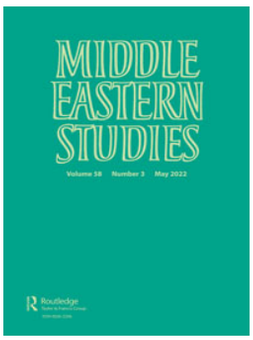

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Turkey's energy dilemmas: changes and challenges

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Energy supplies have become a critical and controversial issue in global politics. On the one hand, they create complex problems of dependency between producer and consumer nations, and between both of them when pipelines for oil or gas cross the territory of third parties. Since the dramatic oil price rises of 1974, the price of energy traded internationally has also become a crucial factor in the global economy. Finally, the potentially disastrous impact of global warming has put the need to switch away from fossil fuels to renewable energy sources at the top of the international agenda

Turkey provides an important case study of these issues. Energy has been identified as the Achilles heel of Turkey's economy. On the one hand, it has experienced rapid (if erratically) expanding incomes and industry, with a corresponding rise in the demand for energy. On the other hand, it has very limited supplies of fossil fuels, relying on imports for the bulk of its energy needs. This creates serious economic costs. In the late 1970s, there was a dramatic demonstration of this, when the global oil price explosion of 1974-75, as well as escalating demand, played a major role in the collapse of the economy in the run-up to the military coup of September 1980. Heavy dependence on imported energy may also create serious external political liabilities, with exporters potentially able to put political pressure on importers by threatening to cut off or limit supplies.

More positively, there is the perception that Turkey could play an important role as an intermediary and transit state, between middle eastern and Caspian exporters and European importers, which could reduce Russia's dominant position as Europe's main external energy supplier. After a slow start, reducing greenhouse gas emissions has now become a crucial part of Turkey's energy policies. For Turkey, there is a double incentive for this, since besides the environmental benefits, the switch to renewables also reduces the external dependencies and economic costs of importing fossil fuels.

In recent years deep-laid and politically inspired disputes with its neighbours over off-shore rights to assumed deposits of oil and gas in the eastern Mediterranean, have further exacerbated Turkey's external relations. However, discussion of the issues this raises have been left out of this article, since this would require an expertise in international law which the writer lacks. Instead, what follows starts with a general discussion of the role of energy supplies in the Turkish economy, looking at experiences, current trends and plans. This outline is then disaggregated for the main fossil-fuel energy sources – oil, coal and lignite, and natural gas, with plans for nuclear power introduced as a separate issue. Environmental protection, the reduction of fossil-fuel dependency, and the development of renewable energy sources are then discussed. The final section considers international aspects raised by external dependencies and Turkey's role as a transit state, with the effects of these on its relations with neighbours and global actors.

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Energy and the Turkish economy

Turkey is at a middle stage of the industrialisation process, with continued growth in energy demand due to both rising consumer incomes and continued growth of energy-hungry basic industries. Hence, consumption is rising at just over four per cent per annum, compared with a fall of 0.7 per cent per annum in Europe as a whole (see Table 1). However, per capita consumption is still only about 63 per cent of the European average, suggesting that if per capita incomes continue climbing towards western European levels, demand will continue to rise by around one third before eventually levelling off. Turkey's current five-year Development Plan (2019-23) assumes continued growth in energy demand, but at an annual rate lower than that for the previous 10-year period. By 2023, however, according to the Turkish planners' predictions, per capita demand would still be below the current European average

Turkey's primary problem is that it has limited domestic supplies of fossil fuels, and that other sources have not been fully developed, so it is heavily dependent on imports, which account for about 70 per cent of energy consumption. The current Development Plan claims that this dependency will be reduced, but does not commit itself to any precise target.[1] There are very limited reserves of hard coal: lignite is plentiful, but has low calorific value and causes significant greenhouse gas emissions. Natural gas is almost entirely imported: a recent find, the Sakarya field, in the Turkish section of the Black Sea, put at 320 billion cubic metres, can be expected to alter this picture. However, President Erdoğan's claim that this could be brought on stream by 2023, and that Turkey could soon become a net exporter of energy looks optimistic. Instead, it is suggested that it will take as long as ten years to bring the field on stream, and that it could only meet about one third of Turkey's gas needs.[2]

In the pattern of consumption among different fuels, the main difference between Turkey and the rest of Europe is that currently Turkey has no nuclear power plants, with a correspondingly higher share for coal. Hydro-power accounts for a higher proportion of the total than in the rest of Europe, with a lower proportion currently derived from other renewable energy sources (see Table 2).

Independent researchers at Sabancı University's Istanbul International Center for Energy and Climate (IICEC) have calculated data for energy consumption by main economic sectors – industry, buildings (for heating, lighting and air conditioning), transport and agriculture, shown in Table 3. As can be seen, consumption is split roughly equally between the three main sectors. By contrast, agriculture accounts for less than five per cent of total consumption, although it

Table 1. Primary energy consumption (million tonnes oil equivalent).

				% per annum change	per capita,	
	2009	2019	2023	2008-18	2018	2023
Turkey	102.3	152.0	174.3	+4.1	1.81	2.01
Europe	2,173.3	2,030.2		−0.7	2.93	

Sources: *BP Statistical Review of World Energy 2019* (London: British Petroleum, 2019), p.8: ibid., 2020, p.37: data for 2023 are targets, from *On Birinci Kalkınma Planı (2019-2023)* (Ankara: T.C. Cumhurbaşkanlığı, Devlet Planlama Teşkilatı, July 2019), p.121. Data for 2020-2021 are omitted, since they were exceptionally distorted by the Covid pandemic. 'Europe' includes Turkey, but excludes Belarus and the Russian Federation.

Table 2. Primary energy consumption, by fuel, as per cent of total, 2019, Turkey and Europe.

