Country Report: **Turkey**
Subject: **Energy Sector**

(1) Turkey's Energy Sector in Context

Turkey, while not a large supplier of energy, is a major demand center in the MENA region[1] and a net importer of all three major fossil fuel sources.[2] Turkey is also a country of significant geostrategic importance. Its geostrategic importance stems in large measure from (1) its geographic location and (2) its military capability. Turkey's membership in NATO traces back to the Cold War and it today maintains the second largest standing army in the security bloc. Its proximity to the then Soviet Union made it an important country to include in the NATO alliance. With regard to energy, geography is primary as Turkey controls the Bosporus and Dardanelles straits (the Turkish straits, through which an average of 3 million barrels of oil was transported per day in 2013) linking the Black sea with the Mediterranean – hence controlling a choke point on one of three of Russia's maritime crude oil export routes. Furthermore, the fact that Turkey shares land borders with Iraq, Iran, Syria, Armenia and Georgia to its east, and Bulgaria and Greece to its west means the country is uniquely placed to link supply centers in the Middle East with energy markets in Europe. Furthermore, the possibility of Turkey ultimately providing an alternative export pipeline system to Russian pipeline gas looms large on the global energy scene. This possibility ensures that Turkey maintains a prominent position in any discussion of major supply, demand or transit players.

[1] The MENA region as defined by Fanack.
[2] Referring to coal, oil and gas.

(2) Oil and Gas: Limited Supply

Turkey, as mentioned in the introduction, is not a major supply center but is a significant oil and gas demand center in the MENA region making it an export destination for oil from major regional players Iran, Iraq, and Saudi Arabia, as well as extra-regional players in Russia, Kazakhstan, and Africa. In addition it is a highly compelling transport route where much more oil transits through Turkey than is consumed in it. Turkey has conventional proven oil reserves of 295 million barrels (or about 4.5 days' worth of world oil production), mostly located in the Batman and Adiyaman provinces in the southeast (which is also where most of Turkey's oil production occurs), with additional deposits found in Thrace in the northwest. Turkey's oil production peaked in 1991 at 85,000 barrels per day (bbl/d), declining each year and reaching 43,000 bbl/d before realizing a modest revival beginning in 2004. Although Turkey's production of liquid fuels has increased slightly since 2004, it is far short of what the country consumes each year with 2012 production (nearly 60,000 bbl/d) providing for only about 10% of national consumption.

