Oil and Gas Production and Consumption in Turkey

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ABSTRACT

Turkey has dynamic economic development and rapid population growth. It also has macroeconomic, and especially monetary, instability. The net effect of these factors is that Turkey's energy demand has grown rapidly almost every year and is expected to continue growing, but the investment necessary to cover the growing demand has not been forthcoming at the desired pace. On the other hand, Turkey's strategic location makes it a natural "energy bridge" between major oil and gas producing areas in the Middle East and Caspian Sea regions on the other hand, and consumer markets in Europe on the other. Oil consumption has increased in recent years in Turkey, and this trend is expected to continue, with growth of 2-3 % annually in coming years. Oil provides around 43 % of Turkey' s total energy requirements, but its share is declining (as the share of natural gas rises). Around 90 % of Turkey's oil supplies are imported, mainly from the Middle East and Russia. On the other hand, current gas production in Turkey meets 2.8 % of domestic consumption requirements. Turkish natural gas is projected to increase dramatically in coming years, with the prime consumers expected to be industry and power plants. Turkey has chosen natural gas as the preferred fuel for the massive amount of new power plant capacity to be added in coming years.

INTRODUCTION

Oil and gas currently supply over 60 % of the world's energy needs, and are widely expected to grow in importance in the future. As an illustration, consider the most recent forecast of world energy demand prepared by the Department of Energy, shown in Table 1. Between 2000 and 2010, total energy consumption is expected to rise about 25 % or more than 100 quads. Nearly three quarters of this increase is expected to be in the demand for oil and gas. About three quarters of the increased energy demand, and nearly 60 % of the increased oil and gas demand, is expected to originate in the developing world.

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Table 1
World energy demand (quadrillion Btu)

	1990	2000	2010
World	343.8	402.7	504.2
Oil	134.9	157.7	190.4
Gas	72.0	90.1	130.8
Developed countries	182.7	213.2	240.4
Oil	78.7	90.7	100.2
Gas	35.5	47.4	60.8
East Europe & FSU	73.6	52.0	61.0
Oil	21.0	12.5	13.4
Gas	26.0	22.2	30.2
Developing countries	87.5	137.5	202.8
Oil	35.2	54.4	76.8
Gas	10.5	20.5	39.8

FSU: Former Soviet Union
Source: DOE (2000)

Table 2
World oil balance (million barrels per day)

	1997	2010	2020	1997-2020 *
Total Demand	74.5	95.8	114.7	1.9
OECD	40.9	46.9	50	0.9
North America	20.2	24	26.1	1.1
Europe	14.1	16	16.8	0.7
Pacific	6.5	7	7.1	0.4
Non-OECD	30.1	45	60	3.1
Transition economies	4.7	5.8	7.4	2.0
China	4.1	7.6	11	4.4
East Asia	6.4	10.1	13.6	3.3
South Asia	2.3	4.1	6.2	4.5
Latin America	6.1	8.7	10.9	2.5
Africa	2.1	3	3.9	2.7
Middle East	4.4	5.7	7	2.1
Bunkers and stock changes	3.6	3.9	4.6	1.1
Total Supply	74.5	95.8	114.7	1.9
Non-OPEC	42	46.9	46.1	0.4
OPEC	29.8	44.1	61.8	3.2
OPEC Middle East	19.5	30.5	46.7	3.9
Other OPEC	10.3	13.6	15.1	1.7
OPEC Share (%)	40	46	54	1.3
OPEC Middle East Share (%)	26	32	41	2.0

* Average annual growth rate, in percent
Source: OECD/IEA (2000)

World primary oil consumption is projected to increase by 1.9 % per year, reaching 115 million barrels per day (mb/d) by 2020. Demand in non-OECD countries rises three times as fast as in the OECD, reaching 55 % of total world oil consumption in 2020, up from 43 % today. Non-OECD consumption of oil passes that of the OECD after 2010 and is 20 % larger by 2020. Nevertheless, OECD North America, with a

population of 350 million, will still consume more oil than China and India with their combined population of 2.7 billion. On the other hand, most of the expected incremental oil demand over the next two decades comes from the transport sector. In the OECD, transportation accounts for virtually all oil demand growth (approximately 90% of the total oil consumption). During the 1980s, OECD oil consumption in uses other than for transport (power generation, some industrial applications and space heating) stabilised with substitution by other fuels (OECD/IEA, 2000).

