acceptance and final acceptance, and ultimately the commissioning and operation of the plant. The following table provides an overview of the main issues arising in renewable energy plants, other than hydropower plants.

**Table 5. Main Issues facing Renewable Energy Plants**

Wind	Solar	Geothermal	Biomass
Uncertainties regarding feed-in tariffs in the post-2020 period			
Environmental problems such as wind farms being located on bird migration routes	Lack of adequate substation capacity in suitable solar power plant areas	High investment costs and risk of failure during the drilling of geothermal wells (USD 1,500/m and 60% failure rate)	Problems in biomass supply, failure to conclude long-term contracts with suppliers
Noise emissions and impacts	The long process of obtaining permits	Sustainability of the geothermal reservoir	Issues with distance to the biomass supplier
Inadequate feasibility studies and lower -than-expected generation	Additional taxes imposed on solar panel imports from China	High CO <sub>2</sub> content in reservoirs	Environmental problems arising from poor management of biomass storage areas
Intermittent generation causing balancing problems	Low capacity factor	The large area of land needed for expropriation	Inadequate feasibility studies and selection of low-quality EPC companies
Contributions updated in line with consumer price index	Long duration of repayment of the investment amount, grid connection costs	Potential negative reaction from the local community	
Massive capital need (USD 1-1.2 million/MW)	Additional regulations on unlicensed solar power plants		



## Post-YEKDEM Investments and Status of Unlicensed Power Plants

It was announced that the feed-in tariff under YEKDEM would apply to power plants that will be commissioned by the end of 2020, and the mechanism will be abolished thereafter. Investors expect the current support incentives, specifically for biomass and geothermal energy resources, to be maintained in order to sustain the increase in the share of renewable energy resources, as set out in the framework of national policies to support domestic energy and the international sustainability standards.

Even if the market practice regarding 10-year feed-in tariffs is discontinued, it is expected that the incentives for domestically produced components will continue to some extent. YEKA tenders, which are expected to continue after YEKDEM, also have regulations in place to promote the production and use of domestically produced parts and equipment.

FX-denominated feed-in tariffs have so far helped renewable energy investments gain access to funding from national and international banks and accelerated the commissioning of such investments. At times of Turkish Lira weakness, power plants not included in the YEKDEM scheme are exposed to a high exchange rate risk, since their proceeds from electricity sales are denominated in TL, but the majority of their investment-related liabilities are denominated in a foreign currency. In addition, one thing that has become clear is that sales prices in the free market stand below the levels that had been expected, suffering from the impact of excess supply in recent years. We may even see renewable energy investments, which for the most part have foreign exchange-denominated investment costs, face slightly more difficulty in gaining funding after the feed-in tariff practice ends.

As of the end of October, 94% of unlicensed power plants are solar power plants. The total installed capacity in unlicensed renewable energy plants (including wind and hydropower plants) stands at 4,908 MW, with solar power plants accounting for 4,842 MW of this amount. TEİAŞ data shows that, as of October 2018, the capacity of unlicensed SPPs given call letters was 6,248 MW while the capacity of unlicensed wind farms given call letters, was 158 MW. Considering the existing installed capacity and the applications in response to which a call letter are issued, it becomes clear that almost all of the unlicensed power plants are solar power plants.

Pursuant to the Capital Movements Circular published on May 2, if the borrower's total loan balance is less than USD 15 million, the sum of the loan to be utilized and the current loan balance shall not exceed the total foreign exchange income of the last three financial years. Although this limitation applies to unlicensed renewable energy plants, it does not apply to licensed renewable energy plants generating electricity under YEKDEM. The circular is expected to have a negative impact on the unlicensed solar power plant market, which is anticipated to become more widespread through roof and facade installations, as well as unlicensed power generation projects still seeking funds for investment. The increase in distribution and connection fees regarding unlicensed solar power plants is another step that will reduce the growth rate of such investments in the upcoming period.



