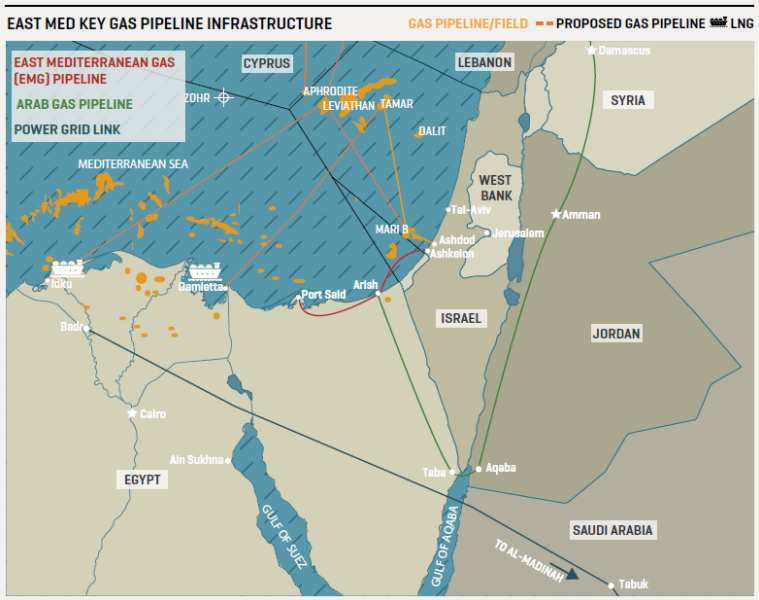
By Gina Cohen 29.12.2016	Egypt	Turkey
Local Gas Production	• November 2016: production was 126 MMcm/Day (45.9 bcm/y production) – with consumption being 49.2 • 2015: gas reserves of 1.85 TCM • Peak production was 62.7 bcm in 2009 with consumption that year being 42.5 bcm • Sept 2016: 4.36 bcf/d • Deepwater Med, Nile Delta & Western Desert contain mainreserves. Majority of current production comes from fields of El Temsah, Ras el Barr, Abu Qir, Baltim and Ha'py • Zohr expected to start producing 1 bcf/d by 2017 and 2.5-3 bcf/d in 2019 • BP expected to be producing from Northern Alexandria field 500 mmcf/d • Ministry expects that in 2022 production and consumption will be nearly balanced (production estimated to be 60.1 bcm and consumption estimated to be 60.9 bcm)	• Indigenous gas production has been in decline from 1.017 bcm in 2008, to 0.684 in 2008 to 0.4 bcm in 2015. Most of the gas is produced by TPAO in the Black Sea offshore shallow waters. • Estimated remaining gas reserves of 5.4 bcm. • Government estimates there is a potential 551 bcm of shale gas. Most of the shale is located in the south-east Anatolian area affected by the war in Syria.
Gas Exports	• In July 2003 Egypt began to export gas by pipeline to Jordan and soon after that started to also export LNG. • In 2008 it started exporting gas to Israel: 0.32 bcm in 2008, 1.51 bcm in 2009, 2.10 bcm in 2010, 0.69 bcm in 2011 • In fiscal year 2007-8 Egypt earned $3.2 b from exports • Most of the LNG export stopped in 2014. • Since September 2016, Shell has exported 3 LNG cargoes via Idku. Shell agreed with the Ministry of Petroleum on gradually increasing quantities specified for export to 250m cubic feet per day, to achieve a return that will help the company to repay loans due in instalments.	• 0.4 bcm to Greece in 2008 increasing to 0.6 bcm in 2015. • Turkey could export gas to Eastern Europe if Turkish companies managed to source gas and obtain capacity that freed up in 2016 on the available interconnection points on the Western Line to East Europe. Capacity freed up is between Ukraine-Romania, Romania-Bulgaria, Bulgaria-Greece. • Such capacity can be booked on a firm or interruptible basis; it will be made available for the full gas year (starting in October) or allocated daily, monthly or quarterly. Capacity auctions must be organized according to the EU's auction calendar. • Potential sources of gas include Russia, possible volume releases by regional incumbents, LNG from Greece in the short term or Turkey/Croatia in the future, Central European gas if/when Romanian domestic network becomes available for transit, Romanian Black Sea gas after 2019, Caspian volumes when SDII comes onstream in 2020, East Med gas • Problems of course are lack of gas available for such exports, expensive transmission tariffs, technical constraints along the lines such as lack of compression. • Relevant links for such capacity
Transit Pipeline	• Arab Gas Pipeline • EMG Line	• There is talk to build a line between Turkey and Bulgaria, with a 3 bcm capacity potentially increasing to 5 bcm. The Bulgarians only need 1 bcm though. BRHA – plans to build that line if and when. • TANAP (Trans-Anatolian) construction started in March 2015, to bring gas from Shah Deniz II in Azerbaijan to Turkey & Europe by linking South Caucasus pipeline at the Turkey Georgia border with the TAP (Trans-Adriatic) pipeline at the Turkey Greece border. Phase 1 will be 6 bcm to Turkey by 2018/19 & 10 bcm to Europe by 2020, along TAP thru Greece & Albania to South Italy. • TANAP could be scaled up to 32 bcm/y with increased compressor capacity & would require gas from Turkmenistan to enter the system in a trilateral agreement between Turkmenistan Azerbaijan and the EU & on progress with Turkmenistan Turkey EU agreement signed in 1998 to transport 30 bcm of Turkmenistan gas with 16 to Turkey & 14



to Europe. Turkmenistan and Turkey signed GSA in 1999 for 15.6 bcm to Turkey, but no volumes yet forthcoming.

