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SUMMARY REPORT

Securing Energy for Development in the West Bank and Gaza

WORLD BANK GROUP

ESMAP
Energy Sector Management Assistance Program

THE REPRESENTATIVE OFFICE OF NORWAY TO THE PALESTINIAN AUTHORITY

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The report was prepared under the guidance of Vivien Foster (Global Lead, GEEDR, co-task team leader) and Roger Coma-Cunill (Senior Energy Specialist, GEE05, co-task team leader).

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Abbreviations and Acronyms

CCGT	Combined Cycle Gas Turbine
CSP	Concentrated Solar Power
DISCO	Distribution Company
GDP	Gross Domestic Product
GEDCO	Gaza Electricity Distribution Company
GPP	Gaza Power Plant
IEC	Israeli Electric Corporation
JDECO	Jerusalem District Electric Company
HEPCO	Hebron Electric Power Company
kW	Kilowatt
kWh	Kilowatt Hour
MW	Megawatt
NEDCO	Northern Electricity Distribution Company
NIS	New Israeli Shekels (Israeli currency unit)
PEC	Palestinian Energy and Environmental Research Center
PENRA	Palestinian Energy and Natural Resources Authority
PERC	Palestinian Electricity Regulatory Council
PETL	Palestinian Electricity Transmission Company Ltd
PV	photovoltaic
RE	Renewable Energy
SELCO	Southern Electricity Company
TEDCO	Tubas Electricity Distribution Company

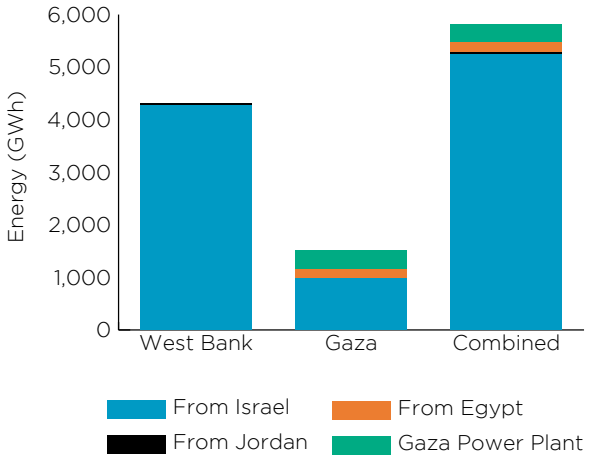
What Is the Current Energy Supply Situation in the West Bank and Gaza?

Energy security challenges are already severe in Gaza and are emerging in the West Bank. The power supply meets only half the demand in Gaza, leading to rolling blackouts of eight hours on and eight hours off. Although the West Bank generally enjoys 24-hour power supply, shortages have emerged during peak winter and summer months. With demand projected to grow at an average annual rate of about 3.5 percent in the foreseeable future—slightly higher in Gaza and lower in the West Bank—shortages are likely to become worse unless new supply options are found.

The West Bank and Gaza rely primarily on Israeli imports to meet electricity needs. In 2015, about 90 percent of their electricity was supplied by the Israeli Electric Corporation (IEC) (figure 1). The situation differs significantly between the West Bank, where IEC imports represent 99 percent of consumption, and Gaza, where they represent 64 percent. Modest amounts of electricity are imported from Jordan into the West Bank and from Egypt into Gaza. The Palestinian Authority has set targets to develop 130 megawatts (MW) of renewable energy by 2020, but only 18 MW had been developed as of June, 2017.

The only large-scale generation capacity in the territories is the troubled Gaza Power Plant (GPP). The 140 MW diesel-fired plant was developed as an "independent power project" (IPP) and has been operating since 2004 on a 20-year power-purchase agreement (PPA) involving significant take-or-pay capacity charges. Due to the high cost of diesel fuel, the plant is so expensive to operate — NIS 1.05–1.65 (US$0.29–0.46) per kilowatt hour — that it can typically be run only at half capacity. It has also suffered repeated damages during armed conflicts, which affected its fuel storage capacity. The best prospect is to convert the plant to natural gas, which would reduce operating costs to about a third of current levels. In parallel, considering the expected long lead time of such a conversion, the development of renewable technologies such as rooftop solar photovoltaic (PV), with shorter implementation time, should be prioritized.

Figure 1: Main Sources of Electricity in the West Bank and Gaza, 2015



Source: Palestinian Central Bureau of Statics. 2015. "Quantity of Electricity Imported (MWh) in the West Bank by Source and Month, 2015" and "Quantity of Electricity Imported and Purchased (MWh) in Gaza Strip by Source and Month, 2015", Ramallah City. http://www.pcbs.gov.ps/site/886/Default.aspx

The electricity sector in West Bank and Gaza has undergone several institutional reforms, which still require further consolidation. In 1995, the sector was reorganized to cluster most of the former municipal service providers into six local distribution utilities. The Electricity Law of 2009 created the Palestinian Electricity Regulatory Council (PERC), with responsibility for tariff setting and monitoring, as well as the Palestinian Electricity Transmission Company Ltd (PETL), a new transmission operator and wholesale single buyer. While there is no Palestinian transmission infrastructure at present, PETL will take charge of four high-voltage substations, three of which have been built, to manage the flow of high



voltage power from Israel into the West Bank, which previously took place through a myriad of low voltage connection points.

The electricity sector has yet to establish a track record as a creditworthy buyer for wholesale power. There are three layers to this problem. First, despite important efforts by PERC, electricity is not priced at cost-recovery levels throughout the West Bank and Gaza. The gap between tariffs and costs is particularly large in Gaza, where tariffs have not been adjusted during the past decade. Second, while the operational performance of the distribution utilities has been improving, full cost recovery has not yet been achieved. In 2015, Distribution Companies (DISCOs) recovered revenue for only 64 percent of the electricity they purchased in the West Bank (table 1), and 50 percent in Gaza. Third, even when revenues are collected, they are sometimes diverted by municipal governments to cover other subnational expenditures rather than being channeled to the purchase of power. Thus, implicit subsidies to the electricity sector have been estimated at close to 1 percent of gross domestic product (GDP) in the West Bank and 4–5 percent of GDP in Gaza.[1]

TABLE 1: OVERVIEW OF WEST BANK AND GAZA ELECTRICITY DISTRIBUTION COMPANIES, 2015

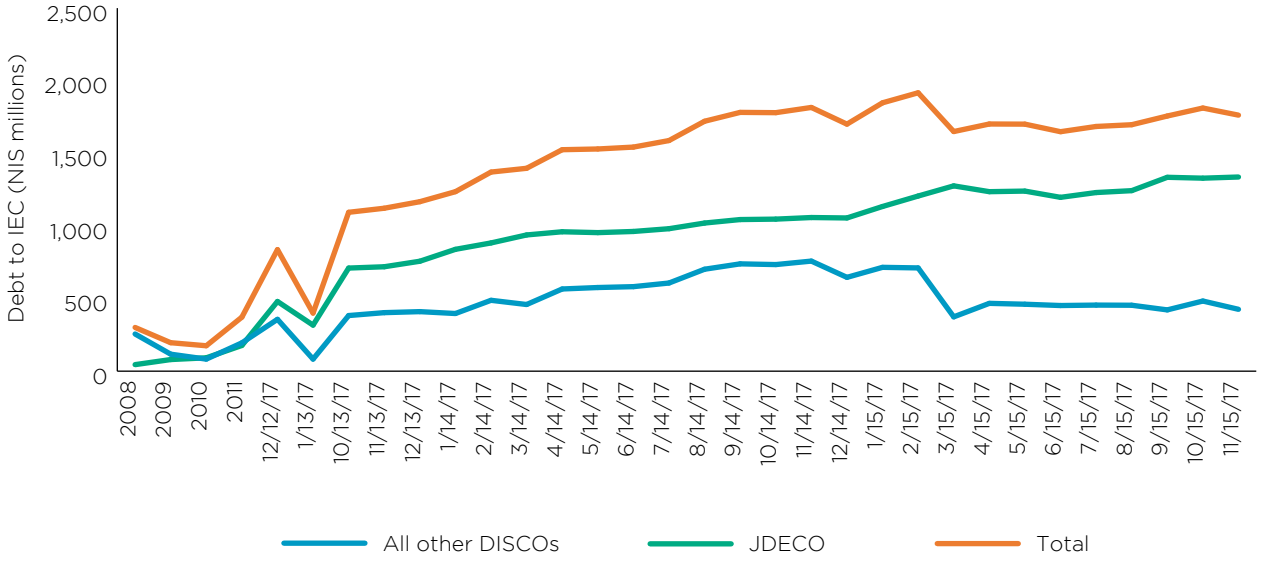
	GEDCO	TOTAL WEST BANK[1]	JDECO	NEDCO	HEPCO	SELCO	TEDCO
Scale							
Customers	231,500	436,389	256,314	90,265	45,660	25,650	18,500
Purchased electricity (NIS millions)	795	1,398	871	250	164	71	42
Billed electricity (NIS millions)	518	1,509	949	245	193	76	46
Net annual income/loss (NIS millions)	n.a.	-76	-82	9	9	-15	3
Performance							
Losses: Technical and nontechnical	26%	22%	24%	17%	20%	28%	16%
Collection ratio	65%	89%	91%	98%	81%	71%	76%
Overhead costs (ie, Operations and maintenance) as percentage of purchased electricity	8%	17%	22%	5%	10%	21%	17%

Source: Information provided by the Gaza Electricity Distribution Company (GEDCO), Jerusalem District Electricity Company (JDECO), Northern Electricity Distribution Company (NEDCO), Hebron Electricity Power Company (HEPCO), Southern Electricity Distribution Company (SELCO), Tubas Electricity Distribution Company (TEDCO).

