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IDA/R2017-0265/1

July 10, 2017

Closing Date: Thursday, July 27, 2017 at 6 p.m.

FROM: Vice President and Corporate Secretary

West Bank and Gaza - Electricity Sector Performance Improvement Project

Project Appraisal Document

Attached is the Project Appraisal Document regarding a proposed grant from the Trust Fund for Gaza and the West Bank, administered by the International Development Association to the Palestinian Liberation Organization (for the benefit of the Palestinian Authority) for an Electricity Sector Performance Improvement Project (IDA/R2017-0265), which is being processed on an absence-of-objection basis.

Distribution:
Executive Directors and Alternates
President
Bank Group Senior Management
Vice Presidents, Bank, IFC and MIGA
Directors and Department Heads, Bank, IFC and MIGA

Document of
The World Bank

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Report No: PAD1608

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A PROPOSED GRANT

IN THE AMOUNT OF US$4 MILLION

FROM THE TRUST FUND FOR GAZA AND THE WEST BANK (TFGWB)

WITH CO-FINANCING FROM THE PARTNERSHIP FOR INFRASTRUCTURE DEVELOPMENT MULTI-DONOR TRUST FUND (PID-MDTF)

IN THE AMOUNT OF US$7 MILLION

TO

THE PALESTINE LIBERATION ORGANIZATION (FOR THE BENEFIT OF THE PALESTINIAN AUTHORITY)

FOR AN

ELECTRICITY SECTOR PERFORMANCE IMPROVEMENT PROJECT

June 30, 2017

Energy and Extractives Global Practice
Middle East and North Africa Region

CURRENCY EQUIVALENTS

Exchange Rate Effective May 31, 2017

Currency Unit	=	Israeli New Shekel (ILS)
US$1	=	ILS 3.62

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AFD	*Agence Française de Développement* (French Developpent Agency)
AMI	Advanced Metering Infrastructure
CAPEX	Capital Expenditure
CMS	Commercial Management System
COGAT	Coordinator of Government Activities in the Territories
DA	Designated Account
DISCO	Distribution Company
EIRR	Economic Internal Rate of Return
ERP	Enterprise Resource Planning
ESMF	Environmental and Social Management Framework
ESPIP	Electricity Sector Performance Improvement Project
FM	Financial Management
GDP	Gross Domestic Product
GEDCO	Gaza Electricity Distribution Company Ltd.
GENRP	Gaza Electricity Network Rehabilitation Project
GoI	Government of Israel
GPP	Gaza Power Plant
GZRM	Gaza Reconstruction Mechanism
HEPCO	Hebron Electric Power Company
HV	High Voltage
ICT	Information and Communication Technology
IEC	Israel Electric Corporation
IFR	Interim Financial Report
IMS	Incidence Management System
IPP	Independent Power Producer
JDECO	Jerusalem District Electricity Company
MCC	Metering Control Center
MDMS	Meter Data Management System
MIS	Management Information System
MOE	Ministry of Education
MOF	Ministry of Finance
MOH	Ministry of Health
MVC	Municipality and Village Council
MSME	Micro and Small Medium Enterprises
NEDCO	Northern Electric Distribution Company

PA	Palestinian Authority
PDO	Project Development Objective
PENRA	Palestinian Energy and Natural Resources Authority
PERC	Palestinian Electricity Regulatory Council
PETL	Palestinian Electricity Transmission Company Ltd.
PIF	Palestinian Investment Fund
PIM	Project Implementation Manual
PLO	Palestinian Liberation Organization
PMU	Project Management Unit
PPA	Power Purchase Agreement
RPP	Revenue Protection Program
SAACB	State Audit and Administrative Control Bureau
SED	Securing Energy for Development
SELCO	Southern Electric Company
SME	Small and Medium Enterprise
SOE	Statement of Expenditure
TEDCO	Tubas Electricity Distribution Company
ToR	Terms of Reference
UNDP	United Nations Development Program
USAID	U.S. Agency for International Development
VAT	Value Added Tax
WB&G	West Bank and Gaza

Regional Vice President:	Hafez Ghanem
Country Director:	Marina Wes
Senior Global Practice Director:	Riccardo Puliti
Practice Manager:	Erik Fernstrom
Task Team Leader:	Roger Coma Cunill

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PAD DATA SHEET

West Bank and Gaza

West Bank and Gaza: Electricity Sector Performance Improvement Project (P148600)

PROJECT APPRAISAL DOCUMENT

Middle East and North Africa Region

Report No.: PAD1608

Basic Information		
Project ID	EA Category	Team Leader(s)
P148600	B - Partial Assessment	Roger Coma Cunill
Lending Instrument	Fragile and/or Capacity Constraints [ ]	
Investment Project Financing	Financial Intermediaries [ ]	
	Series of Projects [ ]	
Project Implementation Start Date	Project Implementation End Date	
27-Jul-2017	20-Jul-2023	
Expected Effectiveness Date	Expected Closing Date	
27-Nov-2017	20-Dec-2023	
Joint IFC		
No		

Practice Manager/Manager	Senior Global Practice Director	Country Director	Regional Vice President
Erik Magnus Fernstrom	Riccardo Puliti	Marina Wes	Hafez Ghanem

Borrower: Palestinian Liberation Organization (for the Benefit of the Palestinian Authority)			
Responsible Agency: Palestinian Energy and Natural Resources Authority (PENRA)			
Contact:	Zafer Milhem	Title:	Acting Chairman
Telephone No.:	+970 2 2986192	Email:	zafer.milhem@menr.org

Project Financing Data (in US$, millions)					
[ ] Loan	[ ] IDA Grant	[ ] Guarantee			
[ ] Credit	[ ] Grant	[X] Other			
Total Project Cost:	11.00		Total Bank Financing:	11.00	
Financing Gap:	0.00				

Financing Source	Amount
Borrower	0.00
Trust Fund for Gaza and the West Bank (TFGWB)	4.00
Partnership for Infrastructure Development Multi-Donor Trust Fund (PID-MDTF)	7.00
Total	11.00

Expected Disbursements (in US$)

Fiscal Year	2018	2019	2020	2021	2022	2023
Annual	750,000	2,250,000	2,500,000	2,500,000	2,000,000	1,000,000
Cumulative	750,000	3,000,000	5,500,000	8,000,000	10,000,000	11,000,000

Institutional Data

Practice Area (Lead)

Energy and Extractives

Contributing Practice Areas

Proposed Development Objective(s)

The Project Development Objective is to enhance the energy sector's institutional capacity, improve efficiency of the distribution system in targeted areas, and pilot a new business model for solar energy service delivery in Gaza.

Components

Component Name	Cost (US$, millions)
Component 1: Strengthening the Capacity of Palestinian Electricity Sector Institutions, PETL and PERC	2.50
Component 2: Improving the Operational Performance of Palestinian Electricity Distribution Companies (DISCOs)	5.30
Component 3: Improving Energy Security in Gaza with Solar Energy	2.50
Component 4: Technical Assistance, Capacity Building and Project Management	0.70

Systematic Operations Risk-Rating Tool (SORT)

Risk Category	Rating
1. Political and Governance	High
2. Macroeconomic	High
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Moderate

5. Institutional Capacity for Implementation and Sustainability	Moderate
6. Fiduciary	High
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	
OVERALL	High

Compliance		
Policy		
Does the project depart from the CAS in content or in other significant respects?	Yes [ ]	No [X]
Does the project require any waivers of Bank policies?	Yes [ ]	No [X]
Have these been approved by Bank management?	Yes [ ]	No [X]
Is approval for any policy waiver sought from the Board?	Yes [ ]	No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X]	No [ ]

Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment OP/BP 4.01	X	
Natural Habitats OP/BP 4.04		X
Forests OP/BP 4.36		X
Pest Management OP 4.09		X
Physical Cultural Resources OP/BP 4.11		X
Indigenous Peoples OP/BP 4.10		X
Involuntary Resettlement OP/BP 4.12		X
Safety of Dams OP/BP 4.37		X
Projects on International Waterways OP/BP 7.50		X
Projects in Disputed Areas OP/BP 7.60		X

Legal Covenants

Name	**Recurrent**	**Due Date**	**Frequency**
Schedule 2, Section I.A.3 of the TFGWB Grant Agreement	X	N/A	Continuous

Description of Covenant
The Recipient, through the Palestinian Authority, shall cause PENRA to (a) establish a revolving fund ("Revolving Fund") for purposes of implementing Part 3 of the Project with a structure, functions and

responsibilities acceptable to the World Bank; and (b) operate the Revolving Fund in accordance with the POM, with the financial management policies in place satisfactory to the World Bank, and (c) shall not amend, suspend, abrogate, repeal or waive any provision of the POM without prior approval of the World Bank.			
Schedule 2, Section I.A.4. of the TFGWB Grant Agreement		May 27, 2018	N/A
Description of Covenant The Recipient, through the Palestinian Authority, shall cause Ministry of Finance and Planning to hire an external financial auditor with qualifications and terms of reference acceptable to the World Bank, no later than six (6) months after the Effective Date and shall not change said external auditor or revise or amend its terms of reference, throughout the life of the Project, without the approval of the World Bank. The terms of reference shall include the hiring of a technical auditor.			
Name	**Recurrent**	**Due Date**	**Frequency**
Schedule 2, Section I.C of the TFGWB Grant Agreement	X	N/A	Continous
Description of Covenant The Recipient, through the Palestinian Authority, shall cause PENRA to enter into an agreement with GEDCO ("PENRA- GEDCO Agreement"), with terms and conditions approved by the World Bank.			

Conditions			
Source of Fund	**Name** Project Operations Manual	**Type**	
Description of Condition		Effectiveness	
PENRA and the PMU will complete and adopt a Project Operations Manual, in a manner satisfactory to the World Bank before Effectiveness.			

Team Composition

Bank Staff

Name	**Role**	**Title/Specialization**	**Unit**
Roger Coma Cunill	Team Leader (ADM Responsible)	Senior Energy Specialist	GEE05
Lina Fathallah Rajoub	Procurement Specialist (ADM Responsible)	Senior Procurement Specialist	GGO05
Nadi Yosef Mashni	Financial Management Specialist	Financial Management Specialist	GGO23
Elisabeth Maier	Team Member	Operations Officer	GEE05
Helen Z. Shahriari	Safeguards Specialist	Sr. Social Scientist	GSU05
Khalida Seif El-Din Al-Qutob	Team Member	Program Assistant	MNCGZ
Liliana Elisabeta Benitez	Team Member	Consultant	GEE05
Mark M. Njore	Team Member	Program Assistant	GEE05

Sara Badiei	Team Member	Energy Specialist	GEE05
Zeyad Abu-Hassanein	Safeguards Specialist	Senior Environmental Specialist	GEN05
Natalia Robalino	Counsel	Senior Counsel	LEGIA
Eric Ranjeva	Team Member	Finance Officer	WFALN
Juliana Victor	Team Member	Senior Monitoring and Evaluations Specialist	GEESO

Extended Team

Name	**Title**	**Location**
Alain Bourguignon	Senior Power Engineer, Consultant	
Jonathan Walters	Senior Energy Economist, Consultant	
Ezgi Canpolat	Gender Consultant	

Locations

Country	**First Administrative Division**	**Location**	**Planned**	**Actual**	**Comments**
West Bank and Gaza	West Bank	West Bank		**X**	

Consultants (Will be disclosed in the Monthly Operational Summary)

Consultants Required?	Consultants will be required.

