The Natural Gas Sector in Israel

An Economic Survey

August 2018

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Main Points:

❖ The upward trend in natural gas consumption in Israel continued in 2017, increasing 7% compared to 2016 to 10.4 BCM. Natural gas consumption for electricity production amounted to 8.5 BCM in 2017, whereas gas consumption for industrial purposes equaled 1.8 BCM.

❖ At the end of 2017 there were 15 large industrial customers connected to the gas transmission system, 57 relatively small customers connected to the distribution network, and another eight customers of compressed natural gas (CNG). It is important to note that 33 out of 36 customers that consumed natural gas in 2017 via the distribution network are located in the Negev and southern distribution regions. This finding displays the concentration of natural gas customers in the southern region, a development that highlights the relatively slow connection of potential customers to the distribution network in other regions.

❖ To this day, natural gas has still not been adopted for use by other customers, such as: small- and medium-sized industrial factories, natural gas filling stations, military bases of the Israeli Defense Forces (IDF), government compounds, residential neighborhoods, and more. It is important to note that any expansion in the use of natural gas in the local economy is closely linked to acceleration in the deployment of the gas transmission and distribution networks across the country, in a manner that will make natural gas accessible to all potential customers.

❖ The Israel Natural Gas Authority forecasts natural gas demand will equal 447 BCM over the next 25 years, with this being dependent on a number of assumptions detailed in the relevant section. In light of the findings, the team reviewing the findings of the inter-ministerial committee to examine the government's policy regarding natural gas in Israel (the Tzemach Committee) recommended that the volume of gas to be retained for the local economy will remain equal to 540 BCM (similar to what was decided by the Tzemach Committee) minus 40 BCM that were consumed since 2013, or 500 BCM in total. This means the quantity of gas produced above this amount may be directed to export, and in this manner will increase the potential growth rate of the economy.

❖ The "Tamar" reservoir is expected to continue to be the primary source of supply of natural gas for the economy until the "Leviathan", "Karish", and "Tanin" reservoirs will be connected. The initiation of gas production from the "Leviathan" reservoir (Stage 1A) is planned for year-end 2019, and the beginning of gas production from the "Karish" reservoir is planned for the first quarter of 2021. Thus, the total supply of natural gas that will be available to the Israeli economy from local sources will equal 26 BCM per year starting in the beginning of 2021 (10 BCM from "Tamar" plus 12 BCM from "Leviathan", and 4 BCM from "Karish").

❖ The main macro-economic effect of the initiation of natural gas production from the "Leviathan" reservoir, together with the continued deployment of the national gas distribution network, involves a reduction in the import of energy products into the country. This reduction is expected to lead to a decline in the country's trade deficit and consequently is likely to support an increase in the current account of the balance of payments (towards 2020), representing a fundamental factor supporting the strength of the shekel. Furthermore, this development is expected to make a positive contribution to GDP growth, on a one-time basis with the drop in the amount of imports.

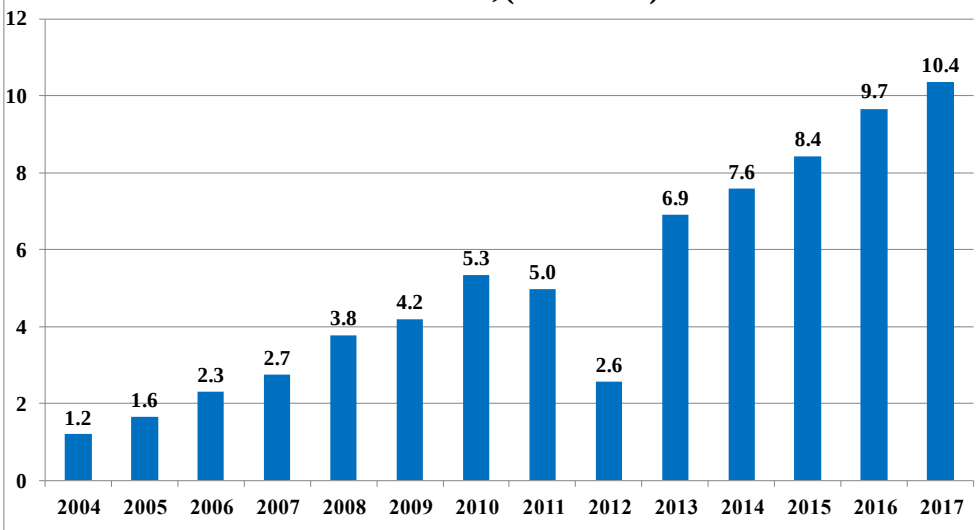
❖ The OECD estimates that the effect of the initiation of gas production from the "Leviathan" reservoir on the Israeli economy is expected to be more moderate compared to the effect of the "Tamar" reservoir, this in light of the limited domestic demand for natural gas, which is supplied mostly by the "Tamar" reservoir. The expected contribution to Israel's GDP, according to the OECD, is approximately 0.3% of GDP, compared to 1.1% of GDP (in the years 2013-2014) caused by the initiation of gas production from the "Tamar" reservoir. Looking forward, it was noted that the main opportunity to increase the contribution to GDP over the longer-term is via an increase in natural gas exports. Therefore, it is very important for policy makers to continue to encourage the development of the natural gas sector in Israel.