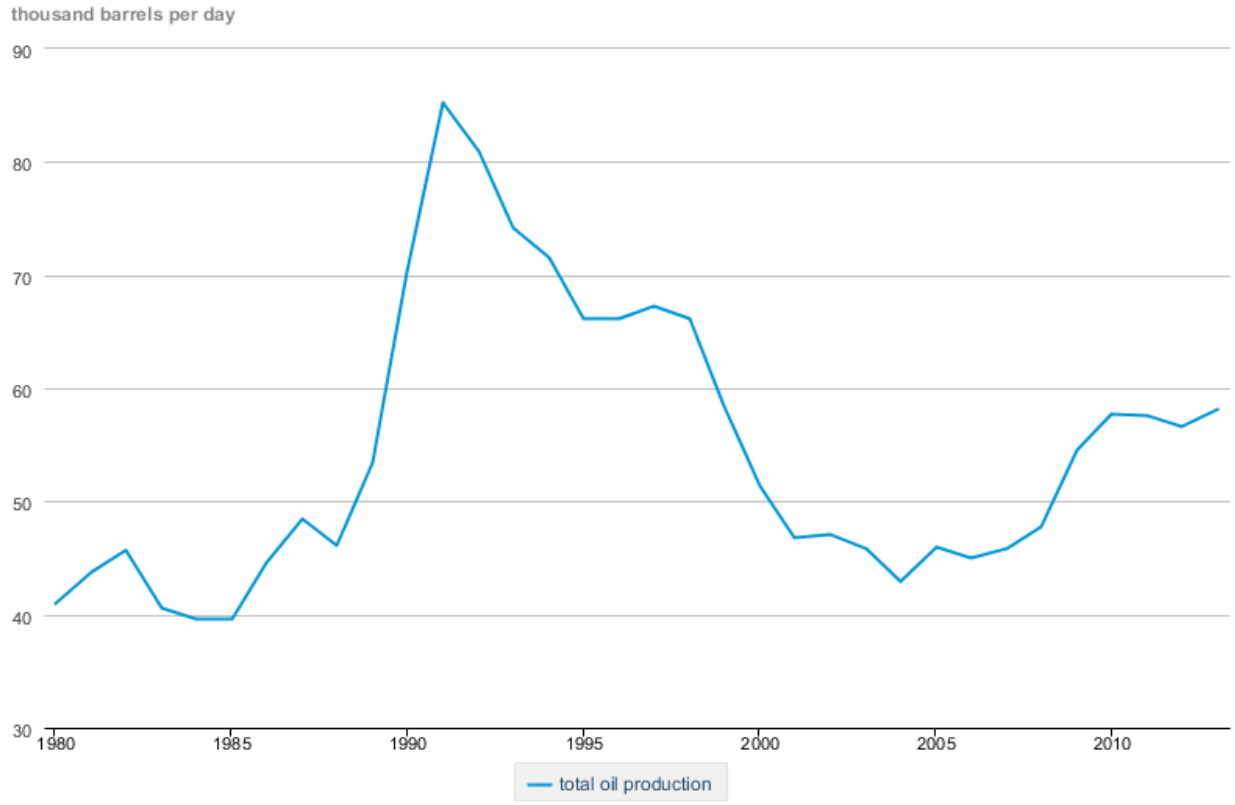


Figure 1: Oil Production since 1980 (Source: EIA)

Proven natural gas reserves in Turkey number 6.17 billion cubic meters (bcm). Turkey produces a very small amount of natural gas, with the total production amounting to 22 Bcf in 2012, providing less than 2% of consumption. Turkiye Petrolery A.O. (TPAO), BP, and Shell account for most of the country's natural gas production. In recent years, a number of natural gas fields

have been brought on line in the Black Sea, including the Akcakoca, East Ayazli, Akkaya, and Ayazli fields. Despite the limited known proven reserves, gas exploration efforts have increased in Turkey in recent years, particularly offshore in the Black Sea. Supermajor Royal Dutch Shell is poised to spend $300 million on an exploration program in the Turkish Black Sea, and ExxonMobil, Chevron, and Petrobras have ongoing exploration programs there. In addition, exploration for unconventional (shale) gas reserves has increased in recent years. Despite the risk in the southeast (PKK and potential spillover from the situation in Syria) Shell has an agreement with TPAO for shale gas exploration, with the Turkish firm taking a 70% share of production and Shell receiving 30%.

(2.1) Oil and Gas: Growing Demand

Next to Israel, Turkey is the only OECD (Organization for Economic Cooperation and Development) member country in the MENA region. Within this advanced economy block, Turkey is forecast to display the highest growth in energy demand of all OECD countries. According to the International Energy Agency (IEA), energy use will continue to grow at an annual growth rate of around 4.5% from 2015 to 2030, approximately doubling over the next decade. The IEA expects electricity demand growth to increase at an even faster pace (electricity is discussed in section 3). Turkey's petroleum product consumption increased relatively slowly overall in the past decade, though demand for automotive fuels and jet fuel rose more strongly. Taxes and changes from oil-fired to natural gas-fired power plants have abated overall oil demand in this period. The modest change is illustrated by noting that total consumption in 2011 was 706,000 bbl/d, up from 619,000 bbl/d in 2001. In 2013, Turkey's total liquid fuels consumption averaged 734,800 bbl/d. More than 90% of crude oil consumption and significant quantities of petroleum products came from imports. Turkey has various crude oil pipelines that bring oil from neighbours Iran, Iraq, and Azerbaijan (more on pipelines in Turkey in subsection 2.2). Crude oil that is not used by Turkish refineries is transited to other countries via oil export terminals such as Ceyhan (see Map 1).

