Independent Statistics & Analysis
U.S. Energy Information Administration

Country Analysis Brief: Turkey

Last Updated: February 2, 2017

Overview

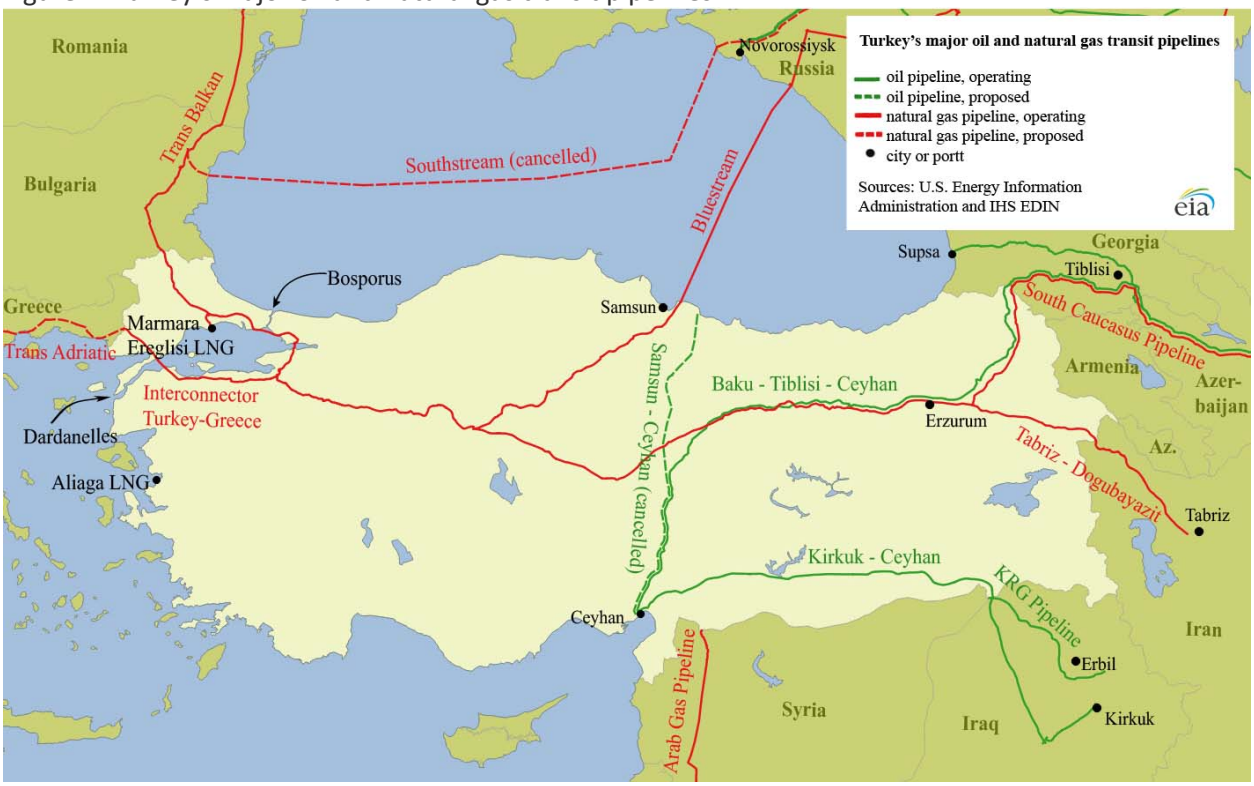
Turkey is an increasingly important transit hub for oil and natural gas supplies as they move from Central Asia, Russia, and the Middle East to Europe and other Atlantic markets.

Turkey is well placed to serve as a hub for oil and natural gas supply headed to Europe and other Atlantic markets from Russia, the Caspian region, and the Middle East (Figure 1). Turkey has been a major transit point for oil and is becoming more important as a transit point for natural gas. Significant volumes of Caspian oil are sent to Black Sea ports (such as Novorossisyk, Russia and Supsa, Georgia) and then to Western markets by tanker via the Turkish Straits (Bosporus and Dardanelles waterways). Caspian oil and oil from northern Iraq also cross Turkey by pipeline, through the Ceyhan oil terminal on Turkey's Mediterranean coast.

Turkey is primed to become a significant natural gas pipeline hub. However, currently most of its natural gas pipeline connections only bring natural gas into the country because growing demands have left little natural gas for export. Since 2010, Turkey has experienced some of the fastest growth in total energy demand among countries in the Organization for Economic Cooperation and Development (OECD). Unlike several other OECD countries in Europe, Turkey's economy has avoided the prolonged stagnation that has characterized much of the continent for the past several years.

