

# South East Europe Energy Outlook 2021/2022 Country Profile Turkey

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# Country Profile Turkey

1. Economic and Political Background

2. Energy Policy

3. Energy Demand and Supply

4. Energy Markets

- ▶ Oil and Petroleum Products
- ▶ Natural Gas
- ▶ Solid Fuels
- ▶ Electricity
- ▶ Renewables
- ▶ Energy Efficiency and Cogeneration
- ▶ Energy Investment Outlook



## 2. Energy Policy

### (a) National Energy Policy

- (i) *Maximum utilization of renewable and indigenous sources,*
- (ii) *Diversification of energy supplying countries and supply routes,*
- (iii) *Reduction of energy intensity,*
- (iv) *Introduction of nuclear energy into the energy mix,*
- (v) *Reduction of environmental impacts of the energy system,*
- (vi) *Development of a competitive energy market.*

### (b) Governmental Institutions

Abolished and newly established institutions

State Planning Organization (DPT) -----> Strategy and Budget Board (SBB)

General Directorate of Petroleum Affairs (PIGM) -----> General Directorate of Mining and Petroleum Affairs (MAPEG)

Turkish Atomic Energy Authority (TAEK) -----> Nuclear Regulatory Agency (NDK)

Turkish Atomic Energy Authority (TAEK) -----> Turkish Energy, Nuclear and Mining Research Agency (TENMAK)

General Directorate of Renewable Energy (YEGM) -----> (existing) General Directorate of Energy Affairs (EIGM)



# 3. Energy Demand and Supply

a) National energy demand

b) National energy supply

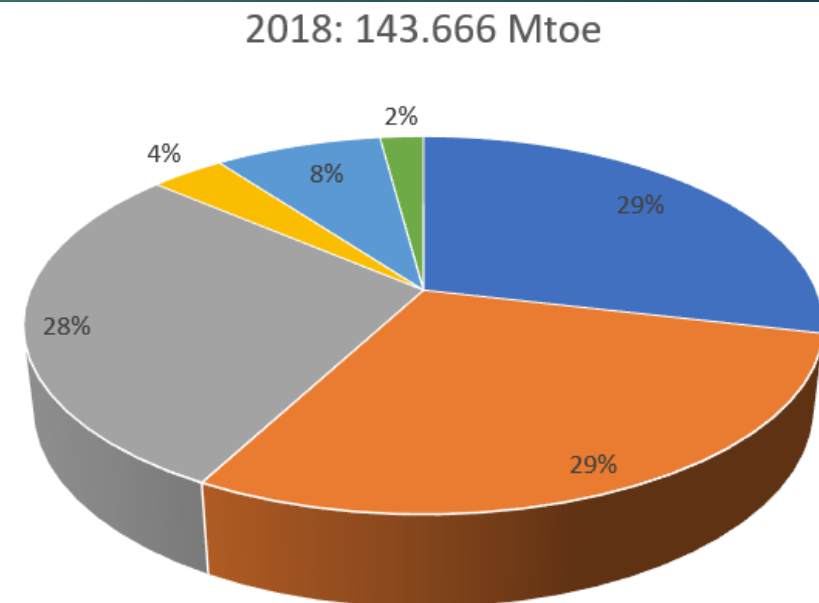
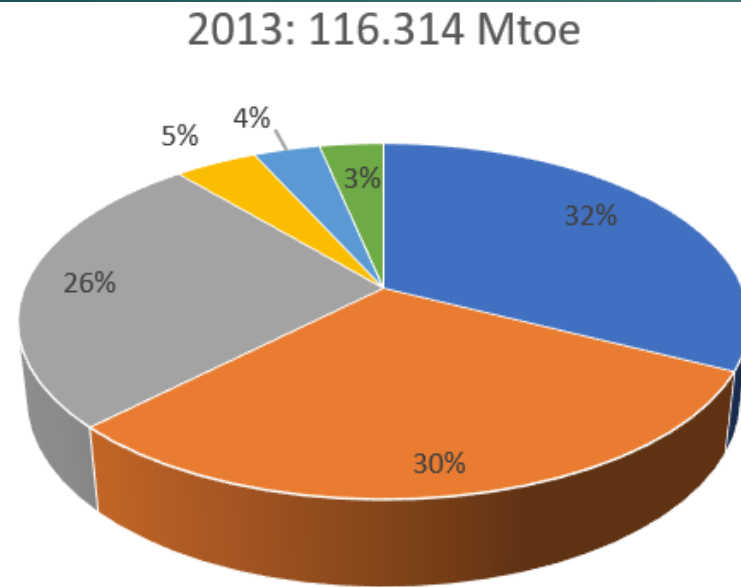
c) Energy balance

d) Energy Mix

e) Energy Dependence

## Total Primary Energy Supply of Turkey, 2013 and 2018

(Source: Ministry of Energy and Natural Resources, 2019)



■ N. Gas ■ Oil ■ Coal ■ Hydro ■ Wind+Solar+Geothermal ■ Biomass+Waste+Other

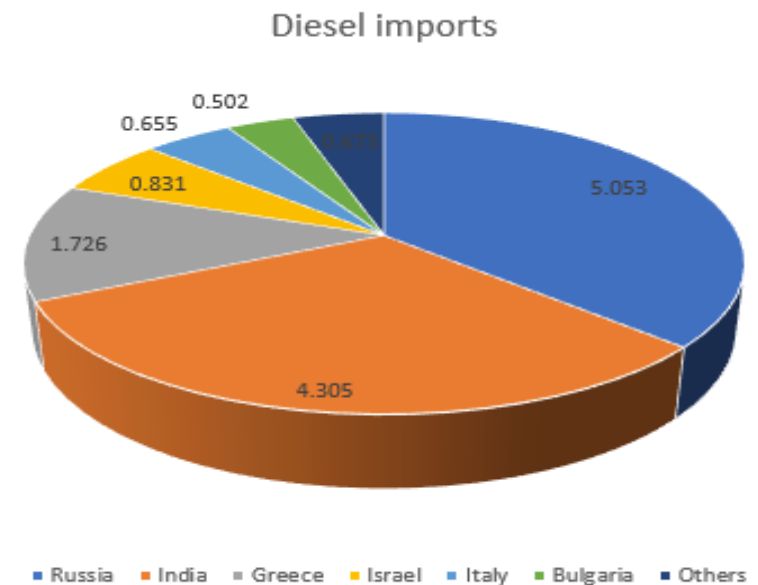
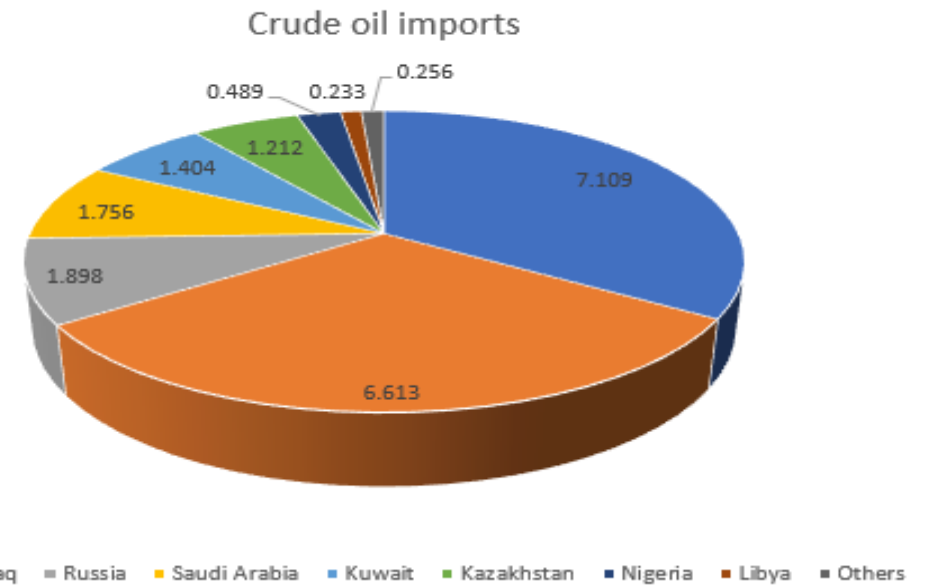
■ N. Gas ■ Oil ■ Coal ■ Hydro ■ Wind+Solar+Geothermal ■ Biomass+Waste+Other

# 4. Energy Markets

## Oil and Petroleum Products

- a) Supply and Demand
- b) Oil Imports
- c) Upstream Sector
- d) Downstream and Midstream
- e) Security of Supply
- f) Planned Projects

Figure 3,4: Crude oil and diesel imports by country 2018 (Mill t)

