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Solar Hopes and Grounded Reality: Should and Could Israel Meet its 2030 Renewable Energy Transition Targets

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Despite the sweeping political consensus in Israel to promote more use of renewable energy sources, Israel's electricity market is only expected to increase its reliance on natural gas in the coming decade. Numerous geographic and technological barriers make the target that the Israeli government has set for itself to generate 30% of Israel's electricity from renewable sources by 2030 a particularly challenging one to meet. Since Israel has a very marginal effect on the overall global balance of manmade carbon emissions (less than 0.23%), it should concentrate most of its efforts on reducing local air pollution and increasing its readiness towards climate-induced threats, with carbon reduction treated mostly as a welcomed side-effect. Israel can achieve some of these goals relatively quickly by reducing the use of its coal-based power stations and encouraging more use of public transportation and electric and hybrid vehicles. Serving as a domestic and relatively cheap source of fuel, natural gas will be an integral part of these solutions for the time being, and the demand for it is only expected to increase in Israel and in all of the countries of the Eastern Mediterranean basin in the next two decades.

In May 2021, the inter-ministerial committee on Israel's natural gas policy recommended increasing the export quota of natural gas from Israel to 52% (up from the current 40%) at the expense of the amount earmarked to the domestic market.[1] The committee argued that in another 20 years the demand for natural gas in Israel and worldwide will substantially decrease due to an expected transition into renewable energy sources. Therefore, Israel should export as much gas as it can today so that it will not be left unused in the ground tomorrow. The committee argued that such a scenario would result in considerable loss of revenue and export royalties for the State of Israel.[2]

The committee's decision seemingly makes sense. The same month that the recommendation was made, the Ministry of Energy also presented for public response Government Decision 465 of October 2020, which set a target to generate

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1 Ministry of Energy, "Recommendations for policy measures for promotion of renewable energy - summary of interministerial administrative work following government decision 564", May 2021 [Hebrew].

2 Israel Fischer, "Change in the Gas Outline: The companies will be able to increase exports", *The Marker*, May 31, 2021 [Hebrew].

30% of Israel's electricity from renewable sources by 2030, in line with similar targets set by the European Union in 2018.[3] Assuming the Israeli energy market will indeed meet these targets and even exceed them in the subsequent decade, there is a legitimate concern that demand for natural gas will fall and that the energy companies operating in Israel would be left with stranded assets in the ground. Moreover, the current gas export allocation of 40% is not proving to be sufficiently attractive to investors wishing to build a gas liquefaction plant or an underwater pipeline to Europe, at an estimated cost of approximately $7 billion. This is due partly to the fact that the amount allocated to them is relatively small, around 300 billion cubic meters (BCM) over 30 years. Without increasing the quota, the gas companies operating in Israel fear they will not be able to attract additional buyers for approximately two thirds of the gas they still have left for export (after deducting the trade deals with Jordan and Egypt). This gap is especially important ahead of the Ministry of Energy's new licensing round designed to attract more companies to search for oil and gas deposits in Israel's exclusive economic zone (EEZ), after the previous three rounds failed to arouse sufficient interest. So long as the current companies operating in Israel cannot prove there are buyers for the gas they had already discovered, there is no incentive for new companies to search for more of it.

Besides the ability to release more natural gas for export and make the Israeli energy market more attractive to investors, the promotion of renewable energy also holds numerous advantages for Israel's economy and security and is therefore supported by the entire political spectrum in Israel. Renewable energy in Israel can help (1) increase its energy independence, (2) decentralize and disperse its sources of electricity generation,, thereby increasing the resilience of its grid to rocket attacks launched by militant groups during war, (3) encourage technological innovation in an emerging new field with the help of Israel's vibrant "start-up" sector, which can then be translated into more jobs and products to sell to global markets, (4) supply electricity to remote mountainous areas in the north of Israel and desert areas in the south without having to invest in costly long-distance infrastructure and maintenance, (5) reduce Palestinian dependence on Israeli electricity supply which, quite often, goes unpaid, and (6) reduce Israel's total carbon emissions, compared with the burning of natural gas or coal.

Despite the keen interest in renewable energy in Israel, for the time being there is no realistic scenario in which the Ministry of Energy will meet its targets for 2030 or in which Israel and the countries around it will decrease their use of natural

[3] Ministry of Energy, "Report of the professional panel for the second periodic examination of the government policy on the natural gas market – draft for public comments", May 2021 [Hebrew].