As with oil, Turkey is a large consumer of natural gas, but a small producer. The overall strong growth of the Turkish economy, as well as new power plants being gas-fired rather than oil-fired (about 60% of natural gas is used for electricity generation), drives consumption increases. Consumption has increased by a factor of more than ten in the past twenty years, and has nearly tripled in the past 10 years. In 2011, Turkey's electric power sector accounted for just under half (48%) of the country's natural gas use. The industrial and residential sectors each accounted for approximately 20% (with 6% going to commercial uses, 4% going to other uses and 1% going to transport) . Natural gas demand peaks in the winter months, when natural gas use for power generation and space heating is highest. Demand during winter months can be double the demand during summer months, a common seasonal pattern in high gas use coutntries.

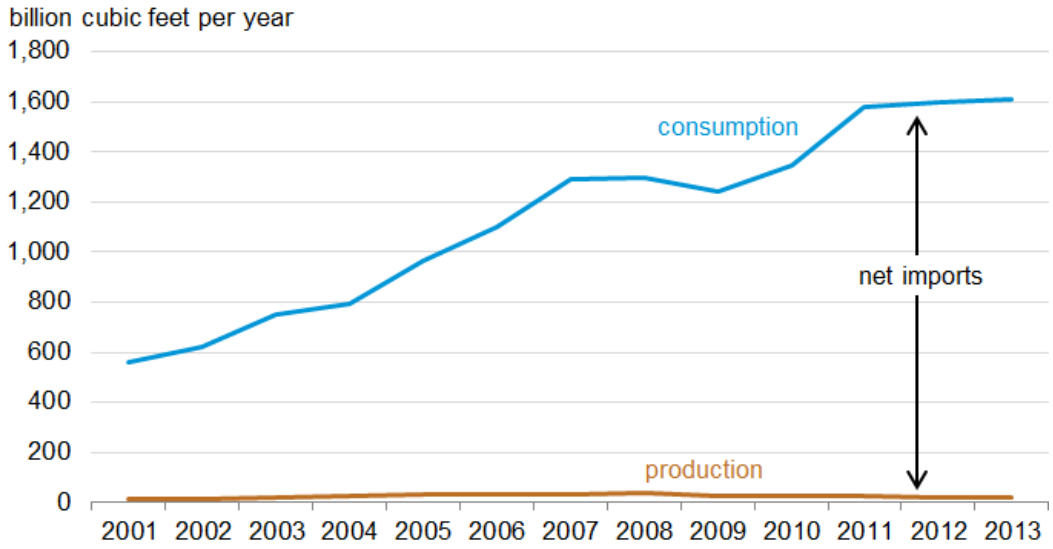


Figure 2: (Source: EIA)

Most of Turkey's natural gas imports arrive in the country via pipeline, including those from Russia (56%), Iran (18%), and Azerbaijan (8%). The majority of Russian gas arrives in Turkey via the Blue Stream pipeline, although sizeable volumes also reach the large population centers in and around Istanbul via the Bulgaria-Turkey pipeline. Turkey received about 290 Bcf of Iranian natural gas in 2012 via the Tabriz-Dogubayazit pipeline. An additional 118 Bcf arrived from Azerbaijan via the Baku-Tbilisi-Erzurum (BTE) pipeline in 2012. Turkey also imports liquefied natural gas (LNG) in the amount of16% of total imports; particularly from Algeria, Qatar, Egypt, Nigeria, Norway and Nigeria. LNG volumes arrive at the country's two terminals, Marmara Ereglisi in Tekirdag and the Aliaga terminal in Izmir.