I. STRATEGIC CONTEXT

A. Country Context

1. **Despite a slow recovery from the 2014 recession, the West Bank and Gaza economic outlook is grim.** The growth rate is projected to be around 3.5 percent in the medium term. Given the high population growth in the West Bank and Gaza, this implies a near stagnation in per capita incomes. The economy has not been able to create enough jobs, resulting in high unemployment rates reaching 27 percent in 2016 (18 percent in the West Bank and 42 percent in Gaza), despite recent steps by Israel to increase the number of work permits for West Bank residents. The productive capacity of the Palestinian economy has been eroded over the years, with a significant decline in the size of manufacturing and agriculture in the economy.[1] Micro and Small Medium Enterprises (MSMEs) are not growing, which hinders bottom-up creation of sustainable jobs[2].

2. **The current situation requires renewed efforts by the donors, the Palestinian Authority (PA) and the Government of Israel (GoI).** More can be done to enhance the performance of the Palestinian economy and improve the fiscal situation. Increased donor support and continued reforms led by the PA are needed to ensure improved competitiveness and fiscal sustainability of the Palestinian economy over time.

3. **Actions to help private sector activity and raise employment levels could significantly mitigate the stress of economic stagnation.** Restrictions have been the main constraint to economic competitiveness and have pushed private investment levels to among the lowest in the world. Restrictions on Area C[3] are among the most detrimental to economic growth, and World Bank analysis has reported that access to Area C could increase the gross domestic product (GDP) by 35 percent and would be expected to lead to a 35 percent increase in employment. The World Bank estimates that GDP losses in Gaza, since the blockade of 2007, are above 50 percent—in addition to large welfare losses.[4]

4. **The reconstruction of Gaza following the 2014 conflict with Israel is progressing but needs to accelerate.** Out of the US$3.5 billion pledged by donors at the Cairo Conference in October 2014, 46 percent has so far been disbursed. The entry of materials into Gaza needs to be accelerated, particularly as efforts shift toward long-term recoveery projects. The Gaza Reconstruction Mechanism (GZRM) has been fairly effective at facilitating materials for minor home repairs and at increasing the transparency of the review and approval process. However, more complex infrastructure projects face long delays depending on the type of material and equipment needed.

5. **Opportunity and outcome gaps between women and men persist in West Bank and Gaza.** According to the West Bank and Gaza Gender Action Plan (WB&G GAP) FY15–17, women in Gaza suffer from worse educational and health outcomes compared to men. Female labor participation rate in the

[1] World Bank. 2016. *Economic Monitoring Report to the Ad Hoc Liaison Committee.*

[2] One of the priorities of the World Bank's draft Assistance Strategy FY18-19 for the West Bank and Gaza is to support a bottom-up approach to create high-quality and inclusive jobs by supporting MSMEs and entrepreneurs.

[3] The West Bank is divided into three areas: Area A, which makes up 18 percent of the land area, is where all of the Palestinian cities are located. For both civil matters and security, Area A is controlled by the PA. Area B, which makes up 22 percent of the land area, is made up of largely rural areas. For civil matters, it is under PA control; however, Israel is in charge of the security. Area C, which makes up 60 percent of the land area, is under full Israeli control for both civil matters and security. Thus, the PA does not control the movement of goods, people, land allocation, and permits for construction in Area C.

[4] World Bank. 2016. *Economic Monitoring Report to the Ad Hoc Liaison Committee.*

country is the lowest in the Middle East and North Africa Region. Women also experience wage gaps and face a general societal disadvantage which prevents them from accessing more and better jobs.

B. Sectoral and Institutional Context

6. **In the last two decades, a sustained reform process supported by the donor community has improved and consolidated the energy sector from a fragmented municipally-based system to a more efficient single-buyer model**. The Palestinian Energy and Natural Resources Authority (PENRA) was established in 1995 and its mandate was consolidated with the approval of the 1997 'Letter of Sector Policy'[5] which highlighted the key institutional reforms needed by the sector. The reform consolidated the electricity distribution services of numerous fragmented municipalities and village councils (MVCs) into larger distribution companies (DISCOs) to benefit from the economies of scale. Currently there are six DISCOs (five in West Bank and one in Gaza). Despite the MVCs' legal obligation to transfer their electricity services to DISCOs, 150 MVCs have not done so yet due to several reasons, among which are weak municipal finances, suboptimal cooperation between the PA and the municipalities, and cross-subsidization from the electricity to other municipal services. In 2009, the Palestinian Electricity Regulatory Council (PERC) was established with the mandate of regulating and monitoring the energy sector. In 2013, the Palestinian Electricity Transmission Company Ltd (PETL) was established with the mandate to be the single buyer and transmission system operator for the Palestinian energy sector. Table 1 below provides an overview of key sectoral facts.

Table 1. Key Features of the Electricity Sector in the West Bank and Gaza

West Bank	Gaza Stri
Population (number): 2,930,000 Electricity demand (GWh): 4,380 Electricity supply (GWh): 4,150 Sources of supply: Jordan and Israel Domestic generation: 15 MW of distributed solar Transmission: None (4 HV substations yet to be energized) Distribution: 5 DISCOs (JDECO, NEDCO, SELCO, HEPCO, and TEDCO) and several municipalities and villages councils Regulation: PERC except East Jerusalem which is regulated by Israel Public Utility Authority (PUA)	Population (number): 1,880,000 Electricity demand (GWh): 2,461 Electricity supply (GWh): 1,890 Sources of supply: Israel, Egypt, and Gaza Power Plant (GPP) Domestic generation: 60 MW GPP (140 MW rated capacity) Transmission: None (161 kV line from Israel in planning stage) Distribution = 1 DISCO (GEDCO) Regulation = PERC, but mandate not effective in Gaza

Source: Palestinian Energy and Environment Research Center.
Note: JDECO = Jerusalem District Electricity Company; NEDCO = Northern Electric Distribution Company; SELCO = Southern Electric Company; HEPCO = Hebron Electric Power Company; HV = High Voltage; TEDCO = Tubas Electricity Distribution Company; GEDCO = Gaza Electricity Distribution Company Ltd.

7. **The 'net lending' caused by the electricity sector drains around 6.8 percent of the PA revenues.[6]** For years, the PA has subsidized non-payers of electricity, including DISCOs, municipalities, and village councils, creating a moral hazard in the electricity system through the mechanism known as 'net lending.'[7]

[5] 'Palestine National Authority, The Palestine Energy Authority, The Power Sector, Letter of Sector Policy', August 7, 1997.
[6] Source: Ministry of Finance (MOF), for 2016.
[7] **'**Net lending' refers to the process by which Israel deducts a portion of unpaid electricity bills, owed by Palestinian distributors, to the IEC—which supplies over 95 percent of the energy to the West Bank – from collection revenues that are collected by the Israeli MOF on behalf of the PA. This process essentially forces the PA to indirectly pay for the outstanding bills of DISCOs through collection revenues destined for the national budget.

In 2014, the World Bank conducted a detailed study to better understand its causes[8] and concluded that a lack of transparency, weak governance, poor sector performance, and political factors are among its key drivers. Alongside a continuously increasing electricity consumption, nonpayment of electricity services has also grown, reaching 58 percent of the total cost of imports of the Israel Electric Corporation (IEC) (US$381.3 million in 2013).[9]

8. **Consolidation of the PETL as a single buyer, Transmission System Operator and key sector player has been delayed because of the large accumulated debt of Palestinian electricity distributors to IEC, which amounted to US$534 million equivalent (ILS 2.03 billion).[10]** Currently, IEC deals directly with distributors (6 DISCOs and 150 MVCs) selling power and collecting payments on over 280 connection points leading to an inefficient power supply. To reduce the number of bilateral transactions between IEC and Palestinian service providers, the PETL was established in 2013 to act as the single buyer of electricity with the goal to purchase power from suppliers, that is, IEC, future independent power producers (IPPs), Egypt, Jordan, and to distribute it to Palestinian DISCOs, which in turn would distribute it to end customers. Thus, there would be one channel for power transactions between Israel and the Palestinian territories, and Palestinian service providers would be accountable to a single entity. The PETL is fully staffed and operational, owing to the World Bank and other donor support, that funded this interim period. The resolution of the large Palestinian outstanding electricity debt is a condition for IEC to further improvements of the Palestinian electricity sector, including energizing two HV substations, which could pave the way for the PETL's financial sustainability.

9. **On September 13, 2016, the PA and the GoI agreed to resolve past electricity sector debt and agreed on general principles for a future Palestinian energy market.** This agreement confirmed the role of the PETL as the sole purchaser of electricity in the Palestinian territories. The commercial relationship between IEC and the PETL would be governed through a Power Purchase Agreement (PPA) to be signed within six months of signing the PPA. This is yet to happen. In addition, four HV substations financed by the European Investment Bank and constructed by IEC in the West Bank would be energized, bringing critical additional power supply and reducing losses.

10. **Despite significant improvements in the electricity sector's performance, further efforts are required to achieve sustained improvements, address power supply constraints that limit MSME growth and job creation, and ensure successful implementation of the Israeli-Palestinian electricity debt agreement.** DISCOs' electricity bill collection rates increased from 52 percent (2007) to 84 percent (2015) on average due to the companies' decisive actions supported by the World Bank and other donors under the US$140 million Electric Utility Management Project approved on April 2008 (now closed). Network losses (technical and nontechnical) remain a major source of concern, because 25 percent (2015) of the power purchased is lost and cannot be billed to the end customer (up from 19 percent in 2007). Overall electricity sector efficiency[11] improved from 42 percent (2007) to 63 percent (2015) but still leaves significant room for improvement. The success of the new electricity debt agreement depends on the fact

[8] World Bank. 2014. *Assessment and Action Plan to Improve Payment for Electricity Services in the Palestinian Territories*, (also referred to as 'Net lending' study).

[9] World Bank. 2014. *Assessment and Action Plan to Improve Payment for Electricity Services in the Palestinian Territories*, (also referred to as 'Net lending' study).

[10] Data as of September 2016.

[11] Defined as (1 – losses) x collection rate, which represents the amount of electricity collected by the DISCOs as a percentage of the total electricity purchased from suppliers.

that the PETL pays 100 percent of the power purchased to IEC. In turn, DISCOs and end consumers need to follow suit along the value chain.