	Oil	Natural Gas	Coal	Nuclear	Hydro	Renewables
Turkey	30.9	24.0	27.0	–	12.1	6.0
Europe	36.3	23.8	13.2	9.9	6.7	9.8

Source: *BP Statistical Review of World Energy 2021*, p.9. 'Renewables' includes wind, solar, geothermal and biofuels.

Table 3. Turkey: final consumption by sector and fuel, as per cent of total, 2018.

Sector	Electricity	Natural Gas	Oil	Coal	Renewables	Total	As per cent of total, all sectors
Industry	27.6	25.9	10.5	26.2	9.7	100	35.3
Buildings	33.8	41.0	3.0	11.7	10.5	100	32.6
Transport	0.3	0.3	98.6	–	0.7	100	27.6
Agriculture	17.4	4.3	65.2	–	13.0	100	4.5

Source: Sabancı University, Istanbul International Center for Energy and Climate, *Turkey Energy Outlook* (https://iicec.sabanciuniv.edu/teo), pp.429-31. 'Renewables' includes hydro-power, plus wind, solar, geothermal and biofuels; 'agriculture' includes fisheries.

Table 4. Electricity generation, by fuel, Turkey and Europe (terawatt hours) 2019.

	Oil	Nat.Gas	Coal	Nuclear	Hydro	Renewables
Turkey	0.3	57.3	–	112.9	88.8	43.3
As % of total	0.1	18.9	37.2	–	29.2	14.2
Europe	53.6	774.2	689.5	930.0	627.9	840.0
As % of total	1.3	19.4	17.3	23.	15.7	21.0

Source: *BP Statistical Review of World Energy 2021*, p.65. Fuel data exclude 'Other' (less than 2 per cent) so percentages do not add exactly to 100.

accounts for around seven per cent of Gross Domestic Product (GDP)[3] and 18 per cent of total employment.[4]

Imports of oil, natural gas and hard coal account for a major part of Turkey's large foreign trade deficit, which is in turn a crucial economic weakness. According to Turkish official data for 2019, the country's visible trade balance showed a deficit of $29.5 billion, with fuel imports (principally coal, oil and natural gas) at $15.1 billion, or 7.2 per cent of total imports.[5] If Turkey could substantially reduce its fossil fuel imports this would help to cure one of the most persistent and serious problems in the economy.

Main energy sources and policies

As noted in Table 3, electricity generation accounts for around 35 per cent of total energy consumption in Turkey. However, power stations are a secondary source of supply, as they must draw their fuel from other primary energy sources – coal, oil, natural gas, or hydro – and nuclear power, plus renewable sources such as wind or solar generators.

The percentage shares of different energy sources in electricity generation, shown in Table 4, reflect the pattern shown in Table 2, with coal accounting for a large proportion of the total, in the absence of nuclear power. Hydro-power is also significantly more important in the Turkish case than in Europe as a whole.

Domestically, the electricity generating and distribution system faces a number of problems. Currently there is excess electricity generating capacity of around 35 per cent. Original government forecasts for 2007-13 expected an average Gross National Product (GNP) annual growth rate of 7 per cent, against an outcome of around 5 per cent, and for 2014-18 of 5.5 per cent against an outcome of 4.9 per cent. On this basis, it was expected that electricity consumption would increase to 363 terawatt hours by 2017, against an outcome of 304 twh in 2019. Although past experience has shown that for Turkey the capacity margin should not fall below 30 per cent due to the high share of hydro and strategic risks to supply, the current excess capacity has created major financial problems for the private sector investors. Private firms were encouraged to expand electricity generation by building new plants which now stand idle. Since many of them borrowed in foreign currency to meet their initial privatisation bids and subsequent investments, the depreciation of the Turkish Lira has left them with heavy debts.[6] A longer term issue is how this excess capacity is to be squared with the development of nuclear power, or of renewable energy.

As already noticed in Table 2, oil is the largest single energy source in Turkey, accounting for just over 30 per cent of total consumption. In line with the growth in the economy, consumption has grown fairly steadily, from just under 700,000 barrels per day (b/d) in 2010 to almost one million b/d in 2019.[7] Of this, only a small fraction (5.75 per cent in 2019)[8] is domestically produced from small oil fields in south-east Anatolia; hence, almost all crude oil and products must be imported. Excluding non-energy uses such as petro-chemicals, transport accounts for 78 per cent of consumption, followed by industry (11 per cent), agriculture (8 per cent) and residential and commercial services (3 per cent). In refined products, diesel fuel accounts for 63 per cent of the total, followed by liquid petroleum gas (LPG) at 12 per cent, petroleum coke (10 per cent), gasoline (6 per cent), naptha (5 per cent) and fuel oil (0.5 per cent).[9] Since road transport accounts for the big majority of total demand, the low proportion of gasoline is notable, the explanation being the high proportion of trucks and buses in the total vehicle stock, and the heavy use of diesel and LPG by private cars, given their tax advantages. Fuel oil has been virtually eliminated in power generation, and LPG increasingly replaced as a domestic fuel by expansion of the natural gas supply network.[10]

In policy terms, the main issue for Turkey is the cost of oil, and hence its impact on the balance of payments However, as in the case of other oil-importing countries, there is little that the government can do about this, given that crude oil is an homogenous and widely internationally traded commodity whose price is determined by the global balance of supply and demand. Hence, the most urgent policy priority is to control, and if possible reduce consumption to meet environmental needs, a topic returned to later.