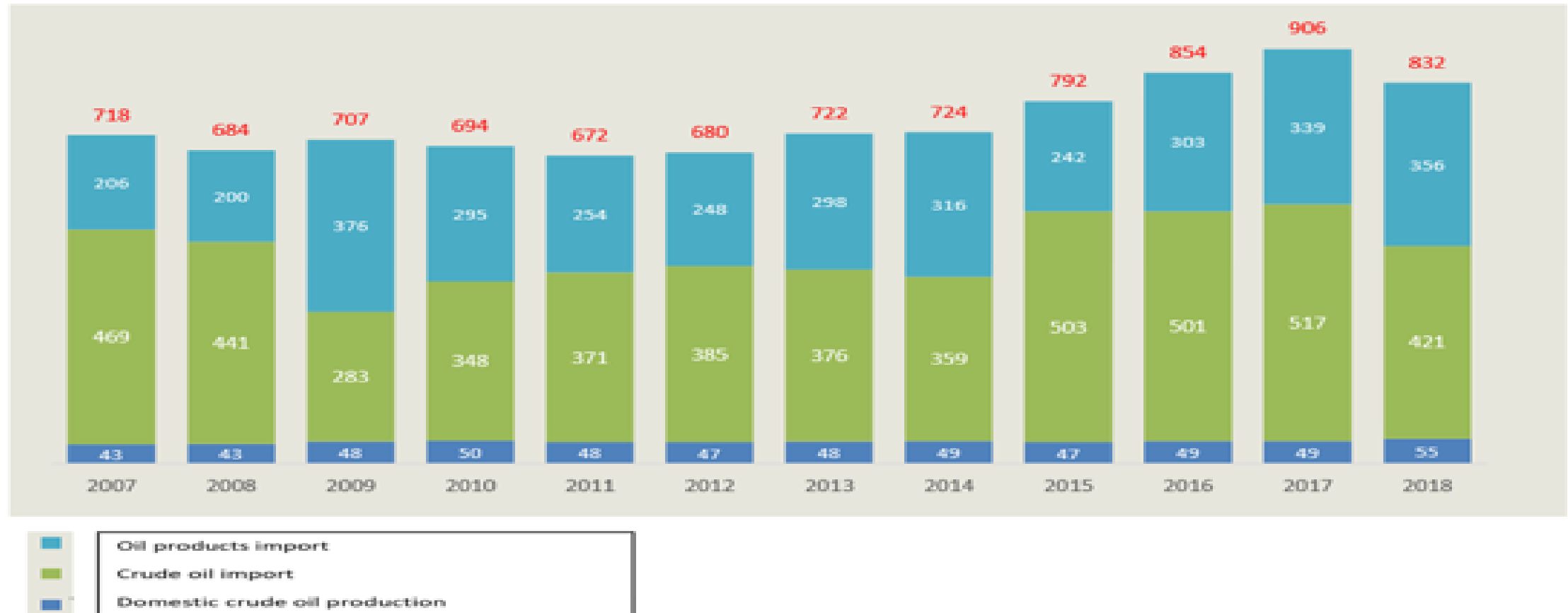


Source: Petroleum Market Report 2018, Energy Market Regulatory Authority EPDK, 2019.

# 4. Energy Markets

## Oil and Petroleum Products

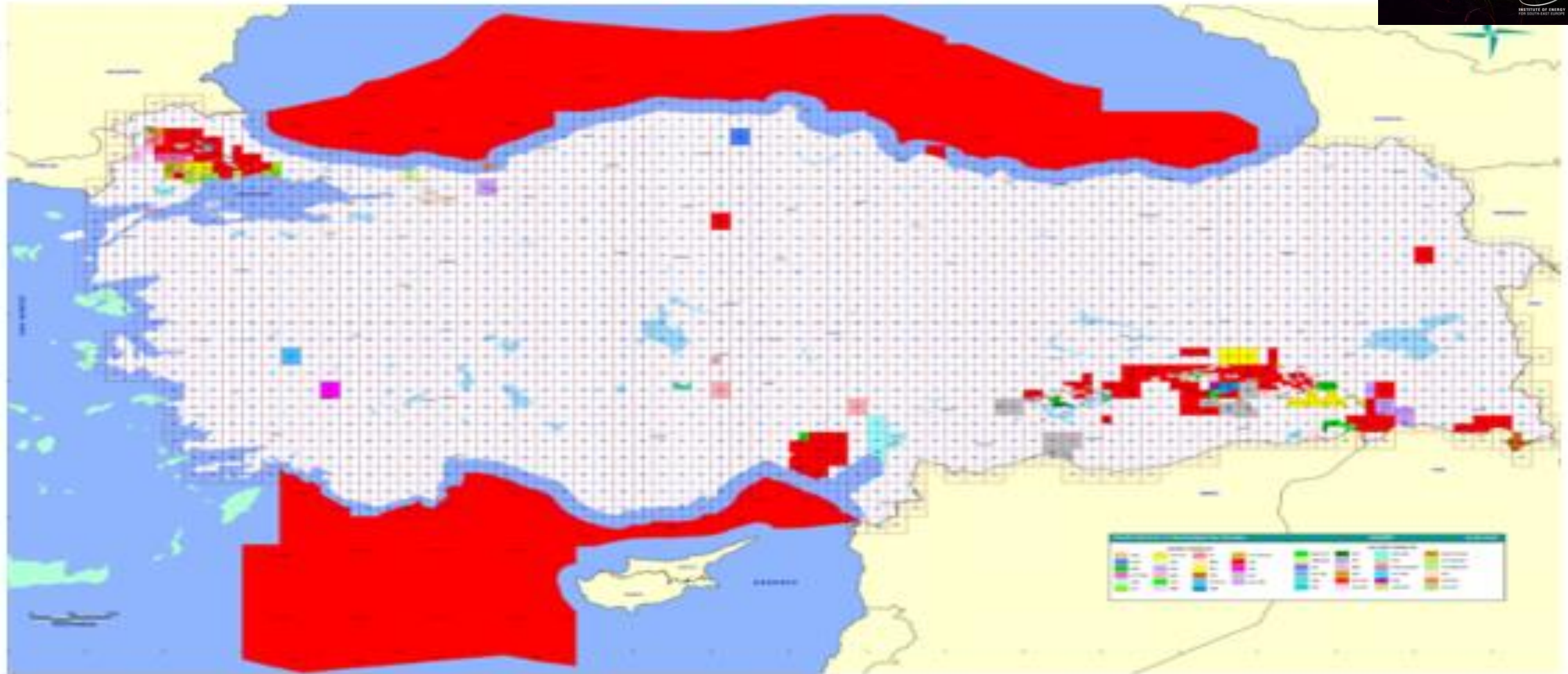
Figure 5: Oil imports and domestic crude oil production 2007-2018 (Thousand barrels per day)



# 4. Energy Markets

## Oil and Petroleum Products

Figure 6: Exploration and production licences in Turkey.



Source: MAPEG General Directorate for Mining and Petroleum Affairs, 2019. Areas in red colour indicate TPAO licences.

# 4. Energy Markets

## Oil and Petroleum Products



Table 5: Refinery capacities and oil products demand.

Turkey Demand	Tüpraş	STAR	Total		Turkish Market Demand	Balance
LPG	1.1	0.3	1.4		4.1	-2.7
Petchem F.	0.2	2.6	2.8			
Gasoline	6.1		6.1		2.4	3.7
Jet Fuel	5.2	1.6	6.8		5.2	1.6
Diesel	10.7	4.5	15.2		26.5	-11.3
Fuel Oil	1.8		1.8		1.3	0.5
Bitumen	3.1		3.1		3.1	
Pet coke	0.8	0.7	1.5		4.6	-3.1
Total	~30	~10	~40			

Source: TÜPRAŞ Investor Presentation, March 2020

# 4. Energy Markets

## Natural Gas

- a) Supply and Demand
- b) NG Imports
- c) Dependence
- d) Exploration & Production
- e) Infrastructure
- f) Domestic Market
- g) NG Policy
- h) Planned Projects



Table 7: Sectoral breakdown of natural gas consumption in Turkey.

	2015	2016	2017	2018
Energy&Conversion	19.313	18.493	22.593	19.933
Industry	13.966	12.600	13.372	11.988
Residential	11.000	11.701	13.515	12.702
Services	3.161	3.123	3.726	4.043
Transport	0.423	0.457	0.529	0.431
Others	0.137	0.107	0.122	0.233
Total	47.999	46.481	53.857	49.329