World oil supply (including conventional and unconventional oil) is expected to grow from 75 mb/d in 1997 to 96 mb/d in 2010 and to 115 mb/d in 2020. Two key trends emerge: (1) Total non-OPEC supply matures and flattens after 2010. The transition economies, West Africa and Latin America will contribute most to non-OPEC supply gains. Deepwater offshore fields are expected to play a key role, particularly in Angola and Brazil, as well as in the United States; (2) Production in OPEC, especially the Middle East countries, increases steadily, accelerating in the second half of the projection period. On the other hand, the Outlook (OECD/IEA, 2000) views the world oil-resource base as adequate to meet demand over the projection period. Table 2 shows the projected world oil balance.

Table 3
Total World primary supply of natural gas (Mtoc)

	1997	2010	2020	1997-2020*
OECD	999	1349	1549	1.9
North America	579	721	778	1.3
Europe	344	522	650	2.8
Pasific	77	107	121	2.0
Non-OECD	912	1376	2002	3.5
Transition Economies	484	572	714	1.7
Africa	41	73	108	4.3
China	21	56	111	7.5
East Asia	88	176	286	5.2
South Asia	37	87	163	6.6
Latin America	108	205	313	4.7
Middle East	132	207	307	3.8
World	1911	2724	3551	2.7

* Average annual growth rate, in per cent
Source: OECD/IEA (2000)

World primary gas consumption as projected in the Reference Scenario grows at an average annual 2.7 % from 1997 to 2020 (Table 3). Demand is strongest in the non-OECD regions, growing by 3.5 %, while OECD consumption increases by 1.9 %. The non-OECD region's share of total world gas demand reaches 56 % by 2020, as against 48 % in 1997. Demand growth is particularly strong in non-OECD Asia, although its share of global demand remains below that of Europe and North America in 2020. Gas use in the transition economies expands more slowly than in any other region except North America, but these countries remain the second largest consuming region and the largest outside the OECD in 2020. World reserves of natural gas are expected to be more than sufficient to meet the projected 86 % increase in demand over the outlook period. Table 4 shows world natural gas reserves produced by the countries (DOE, 2000).

Table 4
World natural gas reserves by the country (1999)

Country	Reserves (Trillion m^3)	Percent of total world (%)
Russian Federation	48.1	33.0
Iran	23.0	15.8
Qatar	8.5	5.8
United Arab Emirates	6.0	4.1
Saudi Arabia	5.8	4.0
United States	4.7	3.3
Venezuela	4.0	2.8
Algeria	3.7	2.5
Nigeria	3.5	2.4
Iraq	3.1	2.1
Turkmenistan	2.9	2.0
Malaysia	2.3	1.6
Indonesia	2.0	1.4
Uzbekistan	1.9	1.3
Kazakhstan	1.84	1.3
Canada	1.81	1.2
Mexico	1.78	1.2
Netherlands	1.78	1.2
Kuwait	1.47	1.0
China	1.36	0.9
Top 20 countries	129.6	89.0
Rest of World	16.0	11.0
Total World	145.6	100.0

Source: DOE (2000)

Turkey's strategic location makes it a natural "energy bridge" between major oil producing areas in the Middle East and Caspian Sea regions on the one hand and consumer markets in Europe on the other. Turkey's port of Ceyhan is an important outlet both for current Iraq's oil exports as well as for potential future Caspian oil exports. Turkey's Bosphorous Straits are a major shipping "choke point" between the Black and Mediterranean Seas. On the other hand, several waves of liberalisation have been launched since 1983, leading to a gradual opening of the Turkish energy market and improving situation. Turkey has made early and extensive use of financing models such as build-own-operate (BOO) and build-own-transfer (BOT). As yet, however, no decisive breakthrough has been achieved.

Turkey's natural energy resources are quite diversified; hard coal, lignite, asphaltite, oil, natural gas, hydro, geothermal, wood, animal and plant wastes, solar and secondary energy resources such as coke and briquettes are produced and consumed. Although Turkey' s oil and natural gas reserves seem limited, coal reserves are quite abundant. On the other hand, Turkey has substantial renewable energy resources, especially hydroelectric power and it is currently constructing a series of dams and hydroelectric power plants. The use of fuelwood and animal wastes is also important for the rural regions of the country (Kaygusuz, 1999; 2000; 2001 and 2002).