11. **PERC has proven its capacity to monitor and regulate the energy sector, but its role needs to be strengthened.** PERC proposed the existing unified tariff for all DISCOs in the West Bank and is responsible for its revisions. Moreover, PERC provides licenses to DISCOs and monitors their financial, technical, and operational performance parameters, including losses and collection rates. The PA has shown its commitment to strengthen the role of PERC, but further donor support is required for TA and to help address the financing gap.

12. **The almost 2 million people living in Gaza suffer from severe electricity shortages due to the inability to implement sustainable power supply options.** Available power supply in Gaza only meets half of the demand, resulting in rolling blackouts where 8 hours of electricity supply are followed by 8 hours of power cuts. During winter and summer peak load conditions, the situation deteriorates and power is only available 3–4 hours per day. This recurrent situation frequently leads to mass protests and anger toward the PA and DISCOs. To address these emergencies on time, bilateral aid from countries such as Qatar or Turkey provide large sums of funding for additional emergency diesel fuel for the highly inefficient and expensive GPP[12]. Alternative solutions to provide more sustainable supply options, such as increased imports from Egypt and Israel, and an expansion and rehabilitation of the GPP to run on natural gas instead of diesel, have been in negotiations for over a decade. However, none of them has progressed due to a political stalemate. Development of distributed solar PV could improve the living conditions of a significant number of households, while a solution to the other power supply options is under development.

13. **Gaza Electricity Distribution Company (GEDCO) is highly unpopular with the population due to poor service provision.** Because power rations are delivered to neighboring blocks on alternating schedules, customers connect illegally to neighboring networks to increase the number of hours of supply to their homes. In addition to these illegal connections, electricity is lost in the network because of the poor physical state of the infrastructure. Given the high unemployment rate and people's unwillingness to pay for such poor service provision, collection rates are in the range of 40–60 percent. Improvements in service provision would enable GEDCO to work with the population to reduce losses and improve collection.

14. **Improving energy security in the West Bank and Gaza could contribute to narrowing the gaps between females and males in accessing more and better income-generating opportunities, and in health and education outcomes**. Women are often responsible for performing household chores, and a lack of access to reliable modern energy increases their manual workload and reduces time that can be spent on income-generating and educational activities. The drudgery of fulfilling household tasks manually also has implications for women's overall health and well-being. Enhanced energy security can increase productive time for work and study, contributing to improved educational outcomes, access to higher-earning jobs, and increased entrepreneurial opportunities for women. Lack of access to energy also increases disparities in health between females and males. Women and children carry significant health risks due to indoor air pollution resulting from the use of solid fuels for cooking and heating

[12] The only large scale generation capacity in the Palestinian Territories is the Gaza Power Plant**.** The 140 MW diesel-fired plant was developed as an Independent Power Project and has been operating since 2004 on a 20-year Power Purchase Agreement involving significant take-or-pay capacity charges. Due to the high cost of diesel, the plant is so expensive to operate that it can typically be run only at half capacity.

purposes. Enhanced energy security can improve women and children's health through reduced indoor air pollution.

C. Higher Level Objectives to which the Project Contributes

15. **This project is well aligned to the forthcoming World Bank Group's Assistance Strategy for the West Bank and Gaza (under preparation, to be discussed by the Executive Directors in FY18 Q2), whose overarching objective is to create conditions that incentivize the private sector and simultaneously mitigate the risks faced while investing in a fragile and uncertain environment.** The proposed strategy is structured around two pillars: Stimulate an environment for dynamic, inclusive private sector growth for job creation and strengthen institutions' accountability and capability toward protecting the most vulnerable and building the public's trust. The project supports the PA in improving the electricity distribution service and revenue recovery, strengthining the financial sustainability of the sector, and creating a conducive environment for private sector investment in power generation.

16. **The project supports the World Bank Group's strategic goals of ending extreme poverty and boosting shared prosperity in a sustainable manner because it will have significant co-benefits for people living in fragile and conflict-affected situations**. The project is in line with the World Bank's regional Middle East and North Africa strategy by supporting two of its pillars: "Renewing the Social Contract" and "Recovery and Reconstruction". The project's support to DISCOs to improve their operational performance and electricity service quality through a Revenue Protection Program (RPP) would contribute to renewing the social contract. The roof-top solar PV sub-project will pilot a business model, which could contribute to rapidly increasing the penetration of solar energy in Gaza.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

17. The Project Development Objective (PDO) is to enhance the energy sector's institutional capacity, improve efficiency of the distribution system in targeted areas, and pilot a new business model for solar energy service delivery in Gaza.

Project Beneficiaries

18. **The project beneficiaries include consumers, service providers, taxpayers, and the PA.** From a PA standpoint, increased cost recovery for electricity imported from IEC will reduce subsidies through the net lending mechanism. This reduction would also benefit Palestinian taxpayers and citizens who would benefit from additional public services due to lower reduction of tax revenues from the PA's budget. Increased collection rates and reduced system losses would also improve the creditworthiness of the energy sector and its attractiveness to investments in additional supply. Consumers in Gaza will also benefit from increased reliability of power supply from the solar energy pilot**.**

PDO Level Results Indicators

19. Key results indicators are as follows:

- PETL collection rate[13] from DISCOs (%)
- Electricity losses per year in the project area[14] (Percentage)
- People provided with new or improved electricity service (Number, disaggregated by gender)

III. PROJECT DESCRIPTION

20. The proposed project aims to improve the efficiency of the Palestinian electricity sector, reduce system losses, and pilot a business model for solar rooftop energy in Gaza in support of energy security goals. These objectives will be achieved through several interventions along the Palestinian energy supply chain, from generation, distribution, transmission, to regulation. The project will also have climate change co-benefits as it is expected to reduce 42,000 tons of CO_2e over its lifetime.

A. Project Components

Component 1: Strengthening the Capacity of Palestinian Electricity Sector Institutions: PETL and PERC (US$2.5 million)

21. This component focuses on the sustainability and performance of the PETL and PERC. It would reinforce the PETL's and PERC's operational performance through the following interventions:

Subcomponent 1.1: Strengthen the Capacity of Palestinian Electricity Transmission Company Ltd. - PETL (US$1.8 million)

22. This entails investments to support the technical, operational, and legal functions of the PETL. It would strengthen the PETL's capacity as the single buyer of electricity from suppliers (that is, IEC, future IPPs, Egypt, and Jordan) and as seller of electricity to Palestinian DISCOs. Key investments include the following:

- Testing and commissioning equipment, and metering test bench for the PETL
- Supply of vehicles and fault locator for the Project Management Unit (PMU) and PETL
- Consultant to support PPA negotiations

Subcomponent 1.2: Palestinian Electricity Regulatory Council - PERC (US$0.7 million)

23. This subcomponent supports monitoring, evaluation, and financial audit functions of PERC. It provides funding to monitor the quality of service of DISCOs, tracking key performance indicators, auditing financial statements, and reviewing the use of Enterprise Resource Planning (ERP) systems. This subcomponent will also support PERC in establishing the bulk-supply tariff at the distribution level and retail once the PPA between IEC and the PETL has been negotiated.

[13] Collection rate is defined as the total collected revenue or the total billed revenue.
[14] Electricity losses represent the average total losses of JDECO and HEPCO. This indicator is calculated as the percentage of total billed amount of energy/total purchased amount of energy.

Component 2: Improving the Operational Performance of Palestinian Electricity Distribution Companies (DISCOs) (US$5.3 million)

24. This component focuses on the sustained improvement of operational performance of the five DISCOs in the West Bank. It includes an RPP with improved metering and billing systems. The RPP will reduce commercial losses by installing smart meters for high-end customers and advanced metering infrastructure (AMI). In addition, the component will finance new or upgraded Management Information Systems (MIS) in selected DISCOs to further improve their commercial operations. A US$1 million complementary West Bank and Gaza Energy Sector Programmatic Technical Assistance (P162545) will finance a diagnostic of the existing meters in the utilities' customers and put forward adequate technical specifications and an implementation action plan.

Subcomponent 2.1: Revenue Protection Program (US$3.4 million)

25. The RPP will install smart meters to improve billing and collection for the high-value segment of consumers, which represent the largest electricity consumption and sales. The RPP will also include Advanced Metering Infrastructure (AMI), comprising communication devices, software (Meter Data Management System [MDMS]), and a Metering Control Center (MCC). The functionalities of the AMI and MCC include revenue protection (detection of theft and frauds), automatic meter reading, remote disconnection/reconnection, and load control and outage detection.

26. In total, approximately 13,200 smart meters will be installed to five DISCOs in the West Bank, which will ensure billing and metering of up to 50 percent of sales. The coverage is broken down as follows:

- Hebron Electric Power Company (HEPCO): Smart meters will be installed for approximately 2,600 out of 40,000 (6 percent) consumers, which represent 45 percent of revenues.
- Northern Electric Distribution Company (NEDCO): Smart meters will be installed for approximately 2,000 out of 95,000 (2 percent) consumers, which represent 30 percent of revenues.
- Jerusalem District Electricity Company (JDECO): Smart meters will be installed for approximately 7,200 out of 256,000 (3 percent) consumers, which represent 33 percent of revenues.
- Southern Electric Company (SELCO): Smart meters will be installed for approximately 870 out of 27,000 (3 percent) consumers, which represent up to 20 percent of revenues.
- Tubas Electricity Distribution Company (TEDCO): Smart meters will be installed for approximately 500 out of 25,000 (2 percent) consumers, which represent up to 30 percent of revenues.

Subcomponent 2.2: Management Information Systems (US$1.9 million)

27. This component focuses on providing advanced tools to Palestinian DISCOs in the West Bank that will enable improving key companies' commercial and operational performances. The investment entails incorporating MIS that have the following features:

(a) Commercial Management System (CMS) to support the regular commercial cycle (meter reading, billing, collection, and disconnection/reconnection)

(b) Incident Management System (IMS) for effective attention to customer's complaints due to outages and other issues in electricity supply and fast service restoration

Component 3: Improving Energy Security in Gaza with Solar Energy (US$2.5 million)

28. This component supports the design and implementation of a pilot business model for rooftop solar energy in Gaza. The pilot aims to reduce the barrier to entry for all income levels, including the poor, thereby creating a model that can be easily replicated and rapidly scaled up. Due to limited funding, this pilot will not significantly change Gaza's energy crisis on its own. However, in the long term, the benefits of scaling up rooftop solar will include: (a) increased energy security in case of conflict; (b) longer hours of available power supply; and (c) cleaner and cheaper alternative to stand-by generators.

29. The pilot will aim to install solar systems on the rooftops of residential customers, small and medium enterprises (SMEs), and hospitals for a total of around 1.5 MW installed capacity. Qualified residential and SME consumers who receive rooftop solar systems[15] will pay back the cost in monthly installments until the system is paid off. Hospitals will receive the solar systems as a donation and will be exempt from making any monthly payments. The monthly payments from the residential and SME consumers will then return to a revolving fund that will be used to install more solar systems. The goal for these consumers is to reduce the large up-front cost of rooftop solar systems by allowing them to pay in monthly installments into the revolving fund. To award payment loyalty and good consumer behavior, these beneficiaries will be selected not only based on need but also based on their payment track record. If the existing seed fund for the model is leveraged through additional funds from donors, then more capacity can be installed and a greater number of consumers reached by the program.