- In 2014 Azerbaijan invited Iraq to use TANAP to supply its own gas. Iraq could also construct an Iraq-Turkey gas line along route of crude oil Kirkuk Ceyhan line

- 10 Oct 2016 – Russia and Turkey signed agreement for 2 strings of TurkStream 1,200 km line across the Black Sea and to reroute gas away from Ukraine after 2019 when the existing GSA expires. Each stream is for 15.75 bcm/y, with the 1st stream going ahead and having been ratified by all concerned in December 2016. The problem is that although the Western Line is in very poor condition there is no utter certainty that Russia will shut it down

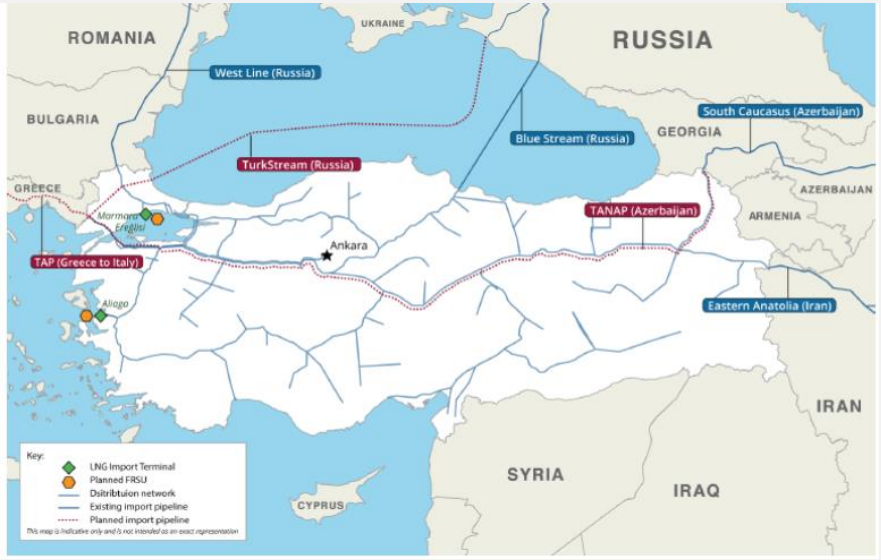
- Indeed, TS is an alternative transport route if the existing Western Line, which crosses Ukraine, Romania and Bulgaria before entering Turkey is cancelled when a transit contract expires in 2019. Second it establishes itself as a rival to EU backed Southern Gas Corridor to bring Caspian Sea to Europe via Turkey.

- The proposed route of TurkStream crosses Thrace in northwestern Turkey which is already supplied by 14 bcm/y of gas on the West line and may struggle to absorb much more Russian gas without further capacity expansions.

- The TurkStream will need access to South European markets where it will be competing with TAP and must also contend with EU commission rules on 3rd party access. The recent decision of October 2016 to grant Gazprom greater flexibility of access to the Opal pipeline in Germany may encourage Moscow to believe a compromise can be achieved.

- Russia can play TS against North Stream 2 under Baltic Sea which was rejected by Poland.

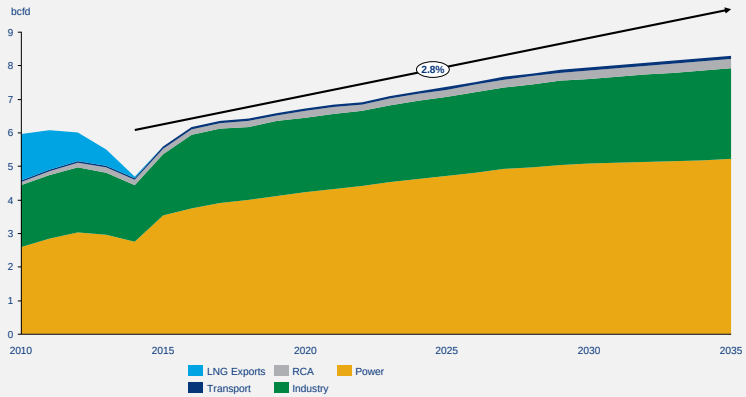
- Construction of 2nd leg though depends on demand in South East Europe.



- **Turkey Bulgaria pipe (ITB)**: feasibility study ongoing. This would be bi-directional line with 3 bcm/y capacity.

- **ITGI (Interconnector Turkey-Greece-Italy)** is designed to transport approximately 15