1. Total West Bank is made up of JDECO, NEDCO, HEPCO, SELCO and TEDCO which are the 5 DISCOs in the West Bank. GEDCO is the only DISCO in Gaza.



Figure 2: Electricity Sector Debt to IEC, 2008–2015



Source: Information provided by ECO Energy.
Note: IEC = Israeli Electric Corporation; DISCO = Distribution Company; JDECO = Jerusalem District Electricity Company.

The poor record of paying for power imported from Israel has led to the so-called net lending crisis and a large accumulation of outstanding debt. The power purchased from IEC is only partially paid for by the DISCOs, with the unpaid portion being partially covered through net lending (a fiscal mechanism whereby money is deducted from clearance revenues that would otherwise be transferred from Israel to the Palestinian Authority) and partially accumulated as outstanding debt. By September 2016, the accumulated debt owed to IEC exceeded NIS 2 billion (US$500 million) (figure 2). An agreement was reached in September 2016 that allowed for the settlement of past accumulated debt and laid the vision for a future power market with imports channeled through the new high-voltage substations and tariffs set according to a new, long-term power-purchase agreement. According to this vision, PETL would act as the single buyer, purchasing power from IEC and selling it to the DISCOs.

What Options Exist for Improving Energy Security in the West Bank and Gaza?

Looking forward, the West Bank and Gaza have several tangible options for expanding and diversifying electricity supply. For example:

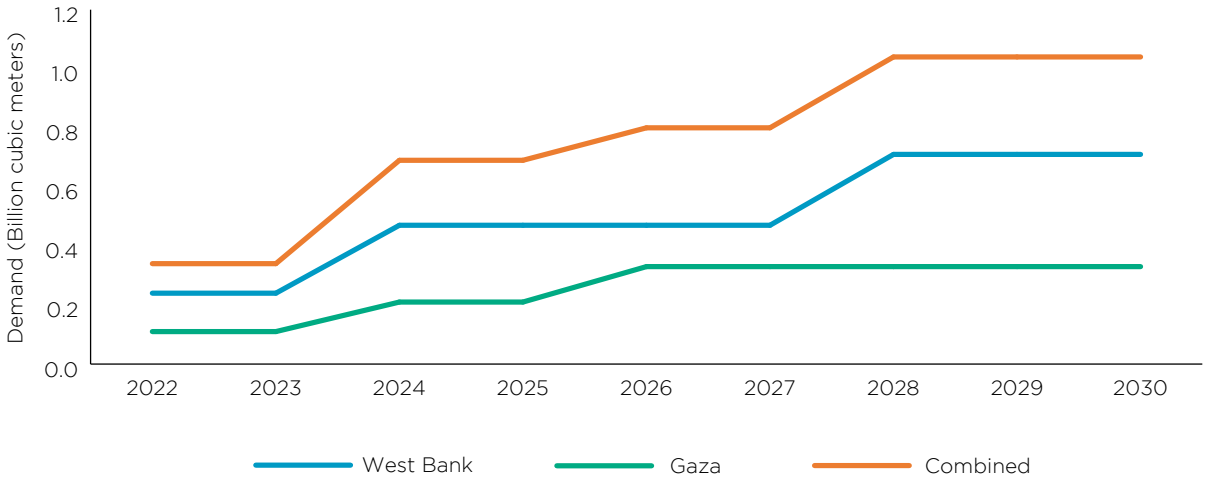
Israeli electricity imports continue to be a valid option, but this route requires a significant scaling up of interconnection capacity. Israel has a strong track record of providing reliable power supply to the West Bank and Gaza. As long as the net lending crisis can be satisfactorily resolved, there is potential to increase Israeli power imports to the two economies, provided the existing interconnection capacity is upgraded accordingly. The West Bank and Gaza combined already represent IEC's largest and fastest-growing electricity customer. However, IEC is facing high levels of indebtedness and an uncertain operating structure. Under the current Israeli power sector reform, all new Israeli generation capacity is being developed by independent power producers, which may present an alternative and more commercially oriented Israeli power supply option for the West Bank and Gaza in the future.

Increasing power imports from Jordan and Egypt is a realistic medium-term option, although it is not without challenges. Jordan and Egypt have recently overcome power supply crises caused by a shortage of Egyptian gas and are now heading for significant power surpluses. In principle, the existing interconnection capacity of 20 MW from Jordan and 20–30 MW from Egypt could be upgraded to support higher volumes of imports. Jordanian electricity has been more expensive than Israeli power, due to heavy reliance on liquefied natural gas, but is expected to become cheaper as Israeli gas enters the Jordanian market and as the share of renewables increases in Jordan. Egyptian power is currently cheaper than Israeli power due to the historic low cost of natural gas, while the size of Egypt's power system is about 30 times that of West Bank and Gaza's demand, making it relatively easy for Egypt to supply the scale of power needed in West Bank and Gaza. Nevertheless, historical imports from Egypt into Gaza, which have been managed through the local Egyptian distribution company rather than the national Egyptian transmission operator, have proved unreliable due to security issues in Sinai. In addition, Gaza has not yet established any payment record with Egypt, since the cost of these imports has been covered by third party benefactors to date. Finally, neither Jordan nor Egypt has access to the controversial net-lending mechanism that has provided Israel with an informal payment-security mechanism to at least partially offset payment risk from the West Bank and Gaza.

Thanks to major gas discoveries in the eastern Mediterranean, it would be feasible in the medium term to import gas to the West Bank and Gaza for power generation. Israel became a major gas producer in 1999 with the discovery of the 10.9 trillion-cubic-foot (TCF) Tamar field. The imminent development of the 21.9 TCF Leviathan field will make Israel a gas exporter. The Israeli government has already given approval for a 40-kilometer pipeline extension from the Ashkelon terminal in Israel into Gaza, which would enable the conversion of GPP to operate on natural gas, as well as for a 15-kilometer spur from the Israeli national gas transportation network into Jenin in the north of the West Bank, to allow for the construction of a new 400 MW combined cycle gas turbine (CCGT) plant.

The Gaza Marine gas field, discovered almost two decades ago, has yet to be developed. The eventual development of this 1.2 TCF gas field could eliminate the need for Israeli gas. The investment costs of developing Gaza Marine have been estimated at US$0.25 billion to US$1.20 billion, depending on the extent to which existing gas infrastructure is shared with Israel. However, development would require a

Figure 3: Estimated Natural Gas Demand in the West Bank and Gaza until 2030



Source: Information provided by ECO Energy.

gas supply contract with a creditworthy buyer, and it will take some time before gas demand in the West Bank and Gaza builds up to the requisite levels (figure 3). Once developed, Gaza Marine has the potential to generate US$2.7 billion in fiscal revenues for the Palestinian Authority over an estimated 25 years of production.

There is substantial potential for solar electricity in the West Bank, particularly in Area C (table 2). Solar energy is the only significant renewable resource in the Palestinian Territories. The technical potential in the West Bank is estimated to be around 530 MW of rooftop solar PV, and at least 100 MW of utility scale solar in Areas A and B. This is dwarfed by the vast solar potential of over 3,000 MW estimated in Area C, which would be suitable for both PV and CSP technologies. Nevertheless, the significant political challenges associated with securing Israeli approval for construction in Area C cast some doubt over the possibility of developing this resource. By contrast, extreme land constraints in the Gaza strip limit the available solar potential to 160 MW of rooftop solar. However, even this limited solar capacity could play a vital role in increasing energy security and acting as an electricity safety net.



TABLE 2: SOLAR ENERGY POTENTIAL IN THE WEST BANK AND GAZA

POTENTIAL AVAILABLE RE CAPACITY (MW)				
Utility scale PV or CSP				
	Areas A and B		Area C	Total
West Bank	103		3,374	3,477
Gaza				0
Combined				3,477
Rooftop solar				
	Residential	Public	Commercial	Total
West Bank	490	13	31	534
Gaza	136	8	19	163
Combined	626	21	50	697

Source: World Bank estimates.
Notes: For utility scale PV or CSP, according to PETL and the Palestinian Energy and Environmental Research Center (PEC), 0.12 percent of Areas A and B and 3 percent of Area C are available for solar installations. The land requirement is about 28 square meters per kilowatt peak (includes space for control rooms and so forth). For rooftop PV, according to the Palestinian Central Bureau of Statistics and PEC, in West Bank and Gaza, there are over 400,000 residential, 2,500 public sector, and 5,000 commercial sector rooftops. The rooftop areas range from 150 to 300 square meters, and 30–50 percent of the rooftops are available for solar installations. The rooftop space requirement is nine square meters per kilowatt peak. RE = Renewable Energy; MW = Megawatts; PV = photovoltaic; CSP = concentrated solar power.