ENERGY OVERVIEW

The energy demand of Turkey will double between the years 2000-2010 and will increase fourfold during 2000 and 2025. This rapid increase in demand is due to high economic development rate of Turkey. The estimated amount of investment for production facilities by the year 2010 is around 45 billion dollars. Transmission and distribution facilities will require an additional 10 billion dollar investment in the same period. The government has undertaken measures to attract local and foreign private sector for new investments, and also to transfer operational rights of existing units to private sector for their renewal and efficient operation (WECTNC, 2000).

Turkey is an energy importing country; more than half of the energy requirement has been supplied by imports. Oil has the biggest share in total primary energy consumption. Due to the diversification efforts of energy sources, use of natural gas that was newly introduced into Turkish economy, has been growing rapidly. Turkey has large reserves of coal, particularly of lignite. The proven lignite reserves are 8.0 billion tons. The estimated total possible reserves are 30 billion tons. A majority of these lignites mostly situated in Afsin-Elbistan, Soma and Tunçbilek, are characterised with high ash contents in the range of 14 to 42 %, high moisture contents ranging from 15 to 50 % and volatile matter contents of 16-38 % . On the other hand, important developments have been recorded in primary energy and electricity consumption during the last forty years. In this period, primary energy consumption has increased by an average of 5.0 percent and electricity consumption by 10 percent, annually. Despite high growth rates, primary energy and electricity consumption are quite below the levels of OECD countries (WECTNC, 2000).

Energy forecasts show that primary energy demand would be 90 million tonnes of oil equivalent (Mtoe) in 2001, 115 Mtoe in 2005 and 150 Mtoe in 2010. However, the share of indigenous production to meet the energy demand of Turkey are expected to be as 44 % in 2001, 42 % in 2005 and 38 % in 2010. As can be seen, the share of indigenous production will decrease progressively. Considering the production objectives and demand forecasts, it will be necessary to import a total 96 Mtoe in 2010. On the other hand, in Turkey lignite has the biggest share in total primary energy production by 44 %. The complex geology has inhibited exploration in the country. For this reason in primary energy production oil has a share of 14 % and natural gas has a share of 1 % (MENR, 2001).

Oil has the biggest share (44 %) in total primary energy consumption, while natural gas has a share of 12 %. Due to the diversification efforts of energy sources, use of natural gas that was newly introduced into Turkish economy (in 1987) has been growing rapidly. Natural gas consumption (6.8 billion m^3) is expected to increase by 12% and will reach to 32 billion m^3 with a share of 18% in total consumption in 2010. Although it is expected that natural gas production will remain the same for the future years, again consumption of natural gas will increase. Predictions show that natural gas production of Turkey will be around 16.8 Mtoe for the future 13 years. In 2000, Turkey's total natural gas consumption is 14 Mtoe and it is expected to be 22.5 Mtoe in 2005 and 26.2 Mtoe in 2010.

The annual oil consumption of Turkey is around 28.2 Mtoe. 84 % of total consumption is supplied from imports, and only 18 % is supplied from indigenous production. On the other hand, total oil production of Turkey is now around 3.6 Mtoe, and predictions show that it would be 1.6 Mtoe in 2001, 0.81 Mtoe in 2005 and 0.412 Mtoe in 2010. However, share of indigenous production to meet the oil demand of Turkey is expected to be as 5 % in 2001, 2.2 % in 2005 and 1.3 % in 2010. Like energy, share of indigenous production of oil will decrease progressively. Oil consumption has an opposite trend and it is expected to increase 33.3 Mtoe in 2001, 36.2 Mtoe in 2005 and 42.4 Mtoe in 2010. Considering these production and consumption figures, it seems that Turkey's total oil importation will reach to 42.3 Mtoe in 2010 (TPAO, 2001). Table 5 shows primary energy production and consumption of Turkey during 1997-2000.

Table 5
Primary energy production and consumption of Turkey during 1997-2000 (Ktoe)

	Energy production				Energy consumption			
	1997	1998	1999	2000	1997	1998	1999	2000
Hard coal	1347	1678	2729	1769	8495	8160	11286	8149
Lignite	11759	12514	12685	12830	12280	12414	12984	12830
Oil	3630	3230	3056	2925	30515	32083	32916	34893
Natural gas	230	684	662	631	9165	10635	12902	14071
Total fossil	16966	18106	19132	18155	60455	63292	70088	69943
Hydropower	3424	3632	2982	2656	3424	3632	2982	2656
Geothermal	179	256	274	286	179	256	274	286
Solar	80	98	114	120	80	98	114	120
Wood	5512	5512	5293	5081	5512	5512	5293	5081
Waste & Dung	1512	1492	1510	1376	1512	1492	1510	1376
Total renewable	10707	10878	10650	9519	10707	10878	10650	9519