## Expectations and Trends

The existing infrastructure, with the ongoing investments, are more than sufficient to meet the potential demand in the Turkish electricity sector in the upcoming period. It could even be claimed that there is excess capacity when it comes to the short-term supply-demand balance. The short-term issues regarding the electricity market include a sharper increase in supply capacity than can be absorbed by the growth in demand in the last couple of years, weaker growth in demand in 2018 when compared to previous years, and the expectation of limited demand growth in 2019 due to economic recession. The excess supply, excluding hot reserves, could suppress market prices for electricity sales.

Recently, the prices of natural gas and imported coal have been rising, and this increase has been reflected to the power plants, in turn precipitating a rise in TL-denominated electricity prices. Although this is welcome for electricity generation companies, helping them cover their operating costs and the repayments of investment liabilities, the fall in the value of the Turkish Lira compromise this positive development. The sales revenues of firms, which are not included in the YEKDEM and who have taken out FX-denominated loans to finance their investments (and are exposed to market risk), are mostly denominated in TL. The rise in TL-denominated electricity prices, as it stands, has outpaced investors' projections and limits the mitigating impact of the increase in electricity prices for electricity generation companies. This is an issue that will surely be discussed frequently in 2019 under the energy economy. It is a result of changes in macroeconomic balances and is related to the price movements explained above.

The performance of loans in the energy sector will be monitored very closely within the economic agenda in 2019. Players in the energy and banking sectors will adopt a holistic approach to address the problem-free continuation of loan repayments and a strong maintenance of financial sustainability in the energy system.

Sensitivity work on varying exchange rates and interest rates is an important item with respect to all new and ongoing energy investments recently undertaken. This framework includes electricity and natural gas transmission/distribution lines, power plant refurbishment, work to prevent emissions and expansion investments. This may also lead to a controlled review of power plant investments and installed capacity-commissioning schedules in the electricity sector. However, given that demand is closely monitored nowadays, potential delays are unlikely to create major problems.

On the other hand, it was announced that renewable energy support would be discontinued with effect from the end of 2020. If the renewable energy plants for which the projects are already designed cannot be commissioned by the end of 2020, such projects will not be eligible to benefit feed-in tariffs and may not gain access to the expected funding. There are various schools of thought regarding the feasibility of electricity generation from renewables completely under market conditions in the post-2020 period, and it is considered that the process will proceed in line with supply-demand developments in the electricity market.

Similarly, there is another significant item on the agenda for the market players: regular payments by electricity distribution companies to unlicensed power plants, which are mostly made up of photovoltaic solar power plants. This is a matter which is closely monitored, as it is possible that the financial conditions currently affecting distribution companies may have an impact on unlicensed solar power generation companies as well.

Medium-term goals include combining the equipment technology and generation capacity acquired under the awarded and future YEKA projects with the "know-how" on YEK support, and developing an integrated process management system for exporting renewable energy. For this to

happen, it is critical that new YEKA tenders are held on time and successfully concluded.

Price increases in the energy sector affect consumer price inflation, and is a matter of concern nowadays when anti-inflationary measures have gained more importance. This impact becomes more apparent at times when oil prices are high. Having embarked on a rising pattern since the third quarter of the year in USD terms, oil prices should be watched closely, not only with regard to their impact on the current account deficit but also in terms of the negative impact they will have on inflation. Given that natural gas prices move broadly in parallel with oil prices, pricing of all energy products and services, particularly electricity, means there is a fine line to tread between macroeconomic goals such as inflation and tax revenues and the profit expectations of sector players.

It goes without saying that the U.S. sanctions against Iran have been instrumental in the fluctuation of oil prices. After the sanctions were imposed, Saudi Arabia declared that it could step in and increase production to a level which would compensate the decline in Iran's production. More importantly, key consumers such as China and India have pledged a different attitude to the U.S. when it comes to importing oil from Iran. Indeed, the USA has granted exemption to eight countries which have a major share in Iran's oil exports from the sanctions. Nonetheless, against a backdrop of political turmoil and economic bottlenecks, coupled with the 50% decline in oil production in Venezuela, oil prices are set to remain high in the upcoming period.