Measures to improve energy efficiency can make a valuable contribution to energy security. The National Energy Efficiency Action Plan aims to make savings equivalent to 1 percentage point of energy consumption annually through 2020. It focuses primarily on reducing electricity consumption by improving the energy efficiency of residential buildings. A much more ambitious action plan is under consideration by the Palestinian Energy and Natural Resources Authority (PENRA) for 2020–2030. It aims to save 5 percent of the anticipated energy consumption during that period. The new strategy encompasses use of high-impact, energy-efficient appliances (such as heaters, fridges, and air conditioners); tightening of efficiency standards for buildings; and smart grid infrastructure to allow consumers to participate in the energy market as demand response. Investments to improve energy efficiency are proven to be much more cost-effective than expanding power generation capacity. Many of the measures included in the government's plans cost between US$0.01 and 0.05 per kilowatt hour (kWh), while new generation would cost at least US$0.10 per kWh.

As domestic generation capacity expands, transmission infrastructure must develop. At present, there is no significant power transmission infrastructure in the West Bank and Gaza. Most power is simply absorbed and distributed from the Israeli grid at low voltage. As the Palestinian territories increase their domestic generation capacity, there will be an increasing need to move power from the point of generation to centers of demand, which may be located some distance away. In Gaza, this will call for creating a transmission backbone within the compact urban area. In the West Bank, this could initially be managed by putting ("wheeling") power out into the Israeli grid at one location and bringing it back into the West Bank at a different location. The level and structure of associated wheeling charges will have a significant effect on the cost of power to end consumers. As the volume of wheeling rises, it will become increasingly attractive to develop a domestic transmission backbone in the West Bank. However, since the backbone would need to traverse Area C, the issue of securing the necessary construction permits from Israel would present a significant challenge.

How Can the West Bank and Gaza Choose among the Options?

Choosing among the available energy supply options involves balancing technical and financial considerations. Meeting electricity needs typically involves developing a balanced portfolio that represents a reasonable, affordable cost.

From a technical standpoint, the options must be sequenced and packaged into an investment plan that reliably meets demand. The options described in the previous section vary in production cost, physical production characteristics, availability, and associated risks. For example, gas-fired power generation will be feasible only after gas transportation infrastructure is completed and a gas supply agreement can commence, while generating solar power from PV panels is subject to variability in solar radiation throughout the day and from one day to another. Gas-fired power generation may be vulnerable to a curtailment of gas supply, while solar power is a fully indigenous resource. Also, the costs of gas-fired power generation are relatively well understood, although they are susceptible to variations in the price of natural gas, while the costs of generating solar power are declining rapidly along a path that is not straightforward to predict. These considerations must be carefully balanced to define the best possible power generation investment plan, and a range of alternative scenarios must be considered. (Box 1 provides an overview of alternative scenarios that were considered in a novel Robust Power System Planning Model developed uniquely for this study)

It is important to understand the tariff implications of the preferred investment plan and whether it is affordable to the population. The costs of providing a secure electricity service include the cost not only of power generation but also of the associated transmission and distribution infrastructure. Inefficient operation could inflate costs. Given fiscal constraints in the West Bank and Gaza, domestic power generation could be developed by the private sector under a power-purchase agreement, leaving public investment for transmission and distribution, for which private investment would be difficult to harness. Ultimately, these costs must be paid either by the consumer through retail tariffs or by the government through subsidies. Both sources of funding are constrained, given the relatively low income of the population and the limited budget of government. An important reality check for any power-sector investment plan is to

Box 1: A Robust Power-Systems Planning Model for the West Bank and Gaza

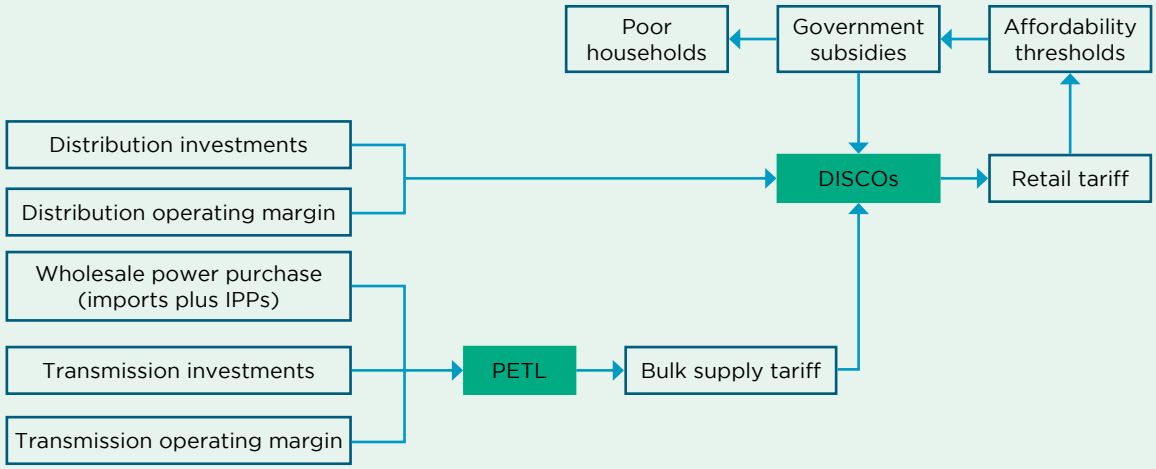
To select from among the energy supply options, a traditional least-cost power-systems planning model is modified to account for the uncertain nature of the Palestinian context and used to identify investment plans that are as resilient as possible to alternative states of the world. Five illustrative planning scenarios for West Bank and Gaza are explored, covering the period through to 2030.

1. **'Do nothing'** considers how rapidly energy security will deteriorate if no further investments are made.
2. **'Planned future'** looks at the impact of implementing all investment projects currently in the pipeline.
3. **'PENRA vision'** explores limiting dependence on any one source of energy to no more than 50 percent.
4. **'Maximum cooperation'** considers meeting demand growth primarily through increased Israeli imports.
5. **'Maximum independence'** considers the fullest possible extent of domestic power generation.

Box 2: A Power-Sector Financial Model for the West Bank and Gaza

The planning model (see box 1) feeds into a comprehensive financial model of the West Bank and Gaza power sector. This sheds light on the financial implications of any investment scenario. The financial model looks at how the selected generation investment plan translates into an average cost of power generation, converts this into a wholesale power tariff by incorporating the costs of any future transmission system, overlays a distribution margin to create a retail tariff, and, finally, assesses the affordability of this tariff to the population, as well as the fiscal implications of any remaining subsidies.

Figure B2.1 The Power-Sector Financial Model



Note: IPP = independent power producer, PETL = Palestinian Electricity Transmission Company Ltd, DISCO = Distribution Company

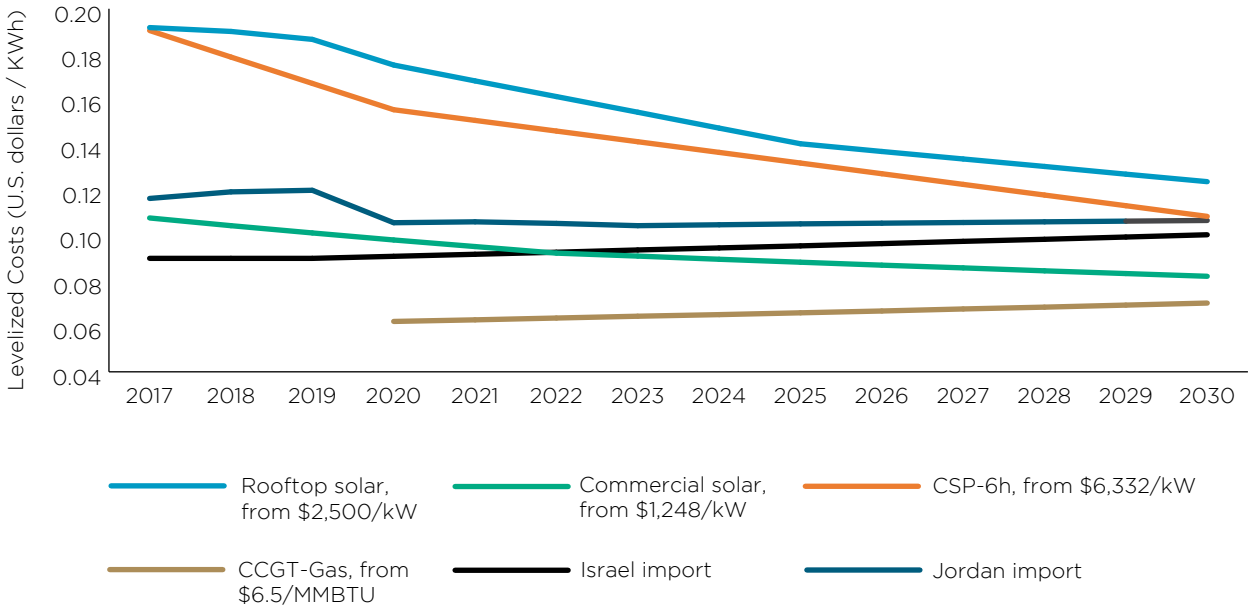
examine its impact on retail tariffs, determine whether these are affordable, and, if not, determine what the potential size of the associated subsidy bill would be. Due to the diverse features of the power sector in the two territories, the study analyses the West Bank and the Gaza Strip separately. (For more information on the financial model of the electricity sector developed for this study, see box 2.)

WHAT DOES THE WEST BANK'S ENERGY FUTURE LOOK LIKE?

Failure to invest in the West Bank's power sector would lead to deepening shortages over time. Under the '*do nothing*' scenario, unserved demand rises from negligible levels today to reach 9 percent of the forecasted load by 2030, with certain locations—such as Jenin and Nablus—having already experienced unserved demand in 2016. To avert this outcome, the West Bank must develop several alternative energy supply options.