The country has, however, faced some recent challenges. On November 24, 2015, Turkey shot down a Russian jet near the Turkey-Syria border. After the incident, Russian-Turkish relations were tense. Russia imposed various economic sanctions on Turkey, and discussions related to the Turkish Stream natural gas pipeline were suspended. Since the attempted coup in Turkey in July 2016, relations between Turkey and Russia have improved, and the Turkish Stream pipeline project is again under discussion.

Figure 1. Turkey's major oil and natural gas transit pipelines



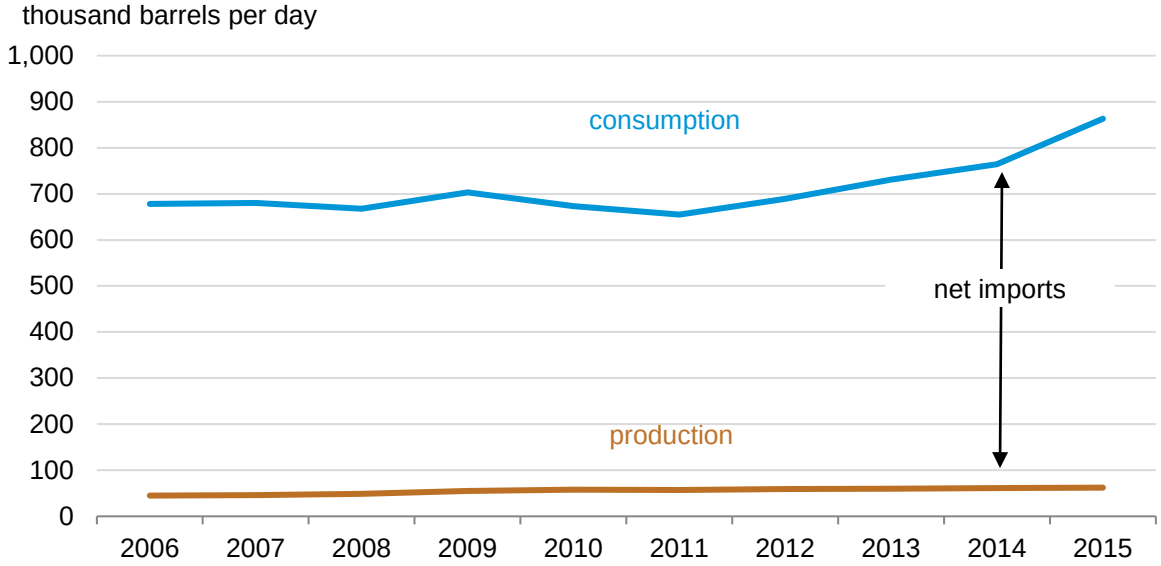
Source: U.S. Energy Information Administration and IHS EDIN

Petroleum and other liquids

Over the past decade, Turkey's economy has expanded, and its petroleum and other liquids consumption has increased. With limited domestic reserves, Turkey imports nearly all of its oil supplies.

As of January 1, 2016, the *Oil & Gas Journal* (*OGJ*) estimated Turkey's proved oil reserves at 312 million barrels,[1] located mostly in the southeast region of the country. Turkey's petroleum and other liquids production peaked in 1991 at 85,000 barrels per day (b/d), but then production declined each year and bottomed out in 2004 at 43,000 b/d. Although Turkey's production of liquid fuels has increased since 2004, the country's production is much less than what the country consumes each year (Figure 2).

Figure 2. Turkey petroleum and other liquids consumption and production



Source: U.S. Energy Information Administration

Sector organization

Türkiye Petrolleri Anonim Ortaklığı (TPAO) is the dominant exploration and production entity in Turkey. As a state-owned firm, TPAO has preferential rights in petroleum exploration and production, and any foreign involvement in upstream activities is limited to joint ventures with TPAO. In 2014, TPAO produced 33,602 b/d of crude oil, accounting for 72% of the total crude oil production in Turkey.[2]

Exploration and production

Most of Turkey's proved oil reserves are located in the Batman and Adiyaman Provinces in the southeast (where most of Turkey's oil production occurs), with additional deposits found in Thrace in the northwest. In 2015, Turkey produced an estimated 62,000 b/d of petroleum and other liquids, accounting for about 7% of Turkey's oil consumption.