Thanks to its rapid expansion over the last two decades, natural gas has become a critical element in Turkey's energy supply mix. Unlike oil, natural gas is commonly delivered by pipeline from producers to consumers. Since this commits the importer to a limited number of exporters (and often to a single exporter) prices and volumes are determined in advance by long-term contracts. Price, volume, and security of supply are thus important issues for both parties. In this respect, Turkey has an important advantage over other importers, since it is a near-neighbour of three important gas exporters – Russia, Azerbaijan and Iran. Until 2001 Russia was the sole supplier, via a pipeline passing through eastern Europe, but at this date an alternative pipeline from Iran was brought on stream. This was followed by two further pipelines from Russia passing under the Black Sea ('Blue Stream', opened in 2003, and 'TurkStream' in 2020) as well as a pipeline from Azerbaijan, passing through Georgia, opened in 2006. Meanwhile, thanks to technical developments and world market conditions, between 2013 and 2020 the landed price of liquid natural gas (LNG) in Europe fell by over 60 per cent, making it competitive with pipeline supplies.[11] As a result, Turkey's natural gas imports from Russia fell from 17.6 billion cubic metres (bcm), or 46 per cent of the total in 2010, to 16.2 bcm, or 34 per cent of the total, in 2020. By the latter year, imports from Azerbaijan accounted for almost 24 per cent of the total, with 11 per cent from Iran, and over 31 per cent provided by LNG, mainly from Algeria and Nigeria (see Table 5).[12]

In principle, using the availability of cheaper LNG, Turkey could bargain for lower prices and shorter contracts in negotiations for pipeline gas imports from Russia, Azerbaijan and Iran. As Manfred Hafner argues, LNG is 'making gas markets increasingly look like oil markets'.[13] All other

Table 5. Turkey, natural gas imports, by origin, 2020 (billion cubic metres).

	Russia	Azerbaijan	Iran	LNG	Total
Volume (bcm)	16.2	11.5	5.3	15.1	48.1
As per cent	33.7	23.9	11.0	31.4	100

Source: Nuran Erkul Kaya, 'Turkey's Gas Imports from Iran see sharp fall in 2020', Anadolu Ajansı, 26 February 2021 (https://www.aa.com.tr/en/energy/energy-diplomacy/turkeys-gas-imports-from-iran-see-sharp-fall-in-2020/31999#).

things being equal, this should allow importer countries like Turkey to bargain for more flexible and probably cheaper contracts with pipeline suppliers. By the end of 2021, long-term contracts for the import of 16 billion cubic metres per year (bcm/y) out of a total of around 45 bcm/y of natural gas imports will have expired, allowing Turkey to exit the costly long-term sales contracts, with oil price indexation and take or pay schemes which had previously applied. Over the following five years, a number of other long-term contracts, especially with Russia, are due to expire, extending this process some way into the future. Through possible reverse flows on the Trans-Anatolia Pipeline (TANAP) and Turk-Stream pipelines (see below) conveying gas across Turkey into southern Europe, it could also access gas at European hub prices, putting extra pressure on its existing suppliers. Assuming it comes on stream in 2023, the Sakarya field could reduce Turkey's annual bill for imported gas by around $2.6 bn.[14] To achieve the best results, however, Turkey needed to have reasonably accurate forecasts of its energy needs over the next 15-25 years. On this score there were complaints that the relevant state institutions, such as the state pipeline company BOTAŞ and the Ministry of Energy, were far from transparent in their release of the relevant data.[15]

In the short term, however, these predictions failed to materialise, since the prices and availability of natural gas can be highly unstable. The point was made by the dramatic rise in gas, and hence other energy prices during 2021-2. Thanks to low reserves following a harsh winter, and a faster than expected recovery of the global economy after the first phase of the Covid 19 pandemic, European gas prices quadrupled between April 2021 and January 2022, affecting Turkey along with other consumer countries. It was also alleged that Russia was deliberately restricting supplies as a way of putting political pressure on the EU, or of inducing Germany to agree to the opening of the controversial Nord Stream 2 submarine pipeline between the two countries.[16] In Turkey's case, problems were made even more acute by the fall in hydro-power output in 2021 (see below).

Coal production in Turkey has been falling slightly over the past ten years, albeit less slowly than that of Europe as a whole (Table 6). Production in 2018 totalled 82 million tonnes, but of this all but one million tonnes was accounted for by lignite, which has a much lower calorific value than hard coal. Against this, hard coal, needed for steel-making and other industries as well as power generation, is almost entirely imported (38 million tonnes of 39 million tonnes total in 2018).[17] While coal accounted for 37 per cent of power generation in 2019, 60 per cent of this was provided by hard coal, and 40 per cent by lignite, further increasing Turkey's overall import dependency. Since lignite is currently Turkey's second largest indigenous energy source, after hydro-power, there is naturally a political-cum-economic incentive to increase its share of total power production. Against this, burning lignite is highly damaging to the environment, with a carbon dioxide emission rate around 3.5 times that of natural gas for the same power output.[18] There is thus a direct trade-off between energy independence and increased output, on the one side, and the reduction of greenhouse gas emissions on the other. In 2017, with the hashtag '*Bizim kömürümüz bizim enerjimiz*' ('our coal, our energy') the Ministry of Energy

Table 6. Coal production and consumption, Turkey and Europe, 2009-19 (exajoules).

	2009	2019	Per cent change
(a) Coal Production			
Turkey	0.73	0.73	–
Europe	9.6	5.53	−42
(b) Coal Consumption			
Turkey	1.32	1.76	+33
Europe	15.34	9.4	−39
Turkey, imports	0.59	1.03	
Imports as % consumption	44.7	58.5	

Source: *BP Statistical Review of World Energy 2021*, pp.48–49.

adopted the aim of increasing coal-fired generating capacity from 17.3 Gigawatts to 30 Gigawatts by 2023.[19] The current five-year Development Plan states that 'the use of our lignite reserves in electric power production will be increased' so that 'dependence on imported sources will be reduced and an increase in employment secured', and that this would be done 'in a manner conforming to environmental standards', but without saying what standards or how this is to be achieved.[20] In effect, this seems to be an unsolved dilemma in Turkey's energy policies.