Source: MENR (2001)

The findings of the Ministry of Energy and Natural Resources (MENR) suggest that the primary energy demand will be equivalent to 91.1 Mtoe in the year 2000, and 314.35 Mtoe in 2020 in Turkey. In line with this trend, in 2023 marking the centennial of the country, the primary energy consumption will reach 367.7 Mtoe and 407.1 Mtoe two years later in 2025. According to the Ministry's production forecasts, domestic production of primary energy will level 31 Mtoe in 2000 and 79.4 Mtoe by 2020. The projections foresee domestic generation to top 91.4 Mtoe in 2023 and 96 Mtoe in 2025. Table 6 and 7 are show the findings related to primary energy resources and their domestic production planning (WECTNC, 2000, MENR, 2000).

PRESENT OIL SITUATION

Oil Demand

Oil demand grew at an annual average rate of 4.1% between 1979 and 1990. In the following decade, the growth slowed somewhat, and the government expects lower growth rates in the vicinity of 3% per year until 2010. The government expects oil consumption to increase fastest in the transport sector, leading to a near-tripling of

demand by 2020. Industrial demand is also expected to more than double by 2020. In the commercial and residential sector, oil consumption is expected to continue to increase, although less rapidly, especially because of growing demand in agriculture.

Table 6
Primary energy production targets of Turkey between (Ktoe)

Energy Sources	2005	2010	2015	2020	2025
Hard coal & lignite	21259	28522	31820	39385	45944
Oil & Natural gas	2127	1735	1516	1604	1455
Central heating	495	884	1336	2018	2748
Hydropower	5845	7520	8873	9454	10445
Wood & Waste	6760	6446	6029	5681	5393
Geothermal	1380	3760	4860	4860	5400
Nuclear	0.0	3657	9143	18286	29200
Solar	459	907	1508	2294	3248
Wind	250	620	980	1440	2134

Source: WECTNC (2000)

Table 7
Primary energy consumption targets of Turkey (Ktoe)

Energy Sources	2005	2010	2015	2020	2025
Hard coal & lignite	30474	50311	83258	129106	296997
Oil & Natural gas	73256	92637	112993	136365	179765
Central heating	495	884	1336	2018	2748
Hydropower	5845	7520	8873	9454	10445
Wood & Waste	6760	6446	6029	5681	5393
Geothermal	1380	3760	4860	4860	5400
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Source: WECTNC (2000)

Turkey is the fourth-largest European consumer of liquefied petroleum gas (LPG) after Italy, France and Spain. LPG consumption increased on average by about 8 % per year over the past decades. Recently, LPG consumption has increased drastically, since the government started subsidising LPG intended for household (cooking) use. Tax exemptions pushed the price of LPG below gasoline or diesel. As normal car engines cannot use LPG, the government expected that its use in cars would remain limited, except for taxi drivers, who in large cities such as Istanbul and Ankara were encouraged to use LPG because it causes less air pollution than diesel or gasoline. An underground industry then developed to convert gasoline and diesel engines to LPG. With a payback period of less than two years, the operation was sufficiently simple and cheap for drivers to convert massively to LPG use. Alerted by the resulting loss of tax revenue, the government began to phase out the tax break at end-2000. The new tax regulations on LPG have brought the use of LPG back under control (OECD/IEA, 2001).

Production and Exploration

The Turkish Petroleum Corporation (TPAO), the state economic enterprise (SEE) is responsible for petroleum exploration and production in Turkey. TPAO does not have any statutory monopoly in the upstream market. Twenty-five companies, including three Turkish companies, are active in the upstream petroleum sector in the country. But TPAO has the largest market share. In 1999, ten companies, of which two are domestic and eight foreign, were involved in production, either individually or as joint production companies. The TPAO's share of the total production is 74.4 %, followed by the Dutch company Perenco N.V. (20.4 %). The remaining 5.2 % was produced by the other Turkish and foreign companies. Table 8 shows crude oil production from 1996 to 2000 by company (TPAO, 2001).