30. The selection of beneficiaries will be carried out in phases to allow for incorporation of lessons learned after each round. For each phase, once the beneficiaries and sizes of solar PV systems have been identified against a set of selection criteria, a tender will be launched to select a contractor who will provide the material and carry out the installation of the systems. To ensure product sustainability, contractors will be required to provide a 2-year warranty on parts and installation and have a permanent presence in Gaza so that consumers, including hospitals, can easily reach them in case of any problems. To increase sustainability of the systems, if components need to be replaced after the guarantee period, such as drained batteries, beneficiaries will be able return the component to GEDCO and request for purchase of new components while paying through the revolving fund mechanism.

31. The program will be led by PENRA in collaboration with GEDCO and will build upon the experiences of the latter in rooftop solar systems in Gaza, to achieve higher penetration of this technology among the population. A successful program would improve GEDCO's image within the community and its performance in terms of cost recovery and loss reduction. The management of the revolving fund will be carried out by PENRA's PMU, which already has experience with such mechanisms through a similar Energy Efficiency project led by the French Development Agency (*Agence Française de Développement*, AFD). To ensure full transparency, a controller from the MOF will monitor and manage the revolving fund.

32. This program will build upon the lessons learned from GEDCO's ongoing rooftop solar program that was rolled out in the first quarter of 2017, with almost 200 systems already installed. The West Bank

[15] The initial targeting goal of the revolving fund mechanism will be 70 percent residential and 30 percent SMEs.

and Gaza Energy Sector Programmatic Technical Assistance (P162545) will support the implementation of this component by financing consultancy services for detailed technical specifications of the systems. Special focus will be given to: (a) technical designs and warrantee schemes to maximize quality and minimize costs; and (b) detailed selection criteria to reduce chances of nonpayment while ensuring wide reaching access for beneficiaries. The operation coordinated closely with the proposed Finance for Jobs II Project (P159337), which also has a solar component in Gaza to ensure complementarity.

33. In case the solar program cannot be implemented in Gaza due to deteriorating political and security conditions, the project will be restructured so that the funds can be used instead for solar systems in the West Bank.

Component 4: Technical Assistance, Capacity Building, and Project Management (US$0.7 million)

34. This component will be used to strengthen the capacity of PENRA and support staffing of the PMU for two years. The PMU is located at PENRA's offices in Ramallah. The PMU staff will be integrated in PENRA's payroll after two years to ensure the project's sustainability.

B. Project Financing

35. The project will be financed from the Trust Fund for Gaza and the West Bank (TFGWB) (US$4 million) and co-financed by the Partnership for Infrastructure Development Multi-Donor Trust Fund (PID-MDTF) (US$7 million of which US$2.5 million was preapproved as part of a Project Preparation Grant on June 9, 2016).

Project Cost and Financing (US$, millions)

Project Components	Project Cost - West Bank and Gaza TF + PID-MDTF
1. Strengthening the Capacity of Palestinian Electricity Sector Institutions: PETL and PERC	
1.1: PETL	1.8
1.2: PERC	0.7
2. Improving the Operational Performance of Palestinian Electricity Distribution Companies (DISCOs)	
2.1: Revenue Protection Program	3.4
2.2: Management Information Systems	1.9
3. Improving Energy Security in Gaza with Solar Energy	2.5
4. Technical Assistance, Capacity Building, and Project Management	0.7
Total Project Costs	**11.0**
Front-End Fees	**0.0**
Total Financing Required	**11.0**

C. Lessons Learned and Reflected in the Project Design

36. **The complex and uncertain political environment in West Bank and Gaza (WB&G) has led to significant delays or non-implementation of infrastructure projects.** This situation had an impact on nascent institutions such as the PETL, which was created in 2013 with the assistance of the World Bank and other donors. The World Bank has been engaged in the sector through several operations, most recently, through the Electricity Utility Management Project (closed in September 2016) and the Gaza

Electricity Network Rehabilitation Project (GENRP) under supervision. The PETL was created as a commercial PA-owned company in charge of purchasing all wholesale power from IEC and other IPPs as well as to develop the Palestinian transmission sector. The PETL's commercial operations were supposed to start in the first quarter of 2016 after selling to DISCOs the power imported through four new 161 kV HV substations financed by the European Investment Bank. However, there is still no power flowing through these new substations because IEC is holding their energization until the PA remediates its debt arrears related to nonpayment of electricity purchases. The PETL has therefore not been able to obtain any revenues. There is currently an agreed process between the parties in the right direction, but the PETL still needs donor support to keep operating until it is self-sufficient.

37. **The Palestinian DISCOs still need to focus on improving their total losses (technical and commercial), but they need PA support to enforce regulations and increase electricity payments.** Despite improving their collection rates in the last five years, the DISCOs have not been able to reduce their total losses below 20 percent. The World Bank's 2014 Net Lending Study[16] explained the main reasons for nonpayment for electricity services, including poor management, distorting incentives, and insufficient law enforcement. To improve DISCOs' management capacity to reduce network losses, the study proposed to further roll out smart meters, among other measures. The proposed project enhances the targeting of that proposal by bringing advanced technology to monitor and bill every kWh sold by the DISCOs to their commercial and industrial customers.

38. **Targeted measures focusing on improving DISCOs' revenues through an RPP approach are more cost-effective than large deployment of smart meters.** In many utilities worldwide, as little as 1–2 percent of the total customer base is responsible for as much as 50–60 percent of the utility's total revenue. An RPP protects the revenues from the company's largest customers to ensure its long-term financial viability. RPPs are being implemented widely worldwide with successful results, for example, in Brazil and the Dominican Republic. An RPP has proven to have the following benefits: (a) high returns with lower investments; (b) high precision in fraud and theft detection; (c) negligible costs for meter reading; (d) increased data transparency, accountability, and corporate governance; and (e) improved quality of service to large customers, that is, outage and fault detection.

39. **The penetration of renewable energies in WB&G needs to accelerate the diversification of its energy supply options and improve service quality.** The Palestinian economy depends on the electricity and fuel products imported from Israel. The complex political economy of Mediterranean gas has so far prevented the imports of gas into the Palestinian market. There are advanced negotiations to bring a 400 MW gas-fired Combined Cycle Power Plant in Jenin, north of West Bank, into commercial operation by 2021. Amid higher legal and security complexities, a project to convert the existing GPP to gas imported from Israel is progressing, but it will take a longer time to materialize. In this context, tapping into the large solar potential of WB&G is the only source that can provide energy independence, increase energy security, and contribute to alleviate the recurrent energy crisis affecting the population, particularly in Gaza. The World Bank's 2017 Securing Energy for Development (SED) study confirmed the WB&G large potential in solar energy, which should contribute more decisively in its midterm energy mix.

[16] World Bank. 2014. *Assessment and Action Plan to Improve the Payment for Electricity Services in the Palestinian Territories - Study on Electricity Sector Contribution to Net Lending*. Report No: ACS9393: http://documents.worldbank.org/curated/en/120271468317065014/pdf/ACS93930WP0P1469990Box385388B00OUO090.pdf

IV. IMPLEMENTATION

A. Partnership Arrangements

40. The project will be co-financed by the PID-MDTF (TF071898), which receives contributions from eight donors, including the Government of Norway, to improve the coverage, quality, and sustainability of infrastructure in the WB&G. The operation will therefore coordinate with several donors in that regard.

B. Institutional and Implementation Arrangements

41. **Recipient and executing agency.** The PA, through the Palestinian Liberation Organization (PLO), is the Recipient of the project, while PENRA is the executing agency. PENRA was established in 1995 and its mandate consolidated with the approval of the 1997 'Letter of Sector Policy',[17] which highlighted the key institutional reforms needed by the sector.

42. During project preparation, attention was given to PENRA's technical and implementation capabilities. PENRA has qualified personnel to: (a) prepare and implement the generation, distribution, and transmission activities to be financed under the proposed project; and (b) prepare, supervise, and ensure the quality control of all studies and activities to be carried out under the Technical Assistance component.

43. Attention was also given to anticorruption measures adopted by PENRA within its own organization and in its dealing with consultants and other suppliers. It was noted that all contracts between PENRA and its suppliers include anticorruption clauses to be signed by the contractors. PENRA procedures agree with the provisions of the World Bank's Anti-Corruption Guidelines applicable to the project.

44. **Project management.** PENRA has a well-performing PMU which has delivered tangible results for all donor-funded projects, including the World Bank's Electricity Utility Management Project (closed in September 2016) and the Gaza Electricity Network Rehabilitation Project (GENRP) under supervision. The PMU staff salaries and operational expenditures will be financed by the project for two years. It has been agreed with PENRA that all PMU staff will be absorbed under PENRA's payroll after this date to reduce donor dependency and ensure project sustainability.

45. The PMU core team comprises an interim Project Director, Procurement Officer, Accountant, Project Engineer, and two engineers to provide procurement support. The PMU ensures coordination with the PETL, PERC, and DISCOs on all equipment and technical assistance to be provided under the project. Salaries paid to PETL staff under the project are subject to PENRA's administrative and staff regulations.

C. Results Monitoring and Evaluation

46. Annex 1 provides a full description of the project's Results Framework and Monitoring.

47. The PMU Director, with the support of PENRA's Chairman, will be responsible for compiling the relevant data for each indicator and communicating it to the World Bank before each supervision mission.

[17] 'Palestine National Authority, The Palestine Energy Authority, The Power Sector, Letter of Sector Policy', August 7, 1997.

48. The outputs will be monitored at least twice a year during the World Bank's supervision missions, based on the implementation schedule proposed by PENRA and agreed by the World Bank.

D. Sustainability

49. Sustainability of the institutions supported by the proposed project (Component 1) hinges on: (a) the PETL obtaining revenues from power sales to DISCOs after energization of Jenin and Hebron 161 kV HV substations; and (b) PERC obtaining revenues from licensing of DISCOs. Regarding (a), IEC and the PETL have not concluded a commercial agreement yet to energize the Jenin HV Substation following several rounds of negotiations. The energization of this substation would be the first step toward the start of the PETL's commercial operations, which would lead to the company's operational and financial sustainability with reduced dependence on donor funding. Regarding (b), PERC is already financially autonomous due to the revenues obtained from granting licenses to DISCOs to operate in their areas. The revenues are collected by the MOF, which only transfers funding to cover the salaries of key staff.

50. The sustainability of DISCOs benefiting from the proposed project (Component 2) depends on the commitment of the DISCOs' top management to reduce network losses and the support they receive from the PA and PENRA. In this regard, the creation of an Interministerial Committee to monitor the operational performance of DISCOs and municipalities and their payment of IEC bills was proposed in the 2014 World Bank-funded Net Lending Study. Since then, PENRA has been leading the PA actions to reduce losses and improve net lending, but stronger action through such a committee is required to improve results. The Development Policy Grant under preparation for West Bank and Gaza plans to make the creation of this committee as a prior action.