Nuclear power has not yet come on stream in Turkey, but can be expected to do so in the near future. Following negotiations going back to 1997, in May 2010 the Russian and Turkish Presidents signed an intergovernmental agreement under which the Russian company Rosatom would build and operate a nuclear power plant at Akkuyu, on Turkey's southern coast. In 2017 Rosatom sold a 49 per cent share in the project to a Turkish consortium, and construction started in the following year. The first of four 1,200 Megawatt units is due for completion in 2023, with the remaining three due to come on stream by 2026. Meanwhile, in March 2015 parliament ratified an agreement with a Japanese-French consortium for a second nuclear power plant, with a total capacity of 4,600 Megawatts, to be built on the Black Sea coast at Sinop. Later, in December 2018, it was announced that Mitsubishi Heavy Industries, the main Japanese member of the consortium, and other partners, were negotiating to abandon the project, leaving its future uncertain.[21]

Apart from serious doubts about the fate of the Sinop project, a large question mark hangs over the overall future of nuclear power in Turkey, as in other countries. Since nuclear power comes in large units with high capital costs, investment is a 'bet the farm' risk Nuclear power projects in other countries have also been plagued by serious cost overruns and delays, apart from past experience of actually or potentially catastrophic accidents. Hence, the International Energy Agency expects that the development of nuclear power will stall at about eight per cent of total global electricity supply through to 2040.[22] In the Turkish case, it is also argued that the Akkuyu project will further increase Turkey's energy dependence on Russia, front-loading the country with debt just when alternative and cheaper energy sources are being developed. The fact that Akkuyu is in an earthquake-prone area has heightened environmental concerns.[23] Critics have also feared that Turkey might use the plant as a first step in the development of nuclear weapons, but currently this seems unlikely. Since 1952, Turkey has been protected by the NATO nuclear umbrella, with the US Airforce deploying tactical nuclear weapons at the joint NATO airbase at İncirlik, near Adana, so it already enjoys protection against other nuclear powers. It is signatory to the Treaty on Non-Proliferation of Nuclear Weapons and the Comprehensive Test Ban Treaty, and seems unlikely to ignore or rescind these commitments.

Environmental concerns, global warming and the development of renewable energy sources

Until recently, environmental protection has not been given a high priority in Turkey's energy policies. Environmental pressure groups have existed for some time, and local protest movements have sometimes been successful, but no national 'green' party has ever entered parliament, or seems likely to do so. In what was until recently a relatively poor country, with inadequate welfare services, governments gave priority to economic growth, with environmental and other issues taking second place. It is only recently that the official rhetoric has begun to alter, with President Erdoğan admitting that Turkey should abandon 'wild growth' in favour of 'compassionate growth' for the protection of the environment.[24] In the summer of 2021 the message was reinforced by torrential rainstorms and destructive floods in the Black Sea coastal region, combined with serious drought in central and eastern Anatolia, and forest fires in the south and west. These brought home the realities of climate change to everyone in Turkey.[25] In August 2021 it was predicted that, by the end of the century, summer temperatures would increase

by 3.5-6.5 degrees Celsius producing even more destructive extreme weather.[26] On the debit side, Turkey was for long the only member of the G-20 group which had failed to sign and ratify the Paris Climate Change Agreement of 2015 – that is to say that the government signed the agreement, but for over six years did not send it to parliament for ratification, on the grounds that Turkey was listed as a 'developed' country, requiring it to give financial support to 'developing countries'. Finally, on 6 October 2021, in preparation for the UN Climate Change Conference to be held in Glasgow in November, the government changed tactics, and the agreement was ratified by parliament.[27]

Meeting the goals of the Paris agreement involves two approaches – first, limiting overall fossil fuel consumption wherever possible, and second, developing renewable energy sources, especially for power generation. On the first score, bringing down the consumption of petroleum in Turkey will not be easy, since transport accounts for the lion's share of consumption. Given economic growth, plus the fact that car ownership in Turkey is still well below European levels,[28] overall demand for transport services is bound to continue rising. Hence, limitation of future petroleum consumption will depend on switching demand from road transport to railways and coastal shipping. Current government policies call for a reduction in the share of road traffic in passenger transport from 90 per cent to 72 per cent, and in freight transport from 90 per cent to 60 per cent, with the railways' share increased to over 10 per cent and 15 per cent, respectively. The target date for achieving these changes is 2023. These are challenging targets given that, for instance, they call for increasing the share of coastal shipping in freight transport from 6 per cent to 20 per cent.[29] On the positive side, an impressive programme of construction of metro lines for urban transport, and high speed inter-city railways, with electrification of the rest of the railway system, is well under way.[30] Reducing the consumption of gasoline, diesel fuel and LPG through new technologies will not be easy, but in 2019 the Turkish Automobile Initiative Group (TOGG) produced a prototype battery-electric car, with production planned to start in 2023 and an initial capacity of 175,000 vehicles per year.[31] No target date for the phasing out of gasoline-driven cars appears to have been set, however.

As noted in Table 3, 41 per cent of energy consumption in commercial and residential buildings is accounted for by natural gas. Reducing this will be hard, as natural gas replaces the previous use of coal and lignite for home heating, and has expanded along with the national gas distribution network. Estimates by the IICEC predict that annual gas consumption by residential buildings will increase from 14.5 billion cubic metres (bcm) in 2019 to around 16-17 bcm by 2030 and 18-19 bcm by 2040.[32] Hence, reduction in the consumption of natural gas, as well as hard coal and lignite, depends chiefly on a switch to renewable sources in electricity generation.