gas. Already today Israel is failing in its efforts to meet the targets it set for itself. Whereas the original target was that 10% of its electricity mix would be generated from renewable energy by 2020, Israel as of 2021 stands at a mere 6.1%.[4] The reason for this is not political, but rather primarily technological. Israel's geographical constraints whittle down the term "renewable energy" to just solar energy, whereas the European renewable target consists primarily of wind energy, hydroelectric, and wood burning.[5] The current generation of photo-voltaic panels (PV) is not particularly efficient relative to the space it occupies, and Israel is facing a steep challenge locating sufficient land area for the number of solar panels it needs to achieve its 30% electricity target by 2030. For calculation purposes, on a particularly hot day in July 2020, Israel reached peak consumption of 13,800 Mega Watts per hour (MW/h).[6] The annual growth in demand for electricity in Israel during this past decade stands at approximately 2.8% on average, and this number may grow to 3.5% per year if electric vehicles and additional water desalination plants enter the market as expected.[7] Even if we take a more modest 3% growth scenario, the demand for energy on a hot summer day in July 2030 will stand at approximately 17,900 MW/h. To cover 30% of this demand Israel will have to generate approximately 5,370 MW from solar energy at any given moment. According to the calculations of the United States Government National Renewable Energy Laboratory (NREL), the continuous generation of such an amount of electricity with the current technologies of PV panels will require an area of between 70-120 sq. km, depending on weather conditions.[8] In comparison, the entire land area of Tel Aviv is 52 sq. km, which means solar panels will have to cover a combined area of at least 1.5 times the city of Tel-Aviv. These calculations assume no growth from 2030 onwards, but in reality, Israel is going to have to provide an extra 7 to 12 sq. km per year to build new solar plants just to keep up with the annual growth and remain within the 30% range – a new Tel-Aviv every 6 years on average.

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4 Ministry of Environmental Protection, "Reducing Greenhouse gas emissions in Israel – annual follow-up report", May 2021 [Hebrew].

5 European Commission, "Directive (EU) 2018/2001 of the European Parliament and of the Council on the Promotion of the Use of Energy from Renewable Sources", December 11, 2018.

6 The Electricity Authority, "Report on the State of the Electricity Market 2020". August 2020 [Hebrew].

7 Roeh, Anat. "Private electricity producers: updating the Israel Electric Corporation's demand forecast, a substantial increase is expected", *Calcalist*, 29 June, 2021 [Hebrew].

8 National Renewable Energy Laboratories, "Land Use by System Technology", Accessed on October 30, 2021.

These constraints only take into consideration the challenge of electricity generation, but the transmission stage can prove even more challenging. Solar energy does not generate electricity on demand, nor does it stop generating electricity when not needed. This requires exceedingly sophisticated and complicated electricity grid management technology to handle. On the one hand, during nighttime or cloudy days there is a shortfall of solar electricity generation just as demand for electricity peaks (between 6pm-10pm), and this needs to be compensated by ramping up the natural gas-powered power stations. On the other hand, when the sun is shining bright in midday and the PV panels are generating at full capacity, some of the gas-powered stations need to decrease generation or completely shut down so as not to lead to its collapse. This requires compensating or subsidizing privately-owned gas power stations, since they would be asked to lose revenue to make way for their competitors. In addition, the more decentralized the electricity grid becomes, and the more private consumers begin feeding electricity into the grid through their own rooftop PV panels in tens of thousands of locations, the "smarter" the grid has to be to balance between supply and demand, all of which are at the mercy of weather patterns that are becoming increasingly hard to predict as the effects of climate change become more prominent. This will necessitate the creation of microgrids and a redesign of the electricity grid in Israel. Electricity storage technologies (e.g. large-scale batteries) can help overcome many of these challenges, but still have a long way to go in terms of price and efficiency. It appears that the only way the Ministry of Energy will be able to come close to achieving its 2030 targets at a reasonable cost is to import "clean" electricity from outside. One possibility is to rely on Jordan's willingness to build large-scale solar farms in its territory and export electricity to Israel in return for desalinated water, despite domestic public resistance to such a deal. The second possibility is to connect underwater electricity lines from Europe through Cyprus, which will provide a partial solution.

Adding to these complications, recent events from around the world are beginning to deter policymakers from taking the necessary risks that often come with the initial transition to renewable energy. Weather events that resulted in widespread power outages in the US, particularly in Texas during the winter of 2021 and in California during the summers of 2020 and 2021, as well as the gas shortages and price hikes in Europe during the second half of 2021, serve as an indication that the transition to renewable energy will be slower and more complicated than what most people are hoping for. The reliance on wind and solar energy is usually an excellent solution throughout the year, but it fails during extreme weather events, which are increasing in frequency due to climate change. Policymakers thus find themselves in a paradoxical situation where the more extreme the weather becomes, the less

enthusiastic they are to invest in renewable energy solutions that are intended to minimize these same events. This is a sign that natural gas will continue to be a dominant factor in the electricity mix of the State of Israel and of the countries around it for several decades to come, as it provides the reliability that policymakers wish to see. The keenness to reach 30% renewable energy by 2030 might wane in Israel (and in the rest of the world) as widespread blackouts continue to plague industrialized countries in the coming years.