The development of gas-fired power generation and renewable energy should be pursued more intensively, considering the cost convergence of different energy supply options over time (figure 4). As of 2017, there is a wide variation in the cost of the different energy supply options available to the West Bank, and Israeli imports carry a cost advantage over any of the alternatives. However, this changes over time. Gas-fired power generation, once available, proves to be cheaper than Israel imports. While continuing technological change in renewable energy brings the cost of utility-scale PV below the cost of Israeli imports before the end of the planning horizon. Rooftop solar and even concentrated solar power

Figure 4: Time Trends for the Levelized Cost of Energy for Different Supply Options in the West Bank



Source: World Bank estimations
Note: kW = kilowatt hour; GPP = Gaza Power Plant; MMBTU = Million British Thermal Units .

start to look a lot more competitive. These evolving relative costs of power generation are one important driver of project selection.

There are several attractive power-development scenarios available to the West Bank, all of which are broadly competitive with Israeli power imports. The performance of the five alternative scenarios presented by the planning model can be compared along several dimensions, with no single scenario dominating on every dimension (table 3).

1. **Average cost of power generation:** This is a key driver of retail tariffs and varies remarkably little across the scenarios considered for the West Bank, ranging from US$0.098 to US$0.102 per kWh. This is due to the convergence in the cost of different power-generation technologies already noted.
2. **Capital expenditure:** Scenarios contemplating continued reliance on Israeli imports require hardly any capital expenditure to be made, whereas those involving the development of domestic power generation capacity would entail private investments of between US$0.85 billion and US$2.28 billion.
3. **Unserved demand:** All scenarios that bring new investment into power generation ensure that all demand can be reliably met.
4. **Reliance on electricity imports:** The degree of reliance on Israeli imports ranges from 96 percent in the "*maximum cooperation*" scenario to 36 percent in the "*maximum independence*" scenario. Hence, Israel remains a significant source of electricity under any eventuality.
5. **Reliance on imported fuel:** All the scenarios entailing significant development of power generation capacity include reliance on gas imports to meet between 32 and 37 percent of electricity needs.
6. **Reliance on domestic renewables:** The maximum share that can be reached for domestic renewables, even under the most optimistic scenario, is 19 percent if production is limited to Areas A and B or 30 percent if sites in Area C can be developed.

TABLE 3: COMPARISON OF RESULTS ACROSS PLANNING SCENARIOS FOR THE WEST BANK

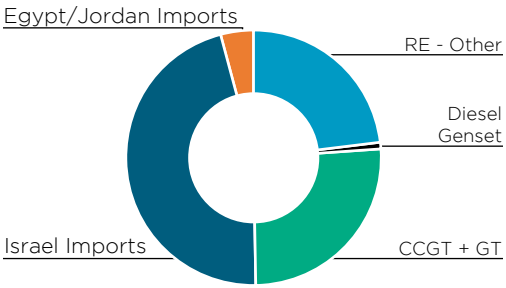
	AVERAGE COST OF POWER (US$ PER KWH)	CAPEX (US$ MILLIONS)	UNSERVED DEMAND IN 2030	ELECTRICITY IMPORTS IN 2030	DOMESTIC GENERATION FROM IMPORTED FUEL IN 2030	DOMESTIC RENEWABLE ENERGY GENERATION IN 2030
1. Do nothing	0.0979	0	9.0%	90.0%	0%	0.4%
2. Planned future	0.1006	850	0%	64.0%	32.0%	4.0%
3. PENRA vision	0.1016	2,133	0%	45.0%	37.0%	19.0%
4. Maximum cooperation	0.0978	174	1.0%	96.0%	0%	4.0%
5. Maximum independence	0.0988	2,284	0%	36.0%	34.0%	30.0%

Note: CAPEX = capital expenditure; PENRA = Palestinian Energy and Natural Resources Authority.

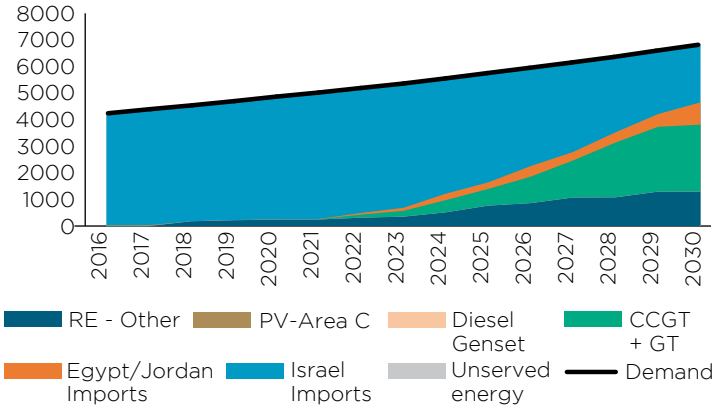
Figure 5: Results of the PENRA Vision Scenario for the West Bank

PENRA Vision: "Dependency ratio on any one source should not exceed 50% in best conditions, with a possibility of importing all needs in case of emergency."

A. West Bank Supply Capacity in 2030 (MW)



B. West Bank energy supply (GWh)

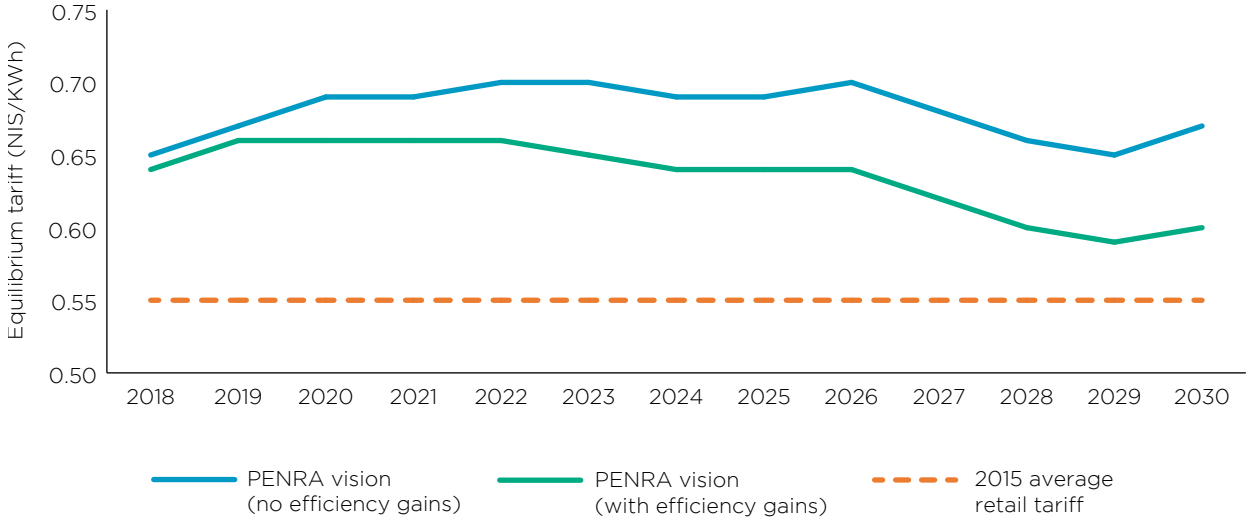


Note: RE = renewable energy; PV = photovoltaic; CCGT= combined cycle gas turbine; GT = gas turbine, Genset = Generator.

Overall, the PENRA vision scenario looks relatively attractive (figure 5). It calls for development of gas-fired power-generation capacity along with aggressive expansion of solar energy on rooftops and in Areas A and B to attain over 500 MW of solar PV capacity by 2030—about four to five times the current target. By 2030, this scenario achieves a relatively balanced consumption of domestic solar and gas-fired power generation with Israeli imports. Import capacity is nonetheless kept higher than strictly needed to provide backup in the case of shortfalls in the other sources of energy.

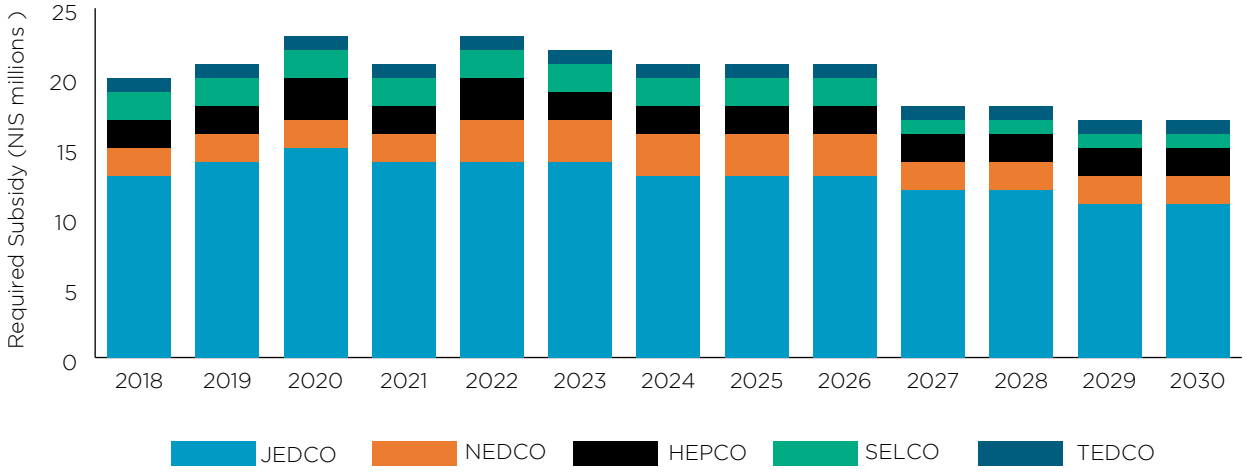
To implement the PENRA's vision, electricity tariffs would need to increase significantly in the medium term, but could decline over time if efficiency targets are met. The financial equilibrium tariff needed to sustain the envisaged investments in generation in the West Bank, as well as the associated transmission and distribution costs, rises in the medium term to NIS 0.66 (US$0.18) per kWh, well above current levels of NIS 0.55 (US$0.15) per kWh (figure 6). However, if the operational and commercial efficiency of the distribution utilities could be improved over the same time, the financial equilibrium tariff could drop toward NIS 0.58 (US$0.16) per kWh by 2030. Essentially, addressing the shortcomings of the distribution utilities can reduce the retail tariff by as much as NIS 0.07 (US$0.02) per kWh. Failure to adjust tariffs as needed would create a financial deficit in the sector peaking at NIS 600 million (US$165 million) per year by 2022 (equivalent to 6 percent of the 2016 public budget for the West Bank).