Of these, hydro-power is normally the most important, thanks to precipitation in the mountains of central and eastern Anatolia, where it can be captured by dams and then released through turbines. Further expansion of this source would decrease both import dependency and greenhouse gas emissions. Turkey is estimated to have a total gross hydropower potential of 433 Gigawatts, but of this only 125 GW can be economically used.[33] Given around 32 GW of installed capacity in 2021, there is still substantial room for expansion. However, this could be constrained by a lack of suitable sites for future hydro-electric dams, plus objections caused by the displacement of local populations and the destruction of important historical and archaeological sites (the İlisu dam project on the upper Tigris is a prominent example[34] but there are several others). Like agriculture, hydro-power production is affected periodically by severe droughts: thus, in the last three months of 2020, power produced by hydro-plants dropped by 20.3 per cent compared to the same period in 2019, with a consequent temporary increase in the share of natural gas.[35] For the whole of 2021, it was reported that the share of hydro-power in total electricity generation fell to 17 per cent, with wind and solar power accounting for 13.6 per cent. Reversing previous trends natural gas filled the gap, with total consumption rising to 61 billion cubic metres in 2021.[36]

After a late start, Turkey has also made progress in developing other renewable energy sources. In January 2021, for the first time, wind generators accounted for more than 10 per cent of total electricity output, with capacity expected to rise by a further 10 per cent in the rest of the year, attracting about $3 billion in funding from banks. By the end of 2021, installed wind generating capacity was expected to reach 10 GW, or around 10 per cent of total capacity.[37] Domestic production of wind generators was also expanding exponentially, with an urgent need of skilled workers to provide for further expansion.[38] On average, Turkey has around 7.5 hours of sunshine daily, so that it surprising that solar generation has lagged behind wind power. Nevertheless installed solar capacity reached 7.3 GW by July 2021, accounting for four per cent of total power generation during the first half of the year.[39]

Besides abundant solar and wind potential, Turkey's position on a tectonic plate boundary allows it to develop geothermal energy as another renewable source; in fact, Turkey is calculated to account for 11.5 per cent of total global geothermal capacity. Potential geothermal generating capacity is currently put at 4.5 GW. Of this, installed capacity stood at 1.6 GW in 2021, with plans to increase this to 2.6 GW by 2025, representing about 3 per cent of current total installed capacity. During the first half of 2021, Turkey's 63 geothermal plants accounted for 3.1 per cent of electricity generation. In addition, about 3.5 GW capacity is used directly for geothermal district heating of houses, greenhouses, and other installations.

International and political issues

Besides being a large energy consumer, Turkey occupies an important geo-strategic position between the world's major exporters of oil and natural gas in the Middle East, the Caspian Basin, and Russia, on the one hand, and Europe on the other. As a result, five important international pipelines currently cross Turkey's territories.

For oil, there is:

From Iraq, the Kirkuk-Ceyhan pipeline bringing oil from Iraq's northern oilfields to Turkey's Mediterranean coast, for export and internal consumption in Turkey. It was originally opened in 1976, then enlarged with a parallel pipe in 1987, giving a total design capacity of 1.6 million barrels per day (mb/d). However, since 2003 the flow has been frequently interrupted by terrorist attacks, and political conflict on the Iraqi side. As John V. Bowlus remarks, 'Transnational oil pipelines in the Arab world generally have had a poor performance record, as mistrust based on sectarian, ethnic and political-historical differences constrain the routes that they can take.'[40] The Kirkuk-Ceyhan pipeline serves as an apt example. Following the US-led invasion of Iraq in 2003, and with the almost constant political strife and terrorist attacks in the region, most of the original pipeline within Iraq is now defunct. As an alternative, the autonomous Kurdistan Regional Government (KRG) has constructed a bypass line, passing through its own territory, from a connection with the southern portion of the original line from Kirkuk, through the KRG's own oilfield at Khurmala, and then to its frontier with Turkey, where it joins the original pipeline to Ceyhan. This was opened in 2013, together with a spur connecting it to a separate Kurdish-controlled oilfield at Taq Taq.[41] As of 2020, this was carrying around 450,000 b/d from the KRG territory, plus another 100,000 b/d from territory controlled by the Iraqi central government – making a total of 550,000 b/d, or well below the original design capacity.[42] Division of the overall oil revenues of Iraq between Baghdad and the KRG was another cause of dispute,[43] causing the Iraqi government to propose the construction of a second line, passing through its own territory to the Turkish border, to carry another one million b/d.[44]

From Azerbaijan, via Georgia, the Baku-Tiflis-Ceyhan (BTC) line, opened in 2006, carries around 1.2 m b/d from Azerbaijan's Caspian field to the Mediterranean, with some crude also from Kazakhstan.[45] This line is far less problematic, since Turkey, Georgia and Azerbaijan all enjoy good relations.

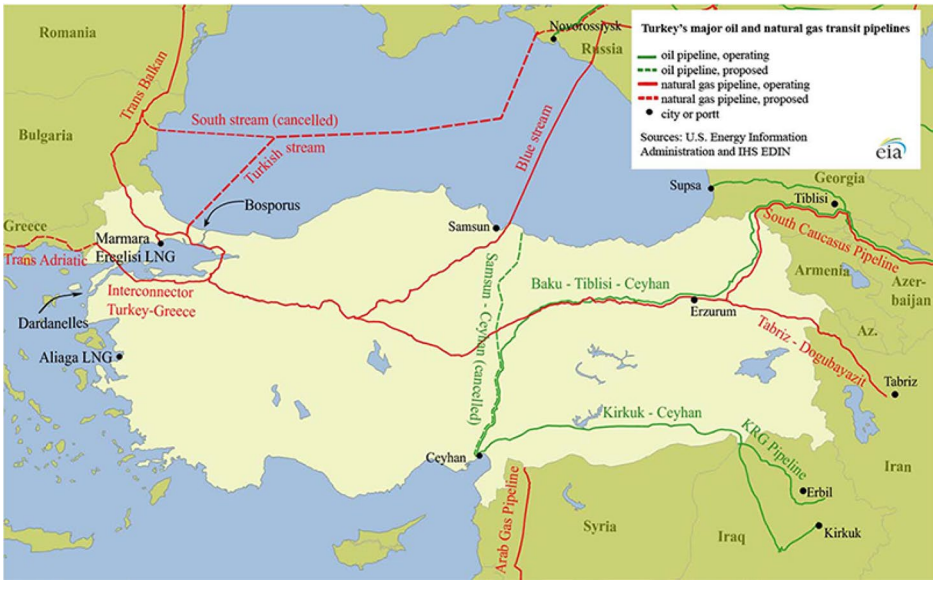
For natural gas:

The Turkey-Iran gas pipeline carries gas from Tabriz, where it connects with the internal Iranian pipeline system, to Ankara, joining the domestic Turkish network. Total capacity is put at 14 bcm/y, although Turkey's import figures for 2020 show that only 38 per cent of this was used (see Table 5).