To dispel any doubt, all of these challenges can be overcome through technological innovation and the cumulative experience of energy markets around the world, but such solutions will come at a higher cost for some countries and will take longer to implement for others, including Israel. This is all in contrast to natural gas, which is cheap and readily available to the Israeli market for the next 35 years at minimum, and which is already supplying it with reliable electricity on demand. Even if Israel succeeds in meeting its targets and will generate 30% of its electricity from solar energy by 2030, the high annual growth in demand for electricity means that the Israeli market will still be consuming more natural gas in 2030 than it is consuming today. Adding to this is the fact that natural gas serves not only for electricity generation in Israel, but also heavy industries, petrochemicals, agriculture, and even some transportation, for which solar energy does not offer a solution. Other countries in Israel's region face similar conditions, as their population growth rates and demand for reliable electricity will only increase in the coming decade. Countries such as Egypt, Jordan, Lebanon, Syria and even the Palestinian Authority are expected to increase their demand for natural gas and construct additional gas-powered stations in parallel to their plans of PV power stations. Therefore, a scenario in which Israel will not need as much natural gas in twenty years as it consumes now simply does not add up with the reality on the ground.

A rather challenging question therefore presents itself: why did Israel set such ambitious targets for itself to advance so much renewable energy by 2030, and can it meet its overarching goals by other means? If Israel's main goal is to lower its own carbon emissions as part of its nationally determined contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC), then it is going to be hard-pressed to justify the costs associated with this transition for such a small payout. As of 2020, Israel's contribution to global manmade carbon emissions is 78 million tons per year out of a total of 33,622 million tons, which amounts to about 0.23% of overall emissions.[9] Even if Israel succeeds in drastically reducing its carbon

9 Ministry of Environmental Protection, "Reducing Greenhouse gas emissions in Israel".

emissions through unprecedented investment in infrastructure and changes in its population's lifestyle, the effect this will have on the global fight against climate change is practically nil. Israel should therefore shift its focus to public health and public safety concerns by reducing local air pollution (which would also reduce carbon emissions) and preparing the economy and infrastructure for the anticipated threats and consequences of climate change. These measures can save lives in Israel and in the surrounding countries much more effectively than those that are focused solely on reducing emissions as the overarching goal of which the rest of the targets are derived.

There is a wide range of practical measures Israel can take in the coming years to cope with the expected challenges posed by climate change, and natural gas is a solution for some of them. In terms of air pollution, shutting down coal-powered stations by 2025 will in itself reduce 17 tons of carbon emissions per year,[10] but more importantly, it will clear the air and reduce death rates in densely populated urban areas situated around the coal stations. This is the right thing to do also for Lebanon, the Gaza Strip, and the West Bank, which burn Diesel fuel to generate electricity, and whose subsequent air and ground pollution does not stop at the border. Only gas-powered stations are able to compensate for the shortage of regular, reliable electricity on demand the way that coal-fired stations do for Israel, particularly if the target date for their closure is 2025 as determined by the Ministry of Energy. Another goal Israel should continue to focus on is advancing more efficient, comfortable, and reliable public transportation and promoting the entry of electric and hybrid vehicles into Israel. The Ministry of Environmental Protection expects that such measures will only yield a modest reduction of another 4 million tons of carbon emissions per year by 2030,[11] however much more importantly, they will drastically reduce the "nose-level" air pollution to which the Israeli public is subject to on a daily basis from gasoline vehicles. Here too, compressed natural gas (CNG) can provide part of the solution for weaning Israel's transportation sector (and particularly the Israeli military) away from more polluting gasoline.

Finally, there is a great deal of uncertainty regarding the effects of climate change on the Israeli economy and its citizens' security. Quite naturally, climate change introduces a great deal of unpredictability into any existing threat forecast, and is rife with changes. These threats may include a modest or drastic sea level rise, an increase in the number and intensity of winter storms which may flood major cities,

10 ibid.

11 ibid.

increase the number of electricity blackouts, and devastate the promenades along Israel's shores, extreme heat waves which may impede on pedestrians and damage road infrastructure, prolonged droughts which may destabilize neighboring countries and induce waves of migration towards Israel's borders, and many other scenarios. Having said that, it is very difficult for decision-makers to commit to specific targets and set aside significant resources for a scenario for which there is no clear estimate and whose cost is yet unknown. Therefore, at this stage Israel should closely monitor climate-related events and prepare appropriate response scenarios, which include introducing a high degree of redundancy to the electricity grid so that unexpected supply cuts can be quickly restored even under extreme events, as a lesson from the recent power outages in the United States and Europe. Natural gas is a critical component in creating this redundancy.

Past experience has proven that in all matters concerning long-term forecasts in the energy sector, it is best to take a cautious, conservative approach. Just as the forecasts regarding the amount of royalties that Israel expected to receive from its gas exports mostly failed to materialize, in this case it is worth remaining with the previous gas export quotas that were set at 40%, at least until the high hopes for solar energy in Israel come true, or until more substantial gas fields will be discovered in Israel's EEZ. If the Israeli government sets unrealistic targets for renewable energy integration merely as an excuse to enable more gas exports, it might find itself without sufficient quantities of domestic gas in another twenty years, and will be forced to resort once again to relying on expensive imports.