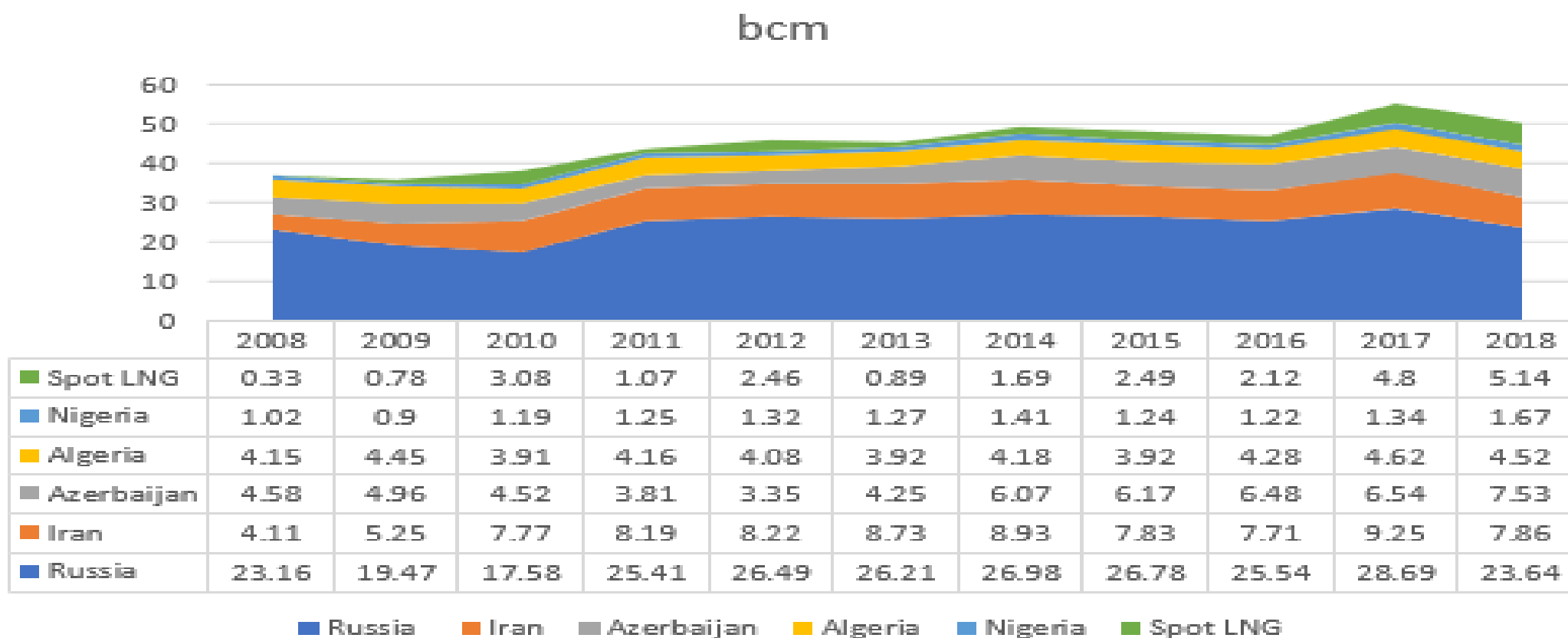
Source: Turkish Natural Gas Market Report 2016, 2017, 2018, Energy Market Regulatory Authority.

The share of residential (2015: 22.9% ---> 2018: 25.6%) surpassed the industrial consumption.

# 4. Energy Markets

## Natural Gas

Natural gas imports by country

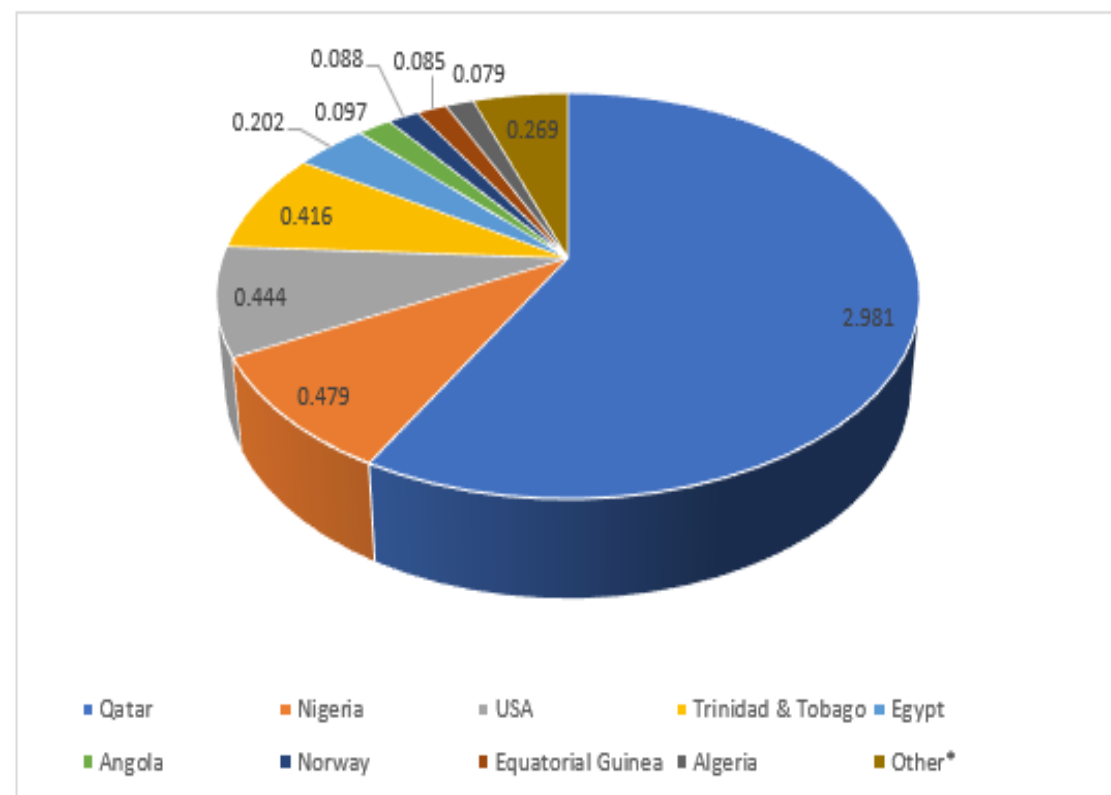


Source: Turkish Natural Gas Market Report 2018, Energy Market Regulatory Authority, 2019.

# 4. Energy Markets

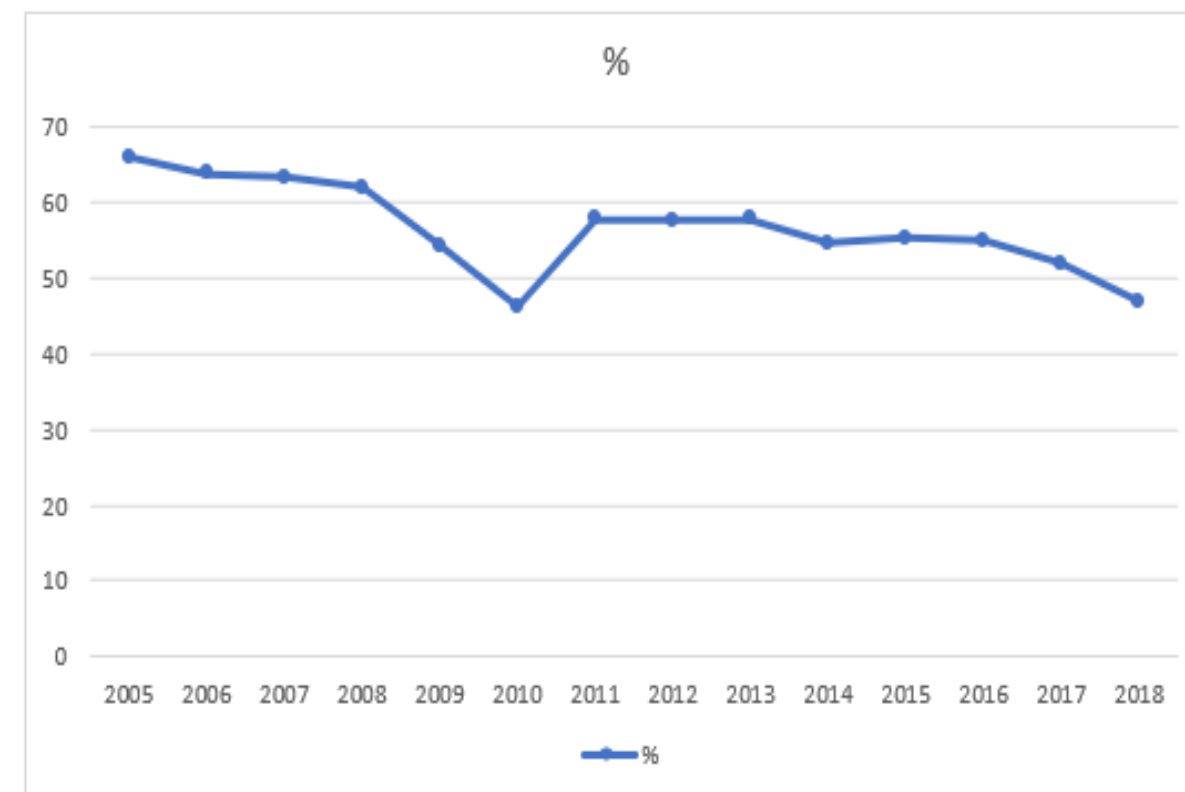
## Natural Gas

Figure 13: Spot LNG imports by country (bcm).



Source: Turkish Natural Gas Market Report, 2018, Energy Market Regulatory Authority. (\*) Re-exports from France and Spain.

Figure 14: The share of Russian Federation in total natural gas imports.



Source: Natural Gas Market 2010 Sectoral Report, Turkish Natural Gas Market Report 2018, EPDK

# 4. Energy Markets

## Natural Gas



Table 12: Turkey's liquified natural gas import infrastructure.

Terminal	Type	Capacity (bcm/year)	Storage capacity (cubic meters)	Send out capacity (mcm/d)
Botaş Marmara Ereğlisi	Onshore LNG	6.0	255,000	37
Egegaz Aliğa	Onshore LNG	6.0	280,000	40
Etki Aliğa	FSRU	5.3	170,000	28
Botaş Dörtüol	FSRU	5.3	263,000	20
Botaş Saros	FSRU	under implementation		

Source: BOTAŞ, Egegaz, Etki FSRU.

Table 13: Turkey's underground gas storage capacity.