		bcm of gas a year from Caspian, East Med and/or Middle East areas to Italy and Europe through Turkey and Greece (the Turkey to Greece 87 km section was completed in 2007). The project comprises the following pipeline sections: http://enipedia.tudelft.nl/wiki/Kipi_-_Komotini_Pipeline • **Turkish grid**, which will be upgraded in order to enable the transit of gas volumes for Italy and Greece • **ITG (Interconnector Turkey-Greece)** which is in operation since November 2007 and has a transport capacity of about 11.5 bcm/y. 296 km. The length of Turkish section is 210 km, of which 17 km are under the Marmara Sea. The length of Greek section is 86 km. The diameter of pipeline is 36 inches (910 mm). The connection is between Ipsala in Turkey and Kypy in Greece. Greece has a contract to buy gas from Azerbaijan. In 2014 exports were around 1.3bcm. These increased to around 1.8bcm in 2015 because of improvements in compression on the Greek side at Nea Messimvria (near the Turkish border). • **IGI (Interconnector Greece-Italy)** project with a transport capacity of about 12 bcm. IGI pipeline will be 800 km (600 km onshore pipeline in the Greek territory (to be developed by Desfa, the Greek Transmission System Operator; **IGI Poseidon**: 200 km offshore pipeline across the Ionian Sea (under development by IGI Poseidon), a joint venture between Edison and the Greek company Depa). • Turkey also has the SCP pipeline connecting gas from Shah Deniz
Share of Gas (2015)	• IEA http://www.iea.org/statistics/statisticssearch/report/?country=EGYPT&product=Balances&year=2014	• Energy production: 32.2 Mtoe: coal 41.8%, geothermal 14.8%, biofuels and waste 10.1%, hydro 17.9%, oil 8.3%, wind 3.1%, natural gas 1% • TPES: 129.7 Mtoe: coal 27.3%, natural gas 30.2%, oil 30.1%, biofuels and waste 2.5%, hydro 4.4%, geothermal 3.7%, solar 0.7%, wind 0.8%, electricity 0.3%. • Electricity generation: 259.7 TwH: natural gas 38.6%, coal 28.3%, hydro 25.8%, wind 4.4%, geothermal 1.3%, oil 0.8%, biofuels and waste 0.5^, solar 0.2% • Turkey imports almost all of the natural gas it consumes, about 99%. Of the 48.4bn m^3 imported in 2015, 55.3% was from Russia, 16.2% from Iran, Azerbaijan 12.7%, Algeria 8.1% and Nigeria 2.6%. • Government's objective is to decrease the share of gas in electricity generation to around 30% by 2019, as the government's objective is to increase the share of electricity generation from renewable (end 2015 Turkey had 266 MW of PV, 4.7 GW of wind and wants to increase its installed capacity from renewable sources to 30% by 2023 by also adding hydro, geothermal, biomass), nuclear (plan for 3 nuclear but 1st project the 4.8 GW Akkuyu being built by Russian Rosatom only expected to be online by 2023) and local lignite coal. In the absence of a carbon price, coal remains competitive to gas. In addition, the policy is to even give financial incentives to local coal power stations. • Turkey has plans for over 80 new coal-fired power plants, in addition to the existing 38 coal and lignite plants (19.5 GW) in operation which could lead to a considerable drop in gas demand from the power sector. • In September 2016, Turkey introduced an amendment to its energy package. Amendment #80 to provide subsidies and exemptions from such matters as CT, tariffs, environmental assessment risks, permitting applications which could seriously help promote coal power projects. The Government is also offering a guaranteed €0.05 per kWh for coal generated electricity and a commitment to buy 6 TWh of coal generated electricity annually.

		• In addition, the government is looking to introduce subsidies for gas-fired generation. • If the subsidies are given to future plants and not just existing ones, that may draw more interest in gas. That, of course, depends entirely on the government's direction in the next months.
Consumption by Sector	• Nov 2016: 126 MMcm/day; 2016: demand of 5.2-5.6 bcf/d • Demand is rising by about 4% a year • 2015: 45.6 bcm/y production with consumption increasing to 6.5 bcf/d by summer of 2017, divided into about 5.5 bcf for power stations, 1.2 for homes, cars and small and mid-sized factories and 900 m for energy intensive industries. About 30% of households are connected to gas • EGAS said that the plan is designed to provide about 6.4bn cubic feet per day in accordance with current data. This amount is divided into 1.4bn cubic feet of imported gas per day and 5bn of domestic production. Estimates are that the 6.4 bcf is to be provided by 5 bcf from domestic consumption and 1.4 from imports, out of which 1.2 is to be provided from the 2 FSRUs in Egypt and 200m imported from the Jordanian FSRU • Peak production was 62.7 bcm in 2009 with consumption that year being 42.5 bcm • Expectation of Ministry is that in 2022 production and consumption will be nearly balanced (production estimated to be 60.1 bcm and consumption estimated to be 60.9 bcm). **Wood MacTotal Gas Demand by Sector (2010-2035)** **gas demand is expected to grow at a CAGR of 2.8% and is driven primarily by the power sector and non-gas intensive industries**  Gas demand in industry (WM):	• Gas introduced into Turkey in 1982. • Consumption of gas tripled between 2000-2015 to 48 bcm, but then dipped in 2015. • Demand grew until 2009 when it declined for first time by 4.2% in 27 years, then recovered by 8.6% in 2010, and by 17.2% in 2011, then slower growth of 1% in 2012-2013, and 6.1% growth in 2014, followed by 1.5% fall in 2015 and 3.5% fall H1 2016. • Demand by 2020 has been forecasted by different entities to be anything between 49 to 53 bcm. The higher figure would require about 4.3 bcm in additional demand compared to today's figures • Decline in gas consumption in 2015 and so far 2016 was due to lower power sector demand which fell in 2015 by 4.4 bcm to 19 bcm. The residential and commercial sectors are continuing to expand though, so that shows that if the power sector is consuming less it is related to specific developments in that sector. The power sector used to consume 47% of total gas demand between 2011-2014 and this fell to 40% in 2015. Power demand in fact grew by 3.3% in 2015, which is slower than the 5% CAGR between 2000-2015, but still an expansion. What happened in 2015 is that gas lot market share to coal fired generation (+3% y/y), hydro (+1%) & renewables (+2.3%). Government has stated its policy to only have 30% of its electricity generated from gas, a sharp drop from 44% in 2014 and 38% in 2015 • 2014: 48.7 bcm: 49.1% power, 22% industry, 19.1% residential, 6.3% commercial & public services; 2.5% other energy, 0.9% transport. • Most towns in Turkey are connected to gas. • Demand in Turkey is rather seasonal with consumption peaking during winter due to demand for space heating. Supplies from Russia and even Iranian volumes have some swing in them, but Turkey relies mostly on the LNG market to provide it with its needed flexibility. This highly seasonal demand forces Turkey into the spot LNG market during a period when demand from Europe and Asia is also strong due to winter. This is also the reason why Turkish government wants to increase storage capacity to 10% of annual consumption by end 2019 and over 20% in the long run. These plans will also see new facilities added in the central and southern Turkey, closer to the demand centers that have emerged since the distribution network was expanded