❖ Expansion in the use of natural gas in the local economy is dependent on the investment of tens of billions of dollars in areas such as: the completion of the deployment of the gas distribution network, the conversion of certain vehicles to fueling with natural gas, the creation of production facilities using natural gas and renewable energy facilities, the connection of industrial factories and other customers to the gas distribution network, and more. Financing for the investment projects noted will apparently come in part from grants and incentives from the Israeli government, and also from foreign financial institutions and from the local financial system.

Natural Gas Consumption Development in Israel

The upward trend in the consumption of natural gas in Israel is continuing. According to data from the Natural Gas Authority within the Israel Ministry of Energy[1], the overall consumption of natural gas in the local economy equaled 10.4 BCM (billion cubic meters) in 2017, representing a 7% increase compared to 2016 when consumption equaled 9.7 BCM. As can be seen in Chart 1, the upward trend in natural gas consumption in the local economy has carried on continuously since 2013, with the initiation of natural gas production from the "Tamar" reservoir. The growth in natural gas consumption is expected to continue also in the coming years.

Chart 1: Natural Gas Consumption in the Israeli Economy in 2004-2017, (BCM/Year)



Source: Ministry of National Infrastructures, Energy and Water Resources (April 2018).

Natural gas is a less polluting energy source (and with a lower cost) compared to the main alternatives (coal, crude oil, and oil distillates). According to estimates of the Natural Gas Authority[1], the total savings[2] to the economy resulting from the use of natural gas between the years 2004 – 2017 equaled NIS 54.4bn. This sum is broken down in the following manner: NIS 41.5bn were saved in the electricity sector and NIS 12.8bn were saved in the industrial sectors. At the same time, broad investments in this space have led to a reduction in expenditures on polluting fuels and also have led to an increase in revenues to the state.

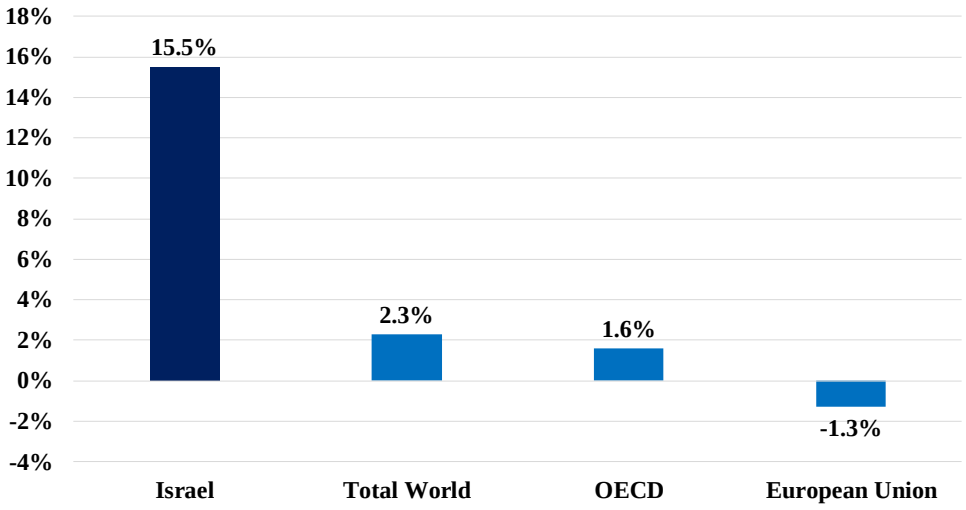
The heightened use of natural gas in Israel over recent years is notable also in an international comparison. According to research conducted by British Petroleum (BP)[3] in June 2018, the rate of increase of natural gas consumption in Israel in 2017 (7%) was high in comparison to the rate of increase of the OECD countries. Furthermore, as can be seen in accompanying Chart 2, the average annual rate of increase in

[1] Survey on the natural gas sector in 2017, published by the Israel Ministry of Energy in April 2018.
[2] The calculation is according to estimates of the Natural Gas Authority, and compares with the situation in which there is no use of natural gas, and with the creation of coal powered plants D and E according to the original plan.
[3] BP Statistical Review of World Energy, June 2018, 67th edition.

the local economy between the years 2006-2016 equaled 15.5%, which is substantially higher compared to the OECD countries (1.6%) and the EU (-1.3%) and also compared to the global rate of increase (2.3%). The high rate of growth in Israel shows that the natural gas sector in the country is still in the growth and development stages, and it is expected to remain like this also in the coming years.