Figure 6: Equilibrium Tariff Needed to Finance Preferred Sector Investment Plan for the West Bank



Note: PENRA = Palestinian Electricity and Natural Resources Authority

Figure 7: Targeted Subsidy Requirement to Offset Affordability Concerns for the Bottom Income Decile in the West Bank



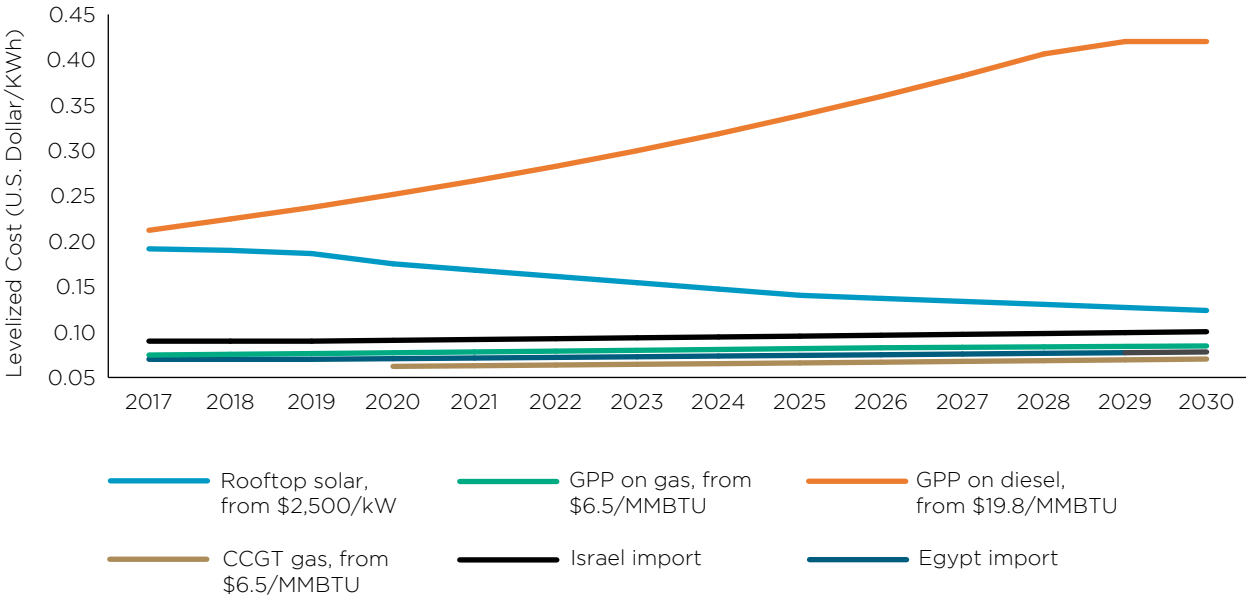
These tariffs would present an affordability problem only for the poorest households in the West Bank, and this could be addressed through a modest targeted subsidy. According to usual practice, electricity service is considered affordable if households can meet their electricity basic needs without spending more than 5 percent of their monthly budget. In the context of the West Bank and Gaza, the retail tariff increases with higher consumption in pre-defined blocks. The first block of the tariff schedule, set at 160 kWh per month, broadly allows households to meet their basic electricity needs. Based on the distribution of income in the West Bank, only the poorest 10 percent of the population would struggle to buy 160 kWh per month at the required financial equilibrium tariff of NIS 0.66 (US$0.18) per kWh. Assuming that these needy households could be identified using existing social registries, the cost of a targeted subsidy to safeguard their basic consumption would amount to no more than NIS 25 million (US$7 million) per year in 2022, declining further as tariffs come down thereafter (figure 7).

WHAT DOES GAZA'S ENERGY FUTURE LOOK LIKE?

Failure to invest in Gaza's power sector would make an already dire situation worse. Gaza is unable to meet 50 percent of its demand today. If no further power options are developed, the extent of unserved energy would escalate to 63 percent of demand by 2030. To avert this outcome, Gaza needs to develop additional power supply options, albeit from a much more limited menu than that available to the West Bank.

The cost of the diesel-fired GPP becomes increasingly unattractive over time relative to alternative options (figure 8). As of 2017, the GPP is already very expensive compared to alternatives and this cost is projected to rise along with the international oil price. Israeli electricity can be imported at fraction of the cost of current domestic generation, and Egyptian imports are even cheaper though heavily restricted in supply and rather unreliable. Conversion of the GPP to natural gas would make it competitive with Israeli and Egyptian imports. While rooftop solar looks relatively expensive today (though still undercutting

Figure 8: Time Trends of Levelized Cost of Energy for Different Supply Options in Gaza



Note: kWh = kilowatt hour; GPP = Gaza Power Plant; MMBTU = Million British Thermal Units; CCGT = combined cycle gas turbine.

TABLE 4: COMPARISON OF RESULTS ACROSS PLANNING SCENARIOS FOR GAZA

	AVERAGE COST OF POWER (US$ PER KWH)	CAPEX (US$ MILLIONS)	UNSERVED DEMAND IN 2030	ELECTRICITY IMPORTS IN 2030	DOMESTIC GENERATION FROM IMPORTED FUEL IN 2030	DOMESTIC RENEWABLE ENERGY GENERATION IN 2030
1. Do nothing	0.1468	0	63%	26%	11%	0%
2. Planned future	0.1339	1,035	0%	26%	68%	6%
3. PENRA vision	0.1230	1,066	0%	47%	46%	6%
4. Maximum cooperation	0.1037	385	0%	93%	0%	6%
5. Maximum independence	0.1515	1,185	2%	9%	83%	6%

Note: CAPEX = capital expenditure; PENRA = Palestinian Energy and Natural Resources Authority.

the GPP), the cost is expected to fall significantly over the planning horizon converging towards Israel imports. These changing patterns of relative costs are one key driver of investment planning decisions.

The options for Gaza are much more constrained than for the West Bank, and the premium associated with energy independence is particularly high. The key energy policy issue for Gaza is where to strike the balance between Israeli imports and domestic gas-fired power generation, while intensively developing solar rooftop PV. The performance of the five alternative scenarios presented by the planning model can be compared along several dimensions (table 4).

1. **Average cost of power generation:** This is a key driver of retail tariffs and varies greatly across the scenarios considered for Gaza, ranging from US$0.10 per kWh, if power is entirely sourced from Israeli imports, to US$0.15 per kWh if domestic generation is developed to the fullest extent. In marked contrast to the West Bank, the premium for energy independence in Gaza amounts to a substantial 50 percent of costs.
2. **Capital expenditure:** Scenarios contemplating continued reliance on Israeli imports require hardly any capital expenditure to be made, whereas those involving the development of domestic power-generation capacity would entail private investments of just over US$1 billion.
3. **Unserved demand:** All scenarios that bring new investment into power generation ensure that all demand can be reliably met, although some chance of unserved demand remains when there is no diversification from Israeli imports.
4. **Reliance on electricity imports:** The degree of reliance on Israeli imports ranges from 93 percent in the “maximum cooperation” scenario to only 9 percent in the “maximum independence” scenario.