The Southern Gas Corridor (SGC) is the longest gas pipeline project in Turkey to date, connecting Azerbaijan's Shah Deniz gas field with southern Italy via Georgia, Turkey and Greece. Besides offshore connections in the Caspian, it consists of three sections: (i) the South Caucasus Pipeline (SCP) running from Baku, via Georgia, to Erzurum, originally completed in 2006; (ii) the Trans-Anatolia Pipeline (TANAP) running from Erzurum to Ankara and the Turkish-Greek border; (iii) the Trans-Adriatic Pipeline (TAP) running from the Greek-Turkish frontier to the Adriatic and southern Italy, where it connects with the internal Italian network. With support from the US government, as a means of reducing Europe's dependency on Russia, the project was completed by the end of 2020. The initial throughput is 16 bcm/y, with 6 bcm/y used in Turkey, but it is planned to raise this to an annual 31 bcm/y.[46]

The Blue Stream gas pipeline runs from near Novorossisk in Russia under the Black Sea to near Samsun, and then to Ankara. This effectively replaced the previous long overland connection via Ukraine, Romania and Bulgaria, allowing Russia to bypass Ukraine and thus avoid interruptions caused by political conflict. Opened in 2003, Blue Stream has a capacity of 16 bcm/y, but currently this is not fully used.[47]

The TurkStream Gas Pipeline carries Russian gas under the Black Sea, first through Russian and then Turkish maritime zones to Kıyıköy, in Turkish Thrace, and thence to Greece, with planned extensions to Bulgaria, Serbia, Hungary, Slovakia and Austria. It has two pipelines, with a total capacity of 31.5 bcm/y, one of which would be used to supply Turkey with the other extending into south-east Europe. Inaugurated in January 2020, TurkStream effectively replaced an alternative project, South Stream, which would have passed through Bulgaria rather than Turkey (see map).[48] It can be seen as the Russian-backed competitor to the SGC project, and the southern counterpart to the North Stream submarine pipelines between Russia and Germany.



This network raises two sets of critical issues. Energy security has been defined as 'the uninterrupted availability of energy sources at an affordable price'.[49] In the Turkish case, this may

be threatened by acute intra-state and inter-state conflict in the Middle East,[50] or by potential use of the energy weapon by Russia and maybe other exporters as a means of exerting political leverage.

Barring a catastrophic war in the Persian/Arab Gulf, which has yet to occur,[51] oil imports are not normally problematic from the security viewpoint, since crude oil can easily be shipped around the world, with a large number of producers. As already noted, oil supplies from Iraq have been badly affected by its internal political turmoil, but Turkey can easily replace the deficit by seaborn imports from other producers. The Kurdish connection is vital for the KRG, and strengthens cooperation between Ankara and the Iraqi Kurds, so in that sense is a political asset for Turkey. Similarly, Azerbaijan depends on the BTC pipeline, as well as a parallel line to the Black Sea via Georgia, for all its oil exports to the west. The BTC line has also been temporarily interrupted by terrorist attacks, and could be in more serious danger in the event of another Georgia-Russia war, but this is currently thought unlikely.[52] Significantly, in July 2020, when Armenian forces attacked Azeri territory in the 'Ganja gap', just north of Nagorno-Karabakh, which is the land passage for the BTC and TANAP pipelines, they were rapidly repelled. In the following six-week war between Armenia and Azerbaijan (27 September-10 November 2020) Russia intervened as a mediator, installing peacekeeping forces between the two sides, with Turkish observers attached to the mission.[53]

Gas has been more problematic since until recently pipeline connections could deliver gas more cheaply than landed LNG, but created complicated interdependencies between the producer, the consumer(s) and the transit countries through whose territory the pipeline passed. As an example, in August 2021 the prospect that Germany would develop the second of two submarine gas pipelines connecting it directly with Russia via the Baltic ('North Stream 2') raised protests from the Ukrainian President Volodymyr Zelensky, who described the project as a 'geopolitical weapon of the Kremlin' which would be dangerous for all of Europe', since Russia might cut off all gas supplies via the Ukraine when present contracts expire.[54] The crucial position of Russia in Turkey's supply system has thus been seen as a vulnerability. There was some evidence of its effectiveness in November 2015, during Russian air operations in northern Syria, as a Turkish F-16 fighter shot down a Russian SU-24 attack plane which Turkey claimed had entered Turkish air space. This led to a bitter war of words between Presidents Putin and Erdoğan, as a result of which negotiations over the TurkStream pipeline were temporarily broken off. However, gas supplies through Blue Stream were not cut off. Instead, Russia banned imports of fruit and vegetables from Turkey, interrupted Turkey's trade with central Asia, and prevented Russian package tourists from visiting the country. The resultant damage to the Turkish economy was eventually enough to induce President Erdoğan to agree to a form of (Russian) words which President Putin could interpret as an apology. Subsequently, relations were restored, and Turkey entered a phase of cautious engagement with Russia in Syria which still continues, albeit with frequent tensions. and differences on crucial political issues.[55]

The implication of this incident was that to put pressure on Turkey, Russia did not need to cut off gas supplies through Blue Stream, since other economic sanctions were enough. Closing the pipeline would have been costly for Russia as well as Turkey, given that Turkey is Russia's third most important customer for natural gas, accounting for just under seven per cent of its total gas exports in 2019.[56] With the opening and expansion of TurkStream, this dependency would increase, since Russia would need Turkish cooperation to expand its gas exports to southern Europe. On the other side, Turkey's current gas imports from Russia are below the capacity of Blue Stream, with the excess to be further increased by TurkStream, causing doubts as to whether the latter will play any part in Turkey's energy imports. Ankara has been fully aware of the need to diversify supplies, and since 2014 has substantially reduced gas imports from Russia (see Table 5). Meanwhile, Turkey's natural gas storage facility under the Salt Lake (Tüz Gölü) is being expanded to 5.4 bcm with an eventual increase to 10 bcm allowing it to ride out any cut-off of supplies from Russia or any other individual supplier for some time.[57]

Finally, it can be argued that, politically, Russia can ill afford a complete political or economic break with Turkey, and is therefore unlikely to use energy as a blackmail weapon except *in extremis*.