Location	Capacity (bcm)	Injection rate (mcm/d)	Withdrawal rate (mcm/d)
<b>Operational</b>			
Botaş Silivri Phase II	2.8	16	25
Botaş Tuz Gölü Phase I	0.6	30	20
<b>Under Implementation</b>			
Botaş Silivri Phase III	4.6	40	75
Botaş Tuz Gölü Phase II	5.4	60	80

# 4. Energy Markets

## Solid Fuels

- a) Supply and Consumption
- b) Local Production
- c) Deposits
- d) Core Imports

Table 15: Total hard coal supply and sectoral consumption in Turkey (1, 000t),

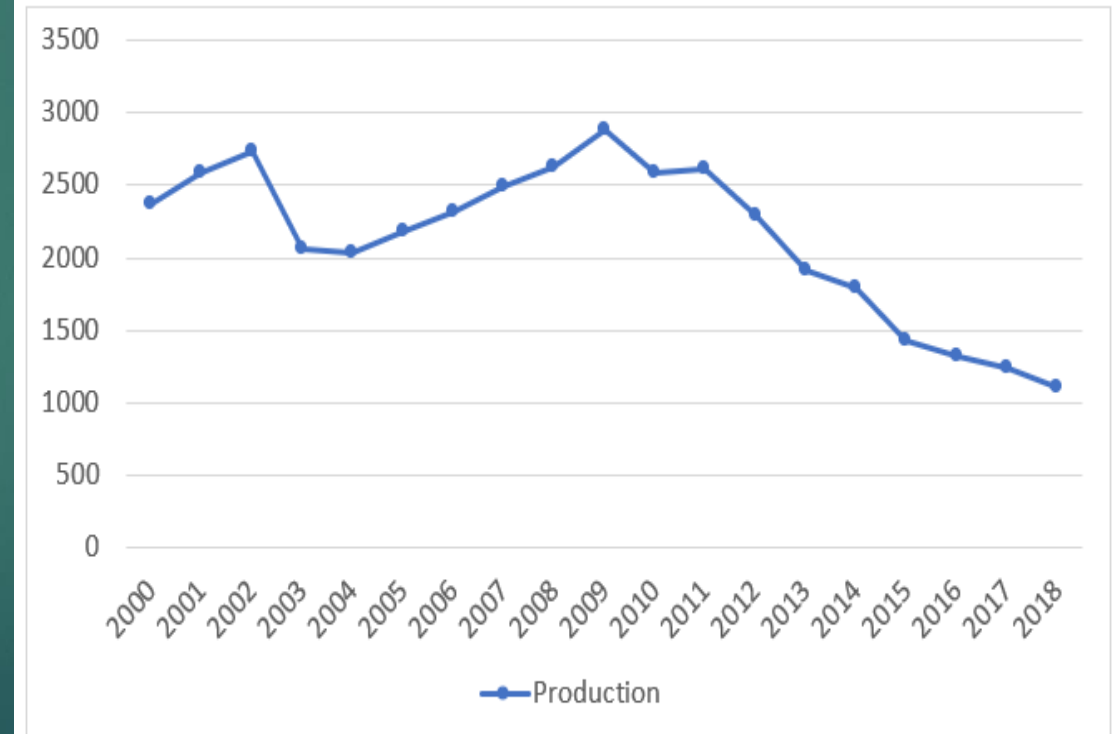
	2013	2016	2017	2018
Total supply	28,491	37,023	38,879	39,545
<b>Transformation sector</b>	<b>17,574</b>	<b>24,288</b>	<b>25,993</b>	<b>29,966</b>
Electricity generation*	11,777	18,318	19,872	23,825
Coke oven	5,571	5,675	5,797	5,771
Own use + losses	226	295	324	370
<b>Industry</b>	<b>4,693</b>	<b>5,954</b>	<b>5,759</b>	<b>5,732</b>
Cement**	2,865	3,877	3,294	2,908
Iron & steel***	1,016	1,228	1,811	1,844
Other industry	812	849	654	980
<b>Other sector****</b>	<b>6,122</b>	<b>6,596</b>	<b>6,933</b>	<b>3,536</b>
Statistical difference	101	185	194	312

Source: Ministry of Energy and Natural Resources ETKB, 2019. (\*) includes heat, (\*\*) includes ceramic,

(\*\*\*) includes nonferrous, (\*\*\*\*) includes households, commerce and services.



Figure 24: Indigenous hard coal production (1000 t)



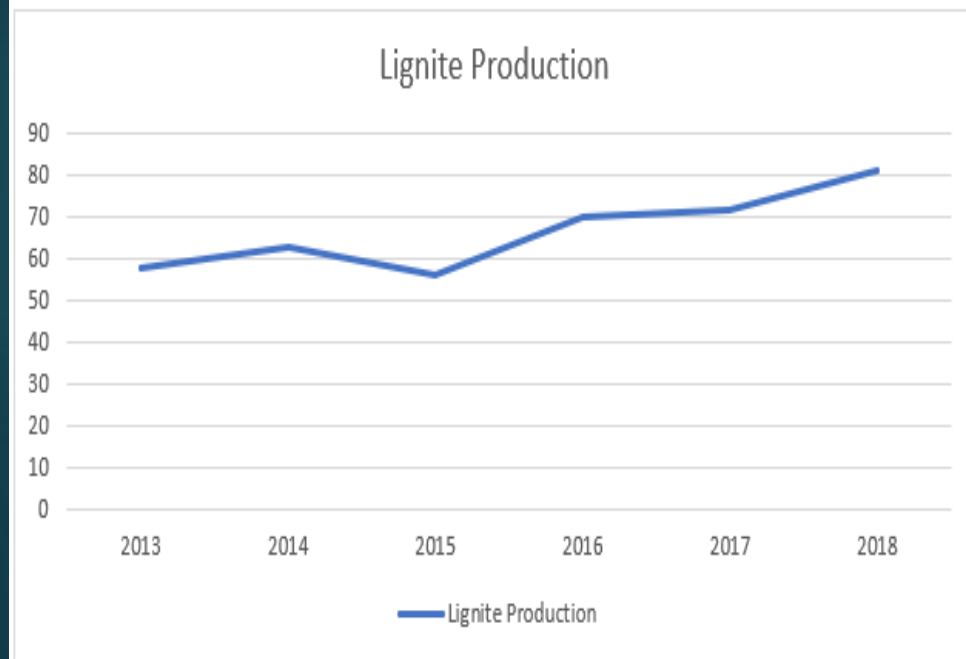
Source: TTK Turkish Hard Coal Enterprises, 2019

# 4. Energy Markets

## Solid Fuels



Figure 25: Lignite production in Turkey (million t)



Source: TKI Turkish Coal Enterprises, Ministry of Energy and Natural Resources (2019)

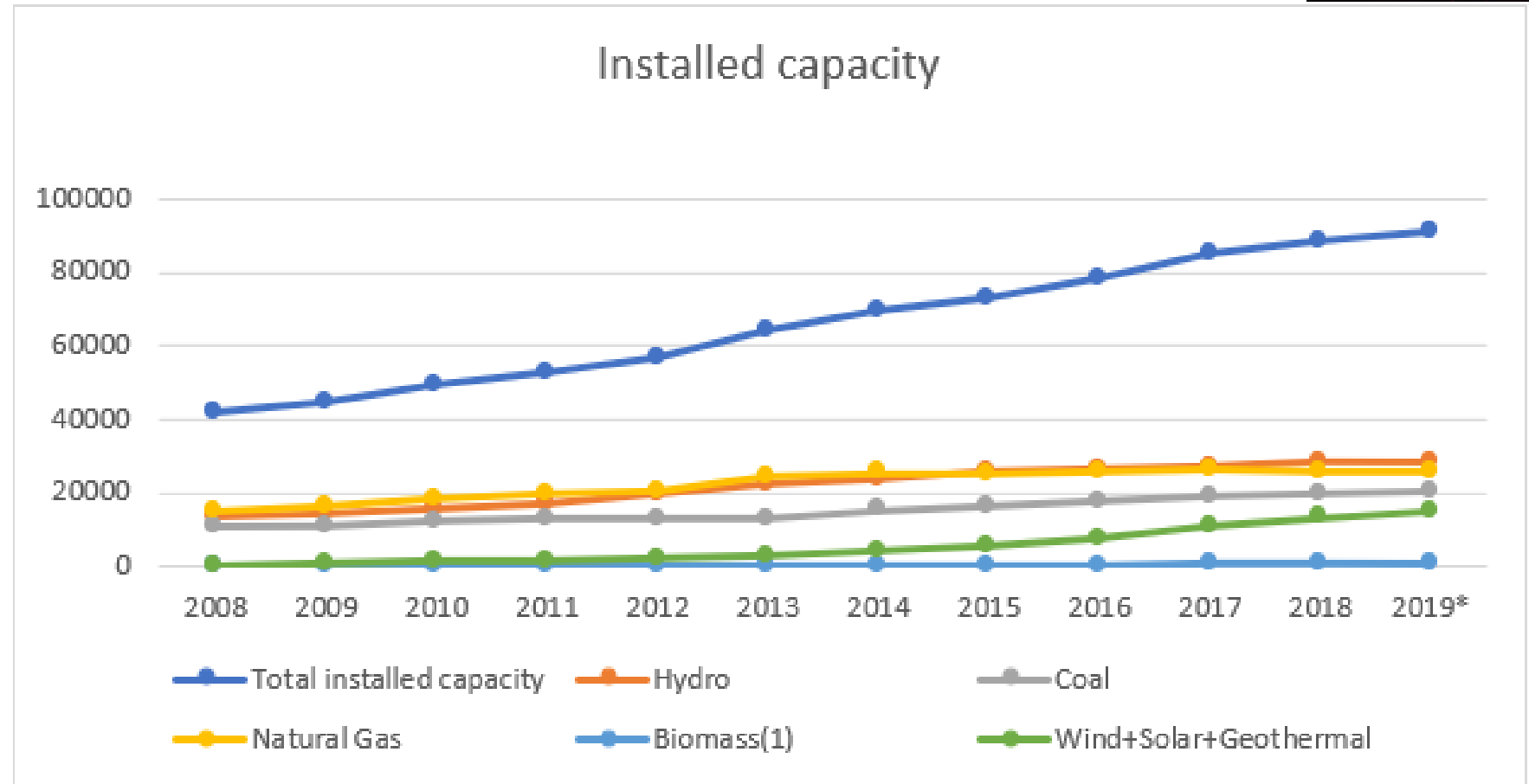


# 4. Energy Markets

## Electricity

- a) Supply-Demand
- b) Install. Capacity
- c) New Capacity
- d) Import-Export
- e) Tariffs
- f) Interconnections
- g) Planned Projects