51. The sustainability of the solar PV project in Gaza (Component 3) depends on the satisfactory demonstration effect of the proposed business model, which could draw significant interest from donors and private sector to scale up decentralized solar PV in Gaza. The success of this project will hinge upon: (a) accurate selection of final beneficiaries and contractor; (b) replenishment of the revolving fund with monthly payments to beneficiaries of solar home systems; (c) availability of qualified after-sales service and spare-parts/consumables.

V. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

52. **The overall risk rating is High.** There are three main risks associated with this operation. Political and governance risk is High. The peace process remains vulnerable and the domestic political situation remains unsettled. Political instability and the long-lasting Israeli restrictions on movement, access, and trade are substantial impediments to project implementation in the Palestinian territories, particularly in Gaza. To mitigate the risk, political and security developments are monitored routinely for the World Bank Group to remain alert to any situation that may require adjustments to its operation. The World Bank Group also partners with local communities, municipalities, nongovernmental organizations, utilities, and educational institutions, which could provide additional modes of implementation to ensure program and project continuity.

53. **Macroeconomic risk is High.** Political instability, including the 2014 war in Gaza and the outbreak of clashes in the West Bank, have remarkably increased the level of uncertainty and negatively affected business confidence. Also, the ongoing system of restrictions on movement, access, and trade imposed by the GoI presents a key binding constraint to private sector investment and economic growth. On the

fiscal side, risks relate to the PA's persistently high fiscal deficit financed through donor grants that have been unpredictable and on a declining path since 2008. Also, the possibility of suspensions of revenue transfers for taxes collected by the GoI on behalf of the PA and the latter's lack of control over public finances and economic management in Gaza significantly add to the risks. A possible further reduction in the level of donor assistance poses significant risks to the sustainability of the macroeconomic and fiscal framework. While the PA has charted a course toward lesser dependence on external aid and is undertaking the relevant reforms, it will take time for the PA to achieve fiscal sustainability and that will only be possible if there is a political settlement that allows for strong private sector-led growth. Thus, a further reduction in the overall level of donor assistance or lack of its predictability is a significant source of risk to the PA's finances and the Palestinian economy as a whole.**Fiduciary risks are High** and could have a negative effect on the achievement of the development objectives. However, close procurement and financial management (FM) supervision as well as preventive actions, for example, technical audits, will reduce the fiduciary risk.

54. **The sector strategies and policies risk is Substantial** because of the PA's policy uncertainties towards Gaza and their potential impact on the solar PV sub-project. However, regular dialogue with PA authorities and close supervision of the project will mitigate this risk. Bank TA to the sector will also serve as a mitigating measure.

VI. APPRAISAL SUMMARY

A. Economic and Financial (if applicable) Analysis

55. The economic analysis covers both the Gaza solar project component and the RPP component. Technical assistance and capacity development components were not included.

56. The economic analysis shows that the proposed solar project component in Gaza is economically viable when including greenhouse gas (GHG) global environmental benefits. The project's economic internal rate of return (EIRR) is 11.7 percent and the net present value (NPV) is US$0.8 million considering a discount rate of 6 percent. GHG emissions reductions for the solar PV component are projected to be 42,000 tons of CO_2e in the main scenario and over the lifetime of the project. If GHG externalities are not considered, the EIRR drops to 7.2 percent[18] and the NPV to US$0.15 million. Table 2 shows the NPV of the project under different discount rates. Details of economic calculations and assumptions can be found in annex 5.

Table 2. Solar PV Component - Sensitivity on Discount Rate (US$)

	3%	6%	9%
NPV without GHG	671,637	154,792	−178,607
NPV with GHG	1,572,077	796,935	301,819

57. The economic evaluation of the solar project component takes a conservative approach to the estimation of benefits. It does not account for several benefits that are difficult to quantify, such as energy security and market development. Lessons from the solar pilot project can facilitate further deployment of solar PV and reduce costs. It is hence quite likely that the EIRR of the proposed project would be higher than estimated results of this analysis.

[18] Following World Bank guidelines of cost-benefit analysis, a conservative approach was followed in the economic analysis and the baseline was considered to be 30 percent diesel and 70 percent IEC grid.

58. The RPP brings down commercial losses attributable to large and medium customers by the installation of smart meters for the commercial and industrial sectors. Two main types of benefits can be associated to reducing commercial losses. First, revenues from high-value customers will increase. This is primarily a financial benefit for the DISCOs. It would generate a welfare gain to the society at large—and therefore also translate into an economic societal benefit—when DISCOs apply the increased revenues to continue investing in improving service quality and expanding electricity access. Second, smart meters influence consumer behavior, resulting in energy savings.

59. With smart meters, consumers become more aware of their consumption and the cost, and they are motivated to use electricity more efficiently. Table 3 shows the results of the economic analysis for smart meters' programs including the five DISCOs, under the assumption that smart meters will reduce 0.5 percent of high-value consumption. The high rate of return reflects the fact that the program would only cover the highest-value customers who have the largest electricity consumption. GHG emissions for the smart meters' component encompassing the four DISCOs is estimated at about 16,000 tons of CO_2e.

Table 3. Economic Analysis of Smart Meters Component

	NPV (US$)	IRR
Without GHGs	1,646,528	47%
With GHGs	2,120,561	56%

Note: Consumer's response to the installation of smart meters: 0.5 percent electricity savings rate. Aggregate results for JDECO, HEPCO, NDECO, SELCO, and TEDCO

60. Other customer societal benefits of the smart meters program are avoided capacity costs, avoided generation capacity costs, enhanced customer service, billing accuracy improvement, informed decision on energy usage, reduced consumption on inactive meters, supply reliability, environmental preservation through reduced peak time usage, increased safety for meter readers and field services personnel, and job boost to the local economy.

B. Technical

61. The proposed project proposes to strengthen the capacity of all institutions involved in the Palestinian energy supply chain, from generation, distribution, transmission, and regulation. Table 4 associates the project components with the main beneficiaries.

Table 4. Project Components and Their Beneficiaries

Project Component	PETL	PERC	DISCOs	Gazan Consumers	PENRA/PMU
1.1	Support operations				
1.2		Increase monitoring of DISCOs			
2.1			Implement an RPP		
2.2			Implement an MIS		
3				Deploy rooftop PV systems	

Project Component	PETL	PERC	DISCOs	Gazan Consumers	PENRA/PMU
4	Technical assistance and capacity building	Technical assistance and capacity building	Technical assistance and capacity building		Technical assistance and capacity building

62. As part of Subcomponent 2.1, an RPP will aim to install AMI, including smart meters, accompanying software, and control centers, for selected DISCOs. The program's aim is to meter and bill every kWh consumed for a 'high value' segment of customers, which represent the largest percentage of overall sales but the smallest number of actual customers. As a result, the program gains maximum benefits in terms of cost recovery based on the minimum investment for metering the largest customers.

63. As part of Subcomponent 2.2, an MIS would be implemented for selected DISCOs. The MIS would be made up of some or all of the following components: (a) CMS used for managing all commercial operations including meter reading, billing, collections, customer service, and so on; (b) IMS used to manage all disruptions to the system including faults, reconnections, customer complaints, and so on; and (c) ERP used to manage all HR, accounting and financial, IT, logistics, and procurement activities.

64. As part of Component 3, a residential rooftop solar program will be launched in Gaza where consumers who could otherwise not afford the up-front cost of rooftop solar systems will be able to receive the systems up front with zero money down, and pay back the cost in installments through a pay-as-you-go financing mechanism until the system is paid off and owned by them. Potential beneficiaries are selected based on their history of paying electricity bills on time and not having any track record of making illegal connections to steal electricity. The initial systems are installed based on the proposed project's available funding. The beneficiaries will repay the total costs in affordable monthly installments automatically deducted from their bank accounts. The repayment flows will be transferred to a revolving fund and used to purchase additional systems once a year. The systems will be composed of panels, batteries, and an inverter that switches automatically between grid, PV, and battery bank based on availability and load.

C. Financial Management

65. The FM assessment for PENRA was carried out during the ongoing GENRP and was updated for this project. The assessment evaluated the institutional capacity of the PMU to implement FM and disbursement under World Bank Guidelines.

66. The PMU will have the overall responsibility for the FM and disbursement of the Grant funds. The PMU has in place an adequate computerized financial system and employs qualified financial staff. It also has a satisfactory track record with the World Bank and other donor-funded projects.

67. A U.S. dollar Designated Account (DA) will be opened for World Bank funds and will be managed by the PMU. Another dedicated separate account will be opened, for the revolving fund only, by the MOF and operated by the PMU in Ramallah.

68. **Revolving fund.** Strong governance arrangement at PENRA should be maintained so that the revolving fund continues to operate properly during and after project implementation. The PMU will ensure that the necessary authority exists for the funds and that the MOF is made aware of all funds established. Revolving funds will follow the MOF financial policies and guidelines. To ensure sound FM, a

comprehensive Financial Policies and Procedures Manual for this revolving fund will be prepared as part of the Project Implementation Manual (PIM). The preparation of an acceptable PIM is a condition for project effectiveness.

69. **Fund flow and accounting.** The revolving fund will be accounted for as a separate accounting entity. The accounts should be kept on accrual basis so that expenditures can be related to revenues and assets made subject to good accounting control. This dedicated account will be separate from other project activities (see annex 3 for fund flow chart). An automated accounting system is used by PENRA. The system can capture all project-related transactions and has the flexibility to permit the establishment of separate cost centers to track and report upon the use of project funds. Also, the system can account for the revolving fund separately. Each loan payable to customers will be matched with the related repayment. PENRA will continue to use the accounting guidelines that will be set in the comprehensive financial policies and procedures during and after project implementation.

70. An external auditor will be hired to audit the financial statements (including the revolving fund financial statements) of the project, based on terms of reference (ToR) acceptable to the World Bank. In addition to the financial audit, the ToRs will be expanded to include a provision on technical audit in accordance with International Standards on Auditing. The cost of the audit will be financed from Grant proceeds. According to the World Bank Policy on Access to Information, issued on July 1, 2010, the audit report with audited financial statements of the project will be made available to the public.

71. The overall FM risk for this Grant is assessed as High mainly because of the risks associated with operating the revolving fund. A detailed description of risks and the related mitigating measures is provided in annex 3.

D. Procurement

72. Procurement for World Bank-financed project components shall be carried out in accordance with the World Bank's Procurement Regulations for IPF Borrowers, dated July 2016, which covers procurement of goods, works, non-consulting services, and consulting services in Investment Project Financing. Furthermore, the PA Public Procurement Law No. 8 of 2014 entered into effect on July 1, 2016. Specific components of the national procurement system (for example National Standard Bidding Documents, single procurement portal, and complaint handling mechanism), which would be acceptable for use in the project, shall be identified as they become available. The 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants', dated October 15, 2006, and updated January 2011, shall apply to the project.