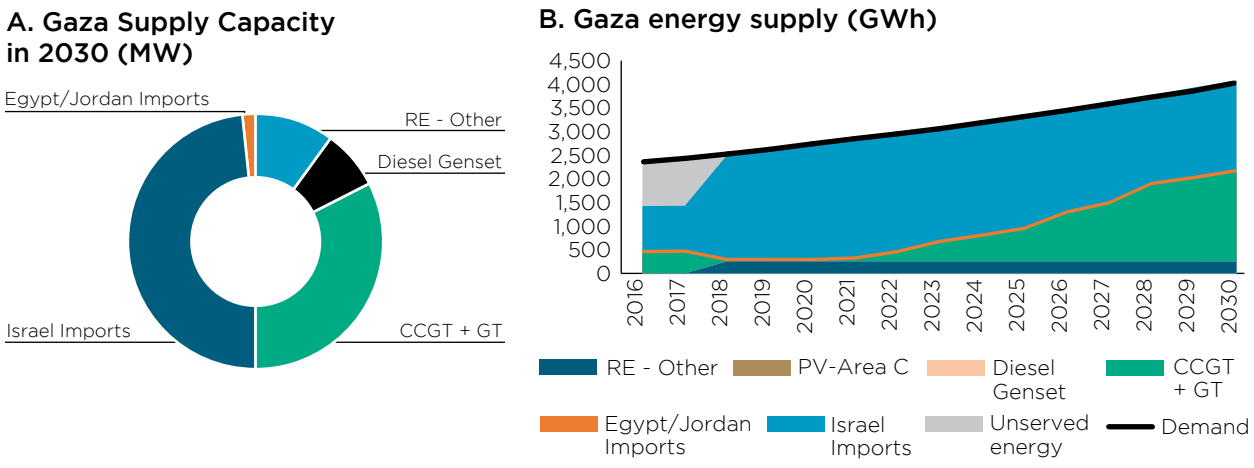
5. **Reliance on imported fuel:** All the scenarios entailing significant development of West Bank and Gaza power-generation capacity rely on gas imports to meet between 46 and 83 percent of electricity needs. In that sense, the "maximum independence" scenario essentially only replaces dependence on electricity imports with dependence on gas imports.
6. **Reliance on domestic renewables:** Gaza's renewable energy potential is limited to rooftop solar, and this is unable to meet more than 6 percent of energy needs under any scenario but should still be maximized to provide a basic safety net where possible.

Among the energy diversification options for Gaza, the PENRA vision is the one offering the lowest cost premium for energy independence. The differential average cost of generation between PENRA's vision and the "maximum cooperation" scenario is NIS 0.07 (US$0.02) per kWh, or about 20 percent, still relatively high but preferable to the alternatives. The PENRA vision scenario envisages a phasing out of diesel-fired power generation in the short run and increased reliance on Israeli imports (figure 9). This brings a double benefit by bringing power generation costs down to a third of current levels while at the same time expanding supply to a point where current outages can be offset. This achievement is contingent on the commissioning of new 161 kilovolt lines to expand import capacity from Israel. Further out, once gas becomes available, the GPP comes back into service and plays a growing role in meeting energy needs. By 2030, the scenario sees an almost 50:50 reliance on self-generation through gas and Israeli imports. In addition, rooftop solar provides a safety net to meet critical needs under emergency conditions.

The tariff impact of implementing the PENRA vision is substantial, although it can be somewhat offset by operational efficiency gains. Any scenario involving significant investment in domestic power generation in Gaza entails financial equilibrium tariffs of the order of NIS 0.91 (US$0.25) per kWh in the medium term, well above the current levels of NIS 0.52-0.56 (US$0.14-0.15) per kWh (figure 10). These would eventually decrease to about NIS 0.62 (US$0.17) per kWh, but only if the Gaza utility substantially improves its operational and commercial performance in line with regional best practice; this can reduce the retail tariff by as much as NIS 0.47 (US$0.13) per kWh by 2030. Failure to adjust tariffs would result in a financial shortfall of around NIS 700 million (US$200 million) by the mid-2020s (equivalent to 12.5 percent of the public budget for 2016).

Figure 9: Results of the PENRA Vision Scenario for Gaza

PENRA Vision: "Dependency ratio on any one source should not exceed 50% in best conditions, with a possibility of importing all needs in case of emergency."



Note: RE = renewable energy; PV = photovoltaic; CCGT= combined cycle gas turbine; GT = gas turbine, Genset = Generator.

Figure 10: Equilibrium Tariff Needed to Finance Preferred Sector Investment Plan for Gaza

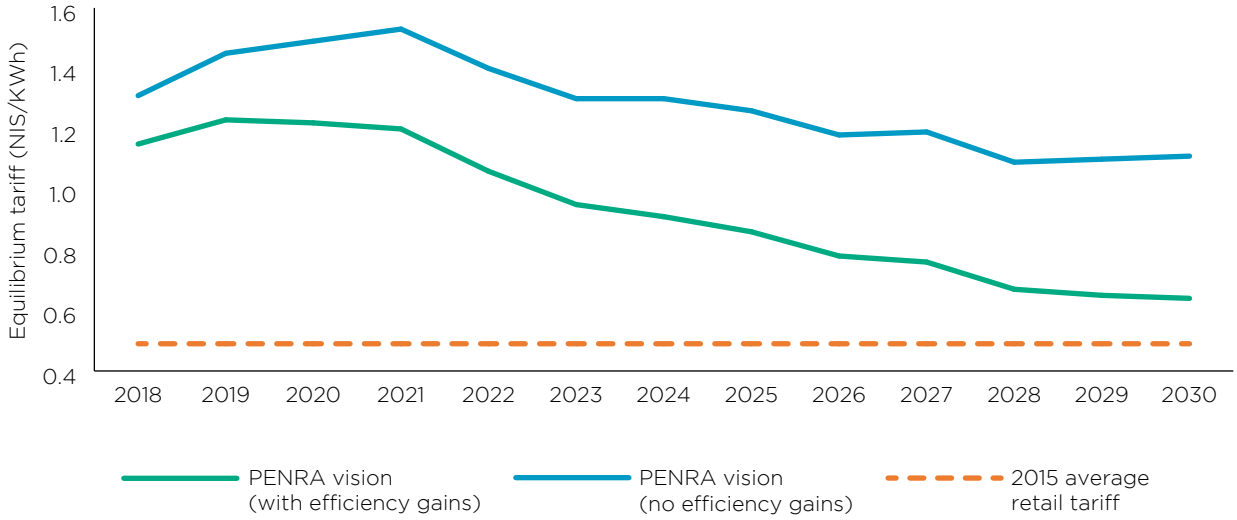
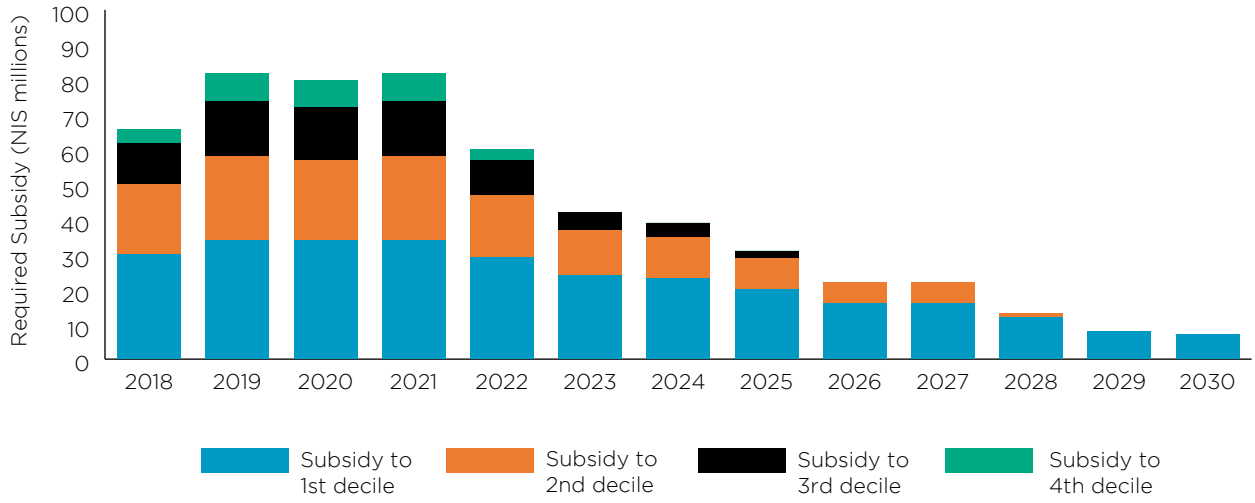


Figure 11: Targeted Subsidy Requirement to Offset Affordability Concerns in Gaza



Affordability is a much more serious concern in Gaza than the West Bank, given higher costs of electricity and a more impoverished population. Based on the distribution of income in Gaza, as much as 40 percent of the population would struggle to buy 160 kWh per month at the required financial equilibrium tariff of NIS 0.91 (US$0.25) per kWh. Assuming that these needy households could be identified using existing social registries, the cost of a targeted subsidy to safeguard their basic consumption would amount to approximately NIS 80 million (US$22 million) per year in 2021. However, as tariff levels decline toward 2030, they would also become more affordable, such that by the end of the planning horizon social protection would be needed for only the poorest 10 percent of the population (figure 11).

What Measures Need to Be Taken by Government?

To make progress toward greater energy security, the Palestinian Authority needs to adopt a sequenced approach to addressing critical policy bottlenecks. The starting point for this roadmap is the completion of the power-purchase agreement with Israel currently under negotiation and the subsequent energization of PETL's four high-voltage substations in the West Bank. Considering the delays in the bilateral negotiations, PETL should seize the opportunity to agree on power supply agreements with Palestinian distribution companies. These downstream arrangements need to be in place before the power-purchase agreement with Israel is signed. Once these immediate measures are taken, the question becomes what needs to be done next to move toward the vision of improved energy security in the Palestinian territories. The analysis suggests that a certain sequence of measures needs to be taken. Four distinct phases have been identified (table 5).

PHASE 1

The first phase, and absolute priority, is to improve the creditworthiness of the sector, without which none of the alternative supply arrangements could be consummated. Progress on all other aspects of the Palestinian energy sector depend on greater creditworthiness. Without it, the sector cannot sign new power-import deals or close power-purchase agreements with independent power producers for increased domestic power-generation projects, let alone import natural gas. None of these ventures can get off the ground unless the Palestinian electricity sector strengthens its creditworthiness. Financial security will bring about energy security, but the reverse is not true. There are several distinct components that must be tackled if creditworthiness is to be improved.