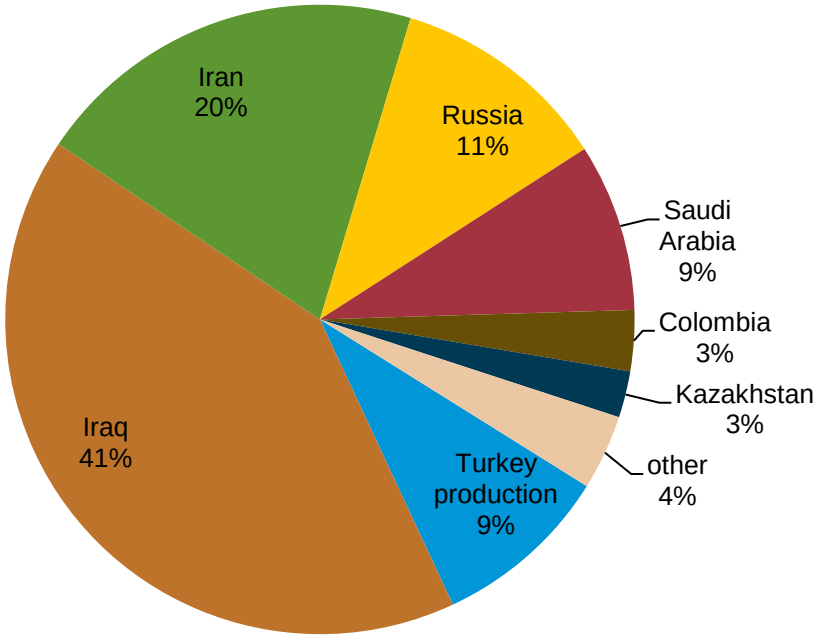
Offshore and shale reserves may become a future source of Turkey's oil supply. Significant resources may lie under the Aegean Sea, although these resources have not been confirmed because of ongoing territorial disputes with Greece. The Black Sea may also hold significant oil production potential for Turkey. In 2015, Shell and TPAO drilled an exploratory well in the Black Sea. The two companies are evaluating the results of that well and of two wells drilled earlier in the Dadas shale located in the southeast of Turkey and in Diyabakir Province.[3]

Consumption and imports

In 2015, Turkey's total liquid fuels consumption averaged about 860,000 b/d. More than 90% of total liquid fuels came from imports. In 2015, most of Turkey's crude oil imports came from Iraq and Iran

(Figure 3),[4] which, combined, supplied slightly more than 60% of the country's crude oil. The share of crude oil from Russia, once the largest source country of Turkey's crude oil, has decreased as Russian crude oil is increasingly going to Asian markets.

Figure 3. Turkey crude and condensate supply by source, 2015



Source: U.S. Energy Information Administration based on International Energy Agency, Monthly Oil Data Service

International oil transit

Turkey plays an increasingly important role in the transit of oil. The country is strategically located at the crossroads between the oil-rich former Soviet Union and Middle East countries, and the European demand centers. The Turkish Straits are home to one of the world's busiest chokepoints, through which more than 2 million b/d of crude oil flowed in 2015.

Turkish Straits

The Turkish Straits, which includes the Bosporus waterway and the Dardanelles waterway, are one of the busiest maritime chokepoints in the world. Significant volumes of Russian and Caspian oil move by tanker via the Turkish Straits to international markets. More than 2 million b/d of crude oil and condensate flowed through the Turkish Straits in 2015 along with several hundred thousand barrels per day of petroleum products.[5]

Pipelines

Turkey currently has two crude oil import pipelines (Table 1):[6] the Baku-Tbilisi-Ceyhan (BTC) pipeline from Azerbaijan and a pipeline from northern Iraq to Ceyhan, Turkey. The Iraq pipeline has two

branches. The original line of the Iraq pipeline stretches from Fishkhabur, on the Iraq-Turkey border, to Kirkuk, Iraq. However, this part of the pipeline has been shut down since the Islamic State of Iraq and Syria (ISIS) began seizing territory in the area in early 2014 and the pipeline was sabotaged. More recently, flows on the operating Turkish section of the pipeline have been interrupted because of security concerns and sabotage. In February and March of 2016, the pipeline was shut down for more than three weeks as a result of violence in southeast Turkey.[7] The BTC pipeline has also been targeted in the past. In August 2008, an explosion in eastern Turkey shut down the BTC pipeline for more than two weeks.