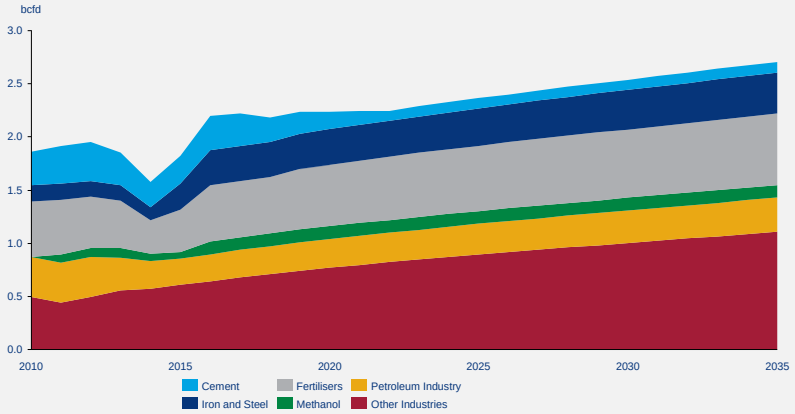
		
Gas Prices	• EGAS has renegotiated contracts at $3.95 - $5.88 • The ENI Zohr contract as of December 2016 is at $5.88	• In 2012, Turkey paid for gas from Russia $12.6, from Azerbaijan $10 and from Iran $15 • In 2013, Turkey paid for gas from Russia: $12, from Azerbaijan $$9.8 and from Iran $14.3. • In 2014, the average gas prices in Turkey were $12.2 mmbtu. At this time, BOTAS was selling on this gas to industrial consumers at about $10/mmbtu and to households at about $11 and at $14.7 to power plants • In April 2016 LNG was being imported at $5-$5.5 including regasification • Gas import prices into Turkey for Q4 2016: Russia: $4.5; Azeri: $4.7; Iran: 4.6; Nigeria: $5.9; Algeria: $5.8. • LNG imports into Turkey in December 2016 and January 2017 are: Botas bought cargoes for Mid-Dec 2016 delivery at $6.50, end Dec delivery at $6.60 and January delivery at $7.50 and even increasing to $8 per mmbtu, higher than anywhere else west of Suez in December 2016.
Gas Imports: LNG & Pipeline	• 5 companies have applied for gas import license	• 99% imported. Imports of gas have increased 80% since 2005. • The market was due to be liberalized by the 2001 Law 4646 with the unbundling of BOTAS with market share due to have been decreased to 20% of the market, but this was never achieved and BOTAS still imports 78% of the gas, whilst since 2013 and the rest is divided between private importers. • 10 private companies import a total of about 10 bcm to Turkey via Western Line from Russia. 4 bcm was freed from Botas in 2007 and valid until 2021, and was transferred to Avrasya Gaz (0.5 bcm terminates in 2021), Bosphorus Gaz, Enerco (2.5 bcm terminates in 2021)) and Shell Enerji (0.5 bcm terminates in 2011)) & 4 companies took 6 Bcm in 2013: Akfel Gaz (2.25 Bcm, terminates ini 2043. Akfel take-over and appointee of Trustees in Dec 2016), Bosphorus Gas (1.75 Bcm terminates in 2043)), Bati Hatti (1 Bcm) and Kibar Holding (1 Bcm terminates in 2043), Western line (1 bcm, terminates in 2036) Imports by private companies

Table 8: Egypt LNG Supply and Demand Forecast, 2005- 2022

Year	LNG Exports (million tonnes)	LNG Imports (million tonnes)
2005	5.1	
2006	10.9	
2007	9.9	
2008	10.3	
2009	9.4	
2010	7.0	
2011	6.3	
2012	4.7	
2013	2.7	
2014	0.4	
2015	0.0	2.6
2016	0.0	4.8
2017	0.0	5.2
2018	0.0	6.4
2019	0.0	7.1
2020	0.8	6.3
2021	2.1	5.4
2022	3.2	3.8

Source: LNGAnalysis

Imports by Private Sector	2011	2012	2013
Avrasya	0.5	0.4	0.5
Shell	0.2	0.2	0.25
Bosphorous	0.7	0.5	2.25
Enerco	1.8	2	2.5
Egegas	3	0.9	0
Akfel	0	0	2.25
Kibar	0	0	1
Western Line	0	0	1
Total	6.2	4	9.74