73. PENRA, through the PMU, will continue to hold the overall responsibility for procurement following the same arrangements in place for the GENRP. More specifically, PENRA will act as the World Bank's counterpart for all procurement aspects of the project. PENRA will carry out procurement in close coordination with the PETL, PERC, GEDCO, and other concerned DISCOs who shall take the lead on technical aspects of procurement, starting with the definition of the requirements, specifications, ToRs, and so on up to the inspection of goods and the review of consultants' deliverables and for subsequently advising PENRA to release payments to suppliers/consultants in accordance with the signed contracts.

74. An updated procurement risk and capacity assessment of PENRA was completed to identify potential risks and propose appropriate mitigation measures. The assessment concluded that the enactment of the new procurement law has brought substantial improvement to the legal framework for public procurement on aspects related to efficiency, transparency, accountability, and integrity. However,

implementation of various provisions of the law is still work in progress. Procurement performance for the GENRP has been moderately satisfactory. PENRA, through the PMU, has significant experience in procurement implementation under the World Bank-financed projects; however, due to staff turnover, its capacity may require strengthening in terms of staffing and training. Some of the envisaged procurement packages, especially information and communication technology (ICT), are rather complex and would require specialized skills. PENRA has prepared and the Bank has approved a Procurement Plan for the first 18 months of project implementation. Procurement risk is rated as Substantial.

E. Social (including Safeguards)

75. The project does not trigger the World Bank Resettlement Policy (OP 4.12). The project does not involve any civil work. Under Component 3, 'Improving Energy Security in Gaza with Solar Energy', the installations will be provided on the rooftops of existing household buildings. To ensure poor consumers are also able to participate, smaller solar PV systems will be provided at lower costs. Even though OP 4.12 (Involuntary Resettlement) was not triggered for the above reasons, since this is a Category B project, an Environmental and Social Management Framework (ESMF) has been disclosed and the PIU environmental safeguards officers will screen all the subprojects for social and environmental compliance.

F. Gender

76. **The gender action plan for the proposed project is based on a review of available data and research on the gender situation in West Bank and Gaza.** The project intends to contribute to closing the relevant gender gaps in West Bank and Gaza, particularly in energy security, by: (a) ensuring women's access to solar systems; and (b) increasing women's awareness about solar energy use and the productive uses of solar power. In addition, the project monitoring and evaluation framework will adopt a targeted results indicator that will track the number of female-headed households or SMEs that benefit from this project.

77. Annex 6 presents an overview of specific activities of the gender action plan that are innately a part of the project, those which require incremental efforts, and the associated funding sources that will support the activities.

Table 5. Gender Action Plan

Gender Gap/ Issue	Project Activity	Expected Direct/Indirect Impact	Funding Source
Improve energy security by providing rooftop solar PV to female-headed households and SMEs. Women tend to have less access to credit than men.	• Provision of solar rooftop PV • Targeted financing mechanisms	• Improved energy security • Better household and SME management • Less household and SME expenses for fuel • Reduced time to gather fuel for generator and hence more time for other activities	Trust Fund for West Bank and Gaza (TFGWB)
Promote female entrepreneurship and other types of income-generating activities	• Provide business, marketing, technical solar system repairs skills and access to credit training to female-headed households		Energy Sector Management Assistance Program

	and SMEs benefiting from the solar energy pilot • Establish a network among female-headed household to share experience and business knowledge		

G. Environment (including Safeguards)

78. This project is classified as Category B according to the World Bank Policy OP 4.01 (Environmental Assessment). Project financing will include interventions for installation of rooftop PV solar panels, smart meters, equipment for operation of substations, and other meters installed on the networks. The environmental impacts of those interventions are limited, localized, and easily mitigated. Because the exact locations of subprojects will be fully determined during project implementation, an ESMF has been prepared and consulted by the client, approved by the World Bank, and disclosed both locally and at the World Bank's InfoShop on May 20, 2017.

79. The ESMF identified the potential negative impacts of the investments during construction and operation, for example, noise, dust, interruption of services, health and safety risks, and waste disposal, among others. It includes proposed measures to mitigate the potential risks. It will also include screening methodology for subprojects against safeguards policies, a monitoring plan and implementation arrangements of the ESMF, and any capacity-building needs. A qualified environmental officer at PENRA/PIU will be hired and will be responsible for conducting subprojects' screening, identifying environmental and social risks, liaising with the Environment Quality Authority as needed, and monitoring compliance of beneficiary DISCOs and their subcontractors with the provisions of the ESMF.

H. World Bank Grievance Redress

80. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1: Results Framework and Monitoring

Country: West Bank and Gaza

Project Name: West Bank and Gaza: Electricity Sector Performance Improvement Project (P148600)

Results Framework

Project Development Objectives

PDO Statement

The PDO is to enhance the energy sector's institutional capacity, improve efficiency of the distribution system in targeted areas, and pilot a new business model for solar energy service delivery in Gaza.

These results are at	Project Level

Project Development Objective Indicators

Indicator Name	**Baseline**	**Cumulative Target Values**						
		YR1	**YR2**	**YR3**	**YR4**	**YR5**	**YR6**	**End Target**
PETL collection rate from DISCOs (Percentage)	0.00	0.00	75.00	80.00	85.00	90.00	90.00	90.00
Electricity losses per year in the project area (Percentage)	23.00	23.00	23.00	22.00	20.00	19.00	19.00	19.00
People provided with new or improved electricity service (Number) - (Corporate)	0.00	0.00	2,310	3,840	5,620	7,400	9,300	9,300
People provided with new or improved electricity service - Female (Number - Sub-Type: Supplemental) - (Corporate)	0.00	0.00	693	1,152	1,686	2,220	2,790	2,790

Intermediate Results Indicators

Indicator Name	**Baseline**	**Cumulative Target Values**						
		YR1	**YR2**	**YR3**	**YR4**	**YR5**	**YR6**	**End Target**
JDECO's electricity losses per year (Percentage)	24.00	24.00	23.00	22.00	21.00	21.00	20.00	20.00
JDECO electricity losses per year without refugee camps (Percentage)	18.00	18.00	17.00	16.00	15.00	14.00	13.00	13.00
HEPCO's electricity losses per year (Percentage)	20.00	20.00	20.00	19.90	19.00	18.00	18.00	18.00
SELCO's electricity losses per year (Percentage)	25.00	25.00	24.00	23.00	22.00	21.00	20.00	20.00
NEDCO's electricity losses per year (Percentage)	20.00	20.00	19.00	19.00	18.00	17.00	16.00	16.00

TEDCO’s electricity losses per year (Percentage)	22.00	22.00	21.00	20.00	19.00	18.00	17.00	17.00
Number of smart meters installed (Number)	0.00	0.00	2,640.00	5,280.00	7,920.00	10,560.00	13,200.00	13,200.00
Number of management information systems in operation (Number)	0.00	0.00	0.00	2.00	2.00	2.00	2.00	2.00
Number of HV substations operated by PETL (Number)	0.00	0.00	0.00	1.00	2.00	2.00	3.00	3.00
PERC's audits of ERPs of two DISCOs (Yes/No)	No	No	No	No	Yes	Yes	Yes	Yes
Installed solar PV systems (Number)	0.00	167.00	260.00	390.00	520.00	650.00	800.00	800.00
Installed solar PV systems for SMEs (Number)	0.00	40.00	80.00	125.00	160.00	210.00	250.00	250.00
Installed solar PV systems in female-headed households and SMEs (Number)	0.00	10.00	30.00	50.00	50.00	75.00	100.00	100.00
Grievances registered related to delivery of project benefits addressed (Percentage)	0.00	50.00	100.00	100.00	100.00	100.00	100.00	100.00

Indicator Description

Project Development Objective Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source/Methodology	Responsibility for Data Collection
PETL collection rate from DISCOs	Collection rate is defined as the total collected revenue/total billed revenue.	Biannually	PENRA implementation report	PENRA/PMU
Electricity losses per year in the project area	Electricity losses represent the average total losses of JDECO, HEPCO, SELCO, and NEDCO, the electricity DISCOs directly benefiting from the World Bank funding on Component 2. This indicator is calculated as the percentage of total billed amount of energy/total purchased amount of energy.	Biannually	PENRA implementation report	PENRA/PMU
People provided with new or improved electricity service	It is expected that at least 800 solar PV rooftop systems will be installed in Gaza by the end of the project. Households have six people on average. This is a corporate indicator that will be available in the Operations Portal starting April 1, 2017. Also, the installation of smart meters in high-value customers of DISCOs (mainly industrial and commercial), including AMI will improve the quality of supply of the beneficiaries. Because most of the beneficiaries will be industrial and commercial, one person per smart meter has been accounted. Overall, this indicator adds the beneficiaries from solar PV rooftops (Component 3) and smart meters (Component 2). In Year 2, for example, 260 solar PV x 6 (number of people/households) + 750 meters installed = 2,310.	Biannually	PENRA implementation report	PENRA/PMU
People provided with new or improved electricity service - Female	30% of female beneficiaries are assumed following World Bank estimates.	Biannually	PENRA implementation report	PENRA/PMU

Intermediate Results Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source/Methodology	Responsibility for Data Collection

JDECO's electricity losses per year	This indicator is calculated as JDECO's percentage of total billed amount of energy/total purchased amount of energy.	Biannually	PENRA implementation report	PENRA/PMU
JDECO electricity losses per year without refugee camps	This indicator is calculated as JDECO's total network losses in all its concessionary area except its refugee camps.	Biannually	PENRA implementation report	PENRA/PMU
HEPCO's electricity losses per year	This indicator is calculated as HEPCO's percentage of total billed amount of energy/total purchased amount of energy.	Biannually	PENRA implementation report	PENRA/PMU
SELCO's electricity losses per year	This indicator is calculated as SELCO's percentage of total billed amount of energy/total purchased amount of energy.	Biannually	PENRA Implementation report	PENRA/PMU
NEDCO's electricity losses per year	This indicator is calculated as NEDCO's percentage of total billed amount of energy/total purchased amount of energy.	Biannually	PENRA implementation report	PENRA/PMU
TEDCO's electricity losses per year	This indicator is calculated as NEDCO's percentage of total billed amount of energy/total purchased amount of energy	Biannually	PENRA implementation report	PENRA/PMU
Number of smart meters installed	Total number of smart meters installed, which are financed under the RPP of the project.	Biannually	PENRA implementation report	PENRA/PMU
Number of Management Information Systems in operation	Total number of MIS in operation, which are financed under the project.	Biannually	PENRA implementation report	PENRA/PMU
Number of HV substations operated by PETL	Self-explanatory	Biannually	PENRA implementation report	PENRA/PMU
PERC's audits of ERPs of two DISCOs	PERC audits the use of ERPs in at least two DISCOs to verify that data transmitted to the regulator is sound and of high quality.	Biannually	PENRA Implementation report	PENRA/PMU
Installed solar PV systems	Total number of solar PV systems installed in Gaza under Component 3	Biannually	PENRA implementation report	PENRA/PMU
Installed solar PV systems for SMEs	Number of solar PV systems installed in SMEs. SMEs include "agricultural, commercial and industrial activities involving electricity services as a direct input to the production of goods or provision of services."	Biannually	PENRA implementation report	PENRA/PMU
Installed solar PV systems in female-headed households and SMEs	Self-explanatory	Biannually	PENRA implementation report	PENRA/PMU
Grievances registered related to delivery of project benefits addressed	Grievances related to the project received and responded by the project implementation agency.	Biannually	PENRA implementation report	PENRA/PMU

Annex 2: Detailed Project Description

WEST BANK AND GAZA: ELECTRICITY SECTOR PERFORMANCE IMPROVEMENT PROJECT

1. On September 13, 2016, the the IEC and PA signed an agreement, which settled over US$500 million of Palestinian electricity sector debt, and agreed on principles for establishing a future Palestinian electricity market. It was agreed by both sides, that within six months of signing the agreement (by March 31, 2017), Israeli electricity would be sold to a single buyer in WB&G, the PETL, at a price dictated by a PPA. In addition, four new HV substations owned and operated by the PETL, would become operational, which would increase the quantity of available power in the West Bank and enable the PETL to act as the only bulk supplier of electricity to Palestinian DISCOs and MVCs. The success of the new agreement hinges on the PETL's ability to become commercially sustainable which, in turn, depends on the ability of DISCOs and MVCs to fully recover their costs creating a solid value chain.