The price of Brent crude was USD 56 per barrel on October 1, 2017 and USD 85 in October 2018 before subsequently receding to USD 65 per barrel. This has urged net oil importers, including Turkey, to monitor the market more closely. The perception of continued high global risk perception and various instances of possible political turmoil may prevent oil prices from dropping in the short run, the fallout of which could be higher costs of energy, including natural gas and electricity.

In 2019, Turkey is expected to press ahead with its oil drilling and exploration efforts. The declining trend in current account deficit, starting from the third

quarter of 2018, will not alter the fact that Turkey has set aside, and will continue to set aside, substantial funds for energy imports. Various tensions in neighboring countries, and specifically the political fault lines growing ever more apparent in the Eastern Mediterranean, will undoubtedly have a far-reaching impact on Turkey's energy policies. In terms of resource diversification, efforts are expected to turn to alternative pipeline projects and various storage units in 2019. It is yet another fundamental projection that all these expectations will be discussed against a background of general economic trends.

In short, costs and prices will be among the key items on Turkey's energy agenda in 2019, coming in the wake of a period in which Turkey has achieved great leaps in terms of its basic energy infrastructure, liberalized its energy markets to a significant extent, strengthened competitiveness and reinforced its determination to make more use of its domestic resources through policy documents and support mechanisms. Potential key items on the 2019 energy agenda also include the matter of ensuring the financial sustainability of technically (and economically) feasible power plants among those that are exposed to market risk, movements in oil prices and the entire financial burden that energy imports impose on the national economy, developments affecting electricity and natural gas prices, and the systemic and subsequent impacts caused by such movements.



Economic Research  
research@tskb.com.tr

Meclisi Mebusan Cad. No: 81  
Fındıklı İstanbul 34427, Türkiye  
T: +90 (212) 334 5041 F: +90 (212) 334 5234 234

This document was produced by Türkiye Sınai Kalkınma Bankası A.S. ("Industrial Development Bank of Turkey") ("TSKB") solely for information purposes and for the use of registered broker or dealer, whether the registered broker or dealer is acting as principal for its own account or as agent for others, or a bank acting in a broker or dealer capacity as permitted by U.S.A. law. This document shall not be reproduced under any circumstances and is not to be copied or made available to any person other than the recipient. It is produced and distributed in the Republic of Turkey. This document does not constitute an offer of, or an invitation by or on behalf of TSKB or any other company to any person, to buy or sell any security. The information contained herein has been obtained from published information and other sources which TSKB considers to be reliable. No liability or responsibility whatsoever is accepted by TSKB for the accuracy or completeness of any such information. All estimates, expressions of opinion and other subjective judgments contained herein are made as of the date of this document. TSKB may, from time to time, have a long or short position in any of the securities mentioned herein and may buy or sell those securities or options thereon either on their own account or on behalf of their clients. TSKB may, to the extent permitted by law, act upon or use the above material or the conclusions stated above or the research or analysis on which they are based before the material is published to recipients and from time to time provide investment banking, investment management or other services for or solicit to seek to obtain investment banking, or other securities business from, any entity referred to in this document.

Any customer wishing to effect transactions in any securities referred to herein or options thereon should do so only by contacting a representative of TSKB. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior consent of Türkiye Sınai Kalkınma Bankası A.S.

This document does not constitute an offer to sell, or an invitation to subscribe for or purchase, any of the offer shares in any jurisdiction to any person to whom it is unlawful to make such an offer or solicitation in such jurisdiction. The distribution of this document in certain jurisdictions may be restricted by law. Persons into whose possession this document comes are required by TSKB and the managers to inform themselves about and to observe any such restrictions. No person has been authorized to give any information or to make any representation except as contained in this publication.

In making an investment decision investors must rely on their own examination of the Company and the terms of the offering including the merits and risk involved.



Economic Research  
research@tskb.com.tr

Meclisi Mebusan Cad. NO: 81  
Fındıklı İstanbul 34427, Türkiye  
T: +90 (212) 334 5041 F: +90 (212) 334 5234

In order to access TSKB Economic Research products please use the QR code below:



Industrial Development Bank of Turkey  
www.tskb.com

P: +90 212 334 50 50 F: +90 212 334 52 34

E: info@tskb.com.tr    