In 2013, the Kurdish Regional Government (KRG) completed construction of a new pipeline which begins at Taq Taq field near Erbil in the KRG-controlled portion of northern Iraq and joins the existing pipeline to Ceyhan, Turkey near the Iraq-Turkey border. Initial flows on the KRG line were low, as the Iraqi central government objected to the KRG selling oil without central government approval or involvement. Exports vary from month to month because of security issues on both sides of the Turkish-Iraqi border and continuing disagreements between the KRG and the central Iraqi government regarding how oil revenues should be shared.

Table 1. Turkey's major crude oil and condensate pipelines

Facility	Status	Capacity (million b/d)	Total length (miles)	Supply regions	Destination	Details
Baku-Tbilisi-Ceyhan	operating	1.2	1,100	Azerbaijan and Kazakhstan	Ceyhan oil port	started operations in 2006
Kirkuk-Ceyhan						started operations in 1976
	not operating	1.5	220	Kirkuk	Fishkhabur (Iraq-Turkey border)	The Iraqi portion of the pipeline was the target of militant attacks and stopped operating in 2014. The pipeline's effective capacity was significantly lower than its nameplate capacity prior to its closure.
	operating	1.5	400	Fishkhabur (Iraq-Turkey border)	Ceyhan oil port	
Kurdish Regional Government (KRG) Pipeline	operating	0.7	250	northern Iraq	Ceyhan oil port via connection to the Kirkuk-Ceyhan pipeline at Fishkhabur	completed in 2013
Samsun-Ceyhan	canceled	up to 1.5	340	Russia and Central Asia	Ceyhan oil port	It would allow oil to bypass the congested Turkish Straits, but the project was canceled in 2013 because it was deemed uneconomic

Sources: U.S. Energy Information Administration based on BP, OilPrice.com, The National (UAE), The Washington Post, Genel Energy, Eni, and United Press International.

Ports

The port of Ceyhan has become an important outlet for Caspian oil exports and for oil shipments from northern Iraq. In addition to the two crude oil pipelines that terminate in Ceyhan, Turkey (BTC and Iraq-Turkey), crude oil and condensate are also trucked in from northern Iraq. In 2015, the port of Ceyhan handled more than 650,000 b/d of Caspian crude oil exports and more than 400,000 b/d of Iraqi crude oil exports, most of which were destined for Europe.[8]

Refining sector

As of January 1, 2016, Turkey had six refineries with a combined processing capacity of 663,000 b/d, according to *OGJ*.[9] Tüpraş is Turkey's dominant refining firm and operates four refineries that account for 85% of the total refining capacity. Tüpraş also owns more than half of the total petroleum products storage capacity in Turkey. Tüpraş was formerly state-owned, but since 2005 it has been 51% owned by a joint venture controlled by Koç Holding, a Turkish industrial and services sector holding company. The remaining 49% of shares are publicly traded.

Natural gas

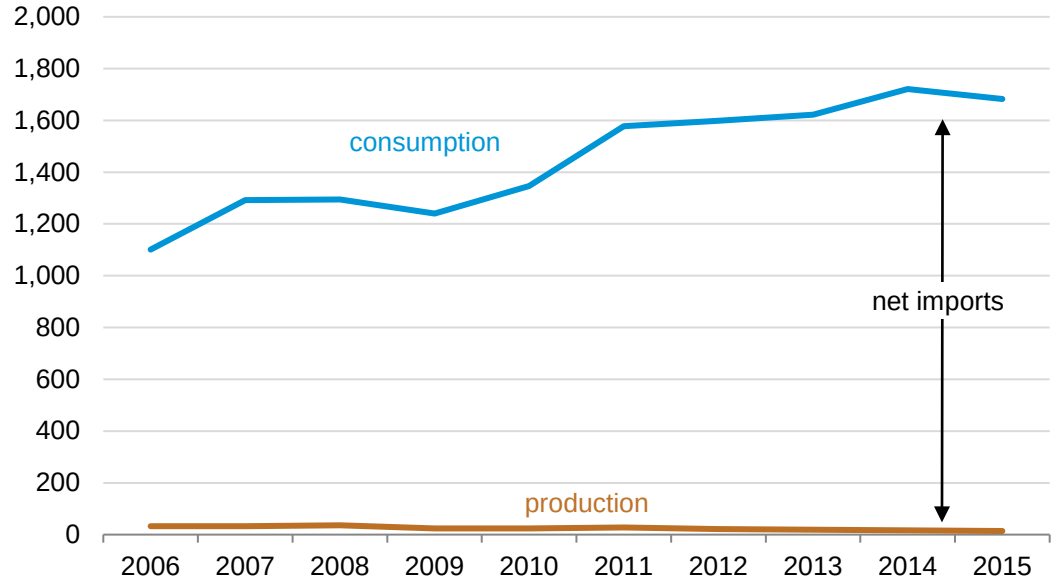
Turkey has a strategic role in natural gas transit because of its position between the world's second-largest natural gas market—continental Europe—and the substantial natural gas reserves of the Caspian Basin and the Middle East.