2. Due to delays in the energization of the four new substations in the West Bank, the PETL was unable to have the revenue stream required to finance its own salaries and operations. To keep the PETL operational and temporarily bridge the gap until the substations were energized, a project preparation advance from the Electricity Sector Performance Improvement Project (ESPIP), in the amount of US$2.5 million, was approved and became effective in August 2016. The staff salaries and operational expenditures financed by the project preparation advance for the PETL and the PMU are included under Components 1 and 4.

3. Recognizing the need for streamlined and efficient cost recovery mechanisms at the PETL and DISCOs, improved billing, commercial management, and resource optimization systems are planned to be rolled out. In parallel, but separate from this project, the U.S. Agency for International Development (USAID) plans to invest in the commercial management and billing systems required by the PETL for purchasing power from suppliers and selling to service providers. The ESPIP will complement the USAID efforts by looking at the next level down the value chain at the systems required by service providers to purchase power from the PETL and sell to consumers. Details are provided under Component 2.

4. To properly monitor and regulate the electricity sector, PERC must have access to relevant data points from Palestinian service providers. Currently, the data available from different service providers are not uniform or standardized, with some more capable of tracking needed parameters than others. Standardized data collection mechanisms and hardware and IT systems are required so that PERC can more easily track performance parameters of service providers.

5. In Gaza, to address the shortage of energy supply, Israeli and Palestinian authorities are engaged in numerous ongoing discussions, including: (a) an additional 161 kV power line from IEC, which would provide an additional 120 MW of power to Gaza; and (b) expansion and upgrade of the GPP, to run on natural gas instead of diesel, which will be cheaper and more efficient. In parallel, GEDCO is exploring a novel residential rooftop solar program, hoping to tap into the region's large unexplored solar energy resources which would help with the problem of energy security, improve service provision, incentivize payment loyalty, and improve GEDCO's image in the community. Consumers in Gaza who already have such systems explain that during past conflicts, and during peak winter and summer loads, they enjoyed continuous power supply whereas their neighbors were left in the dark.

6. GEDCO is currently self-financing the installation of 500 solar rooftop systems in Gaza to customers with excellent payment history to incentivize payment loyalty. GEDCO has already selected two contractors and has already installed almost 200 systems as of end of April 2017. The proposed

Component 3 builds upon GEDCO's model and experience to optimize and streamline implementation with the goal of paving the way for scaling up a large solar PV program in Gaza.

7. A parallel West Bank and Gaza Energy Sector Programmatic Technical Assistance (P162545), in the amount of US$1 million, funded entirely by the PID-MDTF (TF071898), will provide the necessary input for implementing the project components below through a World Bank-executed Technical Assistance window (TF082220) for work executed by external consultants and World Bank staff.

8. The project components are as follows:

Component 1: Strengthening the Capacity of Palestinian Electricity Sector Institutions: PETL and PERC (US$2.5 million)

9. Sustainability and performance of two key organizations, the PETL and PERC, are the cornerstone of the ongoing transformation of the Palestinian electricity sector. This component will focus on reinforcing the PETL and PERC as follows:

Subcomponent 1.1: Strengthen the Capacity of Palestinian Electricity Transmission Company Ltd. - PETL (US$1.8 million)

10. In September 2016, WB&G and Israel reached a landmark agreement (the 'Agreement') on the repayment of arrears to IEC and paved the way for the consolidation of the PETL as the single buyer of all power produced and imported in the Palestinian territories. The Agreement was achieved through a mix of compensation against revenues collected by Israel on account of the PA, cancellation of part of the arrears by Israel, and rescheduling of the balance. IEC is expected to energize the HV substations once the following conditions are met: (a) a PPA is signed between the PETL and IEC, (b) connection fees are paid by the PETL to IEC, and (c) transfer of connection points from IEC to the PETL. An interim PPA to supply power through the Jenin HV Substation is in an advanced stage of negotiation, but an agreement between IEC and PETL has not been concluded yet.

11. The World Bank and several donors through the PID-MDTF[19] are providing technical assistance to support the PETL and PENRA in the ongoing PPA negotiations with IEC and the GoI. Thus, world-class legal transaction and financial experts are supporting the Palestinian negotiation team to achieve the best possible outcome. To ensure the viability of the agreement in the long run, the PETL and the PA need to avoid repeating the build-up of arrears, which reduced tax revenues for the Government and created a moral hazard as the PA was de facto subsidizing municipalities and DISCOs with poor payment performance.

12. To improve payment performance, the PA passed a resolution to oblige all DISCOs and municipalities to open separate escrow bank accounts into which all electricity revenue will be deposited. Revenues in these accounts will be transferred to a unified account held by the PETL which will then transfer the money to IEC. The World Bank is expected to provide technical assistance support in the

[19] Partnership for Infrastructure Development Multi-Donor Trust Fund.

management of these escrow accounts. Moreover, the PETL will be able to disconnect all non-payers of electricity systematically to enforce payment discipline to electricity distributors.[20]

13. As part of a Project Preparation Advance, approved in June 2016, this subcomponent supports the PETL's staff salaries and operational expenditures for one year, equipment to operate HV substations, and consultancy services. Indeed, the subcomponent will include funding for the following: the supply of vehicles and a fault locator, testing and commissioning equipment and a metering test bench, and a legal and technical consultant for PPA negotiations.

Subcomponent 1.2: Palestinian Electricity Regulatory Council - PERC (US$0.7 million)

14. The electricity regulator is responsible for establishing norms defining parameters characterizing quality of electricity supply (frequency and duration of the interruptions, voltage perturbations, and so on) and commercial attention of customers (maximum time for resolution of complaints on billing, attention through call centers and in commercial agencies, options for payment of bills). In addition, the regulator must also monitor that the service received by captive users meets the standards on quality defined in these norms and reflected in the current tariffs. The electricity regulator will have real-time access to the CMS installed in DISCOs and financed under Subcomponent 2.2 and will therefore be able to measure and monitor quality of service received by the customers from the DISCO.

15. This subcomponent will support PERC in (a) monitoring quality of service of DISCOs in real time through the installation of terminals for remote access from its office to the MIS incorporated by each DISCO and (b) auditing the adequate use of ERP systems by DISCOs financed under Subcomponent 2.2. In addition, once the PPA between IEC and the PETL has been negotiated, this subcomponent will support PERC in establishing the bulk-supply tariff, for sales from the PETL to the service providers, as well as the retail tariff, for sales from service providers to consumers.

Component 2: Improving the Operational Performance of Palestinian Electricity Distribution Companies (DISCOs) (US$5.3 million)

16. A sustained improvement of the operational performance of DISCOs is critical to build a robust self-sustainable Palestinian electricity system, which is the prerequisite for a financially sustainable PETL and smooth relations between Israeli and Palestinian electricity sector counterparts. At the DISCO level, there is a vicious circle of poor service delivery which results in high losses and illegal connections and low willingness to pay, which translates to insufficient revenues for DISCOs.

17. To tackle this problem, a two-pronged approach will be taken. The first is to implement an RPP supported by AMI initially focused on large customers that absorb a high level of electricity but represent a small portion of total customers. The second is to introduce MIS to support commercial operations and financial management of the DISCO. The details are highlighted in the following paragraphs.

Subcomponent 2.1: Revenue Protection Program (US$3.4 million)

18. This subcomponent will finance an RPP with the objective to ensure that every kWh of electricity consumed is metered and billed on a permanent basis for a 'high value' segment of customers. In general,

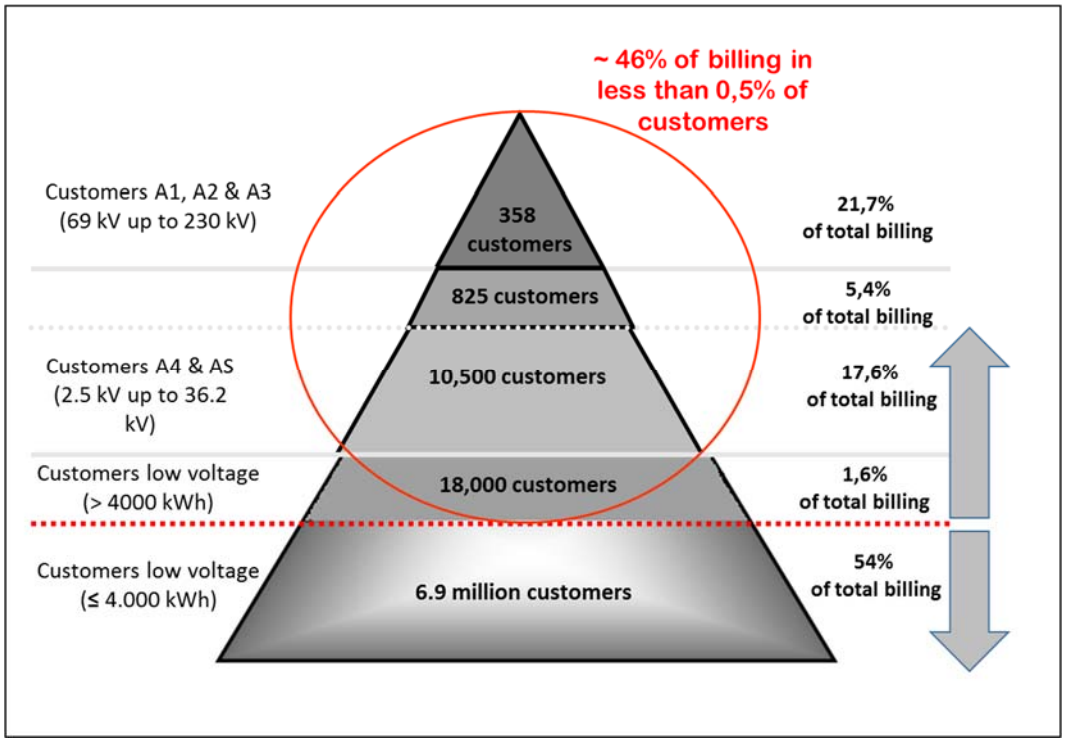
[20] In the current system, IEC supplies power directly to Palestinian DISCOs, municipalities, and village councils through over 200 connection points. IEC has been reluctant to disconnect nonpaying Palestinian customers because of political reasons and the recourse to tax revenues collected by Israel on behalf of the PA ('net lending').

customer segmentations for utilities show the 'Pareto effect' in which a small percentage of number of customers, the company's 'high value' segment, represent the largest sales and potential revenue for the DISCO. The goal of the program is to ensure 100 percent billing and collection from this group, which maximizes the result for the minimum financial investment.