Figure.29: Installed electricity capacity in Turkey, 2008-2019 (MW)

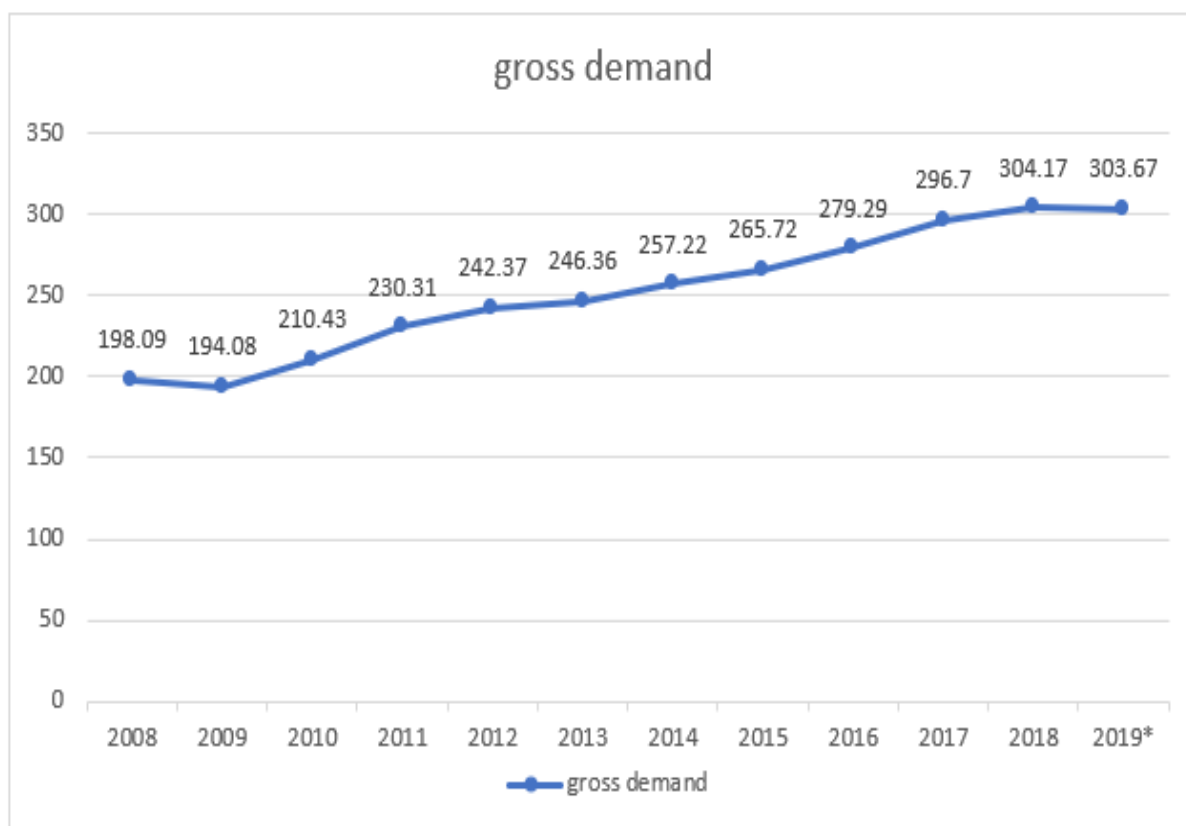


Source: Turkish Electricity Transmission Company TEİAŞ, Jan 2020. (\*) 2019 preliminary data, (1) includes waste and waste heat.

# 4. Energy Markets

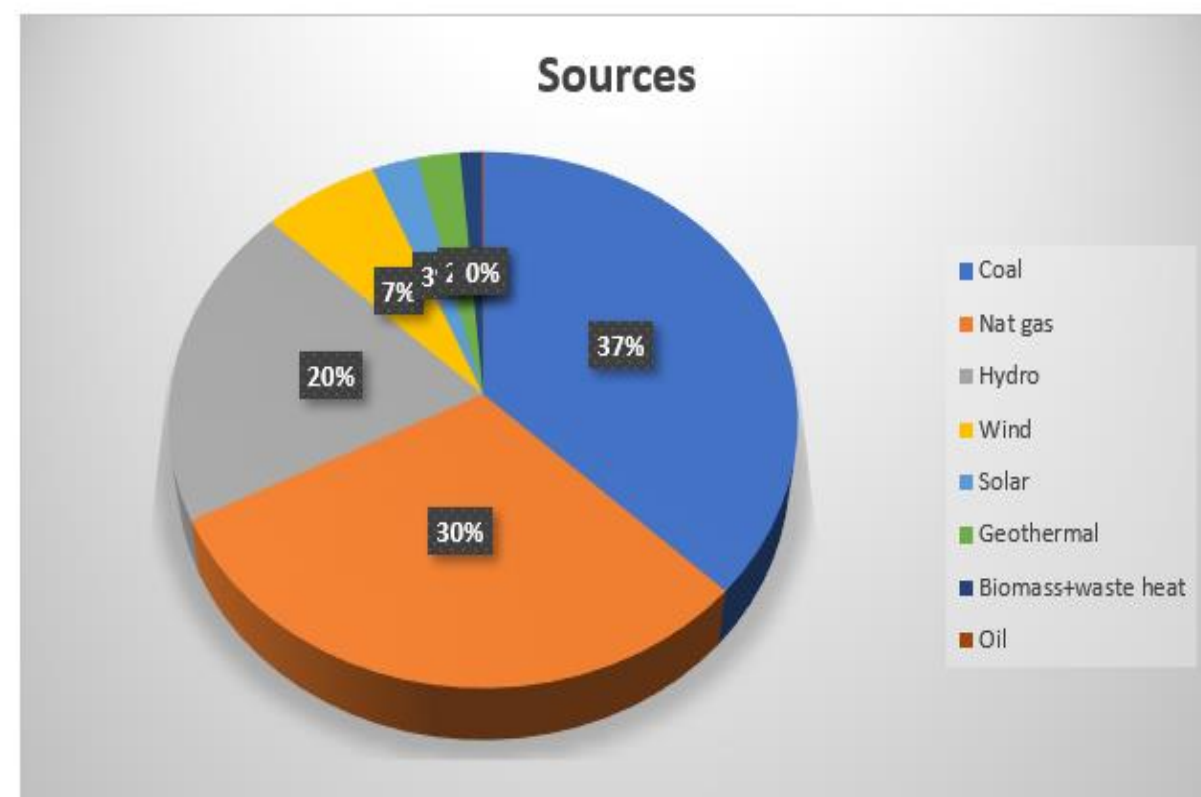
## Electricity

Figure 27: Gross electricity consumption 2008-2019 (TWh)



Source: TEİAŞ, April 2020. (\*) 2019 figure provisional

Figure 28: Electricity generation by fuel types 2018.