As of January 1, 2016, the *OGJ* estimates Turkish natural gas reserves at 177 billion cubic feet (Bcf).[10] Turkey produces only a small amount of natural gas, and total production amounted to 14 Bcf in 2015 (Figure 4).

Turkey is an important consumer of natural gas and is becoming an important transit state for natural gas. Turkey is one of the few countries in Europe where natural gas consumption continues to show strong growth. Turkey's growing consumption has helped spur development of multiple pipelines to bring natural gas into the country, and while it has left little natural gas available for export, new supplies have been contracted and new pipelines are under construction that will increase Turkey's imports and exports of natural gas.

Figure 4. Turkey natural gas consumption and production

billion cubic feet per year



Note: 2015 numbers are preliminary
Source: U.S. Energy Information Administration based on IEA, Monthly Gas Data Service

Sector organization

The state-owned Petroleum Pipeline Corporation (BOTAŞ) dominates the natural gas sector, although most of the market is open to competition. BOTAŞ is vertically integrated across much of the natural gas sector. BOTAŞ accounts for about 80% of natural gas imports. It builds and operates natural gas pipelines in Turkey. It accounts for most of the wholesale market and for most exports of natural gas.

Turkey began liberalizing its natural gas market in 2001 with the Natural Gas Market Law, which required that BOTAŞ be legally unbundled—broken up into separate legal entities for natural gas transport, operating liquefied natural gas (LNG) terminals and storage facilities, and trading and marketing. Several draft and enacted laws since 2001 have also required BOTAŞ to be unbundled, including a draft bill submitted to parliament in 2014. Timelines for completing the unbundling have not been binding and have repeatedly been extended.

Another goal of market liberalization has been to reduce the dominance of BOTAŞ in the market segments in which it operates to foster competitive markets. BOTAŞ is required to reduce its share of imports to no more than 20% of annual consumption by gradually selling off its import contracts.[11] BOTAŞ has made some progress in selling off its import contracts. BOTAŞ has transferred 350 Bcf of its import contracts, equal to about 20% of Turkish natural gas consumption, to seven private companies.[12] Russia's state-owned natural gas company, Gazprom, has a 71% stake in Bosphorus Gaz (which holds import contracts for 26 Bcf per year and 62 Bcf per year, which is about 7% of Turkish consumption).[13]

Consumption, imports, and exports

Turkey is increasingly dependent on natural gas imports because its domestic consumption, especially in the electric power sector, has experienced significant growth.

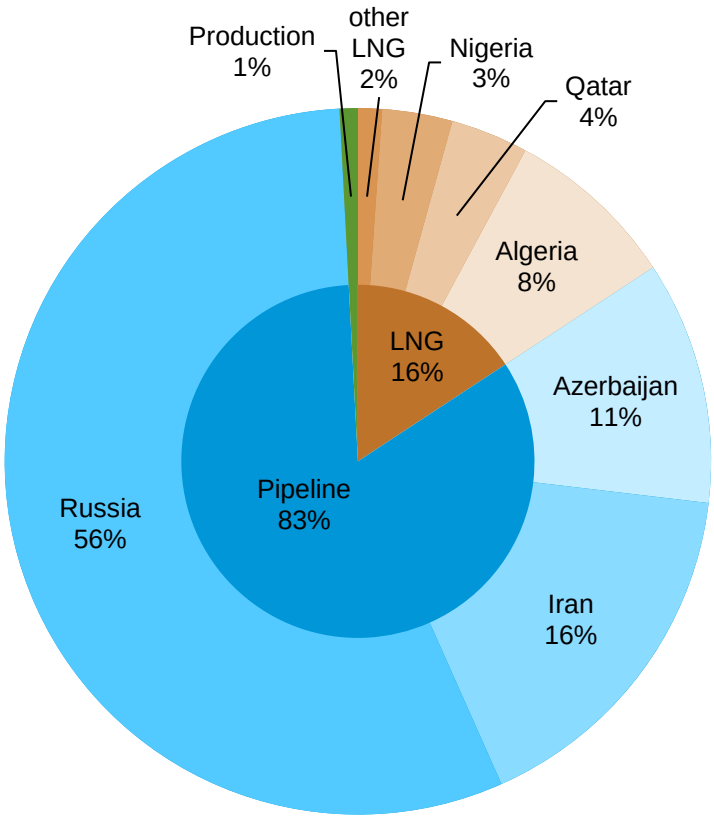
Natural gas consumption in Turkey has increased rapidly over the past decade, reaching a new high of 1.7 trillion cubic feet (Tcf) in 2014. Consumption in 2015 was also 1.7 Tcf, declining less than 0.1 Tcf from 2014. Natural gas is mainly used in power generation, which accounted for almost half of total natural gas consumption in 2014. Most of the remaining consumption is nearly evenly split between the buildings sector (residential and commercial) and the industrial sector. [14] Consumption growth is expected to remain strong as industrial sector growth and rising electricity consumption continue to spur demand.