Table 8
Crude oil production in Turkey (2000)

	Production (tons)				
Company	1996	1997	1998	1999	2000
TPAO	2,723,127	2,655,740	2,459,222	2,187,262	1,973,704
Shell	614,287	612,185	598,512	598,816	609.612
Arco	5,173	4,693	3,725	4,189	3,821
Mobil	99,535	93,132	85,192	80,707	110,625
Others	57,513	91,216	76,971	68,922	51,343
Total	3,499,635	3,456,966	3,223,622	2,939,896	2,749,105

Source: TPAO (2001)

In 2000, TPAO produced 13,552,701 barrels (1,973,704 tons) of crude oil from its fields constituted 72 % of the total crude oil production of Turkey. The total number of production wells was 666 in 2000 up from 647 in early 2000, with the addition of 5 new and 19 re-completed wells and abandonment of 5 wells. At the end of 2000, west Raman depleted cumulative oil reserves was 79,706,847 barrels, with 43,737,626 barrels obtained from CO_2 injection secondary recovery process. On the other hand, within its policy of keeping production at the maximum level, TPAO continued its domestic reserve development and production activities. Declining oil production from heavy oil reservoirs poses a technical challenge. Several reservoir studies are embarked on to offset the production decline and tap the upside potential (TPAO, 2001).

Table 9
Turkish crude oil imports by country of origin (Mtoe)

Country of origin	1990	%	1998	%	1999	%	2000	%
Saudi Arabia	2.9	14.4	5.4	22.8	3.6	15.7	3.4	16.0
Iraq	6.8	33.8	3.1	13.1	4.8	20.9	4.6	21.7
Iran	3.5	17.4	4.5	19.0	4.8	20.9	4.1	19.3
Libya	2.6	12.9	3.3	13.9	3.6	15.7	3.4	16.0
Russia	2.0	10.0	0.9	3.8	2.5	10.8	2.5	11.8
Syria	0.3	1.5	2.2	9.3	2.1	9.0	2.2	10.4
Other	2.0	10.0	4.3	18.1	1.6	7.0	1.0	4.8
Total	20.1	100.0	23.7	100.0	23.0	100.0	21.2	100.0

Source: TUPRAS (2001)

Turkey's oil reserves are minor. The country covered about 10 % (3.1 Mtoe) of its primary oil demand (29.4 Mtoe TPES) through its own production in 1999, the remainder had to be imported. As oil demand shows momentous growth, net crude oil and oil products imports also increased at a 4.2 % annual average growth rate since 1990. On the other hand, as indigenous production is expected to decline and demand is expected to keep growing, oil imports will have to increase substantially in future. Table 9 shows Turkish crude oil imports by country of origin. Before 1990, Iraq was the largest oil supplier. In 1990, after the UN sanctions against Iraq, Turkey increased its crude oil purchases from Saudi Arabia and Iran.

There are five oil refineries in Turkey with a total capacity of 32 million tonnes. Four of them are owned by the state-owned company TUPRAS: the Izmit, Izmir, Kirikkale and Batman refineries. The refining capacity of TUPRAS is currently 27.6 million tonnes per year, or 86 % of Turkey's total refining capacity. The fifth refinery is owned by the private company ATAS and is situated near Mersin on the Mediterranean coast. ATAS was established in 1962 with an annual capacity of 3.2 million tones. It is a joint venture of Mobil (51 %), Shell (27 %), BP Amaco (17 %) and the local company Marmara Petroleum. The refining capacity of ATAS is currently 4.4 million tonnes per year. Table 10 shows crude oil processed in refineries by years in Turkey. On the other hand, 24.2 million tonnes of crude oil were processed, yielding 23.5 million tonnes of products in 2000. During the same period, 5.4 million tones of products were imported while 2.2 million tonnes of products were exported (TUPRAS, 2001).

Table 10
Crude oil processed in refineries (tons)

Name	Crude oil processed by years				
Refinery	1996	1997	1998	1999	2000
Ataş	3,219,000	3,487,000	3,486,000	3,724,000	2,949,000
Batman	705,836	824,893	862,635	688,000	776,000
İzmir	10,200,283	9,922,115	11,000,110	10,645,000	10,668,000
Izmit	8,375,092	8,909,000	8,553,000	7,218,000	6,442,000
Kırıkkale	3,957,094	3,571,000	3,247,569	3,900,000	3,392,000
Total	26,457,305	26,714,008	27,149,314	26,175,000	24,227,000

Source: TPAO (2001)

PRESENT GAS SITUATION

Turkey's natural gas consumption is shown in Table 5. As shown from Table 5, natural gas consumption is the fastest growing primary energy source in the country. Current gas production (0.20 billion m^3 from 14 gas fields) in Turkey meets 2.8 % of domestic consumption. Major gas producers in the country are Arco, TPAO, and Shell. North Marmara region is the country's largest non-associated gas field. North Marmara is located offshore in the Thrace-Gallipoli Basin of the Marmara Sea. On the other hand, Turkish natural gas is projected to increase dramatically in coming years. Turkey consumed 9.79 billion m^3 of natural gas in 1995, accounting for around 10 % of Turkey's total energy consumption. Gas demand is expected to more than quintupled by 2010 (Table 11).