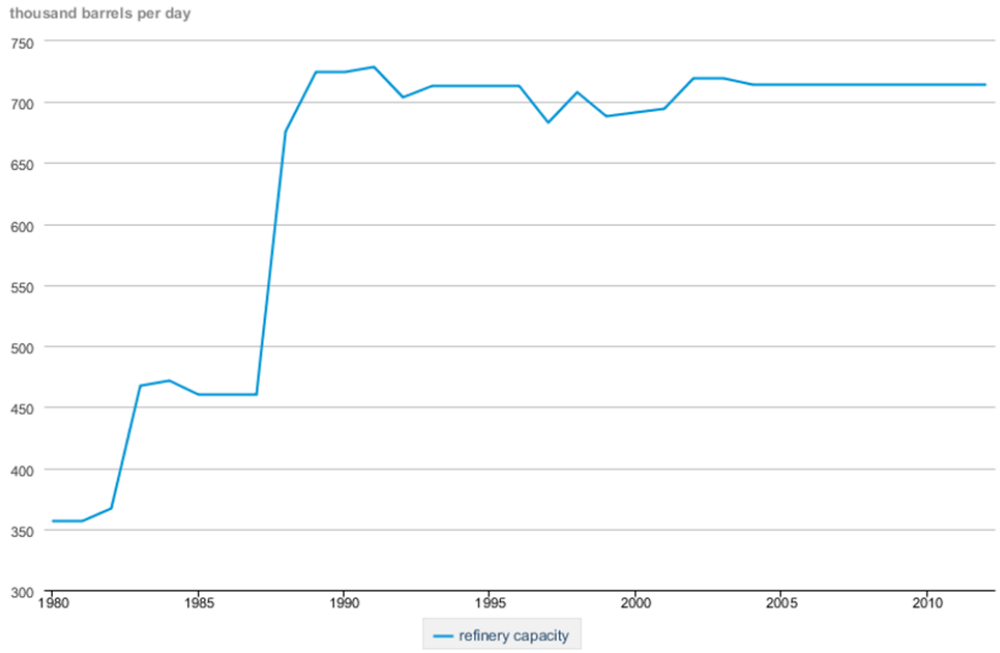
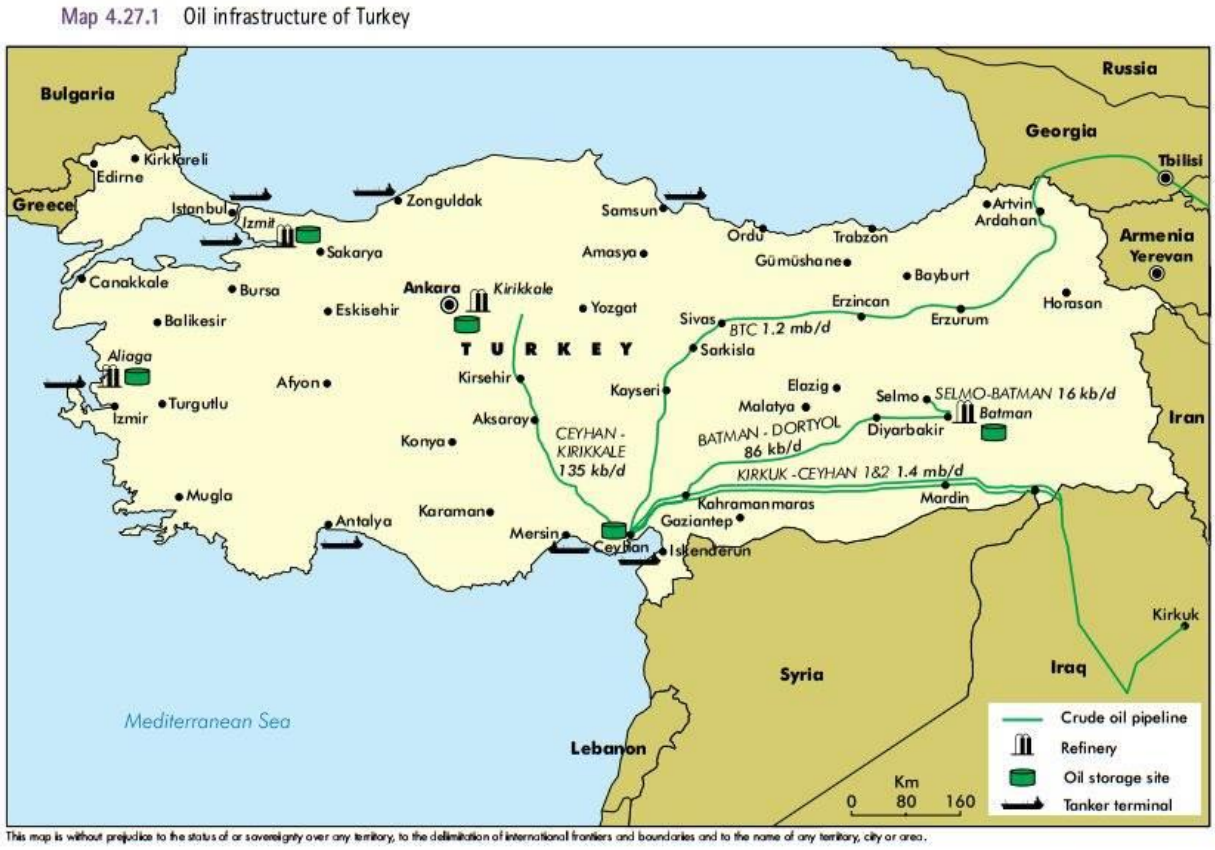