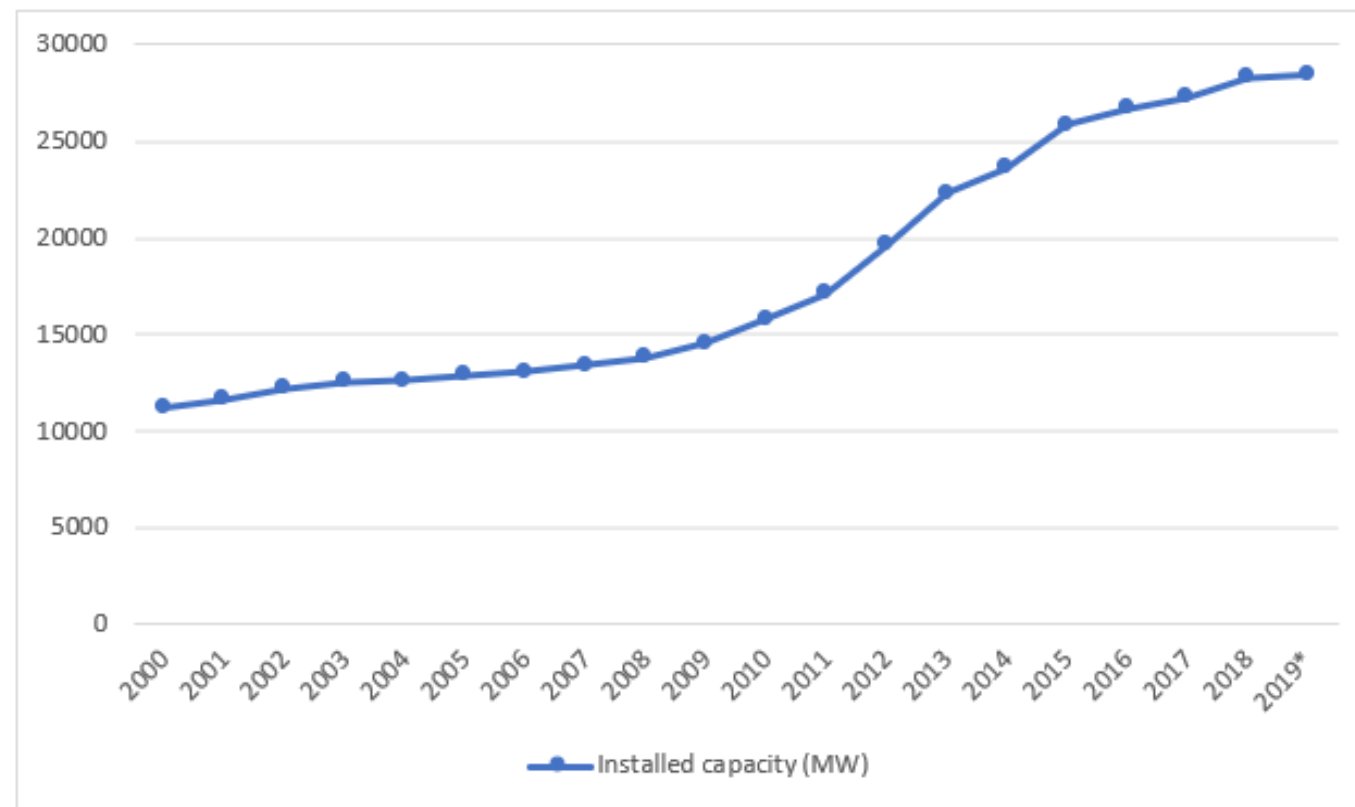
Source: TEİAŞ

# 4. Energy Markets

## Renewables

- a) Sector Development
- b) Legislation, Incentives
- c) Installed capacity
  - Solar (Thermal, PV)
  - Wind
  - Biomass
  - Hydro
  - Geothermal

Figure 37: Installed capacity of hydroelectric plants in Turkey (MW).



Source: Turkish Electricity Transmission Company TEİAŞ, (\*) preliminary figure.

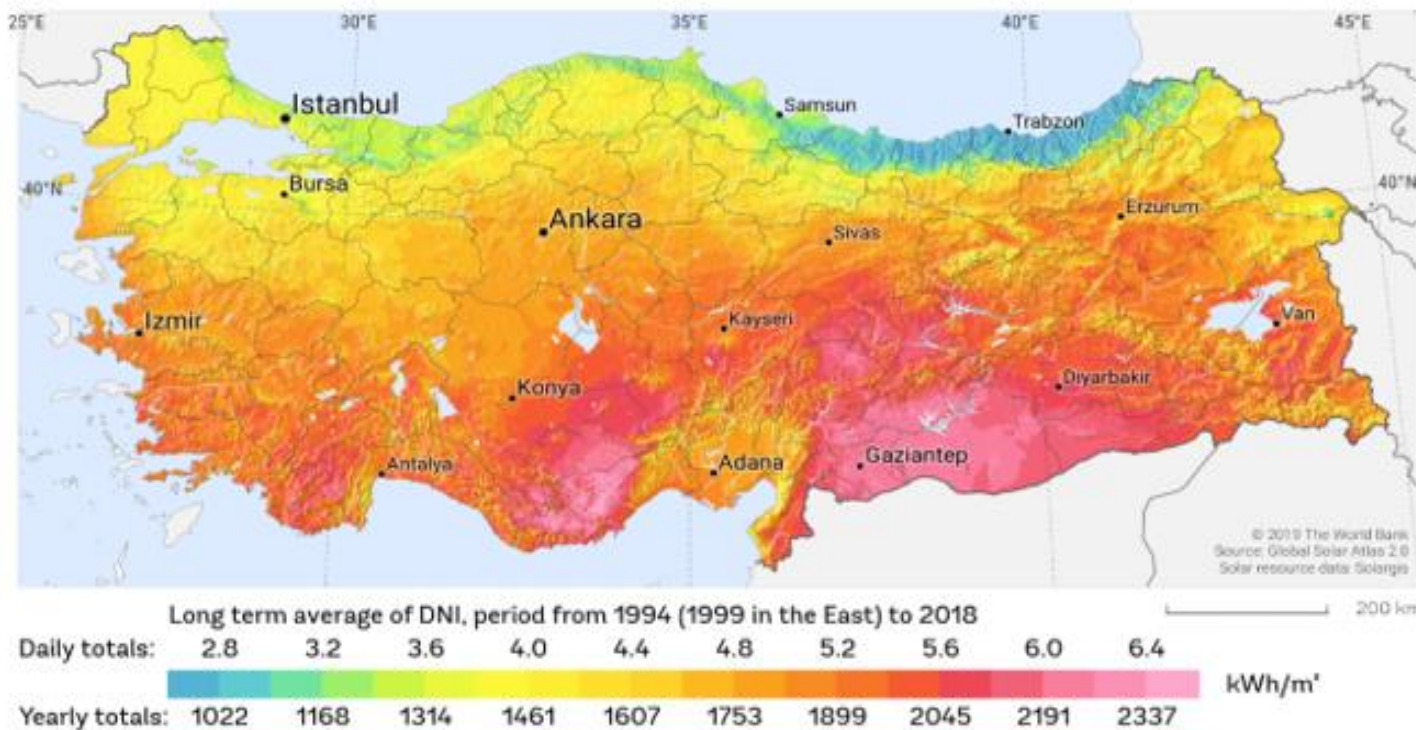
# 4. Energy Markets

## Renewables

Turkey has after China and US the 3<sup>rd</sup> largest installed solar thermal capacity in the world.

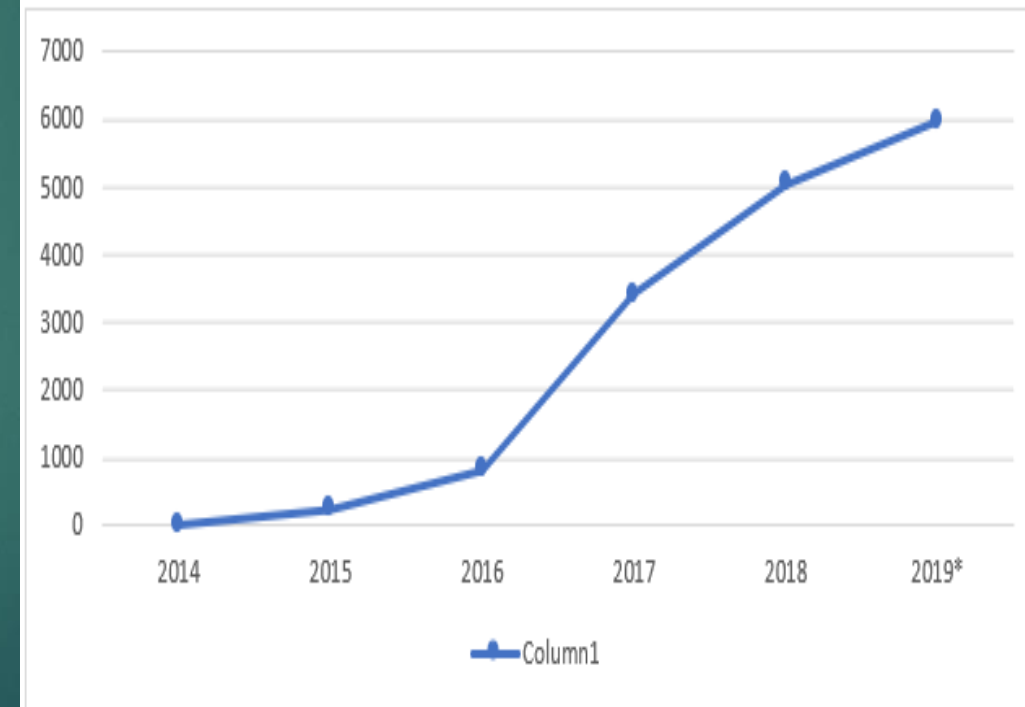


Figure 32: Solar resource map of Turkey (Direct Normal Irradiation)



Source: Global Solar Atlas, 2019

Figure 33: Development of installed solar PV capacity in Turkey (MW)