Turkey has chosen natural gas as the preferred fuel for the massive amount of new power plant capacity to be added in the next years. This makes sense for Turkey for several

reasons; environmental, geographic, energy security, economic, and political. Turkey is seeking to strengthen relations with Caspian and Central Asian countries, several of which are potentially large gas exporters. The Caspian Sea region is important to world markets because it has large oil and gas reserves that are only beginning to be fully developed. Developing these resources has resulted in competition both between companies to get the contracts to develop this potential and between nations to determine the final export routes.

Table 11
Natural gas supply and demand scenarios

	2002	2004	2006	2008	2010
Algeria LNG	4 000	4 000	4 000	4 000	4 000
Nigeria LNG	1 200	1 200	1 200	1 200	1 200
Iran	4 000	6 000	9 000	10 000	10 000
Russian Federation	18 000	22 000	26 000	30 000	30 000
Turkmenistan	0	0	9 200	10 200	12 200
Azerbaijan	0	0	3 000	6 600	6 600
Total demand	21 223	37 620	46 047	49 463	55 102
Total supplies	26 966	32 778	51 320	60 692	62 614

Source: BOTAS (2001)

The bulk of Turkish gas demand is met by imports, nearly all from Russia. Turkey would like to diversify its import sources and has signed gas import deals with a variety of countries, including Algeria, Iran, Nigeria, Russia and Turkmenistan (Table 11). Russia began supplying Turkey with 5.66 billion m^3 of gas annually in 1987. In February 1997, Russia agreed to increase gas supplies to 7.92 billion m^3 at the beginning of 1998. On December 15 of 1997, Russia and Turkey signed a 25 years deal under which the Russian Gas Company, Gazprom, would construct a new gas export pipeline to Turkey for delivery of around 14.15 billion m^3 of natural gas annually by the early 2000s (see Table 12). The US$ 4 billion, 758 miles "Blue Stream" dual pipeline would run from Izobilnoye in southern Russia to Dzhugba on the Black Sea, then under the Black Sea for about 247 miles to the Turkish port of Samsun and on to Ankara. When completed, possibly by 2003, the Blue Stream lines would be the world's deepest underwater gas pipelines. The high cost and complex engineering to construct the pipeline (including a corrosive environment due to high concentrations of hydrogen sulfide at the bottom of the Black Sea) could push Russia to choose alternate routes.

A controversial possibility to supply Turkey with gas is a proposed swap deal between Turkmenistan, Iran, and Turkey. Under this arrangement, Turkmenistan would export gas to Iran, which would then pump its own gas to Turkey. The supply contract will require construction of 3 new pipelines in Turkey. The local consortium of Fernas and STFAEnerkom has won the bid to construct the 260 km long line from Dogubeyazit, on the Iranian border, to Erzurum. From Erzurum, the pipeline will extend to Sivas and then to Ankara. Iranian gas used to supply the pipeline will come from the non-associated Kangan regional fields as well as from associated sources around Ahwaz. Since Turkey is merely trading with Iran, the United States has determined that Turkey technically is not in violation of the Iran-Libya sanctions Act (ILSA), which imposes sanctions on companies investing more than US$ 20 million in Iran's oil or gas industry. For its part, Turkey has steadfastly maintained that it needs

to diversify its suppliers of natural gas away from Russia and that Turkmen and Iranian gas represent economically sound alternatives.