In 2015, Turkey imported 1.7 Tcf of natural gas, accounting for 99% of total natural gas supply.[15] Through LNG and multiple pipeline connections, Turkey has a reasonably diversified supply mix. However, Russia's Gazprom is by far the largest single supplier, accounting for 56% of Turkey's total natural gas supply in 2015 (Figure 5).[16] Turkey is Russia's second-largest export market for natural gas after Germany. In 2015, BOTAŞ exported just 22 Bcf of natural gas.[17]

Because of rapid demand growth, Turkey's annual natural gas consumption is approaching the annual capacity limits of the country's import infrastructure (pipeline and LNG). However, Turkey's natural gas demand is not flat over the course of the year, but peaks in the winter months when natural gas use for power generation and space heating is highest. Additionally, Turkey has little natural gas storage capacity and primarily relies on increased imports to meet the seasonal increase in demand. Natural gas shortages are not uncommon in the winter, as the pipeline capacity is insufficient to meet peak winter demands.

Natural gas consumption in Turkey and exports from Turkey are also highly vulnerable to supply disruptions. Natural gas imports to Turkey have frequently been reduced or temporarily suspended because of insurgent attacks on import pipelines or because of cold weather in countries that export to Turkey. These disruptions can be mitigated by other suppliers if there is spare pipeline capacity. Russia, in particular, has on multiple occasions sent extra natural gas to Turkey when needed.

Figure 5. Turkey's natural gas supply by source, 2015



Source: U.S. Energy Information Administration based on BP Statistical Review 2016

Storage

Companies importing natural gas into Turkey are required to hold rights to storage capacity equal to 10% of their annual imports. However, Turkey currently has just one operating underground storage facility (Table 2)[18] with total storage capacity of about 5% of Turkey's imports of natural gas. For comparison, the 28 countries of the European Union (EU) collectively have storage capacity equal to about 20% of total annual consumption.[19] If all of the storage capacity currently proposed in Turkey is realized, capacity will amount to about 20% of current annual imports for domestic consumption.

Table 2. Turkey's natural gas storage facilities

Facility	Status	Operator	Working gas capacity (Bcf)	Details
Kuzey Marmara	operating	TPAO	90	facility consists of two depleted gas fields; plans to expand capacity to 150 Bcf
Marmara Eregesli LNG	operating	BOTAŞ	6	LNG terminal storage
Aliaga LNG	operating	EgeGaz	6	LNG terminal storage

Tuz Golu	planned	BOTAŞ	35	salt dome storage
Tarsus province	planned	Bendis Energy	180	

Sources: U.S. Energy Information Administration based on Platt's and International Energy Agency

Pipelines

At the end of 2015, BOTAŞ had natural gas pipeline interconnections to four international import pipelines and one international export pipeline (Table 3). [20] With several pipelines under construction in 2016, Turkey is expanding its pipeline system to better accommodate growing domestic natural gas consumption and to transit more natural gas to European consumers.

International and regional politics play a role in any pipeline that crosses borders, but politics is particularly critical in realizing pipelines proposed to transit Turkey. Russia-Ukraine relations, Russia-EU relations, and Russia-Turkey relations have all had a prominent role in Gazprom's planned Turkish stream pipeline. Relations between Turkey, the Kurdish Regional Government, and the Iraqi central government will likely affect plans to build a pipeline from northern Iraq to Turkey. Additionally, insurgents in Turkey and in neighboring countries have, on several occasions, attacked natural gas pipelines.