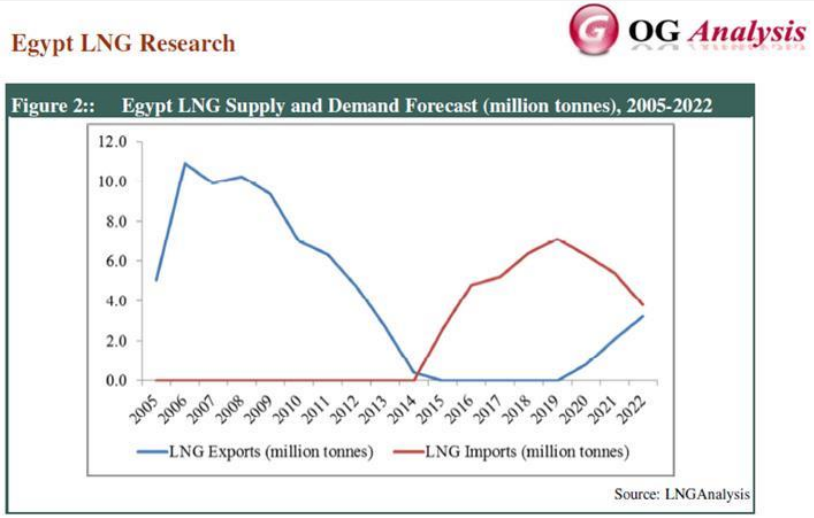
- 1 company was granted an import license in September 2013 to eventually import gas from Iraq.
- The first Russian contract that expires is 2021 (it is via the Western Line)
- Most contracts are long term. Spot and even long-term LNG are used for peak shaving.

		Current Agreements / **BCM/year** / **Years** / **Effective Date** / **Ending** Algeria (LNG) / 4.4 spot prices / 30 / 1994 / October 2024 Nigeria (LNG) / 1.3 fixed prices / 22 / 1999 / October 2021 Iran / 9.6 / 25 / 2001 / July 2026 Russian Republic (Blue Stream) / 16 / 25 / 2003 / End of 2025 Russian Republic (Western Line) / Additional 6+4 BCM coming via private sector / 23 / 1998 / End of 2021 Turkmenistan / 15.6 / 30 / / - Azerbaijan (SD Phase I) / 6.6 / 15 / 2007 / April 2021 Azerbaijan (SD Phase II) / 6 (gradual build-up) / 15 / 2018 / 2033 Azerbaijan (SD Phase III) / 0.15 / / /
		Entry Points / **Supplier** / **2016 (Nov)** / **2017** / **2018** / **2019** / **2020** / **2021** / **2022** / **2023** / **2024** Durusu - Blue Stream / Russia / 48 / 48 / 48 / 48 / 48 / 48 / 48 / 48 / 48 Gürbulak - Iran / Iran / 28.5 / 28.5 / 28.5 / 28.5 / 28.5 / 28.5 / 28.5 / 28.5 / 28.5 Malkoçlar - Trans Balkan / Russia / 51.4 (41) / 51.4 (41) / 51.4 / 51.4 / 51.4 / 51.4 / 51.4 (29) / 51.4 (29) / 51.4 (17) Türkgözü - Shah Deniz I / Azerbaijan / 19 / 19 / 19 / 19 / 19 / 19 / 19 / 19 (0) / 19 (0) M. Ereğlisi LNG (BOTAŞ) / Algeria, Nigeria and spot / 22 / 22 / 27 / 27 / 27 / 27 / 27 / 27 / 27 Aliağa LNG (EgeGaz) / Spot LNG / 16.1 / 24 / 30 / 30 / 30 / 30 / 30 / 30 / 30 K. Marmara (u/g Storage) / - / 20 / 20 / 20 / 20 / 20 / 75 / 75 / 75 / 75 Değirmenköy (u/g Storage) / - / 7.2 (5) / 7.2 / 7.2 / 7.2 / 7.2 / 7.2 / 7.2 / 7.2 / 7.2 TP Akçakoca / Production / 2.1 (0.1) / 2.1 (0.1) / 2.1 / 2.1 / 2.1 / 2.1 / 2.1 / 2.1 / 2.1 Tuzgölü (u/g Storage) / - / 0 / 0 / 20 / 20 / 40 / 40 / 40 / 80 / 80 TANAP Eskişehir / Azerbaijan / 0 / 0 / 17 (5.7) / 17 (11.3) / 17 (14) / 17 (17) / 17 / 17 / 17 TANAP Trakya / Azerbaijan / 0 / 0 / 8.2 (0) / 8.2 (0) / 8.2 (0) / 8.2 (0) / 8.2 / 8.2 / 8.2 Aliağa FSRU (Etki) / Spot LNG / 0 / 20 (14) / 20 / 20 / 20 / 20 / 20 / 20 / 20 Dörtyol FSRU (BOTAŞ) / Spot LNG / 0 / 0 / 20 / 20 / 20 / 20 / 20 / 20 / 20 Kıyıköy -Turk Stream / Russia / 0 / 0 / 0 / 0 / 0 / 0 / 0 / 48 / 48 **Total Entry Capacity** /	**214.3** / **242.2** / **318.4** / **318.4** / **338.4** / **393.4** / **393.4** / **480.4** / **480.4** **Total Supply** /	**199.7** / **221.8** / **286.3** / **289.9** / **312.6** / **360.6** / **348.6** / **426.6** / **426.6** **Note 1:** All the volumes are in Sm^3/day **Note 2:** Figures in brackets show the contractual volumes **Note 3:** Entry capacity volumes are the available capacities of BOTAŞ Turkey adopted an 8 year security of gas program
New Potential sources of gas	• Cyprus – Aphrodite field; East Med: Leviathan and Tamar • New licensing rounds with EGPC awarding latest round in December 2016: EGPC awarded 6 out of 11 blocks that were on offer in a bid round in May. Of the 6 Western Desert blocks, 5 had takers and they went to the key local producers: Apache and Shell, who have production in neighboring blocks, as well as to Apex. But of the 5 Gulf of Suez blocks only 1 had a taker, namely BP. Cairo says the 4 firms have committed to spend $200 across the 6 blocks drilling 33 wells.	• Blue Stream capacity could be increased with compressors from 16-19 bcm – namely 3 bcm more • TurkStream would provide 15.75 bcm namely 1.75 bcm/y more than the Western Line it is due to replace • Western Line could be maintained although it is in very poor condition • Kurdistan region of Iraq, from Miran and Bina fields. Flows had been meant to start in 2016 and reach 10 bcm by 2020, but project is being stalled for the time being. If it moves ahead the feedgas could be provided extremely cheaply.
Regasification:	• 2 regas FSRUs' with total capacity of 8.4 mmtpa, at Ain Sokhna: Hoegh FSRU 1 is	• 2 LNG import terminals + 1 imminent FSRU:

onshore or FSRU

3.7 mmtpa, BW FSRU 2 is 4.5 mmtpa & planned FSRU 3 for 2017 to be 5.6 mmtpa.

- LNG imports started in 2015
- In 2015, Egypt import LNG from Qatar (1.36 mt), Algeria 0.34, Equatorial Guinea 0.13, Australia, 0.07, Nigeria, 0.06, T&T 0.05. and reexported 0.52. Total imports of 2.6 mt
- October 2016 tendered for 96 -108 cargoes of LNG for 2017-2018. Egypt trying to extend payment terms to 180 days.
- Egypt had been considering seriously leasing a 3rd FSRU as of 2017, but on 13th December 2016 they cancelled this option, believing the 2 FSRU's available and possible imports from Jordan's FSRU suffice



1 in the west at Aliaga/Izmir owned & operated by private company EgeGaz but most of the capacity is booked by BOTAS; with 2 LNG tanks & total storage capacity of 0.17 bcm/y & regas & send-out capacity of 6 bcm/y. Started operations in 1994.

1 in north-west at Marmara Ereglisi/Tekirdag, owned & operated by BOTAS with send-out capacity of 8.3 bcm/y, with 3 storage tanks & total storage capacity of 0.15 bcm a year and is currently operating at around 6 bcm/y. Started operations in 2006.

Both above facilities have capacity for spot LNG imports, which fill supply gaps. Turkey has received a couple of cargoes from the US in September and 1 cargo from Idku in Egypt in December 2016.

- Private companies can buy short-term regas capacity, which allows them to access the spot LNG market, but have struggled to do so because of the Egegaz requirement that cargoes be cleared from the terminal within 10 days, as individual companies often lack sufficient distribution demand to absorb a cargo of LNG within that time.
- 3 planned FSRU's:

1st FSRU is at Aliaga / Izmir nearby the Egegaz's onshore terminal. Arrived end December 2016

2nd FSRU applied to EMRA recently for Marmara sea but has not been approved yet

3rd FSRU: BOTAS Dortyol

1st terminal -The terminal-operation documents released by EPDK indicate that plant is to have a tanker unloading capacity of 6,000 m³ per hour on average, with a maximum regasification capacity of 5.01475 Bcm/year, or 13.74 million cu m/day, and storage capacity for 142,862 m³of liquid LNG.

France's Engie chartered the Suez Neptune to be located in the Aegean Sea. The terminal is controlled by the Turkish construction giant Kolin. Private companies are allowed to book half of the 5.14 bcm/y capacity, but rumours are that the procedures are unclear and that BOTAS would be allowed to control most of the capacity.

2nd FSRU – not approved yet, but the shareholder of the company is very well connected to the gov't and may progress faster than anybody else.

3rd FSRU – In November 2016BOTAS declared their FSRU project in a sectoral meeting, which was closed to press. The FSRU will be connected to the grid at Dortyol district of the city Hatay, via using the existing port of state utilities BOTAS and TPAO. The send-out capacity is expected to be 20 mcm/d and planned to be online in 2018

2017 YILI NOKTA TÜRÜ: LNG TERMİNALİ		MAKSİMUM AYRILABİLİR KAPASİTE (Sm3/gün)	MAKSİMUM AYRILABİLİR KAPASİTE (Kwh/gün)
İSTANBUL BÖLGESİ	MARMARA EREĞLİSİ LNG TERMİNALİ	22.050.000,00	234.612.000,00
İZMİR BÖLGESİ	EGEGAZ ALİAĞA LNG TERMİNALİ	24.500.000,00	260.680.000,00