First, replace generation from the GPP with increasing electricity imports from Israel to provide relief until a conversion to gas can be undertaken. The cost of diesel-fired generation at the GPP is very high, at approximately US$0.30 per kWh, even at current low oil prices. This is approximately three times the cost of power imports from Israel, which provides a more reliable source of supply. Until the GPP is ready for the switch to gas-fired generation, which would slash costs to US$0.068 per kWh, it would be desirable to substitute domestic diesel-fired power generation with Israeli power imports, taking advantage of the new 161 kilovolt line that is in an advanced stage of planning. Even if the capacity charges of US$0.026 per kWh to the GPP continue to be paid as per the existing 20-year PPA, every reduction of one kWh in diesel-fired power generation would be sufficient to buy two kWh of Israeli imports. Such a move would simultaneously reduce costs and increase quantity and reliability of supply, and thereby increase prospects for improved cost recovery through tariff revenues.

Second, accelerate improvements in the operational and commercial performance of Palestinian DISCOs. Cost recovery tariffs could be reduced substantially over time if the operational and commercial performance of the Palestinian DISCOs improved to reasonable regional benchmark levels. For the utilities in the West Bank, improved operational performance would take US$0.03 per kWh off the financial equilibrium tariff, while in Gaza improving operational performance is worth as much as US$0.11 per kWh. Achieving further improvements can build on some recent successes with the introduction of prepaid and smart meters that helped to raise revenue collection rates to 85 percent on average across the utilities. Moreover, across the

board, attention needs to turn toward improving network losses, which remain very high despite all efforts. It is recommended that a revenue protection program be established to permanently measure and bill every kWh sold to the largest DISCO customers with state-of-the-art technology.

Third, create securitization mechanisms to ensure that Palestinian DISCO revenues are not diverted to other municipal projects. Due to the lack of a subnational financing framework in the Palestinian territories, DISCO revenues remain vulnerable to diversion into municipal budgets. The long-term solution, which is to strengthen the basis of subnational public finance, is important for development reasons that go well beyond the energy sector. However, it will likely take some time to achieve. Hence the importance of finding interim mechanisms to securitize the revenues needed for the DISCOs to meet the costs of wholesale power purchase. This could take the form of escrow accounts to ring fence electricity bill payments with a payment prioritization hierarchy ensuring payment to wholesale suppliers. The issue of securitization of revenues is particularly critical in Gaza, and would be an essential component of any moves to substitute increased Israeli power imports for domestic diesel-fired power generation.

Fourth, ensure that all Palestinian DISCOs move toward cost recovery. Not all Palestinian DISCOs are charging cost-recovery tariffs. Only two utilities, JEDCO and NEDCO, make formal tariff submissions to PERC. The resulting uniform tariff that is applied across all Palestinian utilities in the West Bank is estimated to under recover costs for all but NEDCO. Moreover, PERC's practice of not passing through collection inefficiencies to the retail tariff, while defensible from the standpoint of consumers, further weakens the financial solidity of the sector. In addition, GEDCO in Gaza does not follow PERC tariff guidelines and has not adjusted its electricity tariff for a decade, currently charging a retail tariff that is US$0.03–0.05 per kWh lower than the wholesale purchase price of electricity, without considering the costs of power distribution. The higher costs of electricity production in Gaza combined with the sensitive social context suggest that efforts to improve cost recovery in Gaza would need to be preceded by the measures noted to both reduce costs and improve the availability of power supply.

Fifth, build the capacity of PETL to play its envisaged role in the sector. In the new sector architecture, PETL has been assigned a dual role of transmission system operator and single buyer and central bookkeeper of the electricity sector. However, its start of commercial operations has been delayed pending the closure of a power-purchase agreement with Israel and the energization of four high-voltage substations. The signing of an interim power-purchase agreement with Israel to energize the Jenin high-voltage substation, which took place in July 2017, was the first step toward PETL's financial and operational sustainability. PETL is now able to resell the discounted high voltage power to DISCOs at a slight markup, allowing it to obtain revenues. The start of PETL's commercial operations enable the company to gradually move beyond donor dependency, paving the way for development of domestic independent power projects. In the meantime, until the full power-purchase agreement for all four substations is signed with Israel, PETL should make further progress toward its goal of being the single buyer, by ensuring that all wholesale power purchases are undertaken through its intermediation to improve transparency and discipline of the sector.

PHASE 2

While the absolute priority is to improve the creditworthiness of the electricity sector, there are several other no-regrets measures that can advance in parallel during a second phase. Even after decisive steps are taken to address creditworthiness, time will be needed for a payment record to be established and a reputation to be built. During this period of consolidation, it would be helpful to accelerate measures that facilitate the development of other power supply options that will become feasible once the issue of creditworthiness has been adequately addressed.

First, create the infrastructure needed to support the import of natural gas into the Palestinian territories. All the planning analysis confirms the strategic role that natural-gas-fired power generation can play in the electricity mix for both the West Bank and Gaza as well as its relatively attractive cost. The first step in making this possible is to construct the relatively modest pipeline extensions needed for the import of gas from the Israeli system. These will create

the platform to have credible negotiations for gas supply agreements and ultimately the construction of new gas-fired plants, or the conversion to gas in the case of Gaza. The Gas-for-Gaza Project led by the Office of the Quartet has focused its efforts on removing key obstacles for the construction of a gas pipeline from Israel to the GPP.

Second, pursue an aggressive program to promote rooftop solar PV. Unlike utility scale solar power, rooftop solar PV is highly decentralized and is not contingent on progress toward sector creditworthiness and the capacity of PETL. Moreover, it has been shown that rooftop solar PV can play a valuable role as an electricity safety net to increase the resilience of the Palestinian electricity system and ensure that critical humanitarian needs can be met. This is particularly true in the case of Gaza, where efforts to pilot rooftop solar programs are already under way.

Third, complete the domestic transmission backbone in Gaza. Domestic transmission constraints are already an issue in Gaza, and these will become more severe as efforts to increase the supply of power bear fruit. It is important to ensure that the modest but needed transmission and distribution upgrades are completed in a timely fashion, and certainly well ahead of any future expansion of the GPP.

Fourth, improve the enabling environment for independent power projects. While the financial creditworthiness of the sector is the single largest impediment to the implementation of independent power projects, there are several simple measures that could improve the quality of the enabling environment, and which could be handled through secondary legislation or executive regulations that develop broad provisions in the existing sector legislation. These include further clarifying the provisions for licensing new generators and the provisions associated with connection to the grid. The roles of PERC and PETL in this process need to be further spelled out.

Fifth, establish a risk-mitigation mechanism to support the next generation of Palestinian independent power projects. Risk mitigation is no substitute for addressing fundamental creditworthiness issues, and it does not make sense to move ahead with risk mitigation until the Palestinian Authority has demonstrated a sustained and credible commitment to improving the underlying financial standing of the sector. Nevertheless, risk mitigation may play a valuable role in getting the next generation of Palestinian independent power projects off the ground. It would therefore be valuable to work with donors to develop a suitable mechanism for risk mitigation, evaluating the relevance of a range of financial instruments such as guarantees, first loss, blended finance, and viability gap finance.

PHASE 3

In a third phase, it will become possible to make progress with the first major wave of Palestinian independent power projects. These will build on the critical foundational elements tackled under the first two phases. It makes sense to begin with those projects that look to be the most tractable from a technical and political perspective, which suggests focusing on developing CCGT capacity and utility-scale solar PV in Areas A and B.

First, convert the GPP to CCGT gas-fired technology as the most urgent of the domestic power-generation projects. Conversion of the GPP once a gas pipeline comes on stream would save between US$45–62 million annually in fuel bills and provide Gaza with a cost-effective domestic source of power generation.

Second, progress with the construction of a new CCGT gas-fired plant, initially in Jenin and eventually in Hebron. Once the gas transportation infrastructure is in place, and some improvements to the sector environment have been achieved, the implementation of the Jenin CCGT plant should be relatively straightforward. Guarantees may be required to reduce the risk of nonpayment by the off-taker. Two important issues need to be addressed in the project design. One is the arrangement for selling any surplus energy back to the Israeli grid. The other is to ensure that the terms of a future gas supply agreement are sufficiently flexible to allow for an eventual switch of supply to or from the Gaza Marine gas field should this prove desirable.

Third, embrace a more ambitious target for utility-scale solar PV farms in Areas A and B. As noted in the planning analysis, it looks feasible to develop more than 600 MW of solar PV capacity in the West Bank based on potential just in Areas A and B as well as rooftop. This goes far beyond the current target of 130 MW by 2020. With the improvements



in the enabling environment in place, as well as the establishment of risk-mitigation mechanisms, it should become feasible to scale up and accelerate efforts to develop this solar potential.

Fourth, establish suitable wheeling arrangements with Israel. As the volume of domestic power generation in the West Bank ramps up, there will be increasing need to move power away from generation plants and toward Palestinian load centers. At present, this can be done only by wheeling power out through the Israeli grid and reimporting it into the West Bank at another location. The analysis suggests that wheeling charges are relatively costly, particularly if low-voltage networks are needed. It will therefore be important to ensure that the number of substations in the West Bank increases to keep pace with the expansion of domestic supply. It would also be important to have a dialogue with the Israeli regulator, regarding the charges for wheeling and to explore possible alternative arrangements (such as power swaps) that may help to contain costs.