Table 3. Turkey's major natural gas pipelines

Facility	Status	Capacity (Tcf)	Total length (miles)	Supply regions	Markets	Details
Trans Balkan natural gas pipeline	operating	0.5	more than 600	Russia	Southeast Europe and Turkey	first deliveries to Turkey in 1987; transits Ukraine, Moldova, Romania, and Bulgaria
Tabriz-Dogubayazit	operating	0.5	1,600	Iran	Turkey	started operations in 2001
Blue Stream	operating	0.6	750	Russia	Turkey	started operations in 2003
South Caucuses Pipeline (SCP)	operating	0.3	430	Azerbaijan	Georgia and Turkey	first deliveries to Turkey in 2007; it follows the route of the BTC oil pipeline from Azerbaijan, through Georgia, and connects to Turkey's domestic transmission pipeline system
Interconnector Turkey-Greece-Italy	operating (Turkey-Greece)	0.4	180	Azerbaijan, Russia, and Iran	Greece	Turkey-Greece interconnector started operations in 2007; little progress has been made on extending the line through Greece and to Italy
Arab Gas Pipeline (AGP)	idled	0.4	630	Egypt	Jordan, Lebanon, and Syria	started operations in 2003; an extension to allow deliveries to Turkey and Europe had been planned, but sabotage and declining Egyptian exports have idled much of the pipeline
South Caucasus Pipeline (expansion)	construction	0.6	430	Azerbaijan	Georgia, Turkey, and southeast Europe	expected to start operations in 2019
Trans-Anatolian Pipeline (TANAP)	construction	0.6	1,150	Azerbaijan	Turkey and Europe	expected to start operations in 2019; will receive gas from the SCP expansion at Turkey's border with Georgia and deliver gas to Turkey's borders with Greece; follows the route of Turkey's existing domestic transmission pipeline system

Facility	Status	Capacity (Tcf)	Total length (miles)	Supply regions	Markets	Details
Trans Adriatic Pipeline (TAP)	construction	0.4	550	Azerbaijan via TANAP and SCP	Italy and Southeast Europe	expected to start operations by 2020; expandable to 0.7 Tcf; built mainly to carry natural gas from Azerbaijan via the SCP expansion and TANAP, but could carry natural gas from Russia or any other source transiting Turkey
Turkish Stream	proposed	up to 1.1	more than 500	Russia	Turkey and southeast Europe via the Black Sea	Plans were cut from four lines to two lines; first line could start in late 2019 at the earliest
Iraq-Turkey	proposed	0.4 - 0.7	--	northern Iraq	Turkey and southeast Europe	Turkey has negotiated with the Kurdish Regional government and the Iraqi government; although no agreement has been reached, BOTAŞ is working to extend the domestic natural gas transmission system to the Iraqi border
Eastring	proposed	up to 1.4	more than 500	bidirectional between northeast Europe, southeast Europe, and Turkey		would be open access, per EU regulations; would run from eastern Slovakia, across Hungary and Romania, connecting to an upgraded Trans Balkan line in Romania or Bulgaria
South Stream	canceled	2.2	560 (offshore)	Russia	Turkey and southeast Europe	canceled in late 2014 and replaced with Turkish Stream

Sources: U.S. Energy Information Administration based on Gazprom, GazpromExport, Natural Gas Europe, BP, Edison, Arab Republic of Egypt, Ministry of Petroleum, Reuters, Trans Adriatic Pipeline, Platt's International Gas Report, Nefte Compass, and Eastring.

Liquefied natural gas

In 2015, Turkey's imports of liquefied natural gas (LNG) accounted for 16% of Turkey's total natural gas supply, according to the *BP Statistical Review of World Energy*. Three countries (Algeria, Qatar, and Nigeria,) accounted for more than 90% of Turkey's LNG imports, with small volumes coming from Norway, Trinidad and Tobago, and from re-exported LNG from the United States and Europe.[21] LNG volumes arrive at the country's two terminals: Marmara Ereglisi in Tekirdag and the Aliaga terminal in Izmir. Marmara Ereglisi has been in operation since 1994 and is owned by BOTAŞ. Marmara Ereglisi has an annual capacity of 280 Bcf. The Aliaga terminal is owned by EgeGaz and has an annual capacity of 210 Bcf of natural gas.[22]

Although Turkey is encouraging natural gas transit across Turkey via pipelines, it is discouraging LNG transit. Ukraine, Romania, and Bulgaria have all, at one time or another, proposed building LNG import facilities on their Black Sea coasts. However, the only way for an LNG tanker to reach such a facility would be through the Turkish Straits, and Turkish authorities have indicated that they would not allow LNG vessels to transit the straits for safety reasons. Additionally, the straits are already a major shipping chokepoint, especially for cargo classified as hazardous (which includes LNG, crude oil, and other petroleum liquids).