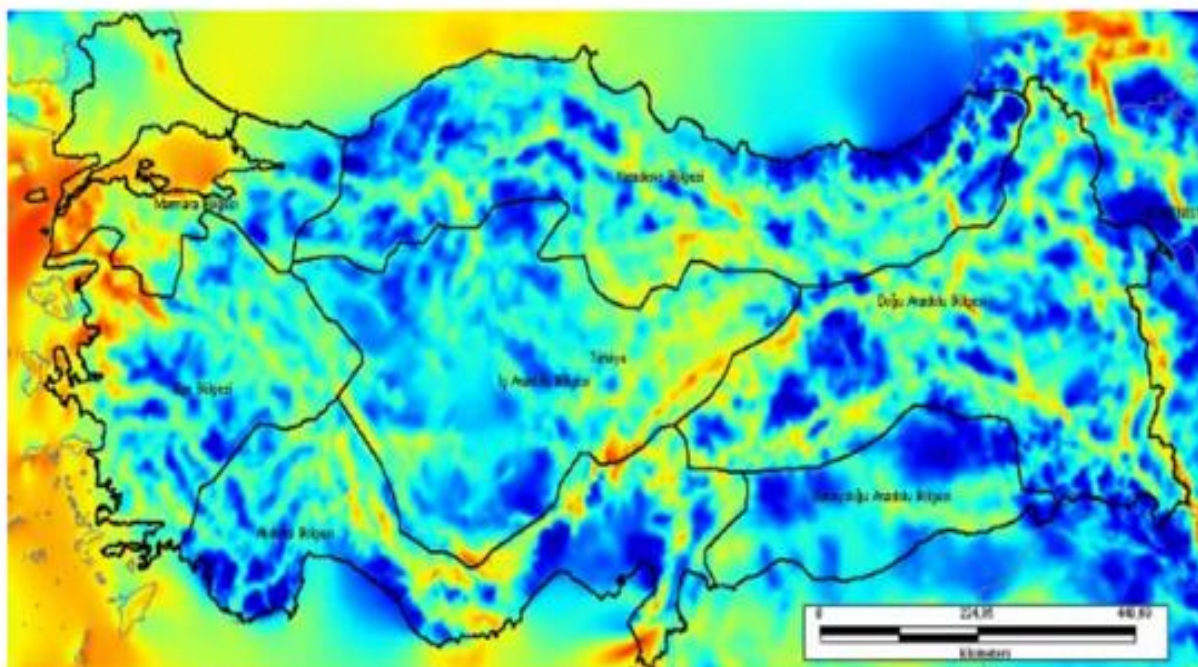


Source: Turkish Electricity Transmission Company TEİAŞ (\*) 2019 preliminary figure.

# 4. Energy Markets

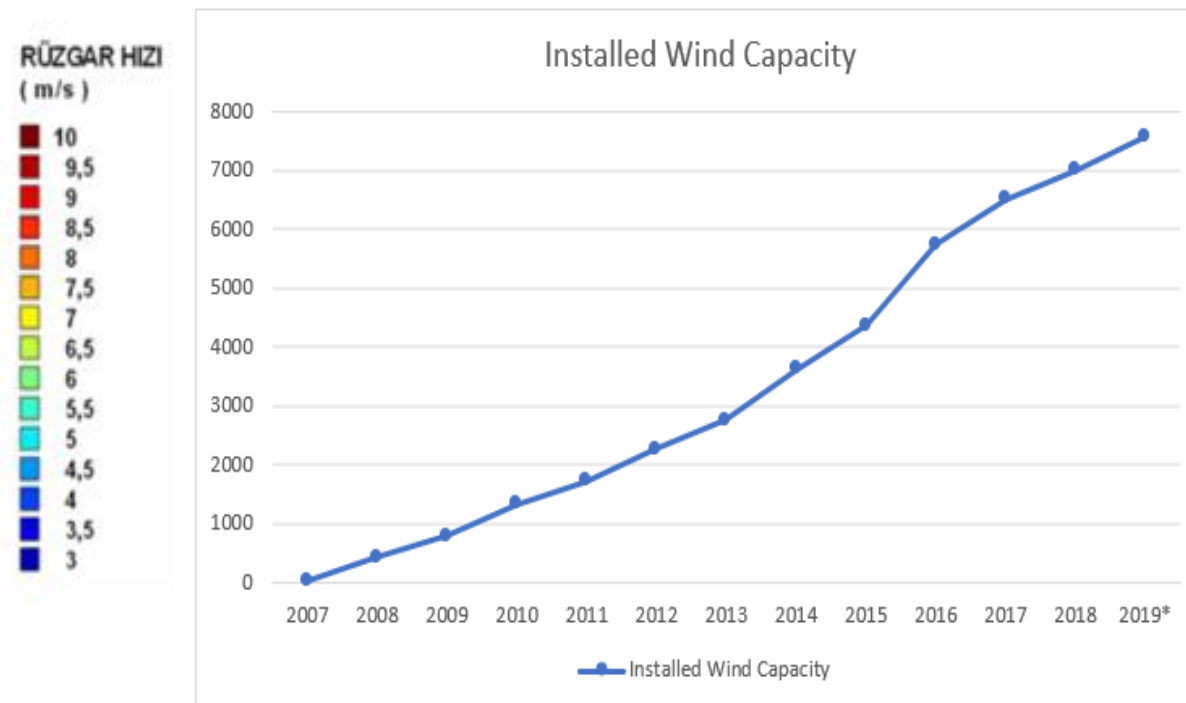
## Renewables

Figure 34: Distribution of annual average wind speed at 50 m height.



Source: Ministry of Energy and Natural Resources.

Figure 35: Development of installed wind capacity in Turkey (MW).



Source: Energy Market Regulatory Board EPDK, 2019, TEİAŞ Turkish Electricity Transmission Company, 2020,

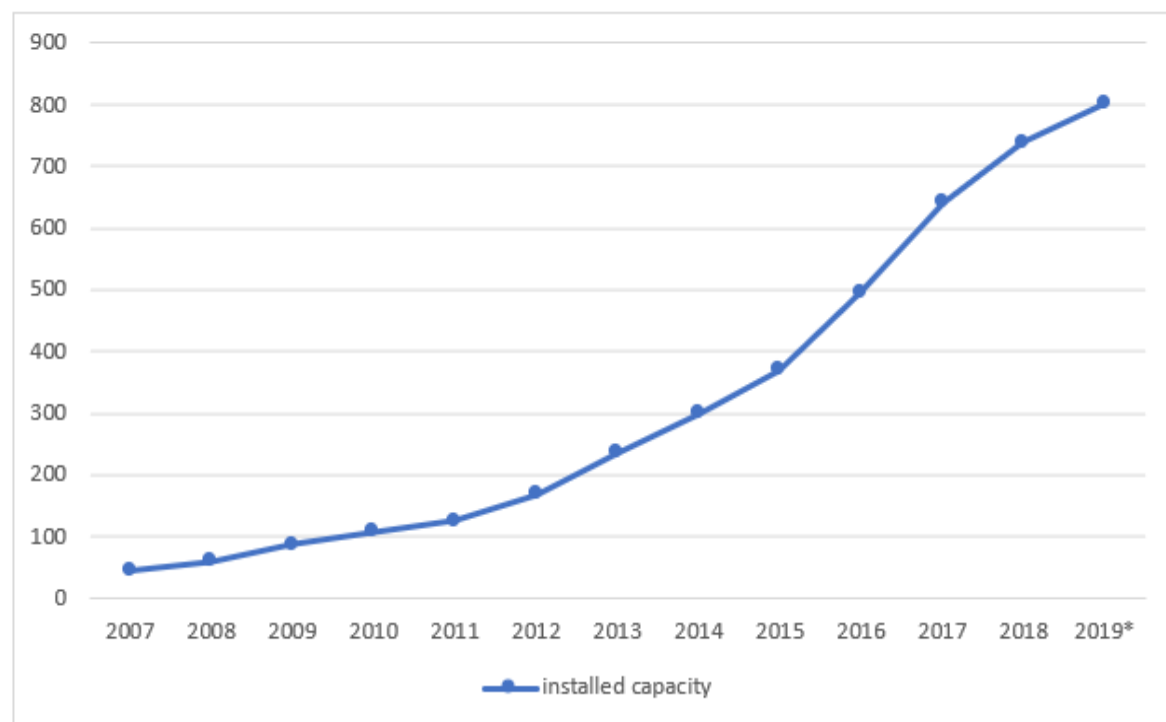
(\*) 2019 preliminary figure.