Fifth, engage in dialogue over the use of Area C for the development of Palestinian power infrastructure and renewable energy generation. The planning analysis highlights the economic value of Area C, both as a location for grid-based solar generation and as the conduit for any future Palestinian electricity transmission infrastructure. While there is much that still needs to be done before the issue of Area C becomes a binding constraint, the political complexity of the issue suggests that it may be helpful to begin a dialogue process that over time can help clarify the modalities for making use of Area C. A related issue is the need to coordinate Palestinian plans to ramp up renewable-energy generation with those that also exist on the Israeli side, in order to ensure that challenges related to grid stability and the integration of intermittent sources can be adequately handled to the benefit of both sides.

PHASE 4

The fourth and final phase would build on earlier success to tackle the more challenging, and potentially transformational, projects needed to complete the Palestinian energy vision. These include the construction of solar generation and transmission backbone infrastructure in Area C, as well as the development of the Gaza Marine gas field.

First, develop a Palestinian transmission backbone in the West Bank. The analysis has shown that as domestic Palestinian power generation ramps up, the cost of wheeling power through the Israeli grid rapidly become quite significant. A more economic option in the long term would be to construct a Palestinian transmission backbone. It would need to cut across Area C, which would present significant technical and political challenges.

Second, develop utility-scale solar PV and CSP projects in Area C of the West Bank. If a successful track record of solar farm development can be established on the more limited land endowments of Areas A and B, and suitable transmission backbone infrastructure can be put in place across Area C, the West Bank would be ready to benefit from larger scale solar development in Area C. This would entail both solar PV and CSP technologies.

Third, move ahead with the development of the Gaza Marine gas field. The development of the Gaza Marine gas field is critically dependent on having a creditworthy buyer to sign the gas purchase deal. Given the abundance of gas discoveries in the eastern Mediterranean and the relatively small nature of the field, development of the field will likely need to be underwritten by a significant Palestinian demand for gas. This demand will take time to develop and would be achieved only once significant gas-fired power generation was on-stream and a solid gas-purchase payment record had been established in both the West Bank and Gaza. That would be a suitable juncture to enable signing a bankable deal for the development of the field, allowing the Palestinian gas-fired plants to switch gradually from Israeli to Palestinian gas as the new field becomes productive. Given the relatively small volume of Palestinian demand, it may make sense to consider the options for Gaza Marine development that require the least infrastructure development—by making use of stranded infrastructure from the Israeli Mari B field—thereby making the field economic at lower levels of throughput. The primary value of the Gaza Marine field to the Palestinian economy lies not so much in a supply of gas, which is abundantly available in the region, nor as a source of energy security, since Palestinian gas would likely be transported through Israeli infrastructure. Rather, the field is an eventual source of revenue for the Palestinian Authority, estimated at US$2.7 billion over 25 years.

What Are the Costs and Benefits of Achieving Energy Security?

The overall investment costs of pursuing energy security for the West Bank and Gaza are estimated to be US$4 billion to US$5 billion (table 6). Of this, almost all would take the form of private sector investment in domestic power-generation capacity, with only US$0.3 billion taking the form of public investment in supporting infrastructure for electricity transmission and distribution as well as gas transportation. Just over half would be needed for the West Bank and the remainder for Gaza. Significant investments would begin in phase 2 of the roadmap, peaking in phase 3, and remaining significant in phase 4.

Macroeconomic simulations indicate that the wider development impacts of pursuing these energy investment pathways would be substantial. According to modeling undertaken for this project, implementing the proposed investments and associated reforms would boost GDP growth by 0.3 percentage points per year in the West Bank and 0.5 percentage points per year in Gaza. Relative to the counterfactual "do nothing" scenario, the energy subsidy bill would come down by 1.7 percentage points of GDP in the West Bank and 5.1 percentage points of GDP in Gaza. The main macroeconomic benefits would come through freeing up resources for higher levels of productive investment in these economies.

This study shows that it is possible to envisage a path toward greater energy security for the West Bank and Gaza, and even if the way is fraught with financial, technical, and political challenges, inaction is not an option.

TABLE 5: INVESTMENT NEEDS FOR THE PALESTINIAN ELECTRICITY SECTOR, 2017–30 (US$ MILLIONS)

	WEST BANK		GAZA		COMBINED	
	PUBLIC	PRIVATE	PUBLIC	PRIVATE	PUBLIC	PRIVATE
Phase 1	-	-	-	-	-	-
Phase 2	7	800–1,100	135	240–320	142	1,040–1,420
Phase 3		930		900–990	-	1,830–1,920
Phase 4	188	375–500	-	250–1,200	188	620–1,700
Total	**195**	**2,105–2,530**	**135**	**1,390–2,510**	**330**	**3,495–5,040**

Source: World Bank estimates

TABLE 6: OVERVIEW OF THE PROPOSED ROADMAP FOR PALESTINIAN ENERGY SECURITY

PHASE 1: IMPROVE SECTOR CREDITWORTHINESS	PHASE 2: ADVANCE PARALLEL NO REGRETS MEASURES
Substitute Israeli imports for diesel-fired generation in Gaza	**Create infrastructure for import of natural gas**
P : Gradually ramp down GPP and use the savings to buy additional IEC supply until GPP can be converted to gas. **I** : Provide additional power to Gaza through 161kV.	**P**, **I** : Construct natural gas pipelines for West Bank and Gaza paving the way for construction of new/ upgraded power plants.
Improve operational and commercial efficiency	**Improve enabling environment for IPPs**
P : Continue improvement of DISCO performance by reducing losses, increasing collection rates and bringing down overhead costs. One mechanism can be through a revenue protection program aiming to permanently measure and bill every KWh sold largest DISCO consumers.	**P** : Update and improve legislation and licensing provisions that would help IPPs enter the market and also clarify roles and responsibilities of PERC and PETL in this environment.
Securitize payments of wholesale electricity	**Promote uptake of rooftop solar PV**
P : Strengthen sub national public finance to avoid diversion of electricity bill collections to municipal budgets and set up escrow accounts both in Gaza and West Bank to ring fence collections.	**P** : Set aggressive targets for 160MW of rooftop PV in Gaza and 530MW in West Bank.
Adjust tariffs to better reflect cost recovery	**Develop transmission backbone in Gaza**
P : Reexamine the retail tariffs and increase rates to allow better cost recovery by DISCOs.	**P** : Upgrade T&D network to allow increase in power supply and reduction in losses.
Build the capacity of PETL to play its role	**Design a risk mitigation mechanism for IPPs**
P : PETL to streamline billing to and payments from DISCOs while in parallel pushing to energize the new substations and sign the PPA with IEC. **I** : Sign bulk supply PPA and energize new substations.	**P**, **D** : After creditworthiness issues from Phase I have been improved, develop financial risk mitigation instruments such as guarantee mechanisms.

P: Palestinian measures **I: Israeli measures** **D: Donor community measures**

PHASE 3: IMPLEMENT FIRST WAVE OF IPPS	PHASE 4: IMPLEMENT TRANSFORMATIONAL PROJECTS
Convert GPP to CCGT gas-fired technology	**Develop grid-scale solar PV/CSP farms in Area C**
P : Complete conversion and upgrade of GPP ensuring flexible gas supply agreement to allow switch to Gaza Marine. **I** : Enter into gas supply agreement for GPP.	**P** : Begin development of renewables in Area C only after a successful track record of renewable development in Areas A and B. **I** : Provide permits for construction in Area C.
Construct new CCGT plant at Jenin, then Hebron	**Develop transmission backbone in the West Bank**
P : Complete JPP and HPP construction with flexible gas supply agreement to allow switch to Gaza Marine. Build additional substations to keep pace with increased domestic generation. **I** : Enter into gas supply agreement for JPP and HPP.	**P** : Begin development of a transmission backbone, considering also the possibility of negotiating a swap mechanism that eliminates the need for wheeling or building of infrastructure. **I** : Provide permits for construction in Area C and/or provide swap alternatives to building a backbone.
Increase renewable energy targets	**Develop Gaza Marine Gas Field**
P : Increase renewable energy targets to 600MW in West Bank and 160MW in Gaza by 2030 (includes rooftop solar) but only after the right enabling environment has been established from Phase I.	**P** : Develop Gaza Marine with least amount of infrastructure development to keep costs low. **I** : Allow permission to use existing Israeli infrastructure for evacuation of Gaza Marine.
Establish wheeling arrangements with IEC	
P, **I** : Negotiate lower wheeling tariffs and/or swap arrangements until a transmission backbone is built	
Engage in dialogue over use of Area C	
P, **I** : Coordinate on Area C access and permitting issues as well as grid stability and regional integration for supply expansion and transmission infrastructure.	

Note: IPP = independent power producer; GPP = Gaza Power Plant; CCGT = combined cycle gas turbine; PV = photovoltaic; CSP = concentrated solar power; IEC = Israeli Electric Corporation; DISCO = Distribution Company; PERC = Palestinian Electricity Regulatory Council; PETL = Palestinian Electricity Transmission Company Ltd; JPP = Jenin Power Plant; HPP = Hebron Power Plant; T&D = Transmission and Distribution; PPA = power-purchase agreement.


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