Coal

Coal, particularly lignite, is Turkey's most abundant indigenous energy resource and is an important fuel for electricity generation.

In 2013, coal production accounted for 35% of Turkey's total primary energy production on a Btu basis. As of the beginning of 2015, Turkey had total coal reserves of 14,160 million short tons (MMst), most of which are lignite reserves. Turkey's lignite reserves tend to be low-quality reserves with a low heat content.[23] In 2014, Turkey produced 71 MMst of total primary coal, 96% of which was lignite. Turkey also imported 30 MMst of coal in 2014, most of which was bituminous coal.

Coal-fired power stations are an important source for Turkey's electricity generation, and there is renewed interest in exploiting Turkey's domestic coal resources. Coal-fired generation accounted for 30% of total electricity production in Turkey in 2014, including 15% each from lignite and hard coal.[24] Turkey has several new coal plants under construction and more plants proposed.

Electricity

Following the restructuring of Turkey's electricity sector, both consumption and generation of electricity have expanded. Most electricity is generated using fossil fuel sources, although the government plans to displace at least some of this generation with nuclear power.

In 2014, Turkey's total electricity generating capacity was 70 million kilowatts, and total net electricity generation was 239 billion kilowatthours (BkWh). In 2010 and 2011, consumption of electricity grew on

average by 10% per year. Consumption growth has slowed since then, with 2014 consumption of 207 BkWh, 5% higher than in 2013.

Most of Turkey's electricity generation comes from fossil fuel-fired power plants (78% of total generation in 2014), with natural gas accounting for almost half of all generation. Electricity from hydroelectric facilities also accounts for a significant share of Turkey's total generation (17%). Although Turkey does not currently generate any electricity from nuclear power, the government has been advocating construction of nuclear power plants to diversify Turkey's electricity supply portfolio.

Sector organization

The state-owned and vertically integrated Turkish Electricity Authority controlled generation, transmission, and distribution of electricity in Turkey prior to the electric sector reforms that began in the 1980s. Since then, the government has passed several laws that have unbundled and partially privatized the Turkish electric sector. The state-owned generation and marketing companies remain the largest providers in those sectors, although the market shares of private companies continue to grow.

The state-owned Electricity Generation Company (EUAS) remains the largest electric generation company in Turkey, accounting for about 28% of the country's electric generation as of the end of 2015.[25] The remaining generation comes from independent power producers and firms given special state concessions to build and operate power plants. The wholesale electricity market in Turkey is also open to private companies; however, the state-owned Turkish Electricity Trading and Contracting Company (TETAŞ) accounted for more than 40% of the market in 2015.[26]

Transmission and distribution services are separate (unbundled) from generation and marketing services. The Turkish Electricity Transmission Company, a state-owned enterprise, owns and operates the transmission system. Turkey has 21 electric distribution regions, all of which are operated by private companies.

Nuclear

Turkey plans to build nuclear power plants at three sites: Akkuyu, on the Mediterranean coast; Sinop, on the Black Sea coast; and a third yet-to-be-decided location. The formal ground-breaking ceremony for the Akkuyu plant took place in April 2015 with construction expected to start by the end of 2016. In accordance with an agreement signed by Turkey and Russia in 2010, Rosatom (Russia's state nuclear company) will build, own, and operate the Akkuyu plant. The plant will have four units with a total capacity of 4.8 gigawatt, and the first unit is expected to begin operating about 2022.

Construction at Sinop for Turkey's second nuclear power plant is planned to start in 2017. The Sinop plant will be built by a Japanese and French consortium and operated by Engie (GdF Suez changed its name to Engie in 2015). Turkish state electric generation company, EUAS, is also expected to take a stake in the power plant. The Sinop plant will have four units with a total capacity of 4.6 gigawatts. The first unit is expected to begin operating in 2023.

Since November 2014, Turkey has been in exclusive negotiations with the State Nuclear Power Technology Corporation of China to build a third nuclear power plant in Turkey using reactors from the U.S. firm Westinghouse. The location of the third plant has not been decided, and construction is not expected to begin until 2019 at the earliest.[27]

Notes

- Data presented in the text are the most recent available as of February 2, 2017.
- Data are EIA estimates unless otherwise noted.

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[24] International Energy Agency, World Energy Balances, 2016 Preliminary Edition, accessed August 24, 2016.

[25] Republic of Turkey, Ministry of Energy and Natural Resources, Electricity, accessed August 24, 2016.

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[27] World Nuclear Association, Country Profiles, Nuclear Power in Turkey, accessed August 24, 2016.