Figure 3: (Source: EIA)

As of January 1, 2014, Turkey had six refineries with a combined processing capacity of 714,275 bbl/d, according to Oil & Gas Journal (see Map 5 for the locations of key refineries). The majority of this refining capacity was built up in the 1980s (see Figure 3).



Map 1: Oil Infrastructure in Turkey. (Source: IEA)

TÜPRAŞ is Turkey's dominant refining firm, operating more than 85% of the total refining capacity as well as controlling 59% of the total petroleum products storage capacity. Given demand – and demand growth – in Turkey, there is room for increased crude oil refining capacity. Currently, Turkey imports some products, particularly diesel, to make up for inadequate refinery output, and a smaller amount of products for which refinery output exceeds local demand is exported (mostly gasoline).

(2.2) Oil and Gas Transit Potential: The 'Southern Corridor'

In addition to the oil pipelines seen in Map 5 (BTC 1.2 mbbl/d and Kirkuk-Ceyhan 1.4 mbbl/d[3]) relevant for domestic consumption of oil as well as export capacity, natural gas transit and export capacity is of significant interest to the global energy demand and supply picture given Turkey's strategic location. To date however, the requisite investment has not materialized but there are plans to increase transit capacity. While Turkey has enjoyed considerable excess import capacity a few years ago, this excess pipeline capacity has eroded as Turkey now uses most of its pipeline capacity to meet its domestic demand pressing on the Turkey's function as a gas transit state. Turkey's state-owned company, BOTAŞ, dominates Turkey's gas transit sector and all else equal, will likely be a key player in any future pipeline endeavors.

An important aspect of the interest in and near term urgency of realizing Turkey's gas transit potential is Europe's import relationship with Russian gas. Russia is the world's largest holder of proved gas reserves and as such is the primary supplier of European markets. The reliability of Russia as a supplier has been called into question on several occasions over rows between the government in Ukraine and Moscow. The result has been gaps in supply to western markets from Russia, as indicated in the chart below.

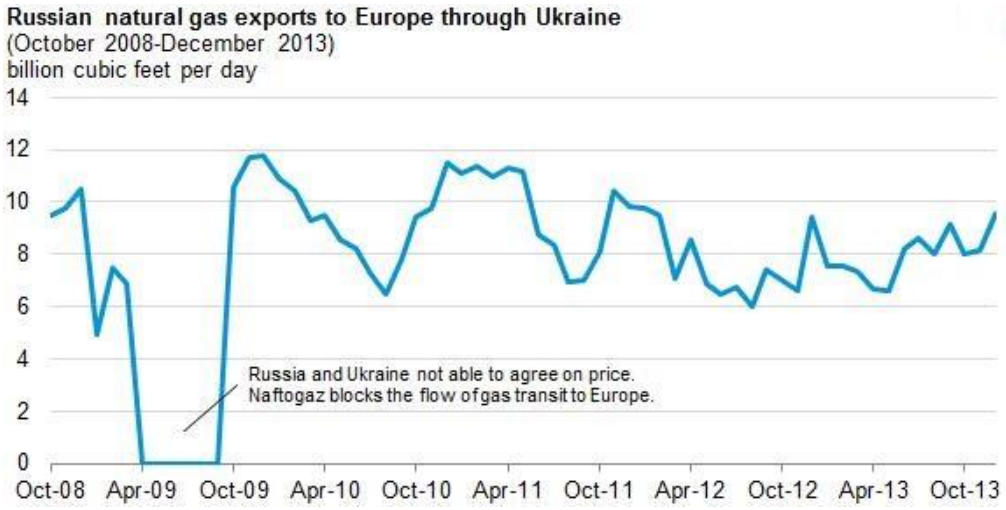


Figure 4: (Source: EIA)

Russia supplies around 30% (5.7 Tcf) of Europe's consumption volume, with a significant amount flowing through Ukraine. The EIA estimates that 16% (3.0 Tcf) of the total natural gas consumed in Europe passed through Ukraine's pipeline network in 2012, based on data reported by Gazprom and Eastern Bloc Energy. Two major pipeline systems carry Russian gas through Ukraine to Western Europe – the Bratstvo (Brotherhood) and Soyuz (Union) pipelines (see Map 2).