Table 12
Some city centers to be supplied by gas in Turkey

	Optimistic		Base Case		Pessimistic	
	Natural Gas Demand (million m^3)	Starting data of natural Gas usage	Natural Gas Demand (million m^3)	Starting data of natural Gas usage	Natural Gas Demand (million m^3)	Starting data of natural Gas usage
Edirne	42	2002	29.4	2004	25.2	2006
Kütahya	28	2003	19.6	2005	16.8	2007
Uşak	40	2003	28.0	2005	24.0	2007
Bolu	40	2003	28	2005	24.0	2007
Adapazarı	25	2002	17.5	2004	15.0	2006
Karabük	70	2003	49	2005	42.0	2007
Zonguldak	23	2003	16.1	2005	13.8	2007
Bartın	64	2003	44.8	2005	38.4	2007
Erzurum	81	2002	56.7	2004	48.6	2006
Sıvas	57	2002	39.9	2004	34.2	2006
Yozgat	127	2003	88.9	2005	76.2	2007
Kırşehir	34	2002	23.8	2004	20.4	2006
Niğde	50	2003	35.0	2005	30.0	2007
Çorum	57	2002	39.9	2004	34.2	2006
Kırıkkale	27	2002	18.9	2004	16.2	2006
Balıkesir	49	2002	34.3	2004	29.4	2006
Manisa	36	2002	25.2	2004	21.6	2006
İzmir	48	2002	33.6	2004	28.8	2006
Isparta	125	2004	87.5	2006	75.0	2008
Denizli	85	2004	59.5	2006	14.4	2008
Afyon	49	2004	34.3	2006	29.4	2008
Malatya	73	2004	51.1	2006	43.8	2008
Adana	76	2004	53.2	2006	45.6	2008
Giresun	46	2004	32.2	2006	27.6	2008

Source: BOTAS (2001)

Natural Gas Production

In 2000, TPAO's cumulative natural gas production was 611,822,413 m^3. The natural gas produced in Thrace Region was sold to 48 local companies including Petroleum Pipeline Corporation (BOTAS) and the natural gas produced from Çamurlu field in Batman Region was sold to a region boarding school and to two companies in the region. The oil equivalent of the natural gas output is 3,600,592 barrels. Thus TPAO's cumulative hydrocarbon production was realised as 17,153,293 barrels, by the end of 2000 (TPAO, 2001).

The initial feasibility study estimate of total natural gas storage capacity of Kuzey Marmara and Değirmenköy fields is 1.6 billion m^3. The projection for natural gas injection rate to these fields during low season is 9.1 million m^3/day where production is predicted as 11 million m^3/day during high season. On the other hand, "Natural Gas Storage and Reproduction Services" agreement signed by TPAO and BOTAS on July 21, 1999 has put TPAO in change of development and operation of Kuzey Marmara and Değirmenköy fields for future underground natural gas storage with the realisation of new investment for conversion. After the signing of the agreement, TPAO initiated the necessary studies.

PIPELINES

Oil and gas transportation is a crucial and contentious in the Caspian Sea/Central Asia regions. Turkey and the United States have been pressing for a "Western route" pipeline that would carry oil from Azerbaijan port of Baku through Azerbaijan and Georgia and then across Turkey to Ceyhan, at an estimated cost of US$ 1.8-4 billion. This would be a major part of the proposed "Eurasian Corridor" to bring Caspian oil and gas to international markets via Turkey, and to bypass Russia and Iran. Russia, on the other hand, is promoting a "Northern route" across the Caucasus to the Russian Black Sea port of Novorossiysk. From there, oil would be transported through the Bosporus (which Turkey claims is too crowded already, and a potential danger to Istanbul) or via a proposed pipeline from Bulgaria to Greece and the rest of Europe. Other proposals include a pipeline to Georgia's Black Sea port of Supsa, and a swap arrangement with, or export pipeline through Iran. On the other hand, one advantage which Baku-Ceyhan has over other potential options for Caspian oil transport is that Ceyhan can handle very large crude carriers, while the port of Supsa (Georgia) and Novorossiysk (Russia) are restricted to smaller tankers which can transit the Bosporus. Another advantage for Ceyhan is that it can remain open all year, compared to Novorossiysk, which is closed up to 2 months per year due to bad weather.

Turkey has far-reaching plans to bring new oil supplies to western markets from the Caspian region, especially Azerbaijan and Kazakhstan. The Baku-Tiflis-Ceyhan project is designed to transport crude oil produced in the Caspian Basin by pipeline to the Ceyhan port terminal. As the Ceyhan terminal has a capacity of 120 Mtoe per year and can receive very large crude carriers, the oil could be shipped to world markets by tanker. The Turkish government expects that the pipeline will have an approximate length of 1,730 km, will carry 1 million barrels of crude oil per day, and will come into service in 2004 or 2006. From its starting point in the Baku (Azerbaijan) on the shore of the Caspian sea, the pipeline is to cross the territory of Azerbaijan and Georgia, enter Turkey near the city of Ardahan, run westwards to Sivas and then dip south to Ceyhan. For this reason, many parties are involved in negotiating this international project, which has been under consideration for a decade (OECD/IEA, 2001).