However, the relatively high rate of penetration of natural gas in Israel is concentrated primarily in electricity production, with a small level also in the industrial sectors (mostly heavy industry). In 2017 83% of total natural gas consumption, amounting to 8.5 BCM, was used for electricity production by the Israel Electric Corporation (IEC), private electricity producers, and industrial factories that partially produce electricity. The remaining 17% of natural gas usage, or 1.8 BCM, was consumed in the industrial sectors. On the other hand, the penetration of natural gas usage in small- and medium-sized industries, as well as for private consumers, has been very limited up until now.

Chart 2: Natural Gas Consumption – Israel in an International Comparison, average rate of change 2006-2016



Source: BP Statistical Review of World Energy, June 2018, 67th edition.

Natural Gas for Electricity Production

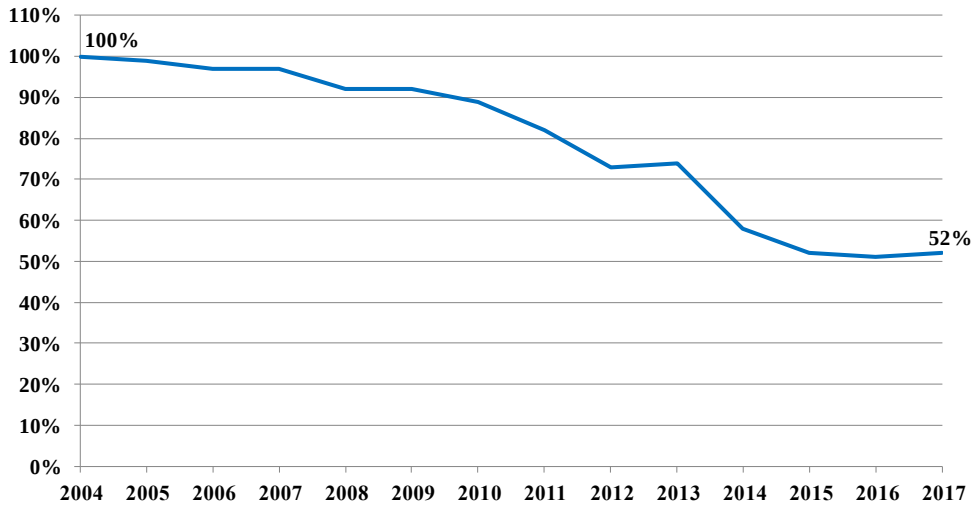
The use of natural gas in the process of producing electricity has gained momentum in recent years, in light of, among other things, government measures to reduce the use of coal and other polluting sources of energy[4]. In 2017 Israel produced 64% of its electricity using natural gas, 32% from coal, and 3% from renewable resources. This compares to 53% of electricity production from natural gas in 2015 and 32% from natural gas in 2011[5].

[4] Among other things, referring to government decisions: number 542 that was approved on September 20, 2015 on the topic "Reduction of greenhouse gas emmissions and streamlining energy consumption", and number 3269 that was approved on December 17, 2017 on the topic "Approval of the national plan for energy efficiency".
[5] According to the budget proposals that the budgeting department of the Ministry of Finance published in recent years for the Ministry of National Infrastructures, Energy, and Water Resources, the most recent of which was published in February 2018.

On this regard, we note that during 2017 the Minister of Energy decided to shut down electricity production units 1-4 operating on coal at the "Orot Rabin" power station in Hadera immediately upon the the connection of two additional gas reservoirs to the Israeli economy and the creation of alternative manufacturing ability using natural gas. The target date for the cessation of activity of the coal powered units was set for June 2022, and the policy of the Ministry of Energy (which has still not received official authority) is for the full closure of all the coal units, gradually by 2030[6]. This development will support a continuing increase in the main component of demand for natural gas in the local economy, which is to say electricity production. On this regard, we note that future additional demand for electricity in the local economy is expected also as a result of the penetration of electric cars and electric trains, this together with the creation of additional water desalination plants.

Competition among the electricity producers in Israel (the IEC and private electricity producers) has increased over recent years and is expected to continue to expand also in the coming years. As evidence of this, we note that since 2015 the IEC's portion of total consumption of natural gas in the Israeli economy stands at 50%. This figure is substantially below what it was in previous years – 74% in 2013 and 100% in 2004 (see Chart 3). In 2017 the consumption of natural gas by the IEC amounted to 5.3 BCM, whereas the private electricity producers consumed a quantity equal to 3.2 BCM[7], representing a 31% share of the total natural gas consumption in the economy, which indicates an increase compared to previous years.

Chart 3: The Portion of Total Natural Gas Consumption by the IEC in the Israeli economy (%)



Source: Ministry of National Infrastructures, Energy and Water Resources (April 2018).