[3] See Country Report: Iraq for an in depth discussion of the Kirkuk-Ceyhan pipeline.

Map 2: Main Features of the Russian Gas Export System (Western Markets)

In the past, as much as 80% of Russian natural gas exports to Europe transited Ukraine. This number has fallen to 50%-60% since the Nord Stream pipeline, a direct link between Russia and Germany under the Baltic Sea, came online in 2011 (see Map 2). Russia has hence sought to replicate its success in the north with a southern equivalent in the Black Sea linking Russia with Bulgaria called 'South Stream.' If successful the project would dramatically reduce dependence on Ukraine as a transit country.

Map 2: Blue Stream and South Stream

However, with the ongoing crisis in Ukraine and sanctions imposed against Russia by Western governments, the South stream project has unsurprisingly come under pressure. The EU has asked member states to stop the construction of parts of the pipeline connecting Russia with Bulgaria, effectively terminating the pipeline. Russia's president Vladimir Putin has commented that "Russia can't start building an underwater pipeline and stop at Bulgaria" with Gazprom Chief Executive Officer Alexey Miller later affirming to reporters in Ankara in December that "the project is over". The graphic below details the portion of the pipeline running into EU countries which were asked to stop construction of the pipeline.

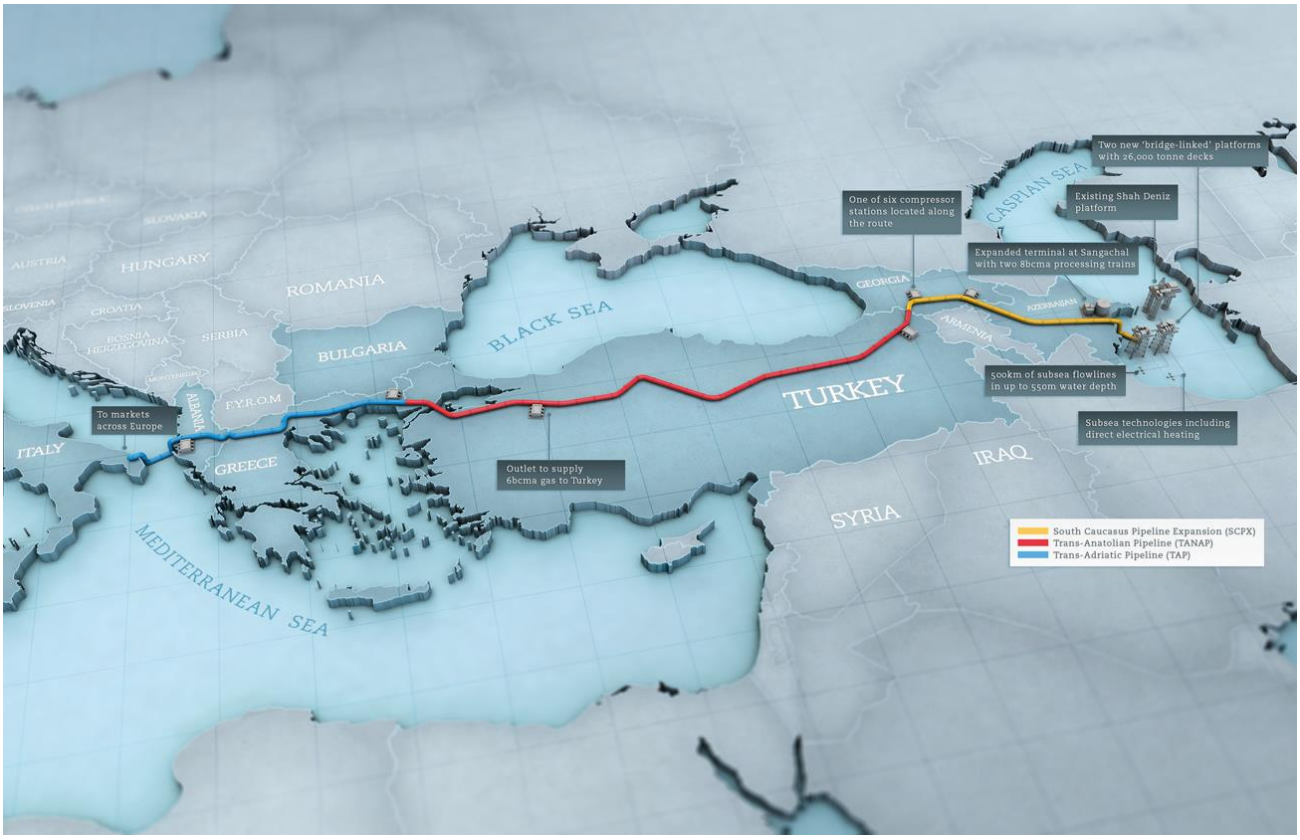
Map 3: Originally Planned South Stream Pipeline Route into Europe with European Partners (Source: Gazprom)