Similar conditions are likely to affect gas supplies from Azerbaijan or Iran. In the case of Azerbaijan, the SCP, and now TANAP, are its only gas export routes, so it is currently unlikely to cut off supplies unless Turkey chooses to pick a quarrel with it, which it shows no signs of doing.[58] In the case of Iran, supplies have often been interrupted through terrorist attacks or technical breakdowns, without seriously damaging effects for Turkey. Thanks to the international sanctions regime, Iran cannot afford to lose one of its few international customers, even if it is at odds with Turkey over Syria and other issues. With the world's biggest natural gas reserves after Russia, Iran's potential as a gas exporter is enormous. Turkey could be a potential partner,[59] but is unlikely to develop this until political conditions improve dramatically. It is also likely that if Iran were able to expand its gas exports, it would do so in the form of LNG, obviating the need for pipelines across Turkey or anywhere else.

Turkey's role in Europe's energy supplies is a further focus of debate. Earlier predictions suggested that this could be critical, especially in the case of natural gas. Besides acting as a transit state between producers and consumers, it was suggested that Turkey could become an 'energy hub' in which producers and consumers meet and trade in an open market, or in which Turkish firms could profit by re-selling and re-exporting gas previously delivered to the Turkish domestic market. To achieve this, however, there would have to be considerable infrastructure investment in Turkey, and liberalisation of the internal market.[60] More broadly, these expectations were based on three predictions – first, that European gas imports would continue to rise exponentially; second, that LNG would not be price-competitive with pipeline deliveries; and third, that Turkey would play a crucial role as a transit country for gas flows from the Caucasus, Central Asia and the Middle East, playing the 'energy card' to obtain concessions in the EU accession process.[61]

In accordance with these assumptions, between 2004 and 2013 there were long-running negotiations for the realisation of the ambitious Nabucco gas pipeline project. This was expected to carry up to 31 bcm/y, or just under five per cent of Europe's total expected gas imports for 2030, and running from Azerbaijan and either or both Iraq and Iran, across Turkey, Bulgaria, Romania and Hungary to Austria. It was abandoned mainly because of the difficulty of arranging imports from either Iraq or Iran, thanks to the continuing political turmoil in Iraq, and the imposition of UN sanctions against Iran in 2006, besides economic and other considerations.[62]

Following the abandonment of the Nabucco project, the Southern Gas Corridor (SGC) was adopted as a less ambitious alternative. However, this has also come in for serious criticism. In the first place, if Germany, as Europe's major gas importer, goes ahead with 'North Stream 2', this would substantially reduce the need for an expanded southern corridor via Turkey. On the demand side, it is argued that since gas pollutes less than oil and coal, combined with the run-down of nuclear power generation and of North Sea gas resources, this could be expected to increase European natural gas imports over the next decade. Against this, there are serious reasons for caution. Out of 14 recent projections of gas demand in the EU for 2030, compared with 2016, 11 show an absolute decrease, with three projecting a small increase and one showing static demand.[63] Meanwhile, Europe's gas imports by pipeline fell by 1.1 per cent per year between 2008 and 2018.[64] This can be seen as the combined result of first, the fall in the price of LNG to a level close to that of gas by pipeline, hence the increased share of LNG in the total and second, the rise in the share of renewables, as the European Union (EU) remains committed to reducing its greenhouse gas emissions by at least 40 per cent by 2030. As Marco Siddi remarks, 'long-term and costly projects such as the SGC lock the [European] Union into a fossil-fuel dependent economy, distract financial resources from renewable energy and therefore contradict the EU's climate and decarbonisation agenda'.[65] He calculates that 'the SGC gas

that will reach the EU market corresponds to less than 3 per cent of total EU gas consumption', hence 'it is unlikely to have a notable impact on prices and competition'.[66] Accordingly, unless Europe seeks to radically reduce its imports from Russia in favour of pipeline suppliers in the Caspian basin and the Middle East, it seems most unlikely that the SGC will be expanded on the scale envisaged by the Nabucco project.

In the political arena, also, there is the idea that Turkey could somehow use its role as a transit state in energy supplies as a bargaining chip in its efforts to further its aim of EU accession. This can be seen as part of the misconception by Turkish politicians in which 'Turkey's entry into the [European] Union is viewed as a goal that could be accomplished through strategic-level bargains, as much as domestic-level transformation.'[67] Instead, progress, if any is attained, is much more likely to depend on settlement of long-running political issues, notably the confrontation with the Republic of Cyprus, and contests with Greece, plus the pressing need to adhere to European standards of democracy and human rights.

Some tentative conclusions

Drawing conclusions from Turkey's recent experiences as an energy consumer, producer and importer which could have some predictive value is an extremely hazardous undertaking. In a highly volatile global energy market, and close to the world's most politically unstable region, Turkey's energy security is heavily dependent on forces outside its control. It is also clear that over the last few years there have been some fundamental changes, both in external market conditions, policy priorities, and technical advances, as well as domestic policies. In a world of over-supply and weak prices, the global power of energy exporters over importers has been seriously reduced. Fears that Turkey would be subjected to political pressure by energy suppliers, especially in natural gas, have been alleviated by the diversification of suppliers, and the rise of LNG as an economically viable alternative to pipeline deliveries. In addition, some suppliers, such as Azerbaijan and Iraqi Kurdistan are themselves dependent on Turkey for political and (in the case of Azerbaijan) military support.