Looking forward, the portion of private electricity producers is expected to increase to 42% through 2020, with the creation of additional manufacturing facilities[8]. At the same time, we note that in recent years the government has been advocating policy that encourages expansion of the use of renewable energy

[6] As was written in the report on the conclusions of the professional team for the periodic examination of the recommendations of the the Tzemach Committee, which were adopted in government decision 442 on June 23, 2013, rough draft for public discussion, July 2018, page 29.
[7] Including the consumption of natural gas at industrial factories for the purpose of producing electricity.
[8] The budget proposal for the Ministry of National Infrastructure, Energy, and Water Resources for 2019 (February 2018).

resources[9]. According to the targets set by the government[10], renewable energy resources will account for 10% of electricity production by 2020, 13% by 2025, and 17% by 2030. These decisions are likely to slightly mitigate the future growth in the demand for natural gas for electricity production; nonetheless, electricity production is expected to continue to lead the demand for natural gas in Israel.

Natural Gas in Industry

The second most important component in the demand for natural gas is the demand from industry. Many industrial sectors consume energy materials during the manufacturing process for the purpose of burning, primarily by fuels such as petroleum, kerosene, and diesel. Natural gas represents a less polluting alternative with a lower cost compared to those just listed. Actually, natural gas consumption in the industrial sectors is possible only after the customer is connected to the transmission or the distribution network. The large industrial companies (heavy industry) generally consume natural gas via the transmission network, while the smaller companies access natural gas via the distribution network[11].

As of the end of 2017, there are 15 large industrial customers connected to the natural gas transmission system, and there are 57 relatively small customers connected to the distribution network (of which 20 were connected during 2017). In addition, there are another eight customers of compressed gas (CNG). In 2017 natural gas consumption in the industrial sectors, over and above the domestic production of electricity, amounted to 1.81 BCM, reflecting an 11% increase compared to 2016. According to the Natural Gas Authority[12] this increase occurred primarily as a result of the connection of new customers to the distribution network, and four new customers using CNG.

In addition, it is important to note that 33 out of 36 customers (more than 90%) that consumed natural gas in 2017 are located in the Negev distribution regions (24 customers) and the south (9 customers). This fact shows a heavy concentration of consumers of natural gas in the south of the country, which likely indicates the relatively slow rate of connection of potential customers to the distribution network in other regions. However, it is also possible that in the southern region there happen to be more potential consumers of natural gas (those for which it is economically worthwhile to convert to natural gas) than in other regions of the country.

Looking forward, regarding customers hooked up to the natural gas transmission network (the large consumers), at the Natural Gas Authority[13] they estimate that the rate of increase in the consumption of fuels (or alternative energy resources) among these customers is the main factor that will affect demand for natural gas, this because the heavy industry that is suitable for the transmission network is already

[9] Referring to energy that is derived from utilizing solar radiation, wind, bio-gas, geothermal heat, and other non-perishable natural resources.
[10] Referring to government decisions: number 542 from September 20, 2015 on the topic "Reduction of greenhouse gas emmissions and streamlining energy consumption", and number 1403 from October 4, 2010, which was approved towards and in continuation of the 2015 UN Conference on Climate Change in Paris.
[11] See details on this matter in our survey on Israel's natural gas sector from January 2017, pages 10-11.
[12] See footnote 1.
[13] See footnote 6.

fully connected. Current estimates call for annual growth of 1.5% in the consumption of fuels in heavy industry.

Regarding the customers connected to the distribution network, heavy industry, light industry and the food industry, we note that from a survey conducted at the Natural Gas Authority it arises that in 2009 the amount of overall consumption of all these players equaled 630 MCM (million cubic meters). For the purpose of estimating future demand, a linear growth rate of 1.5% was assumed per year (from 2009) in the consumption of natural gas via the distribution network, from which was deducted the potential demand of industrial customers for which it is not economically worthwhile to convert to natural gas. In light of this, the Natural Gas Authority estimates the potential industrial consumption of natural gas via the distribution network will equal 720 MCM by 2030, increasing to 850 MCM in 2042.

Natural Gas Consumption in Other Sectors

Natural gas indeed is a notable source of energy in the electricity and industrial sectors; however, natural gas has not yet entered into use among other consumers, such as: small- and medium-sized industrial factories, natural gas fueling stations, hotels, hospitals, prisons, Israel Defense Forces (IDF) bases, government compounds, airports, and more. Furthermore, the potential use of natural gas has not been realized among municipal consumers in a variety of fields, such as: services, trade, households, and more.

This development is the result of relatively slow advancement in the creation of the necessary infrastructure for the consumption of natural gas, and particularly the delay in the creation of the national distribution network. According to the Ministry of Finance (MoF)[14], through the end of 2017 350km of pipeline[15] were deployed in the distribution network out of a planned total of 1,200km. In addition, approximately 180 customers indeed signed contracts for gas distribution, yet less than only 40 factories (and/or other customers) are connected to the distribution network.

According to the MoF, the delay in the deployment of the pipeline has occurred against the backdrop of financial, planning, and regulatory difficulties experienced by the distribution companies, and this was due to, among other things, the decline in oil prices, a decline in the worthwhileness of converting over to natural gas from the viewpoint of the factory, in the face of the relative price in Israel, and increased regulation that creates difficulties and obstacles in the way to the use of natural gas.