Gazprom had spent 487.5 billion rubles ($9.4 billion) in the last three years on South Stream and upgrading the Russian pipelines that would have supplied it, according to bond filings. Some of that work can be used for a separate link to Turkey. Since the cancellation of South Stream Russia will concentrate on supplying gas to Turkey through the Blue Stream pipeline, increasing deliveries by 3 billion cubic meters a year and offering a 6 percent discount from Jan. 1, according to President Putin.

Later in January 2015 a plan was introduced by Gazprom to build the so called "Turk Stream" pipeline. Gazprom CEO Miller said the new pipeline would consist of four lines of 15.75 bcm each, with the first one to supply Turkey only (no comment was given regarding the destination of the other three lines). For reference, gas lines to Turkey from Russia through existing routes numbered imports of 27.4 bcm in 2014. This first line which will be laid via the Black Sea to deliver gas to Turkey's European province of Thrace, through which Turkey currently receives

14bn cm/y of supply from Russia via the Trans-Balkan pipeline from Ukraine. Miller added that Russia and Turkey would sign an agreement on building the pipeline in the second quarter of 2015. Gazprom has still to reveal the estimated cost of the project. If the EU were to tap this new version of South Stream the EU would have to build its own link to the proposed pipeline to Turkey to get Russian gas bypassing Ukraine.

However, the failure of South Stream and the speculative nature of "Turk Stream" means that supply routes through Ukraine remain in play and the present diplomatic row will serve to increase emphasis on what has been termed the 'Southern Corridor' which is the pipeline route through Azerbaijan, Georgia and Turkey. The Map below illustrates this corridor in the main by means of the pipeline under development by BP and others which aims to connect the Shah Deniz (I and II) gas fields in Caspian with European markets.



Map 4: Key Supply Route Linking Europe to Eastern Sources via the 'Southern Corridor.'

The pipelines are the South Caucus Pipeline (in yellow) also known as BTE (Baku–Tbilisi–Erzurum) pipeline, Trans-Anatolian Pipeline (in red) and Trans-Adriatic Pipeline (in blue). The ability of the southern corridor to counter, or at least check, Russia's gas dominance by sourcing from eastern suppliers has been demonstrated as a viable concept with the construction of the Baku-Tblisi-Ceyhan oil pipeline system (see Map 1). The Trans-Anatolian (red) and Trans-Adriatic (blue) pipelines which would complete the link from BTE gas pipeline to Europe are at

this stage planned. The expected completion time of these pipelines is 2017-2018 when the pipeline will begin moving gas exports from Shah Deniz II meeting expected production times of the gas field. Figures have been advanced out to 2026 with flow expectation reaching as high as 60 bcm. Furthermore, the pipeline route which is being demonstrated could serve as the basis for gas exports to Europe beyond Azerbaijani gas; including gas from Turkmen and Kazakh producers through the possible Trans-Caspian Gas Pipeline. The viability of this concept will depend on building a pipeline through the Caspian sea. However, as no concrete plans have been agreed upon and developing major international gas pipelines takes years of planning before a single pipe is welded means that it is not possible at this time to discuss the Trans-Caspian as a certainty.