# 4. Energy Markets

## Renewables

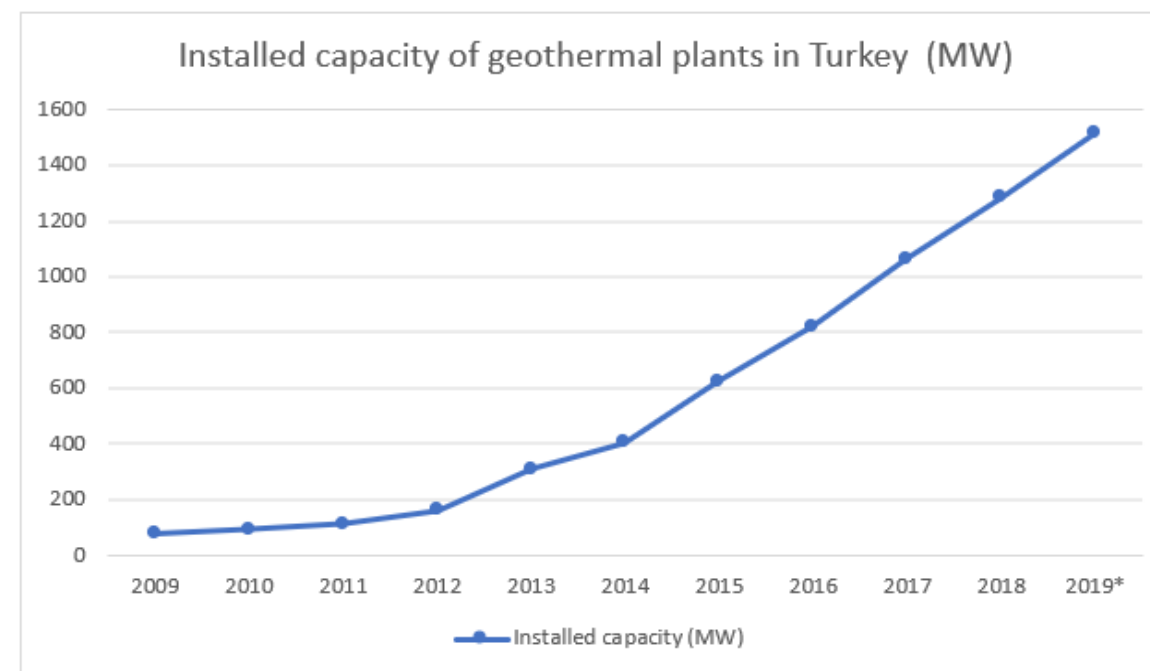


Figure 36: Biomass installed capacity in Turkey (MW)



Source: Turkish Electricity Transmission Company TEİAŞ, (\*) preliminary figure.

Figure 38: Installed electricity capacity of geothermal generation plants in Turkey.



Source: Turkish Electricity Transmission Company TEİAŞ, (\*) preliminary figure.

# 4. Energy Markets

## Energy Efficiency and Cogeneration

- a) National Targets
- b) Incentive based Initiatives
- c) EU & non-EU Programmes
- d) Cogeneration Legislation & Installed Capacity
- e) Planned Projects



Table 20: Total Investments and Projected Savings from Energy Efficiency Projects in Turkey

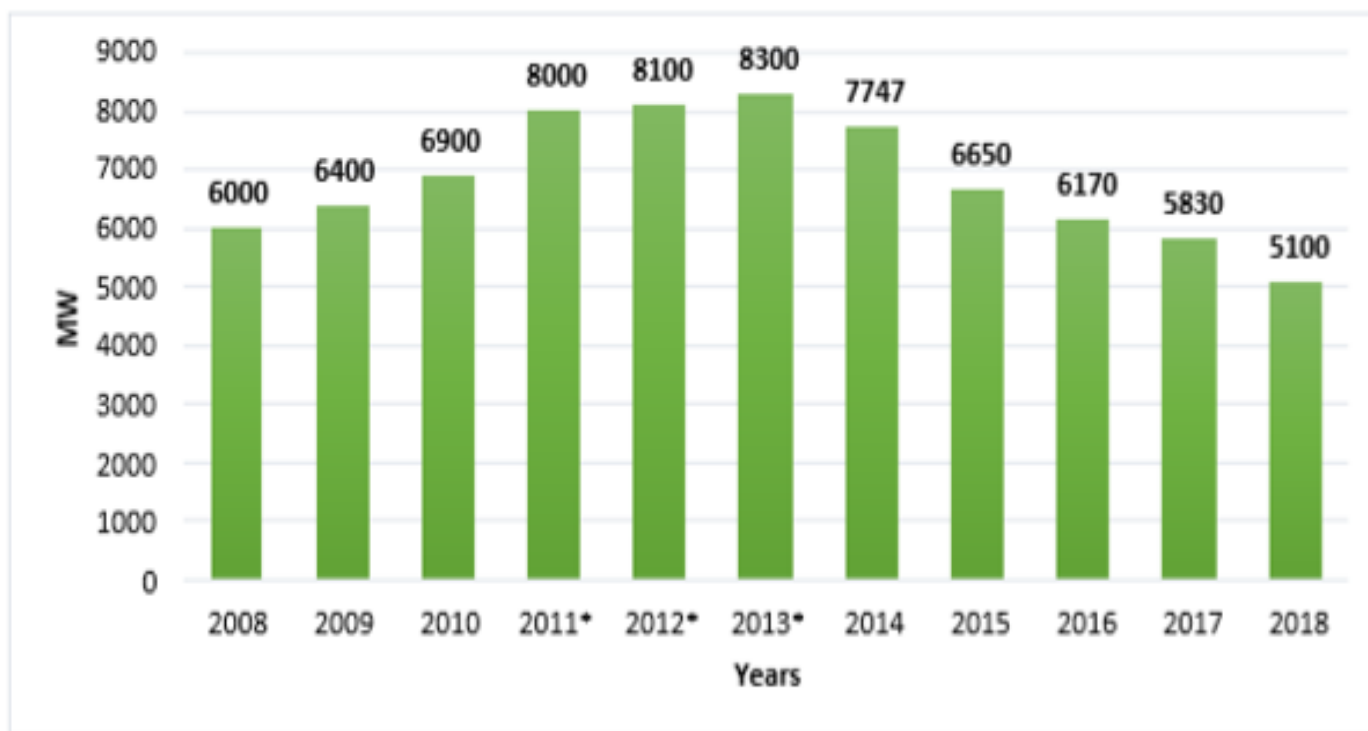
Total Investment Required (million USD)																					
2017		2018		2019		2020		2021		2022		2023		TOTAL							
958		1,279		1,593		1,681		1,748		1,824		1,846		10,928							
Energy Savings																					
2017		2018		2019		2020		2021		2022		2023		Cumulative							
(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)						
577	202	1,630	571	2,493	872	3,378	1,182	4,298	1,504	5,264	1,842	6,261	2,191	23,901	8,365						
Energy Savings																					
2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		Cumulative 2017-2033	
(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)	(ktoe)	(m\$)
6,261	2,191	6,261	2,191	6,261	2,191	6,261	2,191	6,248	2,187	6,248	2,187	6,248	2,187	6,216	2,175	6,216	2,175	86,369	30,228		

Source: National Energy Efficiency Action Plan 2017-2023, Ministry of Energy and Natural Resources.

# 4. Energy Markets

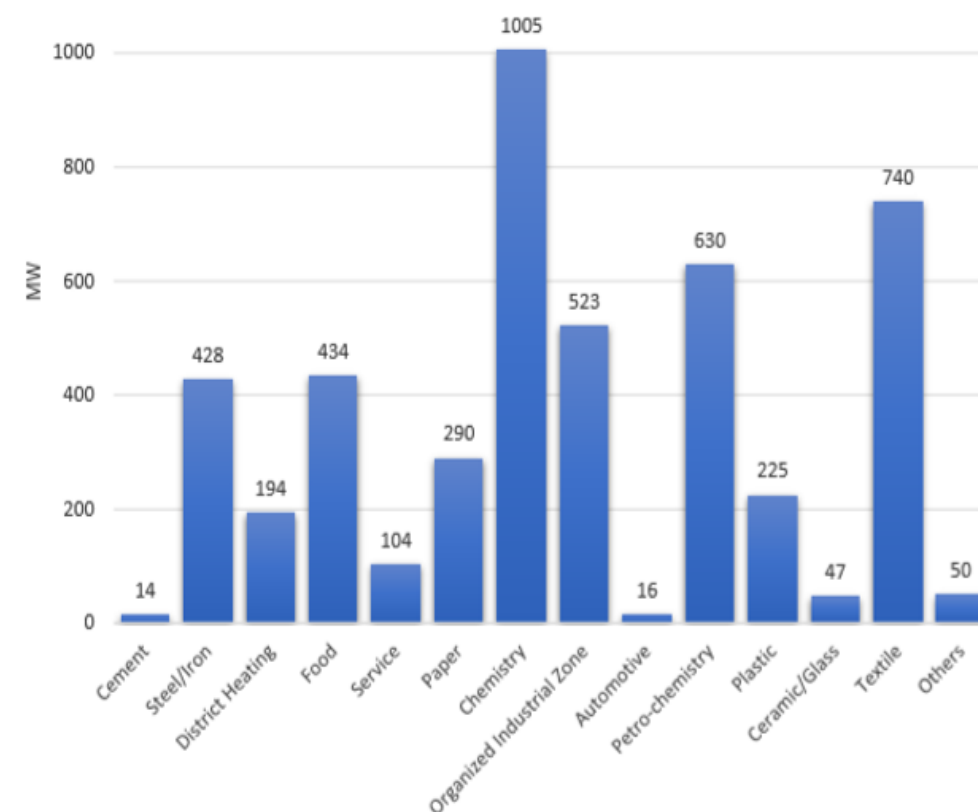
## Energy Efficiency and Cogeneration

Figure 39: Development of installed CHP capacity in Turkey over 2008-2018



Source: Energy and Cogeneration Report 2018.

Figure 40: Installed cogeneration capacity by sector in Turkey.



Source: Energy and Cogeneration Report 2018

# 4. Energy Markets

## Energy Investment Outlook



► 2020-2030: 76 Bill USD + 112 Bill TL

led by 29 Bill USD Renewables investments  
followed by Nuclear and Hydro

2021-2030: Energy Investment Outlook per Country (Chapter 15)

111.2 Bill €

# Thank you

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