In light of the importance of this issue, the 2019 budget reflects increased assistance to accelerate deployment of gas distribution lines and upgrade of the distribution infrastructure. In addition, within the 2019 budget resources are earmarked also for assistance in connecting residential neighborhoods to natural gas. On this regard, we note that in 2017 connection of the Park Ha'nachal neighborhood in Beer Sheva was advanced as a pilot to explore connecting household customers to natural gas (this according to the Natural Gas Authority). During 2018 the connection of additional neighborhoods to natural gas will be advanced.

[14] See footnote 8.
[15] According to the Natural Gas Authority, as of 2017 310km of distribution pipeline has been deployed.

The MoF estimates the annual potential consumption of natural gas in the national distribution network (which includes all industrial customers, power plants using co-generation technology, hospitals, commercial and trade centers) to equal 1.0 BCM. In addition, the expected annual savings from the reduction in the use of fuels resulting from the transition from liquid fuels to natural gas in industry and in transportation is estimated at NIS 1bn per year[16] (including the calculation of significant environmental benefits). At the same time, it was noted that completion of the distribution network across the entire country involves a one-time investment of NIS 1.7bn. That is to say, the data support the economic worthwhileness of investment in the distribution network.

The demand for natural gas in Israel is expected to be supported in the coming years also by the expected conversion of private vehicles from conventional fuel (gasoline and diesel) to alternative propulsion vehicles (electricity and CNG). This estimate is supported by government measures relating to this matter, including: a declaration from the Minister of Energy stating his intention to act to forbid the sale of vehicles powered by gasoline and diesel starting from 2030; and a call from the Ministry of Energy for the establishment of CNG fueling stations (March 2018). Looking forward, we note that the Natural Gas Authority estimates that in a regular business scenario the entrance of 500,000 electric cars is to be expected in 2030. Furthermore, the Natural Gas Authority assumes the creation of a plant for the production of methanol in Israel, both for export and also for domestic consumption, with the production of methanol expected to begin in 2021.

In addition to the investment required for the completion of the deployment of the distribution network and the investment in the establishment of CNG fueling stations and in the conversion of vehicles to fueling with natural gas (which is estimated to equal a number of billions of shekels), there can also be noted the investment in the conversion to natural gas and in equipment that makes use of natural gas in each of the various components of demand. According to the Electricity Authority[17], the total investment required by the private sector through 2030 for the purpose of establishing manufacturing facilities using natural gas and renewable energy plants equals an estimated US$15bn.

In addition, from an analysis of the demand for natural gas in the industrial sectors, there are approximately 500 industrial factories that have the potential for hook-up to natural gas. Among these approximately 80 factories were connected through the end of 2017 (eight of them currently consume CNG). The connection of more than 400 factories to the distribution network involves investment of an additional NIS 1-2bn. In addition, there are hundreds more additional potential customers, such as: government institutions, hospitals, hotels, office towers, households, and more. The connection of these to the distribution network involves additional investment of a number of billions of shekels. The financing for the investment projects noted will apparently come partially from grants and incentives of the Israeli government, foreign financial institutions (including credit from equipment suppliers), and from the local financial system.

[16] This under the assumption of realizing the potential of the conversion of industry to natural gas and the partial conversion of heavy vehicles to the use of natural gas.
[17] Roadmap for the development of the manufaturing section in the electricity sector 2018 – 2030, June 2018, page 3.

Forecasts on the Demand for Natural Gas in the Local Economy

The formation of government policy is of crucial importance for the future development of natural gas demand in the local economy. Government policy, in its role within this realm, influences the rate of expansion in the use of natural gas in the local economy. On this regard we note that the interim report of the professional team for the periodic examination of the recommendations of the Tzemach Commission (from July 2018) presents in detail the forecasts of the Natural Gas Authority regarding the demand for natural gas in Israel for the next 25 years (2018 – 2042)[18]. Within this framework, a number of factors were emphasized that are expected to affect the future demand for natural gas. Factors that support an accelerated increase in the demand for natural gas include: the closure of coal-powered electricity plant units 1-4 at the Orot Rabin site in Hadera by 2022, the cessation of the use of coal by 2030, and the increasing introduction of electric vehicles into the local economy. On the other hand, factors that are likely to slightly offset the demand include: a government target for the streamlining of energy by a rate of 17% by 2030, and a government target to produce 17% of electricity from renewable energy by 2030. The factors noted primarily affect the forecast on the demand for natural gas in the electricity sector, which as mentioned is a central demand component in the natural gas sector and is expected to remain as such in the coming years.

In the report there were eight scenarios presented on the demand for natural gas in the local economy, with the scenarios differentiated from each other by the annual rate of increase of electricity production[19], the rate of penetration of electric vehicles into the economy[20], the rate of achievement of government targets (full or partial achievement of stated targets), and more[21]. From these scenarios it arises that the forecast demand for natural gas between the years 2018 – 2042 ranges between 368 BCM (cumulative over the course of the period) in the modest scenario, and 486 BCM (cumulative) in the aggressive scenario.