		İZMİR BÖLGESİ	ETKİ LİMAN FSRU	20.000.000,00	212.800.000,00

Hub/transit		• Turkey wishes to become a major gas trading center at the crossroads of the Middle East, Caspian and Mediterranean region and Europe. However, progress in achieving a gas hub remains low. An independent gas network operator together with the established gas exchange will need to be created. Turkey has no gas-ahead or secondary gas market, no full entry-exit regime and the balancing regime does not value capacity for its contribution to balancing of the system. Although the natural gas market tariff regulation in Turkey allows transmission and distribution network operators to propose different tariffs for backhaul, interruptible, non-interruptible and similar types of transportation services, in reality there are no consumers even eligible with interruptible contracts, for trading and/or other purposes. Any gas supply shortage – in the event of interruptions during critical days and in winter – places high stress on the system. The availability of flexible short-term gas contracts, interruptible capacity and a flexible balancing regime, as well as new gas supplies, higher physical gas transmission and storage capacity are vital conditions for security of supply and reliable transportation. • The Turkish gas network has a maximum entry-point capacity of 196.5 mcm/d, but winter peak demand can reach much above 230 mcm/d, making gas security of supply a challenge. Turkey has for the past three winters experienced gas shortages during mid-winter cold spells, when gas demand has exceeded the capacity of the existing infrastructure operated by state gas importer Botas. During these periods, Botas has either reduced or completely cut gas supplies to a large combined cycle gas-fired power plant, requiring them to reduce or halt production or switch to burning fuel oil. • Turkey is taking steps to address its lack of storage and some new facilities are being planned to reach 5 bcm storage by 2023. However, even if Turkey can reach 5 bcm of gas storage, this is not enough to service a competitive gas market and international transportation. • TANAP will be the first transit pipeline. • Insofar as being an oil transit, this could be more realistic. Two major pipelines cross Turkey, namely the Baku-Tbilisi-Ceyhan crude oil pipeline carrying Caspian oil from Azerbaijan, and the Kirkuk-Ceyhan pipeline transporting Iraqi oil. The full capacity of these two pipelines is 2.8 thousand barrels of oil per day (mb/d). • There is an additional transit route through Turkey for oil transport and this is the Turkish Straits. In 2010, 2.9 mb/d of crude oil and oil products flowed through the Bosphorus and the Dardanelles. The same year, 1.1 mb/d was carried through the two oil pipelines. This total of 4 mb/d of crude oil and oil products represented around six percent of the daily global oil trade. If the existing two pipelines could be used to full capacity, it would allow the transport of some 6 mb/d, which would represent a significant total of around eight to 10 percent of the daily global oil trade. In oil, therefore, Turkey serves as an important transit country (but not hub) due to the Straits and these two major oil pipelines.
Gas storage	• Storage facility at LNG terminals: Damietta LNG: 300,000 m³, Idku 1: 140,000 m³, Idku 2: 140,000 m³, FSRU 1: 170,000 m³, FSRU 2: 170,000 m³ • Egypt has total LNG storage capacity of 580,000 m³ in 3 liquefaction terminals (4 storage tanks) and 340,000 m³ in regas terminals (2 storage tanks)	• Facility Silivri in north western Thrace region with capacity of 2.84 bcm. To be potentially increased to 4.3 bcm/y by 2020 • BOTAS is developing a new storage facility in a salt formation in Tuz Gölü (Central Anatolia), comprising 12 caverns with a total capacity of 1.5 Bcm (960 MMcm working capacity and 460 MMcm cushion gas). Construction could be partially completed in 2017 (0.5 bcm) and fully completed in 2019. $400 million has been provided by the World Bank. Thus working capacity would be 1st stage of 0.5 bcm a year and second stage reaching a total of 1 bcm/y. • Total storage capacity including LNG & underground: 0.17+0.15+2.84. Possible expansion to total of 0.17+0.15+4.3+0.5/1.0 • Since Turkey has only this limited underground storage capacity, it has limited flexibility to

<table>
<tr><td></td><td></td><td>ramp up imports to meet winter demand. Given the importance</td></tr>
<tr><td>Liquefaction export facility</td><td>• 12.2 mmtpa capacity at 2 facilities totaling 3 trains. Damietta is 5.5 mmtpa and Idku is 2 trains of 3.6 mmtpa

• Started exporting LNG from Damietta in 2004 and from Idku in 2005.

• Nevertheless, Egypt seems to have agreed with Shell that they can export 150 mmcfg/day from Idku to compensate Shell for receivables not paid and indeed about 5 cargoes have been exported over the last couple of months. It is believed the government has several motives for allowing this. First, the exports earn much-needed foreign currency; second, they maintain relationships with the partners; and third, they may yet encourage Shell to commit to phase 9b of WDDM once Egypt repays the $1.3 billion it owes.

• Damietta cost $1.3 billion capex

• Idku train 1 cost $1.12 billion & Idku Train 2 cost $1.1 billion</td><td>• No LNG export facility</td></tr>
<tr><td>Debts to O&G Operators</td><td>• Oct 2016: $3.5 billion</td><td></td></tr>
<tr><td>Gas Network</td><td></td><td>• 12,812 km of pipelines; 9 entry points: 4 international pipeline entry points, 2 LNG entry points (and FSRU in process), two entry points from production fields, 1 entry point from storage facility</td></tr>
<tr><td>Electricity</td><td></td><td>• Turkey has interconnection with all neighboring countries, but the capacity of traded volumes are small. In 205, Turkey’s cross-border electricity net imports amounted to 4.4 TWh or 2.1%of total electricity supply (7.4 TWh imports in 2015 & 3 TWh exports). Exports were mainly to Greece (71)%) and to Iraq (29%)

<table>
<tr><th colspan="5">First 8 monts of 2016</th></tr>
<tr><th>Resource</th><th>Installed Power (MW)</th><th>Share (%)</th><th>Production (TWh)</th><th>Production Share (%)</th></tr>
<tr><td>Natural gas</td><td>26.336</td><td>33</td><td>58.5</td><td>32.1</td></tr>
<tr><td>Hydraulic</td><td>26.274</td><td>34</td><td>49.2</td><td>27</td></tr>
<tr><td>Domestic Coal</td><td>10.509</td><td>13</td><td>28</td><td>15</td></tr>
<tr><td>Imported Coal</td><td>7.480</td><td>9</td><td>29.6</td><td>16</td></tr>
<tr><td>Renewable</td><td>5.870</td><td>8</td><td>13.5</td><td>7.1</td></tr>
<tr><td>Other</td><td>1.576</td><td>1</td><td>4.6</td><td>2</td></tr>
<tr><td>Total</td><td>77.849</td><td>100</td><td>182</td><td>100</td></tr>
</table></td></tr>
<tr><td>Infrastructure attacks; Security of projects</td><td>• Frequent infrastructure attacks</td><td>• Frequent infrastructure attacks.