Even in the Russian case, Moscow is apparently reluctant to use gas supplies as a potential weapon against Turkey, since a cut-off would be economically damaging to Russia as well as Turkey. In any case, as the experiences of 2015-16 demonstrated, Russia does not need to use gas as a means of pressuring Turkey, since restricting Turkish exports to Russia, as well as tourist flows, is quite effective. In the case of middle eastern suppliers, continuing political instability in Iraq has substantially reduced the flow through the Kirkuk-Ceyhan oil pipeline, but Turkey has been able to fill the gap with imports from other exporters. Iran, also seems anxious to continue cautious cooperation with Turkey, and has never shown any clear sign of threatening to cut off gas supplies as a political weapon, even if the flow has occasionally been interrupted due to technical breakdowns.

These changes have also affected Turkey's role as a transit state for oil and gas supplies. Admittedly, the pipelines which currently supply international markets via Turkey will remain important. On the other hand, Europe's switch to non-fossil energy sources, and the growing share of LNG, suggest that the existing system will probably suffice, and that periodic peaks in the gas price, such as that occurring in 2021, will only be temporary. In that case, further pipeline developments, and Turkey's plans to become an international energy hub, are less likely to leave the drawing-board.

While concerns over energy security have arguably been alleviated, a critical new challenge has emerged. In Turkey, as in most other countries, fighting climate change has now become a top priority. Over the past 3-4 years, reversing previous neglect, Turkey has made important progress in developing wind, solar and geothermal power, in addition to an established programme of hydro-electric expansion. Continued reliance on lignite as a fuel for power stations

is still a serious defect, but the signs are that by opting for these renewable sources of energy, besides developing its own gas field, Turkey can reduce both the economic and potential political costs of relying on imported energy

Disclosure statement

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Notes

1. From *On Birinci Kalkınma Planı (2019-2023)* (Ankara: T.C. Cumhurbaşkanlığı, Devlet Planlama Teşkilatı, July 2019) p.119.
2. Initial production has been put at 3.5 billion cubic metres per year (bcm/y) compared with annual consumption of around 50 bcm/y. This was expected to rise to a plateau of 15 bcm/y in 2028: Neşe Katranfil, 'Gas exploration in Black Sea to cover 10,000 square kilometers', *Hürriyet Daily News* (www.hurriyet.com.tr), 5 March 2021. See also 'Turkey's Black Sea gas "miracle" won't solve economic woes', *Deutsche Welle* news website (www.dw.com), 18 September 2020; Onur Ant, 'Turkey to Complete Exploration Drill of Historic Gas Find Next Month', *Bloomberg* website (www.bloomberg.com/news/articles), 19 September 2020.
3. Statista website (www.statista.com/statistics/255495).
4. International Labour Organisation data for 2020 (data.worldbank.org/indicators/SLAGR.EMPLZS?locations=TR).
5. Data from Turkish Statistical Institute (data.tuik.gov.tr).
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9. Data from Istanbul International Center for Energy and Climate, *Turkey Energy Outlook* (https://iicec.sabanciuniv.edu/teo), p.202.
10. Ibid, pp.204–6.
11. Average German import price, for years 2013-20. From *BP Statistical Review of World Energy 2021,* p.41.
12. Data for 2010 from *Turkey Energy Outlook,* p.275. See also Table 5.
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20. *On Birinci Kalkınma Planı*, p.121.
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23. Sinem Köşeoğlu, 'Turkey's Nuclear Power Dilemma' Aljazira website, 10 March 2021 (www.aljazeera.com/news/2021/3/10/turkeys-nuclear-power-dilemma).
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29. *Turkey Energy Outlook,* p.130.
30. See recent reports in *Rail Turkey En – Turkish railway journal and review* (https://railturkey.org). See also *Turkey Energy Outlook,* pp.162-63. Current plans call for the electrification of three quarters of the network by 2023.
31. *Turkey Energy Outlook,* p.130: TOGG, 'Gemlik Facility', p.3 (togg.co.tr/content/gemlik-facility).
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43. See, e.g., Pinar İpek, 'Oil and intra-state conflict in Iraq and Syria: sub-state actors and challenges for Turkey's energy security', *Middle Eastern Studies*, Vol.53, No.3 (2017), p.411.
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45. British Petroleum, 'Baku-Tibilisi-Ceyhan pipeline' (www.bp.com/en_az/azerbaijan/home/who-we-are).
46. See Marco Siddi, 'The EU's Botched Geopolitical Approach to External Energy Policy: the Case of the Southern Gas Corridor', *Geopolitics,* Vol.24, No.1 (2017), pp.129, 131.
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51. This would need to be of catastrophic proportions: as an example, the long-running Iran-Iraq war did not halt oil shipments from the Gulf, since Iran and other Gulf producers continued deliveries, with Iraq using the Kirkuk-Ceyhan pipeline. Nor did the two US-led invasions of Iraq in 1991 and 2003.
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58. That it might not always do so was demonstrated in 2010 following an attempted diplomatic rapprochement between Turkey and Armenia in 2009 (the 'Geneva Protocols'). The Azeri President, Ilhan Aliyev was reported to have been bitterly critical of the Turkish government over this, and according to one account even threatened to cut off gas supplies to Turkey by considering alternative transit routes via Russia, Iran or Georgia: Tigran Zakaryan, 'Landlocked with closed borders: Armenia's problems of access to the sea',

Caucasus Survey, Vol.9, No.2 (2021), p.3. Whether he would actually have carried out the threat remains uncertain, of course.

59. For instance, in 2007 Turkish and Iranian ministers signed a Memorandum of Understanding to build a second gas pipeline to carry 35 bcm/y to Turkey and Europe but this was dropped due to the sanctions regime. *Turkish Daily News,* 16 July 2007: Bilgin, 'Energy Policy', p.409.
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