In the scenario adopted by the team, demand of 447 BCM over the next 25 years is assumed, which is to say average annual demand of 18 BCM (however, the annual consumption is not uniform over the entire period but instead reflects a gradual path of increase). The assumptions that form the basis for this scenario are: the closure of all coal plants by 2030, achievement of the government target of 17% streamlining in energy usage by 2030, achievement in the government target of 17% renewable energy of total electricity consumption by 2030, and a rapid pace of penetration of electric vehicles (1.5m vehicles in 2030). In light of the scenario findings, the examination team of the findings of the Tzemach Committee recommended to not change the quantity of gas that should be retained for the local economy that was set by the Tzemach Committee – 540 BCM less 40 BCM that were consumed since 2013, which is to say

[18] In the report it is noted that this forecast concentrated on the estimated forecast demand for natural gas in the electricity sector (in cooperation with the Electricity Authority), industry, transportation, and the petrochemical industry (page 26).
[19] A relatively moderate annual increase of 1.70% in the demand for electricity (which matches the energy streamlining target of the governemnt) compared to a higher annual growth of 2.47% (which was set in the framework of the roadmap for the electricity sector).
[20] 500,000 electric vehicles in 2032 in the central scenario compared to 1.5m electric vehicles in 2032 in the scenario involving aggressive market penetration.
[21] These parameters are detailed in the report on pages 35-36.

500 BCM. What this means is that the quantity of gas that will be produced above that amount, may be directed to export, and thus to increase the potential growth rate of the economy.

On this regard, we note that in the beginning of 2017 Israel began to export natural gas for the first time, in an amount equal to 0.073 BCM to the Dead Sea factory in Jordan[22]. Natural gas exports are expected to increase with the implementation of export agreements that natural gas suppliers signed with Jordan, Egypt[23], and the Palestinian Authority. The Natural Gas Authority notes that during 2018 will begin a building of a pipeline that will connect in the northern region of the country to the transmission network. This connection will be used for the export of natural gas from the "Leviathan" reservoir. Furthermore, in December 2017 the ministers of energy of Israel, Cyprus, Greece, and Italy signed a memorandum of understanding to lay a natural gas pipeline under the sea to Europe that will pass via Greece and Italy. This step is likely to open the local natural gas industry to exports to the European market, a development that will encourage the exploration and development of additional natural gas reservoirs.

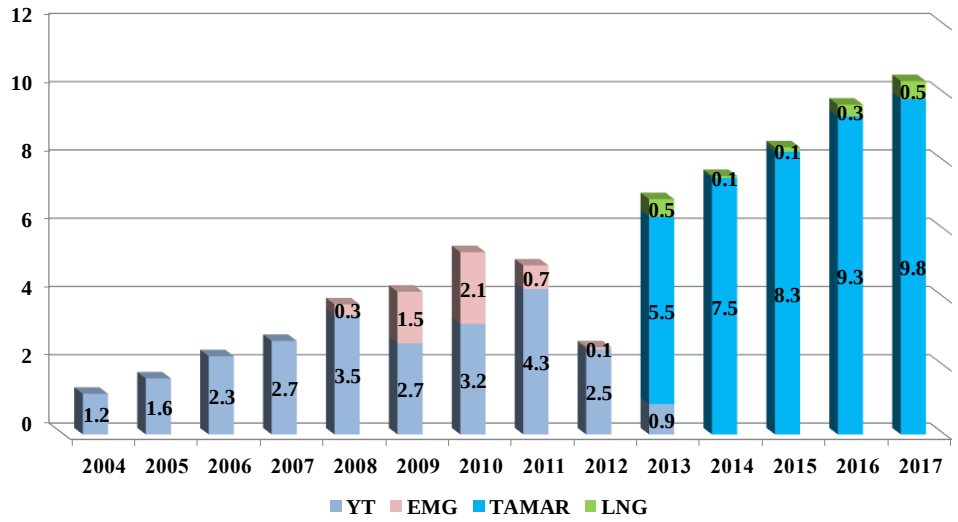
[22] See footnote 1.
[23] In February 2018 the most substantial natural gas export transaction was signed with Egypt, involving an overall export quantity equal to 32 BCM.

Development of Natural Gas Supply in Israel

In the period between 2004 – 2017 there were 70 BCM of natural gas supplied to the Israeli economy. The supply of gas from the Yam Tethys / Mary B reservoir (YT) amounted to 25 BCM in 2004–2013. This gas was primarily used for electricity production. Approximately 4.7 BCM were supplied from Egypt (East Mediterranean Gas Company – EMG) to Israel from 2008 through April 2012, when the gas supply agreement was cancelled due to, among other things, many disruptions in the gas pipeline. From April 2013 onwards the source of the primary supply of natural gas to the local economy has been the "Tamar" reservoir, which supplied from then through the end of 2017 a cumulative 40 BCM.