OIL AND NATURAL GAS POLICIES

The existence of oil in Turkey was first mentioned by the Turkish historian Evliya Çelebi in the 18th century. Exploration began in the second half of the 19th century, when both domestic and foreign companies carried out exploration in Thrace. The first productive well, operated by the European Petroleum Company, was located in the Hora Deresi region (Thrace). However, World war l, coupled with the collapse of the Ottoman Empire and the birth of modern Turkish state, temporarily halted oil-related activity. On the other hand, after the Republic was proclaimed in 1923, oil exploration resumed under the authority of the new Government body empowered to explore for minerals and petroleum in Turkey. The Mineral Exploration and Research Directorate (MTA) drilled several oil wells in the Southeast, primarily in the Raman region. In 1940, the first productive well, Raman 8 was drilled in the Raman Oil Field, setting the stage for later exploration of this large oil field. In 1951, the Garzan field was discovered in the same region, also as result of MTA-sponsored explorations (TPAO, 2001; SPO, 2001).

The Turkish oil market, which had been heavily regulated, underwent significant liberalisation from 1989 to 1990. Before 1954, petroleum operations were classified as public services operations under Petroleum Law Number 792 of 1926. The operations were state-owned and were integral parts of the general government budged. In 1954, a more liberal Petroleum law (No. 6326) was enacted. This law, which was in force until 2001, provided for private-sector activities throughout the upstream oil and gas sectors and the downstream oil market, although it also foresaw government regulation of exploration, production, refining and transportation. No provisions were made regarding oil and gas distribution. Oil product retailing was not restricted. Foreign companies were required to act through Turkish subsidiaries, to have a minimum storage capacity and to own a minimum number of service stations.

CONCLUSION

Turkey in preparing itself for the 21st century, is planning to expand the usage of natural gas to the whole country to reduce the air pollution by using environmental friendly natural gas. Therefore, BOTAS has been developing projects for the wide spreading of natural gas usage throughout Turkey with the purposes of avoiding dependence on current energy sources, finding alternative resources, enhancing supply flexibility and ensuring supply security. On the other hand, three-quarters of the proven oil and gas reserves of the world exist around Turkey. Despite its proximity to these rich resources, Turkey is not a self-sufficient country in terms of meeting its requirements. Therefore, it should import more oil and natural gas and allocate huge budgetary resources to finance it. The crucial point is to import the energy in a most competitive and reliable way and to diversify the energy resources as much as possible by taking into consideration all sorts of opportunities in the world' s oil and gas markets.

Turkey, like some other countries importing natural gas, plans to build an Liquefied Natural Gas (LNG) import terminal to be used for diversifying the natural gas supply sources and increasing the supply security and elasticity. It would also serve as a base load plant and a means of peak shaving when required. For this purpose, as a result of negotiations conducted between the governments of Turkey and Algeria, an agreement for 20 years was signed for the supply of LNG between BOTAS and SONATRACH companies on April 14, 1988. Under this agreement, Turkey would purchase 2 bcm/year of natural gas equivalent of LNG from Algeria. On the other hand, in 1999, 6 billion m^3 of natural gas was imported from the Russian Federation, and also 3 billion m^3 of Russian gas was imported through TURUSGAZ. In addition, 3.6 billion m^3 and 0.077 billion m^3 of natural gas equivalent of LNG was imported from Algeria and Nigeria, respectively. The total purchased volume reached 12.6 billion m^3 including 0.299 billion m^3 of gas supplied by TPAO (BOTAS, 2001).

Recently, considerable attention has been focused on energy resources by the governments in Turkey. The Turkish government's investment needs in the energy sector for the period will be around 65 billion US dollars.. A major dilemma now faced by Turkey is how to invest in new electric power capacity while at the same time adhering to its foreign debt ceiling under lending rules set by the International Money Fund (IMF).

Therefore, Turkey has to adopt new long-term energy strategies to reduce the share of fossil fuels and to increase the share of renewables in the primary energy consumption. As a result, oil and natural gas consumption are the fastest growing primary energy resources in Turkey. Turkish oil and gas consumption are projected to increase dramatically in coming years, with the prime consumers expected to be industry and power plants.

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