Map 6: BTC,BTE, Trans-Caspain (proposed) and Nabucco (proposed)

Further speculation that could realize the Southern Corridor from checking Russian gas export dominance is the proposed pipeline called Nabucco. Nabucco would connect to Caspian production as well as gas volumes arriving through the Trans-Caspian were it to be realized. In addition, Nabucco touts an additional option of connecting to gas fields in Iran. Iran is the world's 2nd largest gas reserve holder and its role in global gas has been largely overlooked due to the diplomatic problems (see Country Report: Iran for an in depth discussion of Iranian energy and the diplomatic situation).

Map 6: Nabucco Route to Western Gas Markets

The mass of potential pipeline projects in the Southern Corridor, in addition to LNG developments underway in Qatar (see Country Report: Qatar) may indeed see Russia's gas dominance seriously undermined, and with these developments the prospect for Iran to tap into the Southern Corridor's supply potential will be increased. The entire concept however at this time depends on a number of as yet unrealized developments. As regards oil, Iran is comfortable with its Persian gulf export routes but the prospect of the lifting of sanction increasing oil and gas production will allow for increased prospecting on Iran to become involved in the gas corridor. Additionally, gas production in Kazakhstan and Uzbekistan has no chance of reaching to Southern Corridor transit system without the construction of the Trans-Caspian pipeline and the 2 pipelines linking Kazakhstan to Baku. Where these developments to the go through the viability of the Southern Corridor and hence the Nabucco supply route, would be increased enormously with Russia's control of the gas market reduced in commensurate measure.

With development in this area charging ahead the risks are increased that the problems on Turkey's southern border may prove a major security threat to its pipeline system. That said, it remains to be seen if the major investment necessary to realize the southern corridor will be achieved and Turkey's need to satisfy rapidly growing domestic consumption will weigh on any expectations of re-export/transit capacity.

(3) Electricity

Fossil fuel and hydroelectricity generation accounts for nearly all of Turkey's electricity generation capacity (56.1 million kilowatts in 2012), with natural gas as the most important source. The breakdown by source is given by 2012 figures[4]:

- Natural Gas 43%
- Coal 22.9%
- Hydroelectric 32.5%

Turkey is a small producer of coal, but also imports coal in order to supply the electric power sector – imports were 23% of total coal supply in 2012. Reserves as of 2008 were total recoverable coal reserves of 2.36 billion metric tons, of which only 529 million metric tons, or about 23%, was “hard coal” (anthracite and bituminous). The remainder, 1.83 billion metric tons, consists of lignite coal reserves. Production in 2011 was 75.4 million metric tons. Only a small fraction of that production is bituminous – less than 6%. Turkey has several lignite mines, but only one bituminous mine. Turkey imported about 27 million metric tons in 2010, and likely a similar figure in 2011 in order to satisfy 2011 consumption of 104 million metric tons. In early 2013 Platts reported that "interest in developing coal-fired plants in Turkey has increased dramatically recently” following statements by Energy Minister Taner Yildiz that Turkey has to diversify away from using imported gas to generate power and to make more of its underused domestic coal reserves. Ostensibly in an effort to boost its role as a gas transit state.

Hydroelectric has also grown in importance with investment in the sector. The country has, by government estimate, about 1% of the world’s hydroelectric potential in its waterways. There are several large rivers, including the Tigris and Euphrates that flow eventually to Iraq and the Persian Gulf. Turkey’s viable hydroelectric capacity potential is estimated at 35,000 MW. The installed capacity is currently about 23 GW[5].

Turkey signed an agreement with Russia in 2010 to build Turkey's first nuclear power plant in Akkuyu, on the Mediterranean coast. The plant would have four units with a total capacity of 4.2 gigawatts and begin operating around 2020. Russian investors, namely Rosatom, agreed to finance a large proportion of the project. However, several Turkish ministries still need to approve the project before formal construction begins.

[4] Source: EIA
[5] Source: International Hydropower Association

Sources

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