At the same time, in the beginning of 2013 a sea terminal was established off the coast of Hadera for the handling of liquid natural gas (LNG), which serves as a back-up gas supply for the "Tamar" reservoir in the event of a temporary stoppage in the flow of gas. And indeed, during September 2017[24] the flow of gas from the "Tamar" reservoir was stopped for a number of days due to an equipment malfunction, during which time natural gas was supplied to the local economy via the sea terminal.

Chart 4: Breakdown of the Supply of Natural Gas to the Israeli economy; between 2004 – 2017, according to supplier, in BCM



Source: Ministry of National Infrastructures, Energy and Water Resources (April 2018).

The "Tamar" reservoir is expected to be the primary source for the supply of natural gas to the economy up until the "Leviathan", "Karish", and "Tanin" reservoirs will be hooked up. Regarding the "Leviathan" reservoir, following the February 2017 investment decision to develop the reservoir, development works began within the framework of stage 1A (at an investment cost estimated at US$3.5bn – 4.0bn). The work is advancing as planned (45% of the project has been completed, as of the end of the first quarter of 2018[25]), and at its conclusion the gas flow capacity from the reservoir will equal 12 BCM per year. The initiation of the production of gas from the "Leviathan" reservoir to the local economy is planned for the

[24] The flow of natural gas from the Tamar reservoir was stopped between September 21 – 26, 2017.
[25] Noble Energy, First Quarter Supplement, May 2018.

fourth quarter of 2019. After stage 1B of the development of the reservoir, the gas flow capacity will equal an additional 9 BCM of natural gas per year (and in total 21 BCM per year).

Regarding the "Karish" and "Tanin" reservoirs, both of which are owned by the Greek company Energean, we note that in March 2018 the company accepted a final investment decision to develop the reservoirs (with the cost of the initial stage estimated at US$1.3bn). This follows the signing of a number of substantial agreements for the sale of natural gas, involving a cumulative volume equivalent to 33 BCM (similar to the volume of gas contained in the reservoir[26]). There are agreements with companies including: the Dorad and Dalia power plants; Edeltech; Ashdod Energy; Rapac Communication & Infrastructure Ltd. and companies owned by the group in Israel; Oil Refineries Ltd.; Israel Chemicals Ltd. (ICL); and OPC. In the first stage the development of the "Karish" reservoir (with an annual volume of 4 BCM) is planned, with the initiation of gas production scheduled for the first quarter of 2021. Development of the "Tanin" reservoir is planned for the second stage.

In light of the above, the total supply of available natural gas to the Israeli economy from domestic sources will equal 26 BCM per year in the beginning of 2021 (10 BCM from "Tamar", 12 BCM from "Leviathan", and 4 BCM from "Karish") compared to an expected domestic demand of 7.10 BCM, which does not include the volume of gas that will be directed to export within the framework of agreements that have already been signed, as mentioned. Furthermore, the fact that the natural gas for the Israeli economy will be supplied by three different suppliers represents a factor acting to increase competition in this market, a development that is expected to be expressed in lower prices to the end user. And indeed, the sales contracts that were signed by Greek company Energean reflect lower prices compared to previous years.

Despite the increase in the supply of natural gas in 2021, the Natural Gas Authority notes there are likely to be certain end points in which there may be irregularities in the supply of demand for natural gas to the local economy, with an emphasis on the middle of the decade between 2030 and 2040. This is under certain assumptions including the forecast demand by the Natural Gas Authority, the current rate of transmission, and under the assumption that no additional reservoirs will be hooked up and/or there will not be new solutions developed for the storage of electricity / natural gas. Therefore, the Natural Gas Authority suggests setting conditions for the approval of exports in order to guarantee supply of demand and to encourage connection of additional gas reservoirs to the system, particularly towards the middle of the decade between 2030 and 2040. It was also recommended to not cancel the agreement with the operator connected to the sea terminal (for the processing of LNG) also after the conclusion of the current validity of the contract in 2022.

During 2017 the government decided[27] to participate in the financing of the creation of a section of the transmission system for small reservoirs ("Karish" and "Tanin" for the moment). This is in order to increase the incentive to develop them, to encourage the connection of additional natural gas reservoirs to the local transmission network, and by these means to increase the number of domestic natural gas suppliers, a development that will improve the reliability of the natural gas supply to the Israeli economy.

[26] In the "Karish" gas reservoir there are 32 BCM according the Israel Natural Gas Authority, Report on the Periodical Examination of the Tzemach Committee Recommendations, July 2018, pages 22-23.
[27] Referring to government decision number 2592 on April 2, 2017.