• The arrest of leading Kurdish politicians in Turkey has profound implications however for the future of the Southern Gas Corridor (SGC) in general and, in particular, energy exports from the Kurdistan Region of Iraq.

• A series of dramatic moves by the government against opposition figures is challenging the very concept of democracy in a country whose stability is crucial for the transit of oil and gas to markets in Europe; for the Mediterranean; and for North America.

• These events pose two questions of massive importance concerning Turkey’s role in energy security. The first is whether depriving Turkey’s Kurdish community of its elected leaders</td></tr>
</table>

		will prompt militants of the PKK, considered terrorists by both Turkey and its NATO allies, to attack existing pipelines in the way they did when the two-year truce between Turkey and the PKK broke down last year. This would have an immediate impact on plans to develop a 10-20bn m³/yr gas pipeline from the Kurdistan Region of Iraq (KRI) to southern Turkey. • The second is whether the government's moves will be seen by an increasing proportion of people in Turkey as signaling the end of effective democracy, leading to conflict within Turkey's cities as well as to an intensification of the government's current war against the PKK in southeastern Turkey. This could trigger a general collapse in foreign investment and, in particular, the failure to secure fresh input into the SGC. • The vulnerability of transit pipelines in Turkey was highlighted when a bomb blast – almost certainly carried out by the PKK – closed the gas line from Iran for four days from October 27. Turkey is now reported to be considering re-laying the pipeline underground, an effective protection against casual violence but not against a determined attack. • The PKK clearly believes pipelines constitute vulnerable targets. When the truce in the last PKK war collapsed in July 2015, it was immediately followed by a five-week spate of PKK attacks on pipelines. Two of them targeted the Baku-Tbilisi-Erzurum line bringing gas from Azerbaijan, one damaged the Iran-Turkey gasline and a fourth hit the Kirkuk-Ceyhan pipeline that carries oil from the Kurdistan Region of Iraq (KRI) to world markets. There was also a fifth attack – on a train carrying pipe for the TANAP gasline. • In February, a PKK offshoot, the Group of Communities in Kurdistan (KCK), specifically warned that plans for a gas pipeline from the KRI to Turkey would only benefit Turkey's ruling AK party. "We will not accept such an agreement to bolster Turkey and to let it stand on its feet since this agreement is a conspiracy putting the lives of the Kurdish nation at risk," a KCK spokesman said in a comment widely interpreted as a threat that the PKK would regard the gas pipeline as a target for attack. Such a line, for which Turkey's Botas was reported to be preparing a tender last April, is vital if the Anglo-Turkish Genel Energy is to implement its plans to deliver some 10bn m³/yr of Iraqi Kurdish gas to Turkey by 2020 and 20bn m³/yr thereafter. • As well as the direct threat to the physical security of pipelines, there is the indirect threat: loss of additional input to the $38 bn Southern Gas Corridor. The SGC is predicated on initial delivery of 16bn m³/yr of gas from the $18.4bn Second Stage upstream development of the Shah Deniz gasfield (SD2) in Azerbaijan. This will be then carried to market via $19.7bn worth of new pipelines stretching from Baku to Italy, notably the $9.2bn, 1,850-km TransAnatolian pipeline across Turkey. • Deliveries for Turkey are scheduled to start in 2018 and to Greece and Italy in 2020. But the pipeline systems under construction are eventually designed to carry twice the initial volumes destined for Turkey and the European Union, and, with gas prices at their current low level, can only be expected to secure even a modest rate of return for their investors if they are full. But who, now, will want to take the risk of investing in upstream projects if they are dependent on transit through Turkey?
Credit Rating & other financial issues	• Standard & Poor's credit rating for Egypt stands at B- with negative outlook. Moody's credit rating for Egypt was last set at B3 with stable outlook. Fitch's credit rating for Egypt was last reported at B with stable outlook. **S&P** B- Negative May 13 2016 **Moody's** B3 Stable Apr 07 2015	• Standard & Poor's credit rating for Turkey stands at BB with negative outlook. Moody's credit rating for Turkey was last set at Ba1 with stable outlook. Fitch's credit rating for Turkey was last reported at BBB- with negative outlook. **Moody's** Ba1 Stable Sep 23 2016 **Fitch** BBB- Negative Aug 19 2016

	Fitch B Stable Dec 19 2014 • Egypt owes $3-4 billion in arrears to IOCs. • Egypt has decreased its currency by 48% in November 2016	**S&P** BB Negative Jul 20 2016 • In October 2016, government cut its GDP growth forecast to 3.2% for 2016 and lowered the 2017 forecast from 5% to 4.4%.
Issues regarding Israeli gas	• IEC/EMG – EGAS arbitration ruled in favor of Israel that Egypt must pay $1.73 billion. Payment is being contested by Egypt and has not yet been made • Selling to end consumers; potential future exports via existing LNG facilities	• Reconciliation between countries achieved in June 2016 • Would help with security of supply, especially since Turkey is prone to supply disruptions especially during peak winter swing demand. • Would help improve gas pressure in system • Selling to end consumers; potential future exports via pipeline to Europe