Summary

Recently there have been a number of developments in Israel's natural gas sector that are expected to affect the market in the coming years. Among these developments can be noted the "Leviathan", "Karish", and "Tanin" reservoirs, which are all in various stages of development, this together with the signing of substantial agreements for the supply of gas from these reservoirs. Furthermore, it is important to note the export agreements that were signed with Jordan (Jordan Electric Power Company) and Egypt (Dolphinus Holdings Ltd.), together with steps for advancement of laying infrastructure for the transport of natural gas from Israel to Europe. These developments are likely to have a substantial contribution to the local economy growth and positioning of Israel as a regional supplier of gas.

The export agreements are important also in order to prevent the creation of a surplus supply of natural gas in Israel during certain periods, since according to the "Gas Outline", the "Karish" and "Tanin" reservoirs are supposed to supply natural gas to the Israeli economy, and also Stage 1A of the development of the "Leviathan" reservoir. The introduction of a relatively large volume of additional natural gas supplied to the Israeli economy each year, given the state of the current deployment of the transmission and distribution networks, is likely to lead to surplus supplies of natural gas and will put into question the economic worthwhileness of continuing the development of the gas reservoirs. Consequently, the signing of export agreements for natural gas is of considerable importance for continued development of the natural gas sector in Israel.

Together with the signing of natural gas export agreements, it is also important to act to expand the use of natural gas in the local economy, this via accessibility of natural gas to large institutional customers (hospitals, government ministries, local municipalities, etc.), small- and medium-sized businesses, household customers, and more. Expansion of the use of natural gas in the local market is closely related to accelerating the deployment of the transmission and distribution networks across the country, in such a manner that will make natural gas accessible to all potential customers. In that sense, increasing the local demand for natural gas is no less important than the signing of additional export agreements.

As mentioned, initiation of the production of natural gas from the "Leviathan" reservoir is planned for the end of 2019. The main macro-economic impact of the initiation of natural gas production from a new reservoir, together with the creation of the necessary conditions for the use of gas in the local market (transmission, regulation, price, etc.) is the reduction in the amount of imports of energy products into the country. This reduction leads to a decline in the trade deficit and consequently supports a rise in the current account of the balance of payments, which represents a fundamental factor supporting the strength of the shekel. Upward pressure on the currency is also a result of the rise in the wealth of the country, while the assessment of the potential economic value of the economy is strengthened in the eyes of foreign investors.

These developments increase the demand for shekels around the world. Consequently, in our opinion, upward pressures on the shekel are expected to be renewed towards the beginning of 2020. Appreciation in this manner is likely to negatively affect economic activity in other sectors of the economy ("Dutch

Disease"). In order to offset the effect of the production of natural gas on the exchange rate, the Bank of Israel is purchasing foreign currency. The volume of purchases reflects the estimated quantitative impact in billions of dollars.

Furthermore, it is important to note that increasing the use of natural gas is expected to reduce the energy costs for firms (currently referring to companies in the industrial sectors only), to improve the degree of competitiveness, and to entrench and strengthen the relative advantages of Israeli exporters vis-à-vis competitors around the world. That is to say, this refers to a situation similar to a real depreciation of the shekel, a development that is likely to enable Israeli firms to increase their global market share and to offset the impact of the currency appreciation.

Natural gas is also expected to assist local manufacturers that sell to the domestic market to better compete against competing imports, and also to act to expand employment in the economy due to the potential for the development of new industries in the sector. Over the longer-term, the broad use of natural gas in the local economy is expected to lead to an increase in productivity in the economy, a development that is expected to increase Israel's potential growth rate.

The decline in energy imports due to the discovery of gas reservoirs is expressed also in the country's national accounts data. The drop in imports actually causes an increase in the surplus of exports (exports minus imports). The surplus in exports positively impacts GDP, and therefore an increase in this component (whether via a rise in exports or a decline in imports) makes a positive contribution to GDP growth. This contribution occurs on a one-time basis with the drop in imports. As the decline in energy import requirements of the economy becomes sharper, the one-time contribution to GDP growth also increases. On this regard, let us emphasize that in light of the fact that the initiation of gas production from the "Tamar" reservoir led to a substantial drop in the energy import requirements of the economy, the current level of energy imports is not as high as it once was. Therefore, the initiation of gas production from the "Leviathan" reservoir will apparently lead to a less substantial decline in imports that will lead to a smaller uptick in the growth rate.

Support for this assessment is expressed in a survey from the OECD on the Israeli economy[28], which states that the impact of the "Leviathan" reservoir on the Israeli economy is expected to be more moderate than the impact felt with the "Tamar" reservoir, this in light of the limited local demand for natural gas, which is supplied almost in its entirety by the "Tamar" reservoir. According to the OECD, the expected contribution to GDP is approximately 0.3% of GDP, compared to 1.1% of GDP (in the years 2013-2014) as a result of the initiation of gas production from the "Tamar" reservoir. Looking forward, it was noted that the main opportunity for increasing the contribution to GDP over the longer-term is through an increase in natural gas exports. Therefore, it is very important for policy makers to continue to encourage the development of the natural gas sector in Israel.

[28] OECD Economic Surveys – ISRAEL, March 2018.

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