19. The conceptual approach of the RPP is to create a systematic process to monitor and record consumption of large consumers with consistent follow-up and corrective action. Therefore, in addition to the smart meters and related AMI, an MCC must be implemented where properly trained staff can monitor consumption and execute corrective action to mitigate illegal connections or nonpayment. Information obtained in the MCC should be transparently shared companywide and with consumers to enforce regulation and controls.

20. This targeting strategy has proved to be successful in emerging markets such as Brazil, India, and the Dominican Republic and is under implementation in Honduras, Vietnam, Mozambique, Uzbekistan, Madagascar, Rwanda, Bahrain, Mali, and Cape Verde. In the example of the Cemig, the largest DISCO of Brazil, the customers are (see in figure 2.1) represented in a pyramid structure where the bottom of the pyramid represents the large number of small consumers, and the top represents the small number of large consumers. Displayed next to the pyramid is the percentage of billing attributed to each segment of customers. Figure 2.1 shows that the RPP is a cost-efficient strategic alternative to the indiscriminate rollout of smart meters.

Figure 2.1. Example of RPP Customer Targeting in Brazil



21. The RPP will include an AMI comprising the installation of communication devices, software (MDMS), and an MCC. The functionalities of the AMI and the MCC include revenue protection (detection of theft and frauds), automatic meter reading, remote disconnection/reconnection, and load control and outage detection.

22. A separate, US$1 million West Bank and Gaza Energy Sector Programmatic Technical Assistance (P162545) for WB&G will finance a diagnostic of the existing meters in the utilities and put forward adequate technical specifications and an implementation action plan. A study will be conducted to assess the options for locating a control center for all utilities. All utilities will have access to the control center through specialized software. The study will be conducted in parallel to the proposed project and will be complementary to project implementation.

- HEPCO: Smart meters will be installed for approximately 2,600 out of 40,000 (6 percent) consumers, which represent 45 percent of revenues.
- NEDCO: Smart meters will be installed for approximately 2,000 out of 95,000 (2 percent) consumers, which represent 30 percent of revenues.
- JDECO: Smart meters will be installed for approximately 7,200 out of 256,000 (3 percent) consumers, which represent 33 percent of revenues.
- SELCO: Smart meters will be installed for approximately 870 out of 27,000 (3 percent) consumers, which represent up to 20 percent of revenues.
- TEDCO: Smart meters will be installed for approximately 500 out of 25,000 (2 percent) consumers, which represent up to 30 percent of revenues.

Subcomponent 2.2: Management Information Systems (US$1.9 million)

23. The management of Palestinian DISCOs requires advanced tools to support their commitment to improve their companies' commercial and operational performances. Thus, this subcomponent proposes to incorporate MIS where gaps exist at the five DISCOs in the West Bank. This could include, at least, the following features:

- CMS to support all commercial functions: regular commercial cycle (meter reading, billing, collection, and disconnection/reconnection); contracting of new customers; attending to customers in agencies; call centers; web and social media; and so on
- IMS for effective attention to customer's complaints due to outages and other issues in electricity supply and fast service restoration
- ERP to support management of shared services: Accounting, finances, human resources, procurement, logistics, corporate planning, and IT.

24. The installation of MIS in a subset of DISCOs will require updating their databases, that is, customers, finances, human resources, and so on, for the MIS to be effective. As a result, the data of DISCOs will increase in reliability and transparency, which will support improved sector regulations. A US$1 million West Bank and Gaza Energy Sector Programmatic Technical Assistance (P162545) for WB&G will finance a study to assess a detailed assessment on existing software gaps and pressing needs in the selected DISCOs and draft bidding documents to optimize costs.

Component 3: Improving Energy Security in Gaza with Solar Energy (US$2.5 million)

25. The energy situation in Gaza has been deteriorating year after year; however, the 2014 war in Gaza served as a wake-up call when the GPP, as well as the import feeder lines from Egypt and Israel, were damaged in the conflict, leaving hundreds of thousands of people without power. Since then, the efforts to harness the abundant energy of the sun, through distributed rooftop solar systems, have dramatically accelerated in Gaza, especially owing to 80 percent drop in the costs of solar systems over the past five years, leading to an increase of large-scale rooftop solar systems installed from 310 kWp between 2012-2014 to 3,500 kWp since 2014.

26. Two trends can be highlighted from the penetration of solar PV in Gaza: (a) all systems are donations, and (b) most donations are to schools and hospitals. In fact, public buildings such as hospitals, schools, and municipal buildings have traditionally received power from the grid, fuel for generators (including the generators themselves), and rooftop solar systems for free. Therefore, there is a consensus that they are exempt from paying for electricity because they provide a public service. While the international community's solution to the energy crisis in Gaza has been to provide donations to the public sector, relatively little attention has been paid to the residential and SME sectors, with little emphasis on responsible payment behavior.

27. In Gaza, consumers receive power in 8-hour cycles on a best-case basis. During peak summer and winter loads, they receive as little as 3–4 hours of power supply per day. Affluent households and business owners use standby generators during blackouts; however, they are shifting toward rooftop solar systems which are much more cost-effective than generators. Modest households and business owners are unable to pay the up-front cost of rooftop solar systems; however, breaking down the cost into monthly payments makes the system more affordable and accessible to a wider range of consumers. Such monthly financing options are slowly becoming available in Gaza; however, due to the high-risk environment, the private sector and banks are entering slowly and mostly focusing on the high-end customers.

28. This component supports the design and implementation of a pilot business model for rooftop solar energy in Gaza to ensure wider penetration across population segments while creating a model that can be easily replicated and rapidly scaled up. Due to limited available funding, this pilot will not maximally contribute to reducing the energy crisis in Gaza, but in the long term, the benefits of scaling up rooftop solar will include (a) increased energy security in case of conflict, (b) longer hours of available power supply, and (c) cleaner and cheaper alternative to stand-by generators and more. Preparation of this component was done in close coordination with the proposed Finance for Jobs II Project (P159337) that also supports solar energy in Gaza, but focused on the private sector, to ensure complementarity.

29. **Design.** The pilot will aim to install solar systems on the rooftops of residential customers, SMEs, and hospitals for a total of 1.5 MW installed capacity. Qualified residential and SME consumers who receive the rooftop solar systems will pay back the cost in monthly installments until the system is paid off. Hospitals will receive the solar systems as a donation and will be exempt from making any monthly payments. The monthly payments from the residential and SME consumers will then return to a revolving fund that will be used to install more solar systems. If the existing seed fund for the model is leveraged through additional funds from donors, then more capacity can be installed and a greater number of consumers reached by the program.

30. **Targeting.** The initial targeting goals of the program will be 70 percent residential sector and 30 percent SMEs. The goal for these consumers is to reduce the large up-front cost of rooftop solar systems by allowing them to pay in monthly installments into the revolving fund. To award payment loyalty and good consumer behavior, these beneficiaries will be selected not only based on need, but also based on

their payment track record. The program will also include a pure grant component for providing rooftop solar systems to essential public services in Gaza, such as critical lifesaving units in hospitals. These participants will not participate in the revolving fund and their selection will be solely based on urgency and need.

31. **Detailed design.** As much as possible, GEDCO's existing business model will be followed to build on top of and improve an existing framework. The West Bank and Gaza Energy Sector Programmatic Technical Assistance (P162545) will be used to fine-tune and improve GEDCO's model by investigating: (a) optimal technical designs to maximize quality and minimize costs, (b) optimal selection criteria to reduce chances of nonpayment while ensuring wide reaching access for beneficiaries, (c) warranty schemes to ensure system quality and longevity of the systems and more. Efforts will be made to keep the design simple and streamlined to create an initial business model that is simple to replicate. As the program rolls forward and the various parameters are better understood, additional layers of complexity can be introduced.

32. **Rolling out through the public sector.** The program will initially be led through the public sector (PENRA and GEDCO) to build upon successfully proven management, procurement, and fiduciary systems, which will allow for successful implementation in a complex environment. The collaboration with GEDCO will allow to access its consumer databases and consumer payment history and to tap into the experience of the staff to better enforce payments. A successful program would also benefit GEDCO by improving their image within the community and increasing their control over the sector, thereby helping improve cost recovery and reduce losses.

33. **Scaling up through the private sector.** Given the high unemployment rate and history of nonpayment in the electricity sector, the private sector in Gaza currently focuses mostly on affluent customers. This pilot project aims to provide a sustainable business model that opens the solar sector to a wider spectrum of consumers and provides a road map for private banks to adopt the model and rapidly scale up. The proposed project will provide useful information, that is, customer's payment capabilities, for other projects developed by donor partners such as the AFD, which will launch the Sunref project by end-2017 to roll out distributed solar PV in the West Bank and Gaza through financial intermediaries. In Gaza, the penetration of solar systems to a wider range of customers through the local banking system will require concessional financing or additional grant support from the international community.

34. **Selection criteria.** The selection criteria will be agreed upon jointly between GEDCO, PENRA, and the World Bank team and may include: (a) availability of rooftop space, (b) historical consumption patterns, (c) payment history, and (d) no record of illegal connections and more. A core team based in Gaza and made up of GEDCO and PENRA staff will announce the program to the public and will screen the applicants against the selection criteria. The final list of beneficiaries will be sent to PENRA Ramallah for approval (see figure 2.2).

35. **Monthly payments and theft prevention.** Applicants should have a bank account into which they receive a regular salary. Consumers without a bank account, and without a salary, will be considered in subsequent phases of this program once the baseline has been better established. The bank accounts will be set up for automatic withdrawal, on a postpaid basis, for the monthly payments. The debited amount will then be transferred automatically to the revolving fund account in Ramallah. The monthly payments will not flow through GEDCO. Once a beneficiary is selected, they will draft a contract with GEDCO, stating the penalties in case of nonpayment. This could include turning off the grid electricity supply to the consumer, dismantling the rooftop solar system, and more. GEDCO has agreed to provide a 10 percent

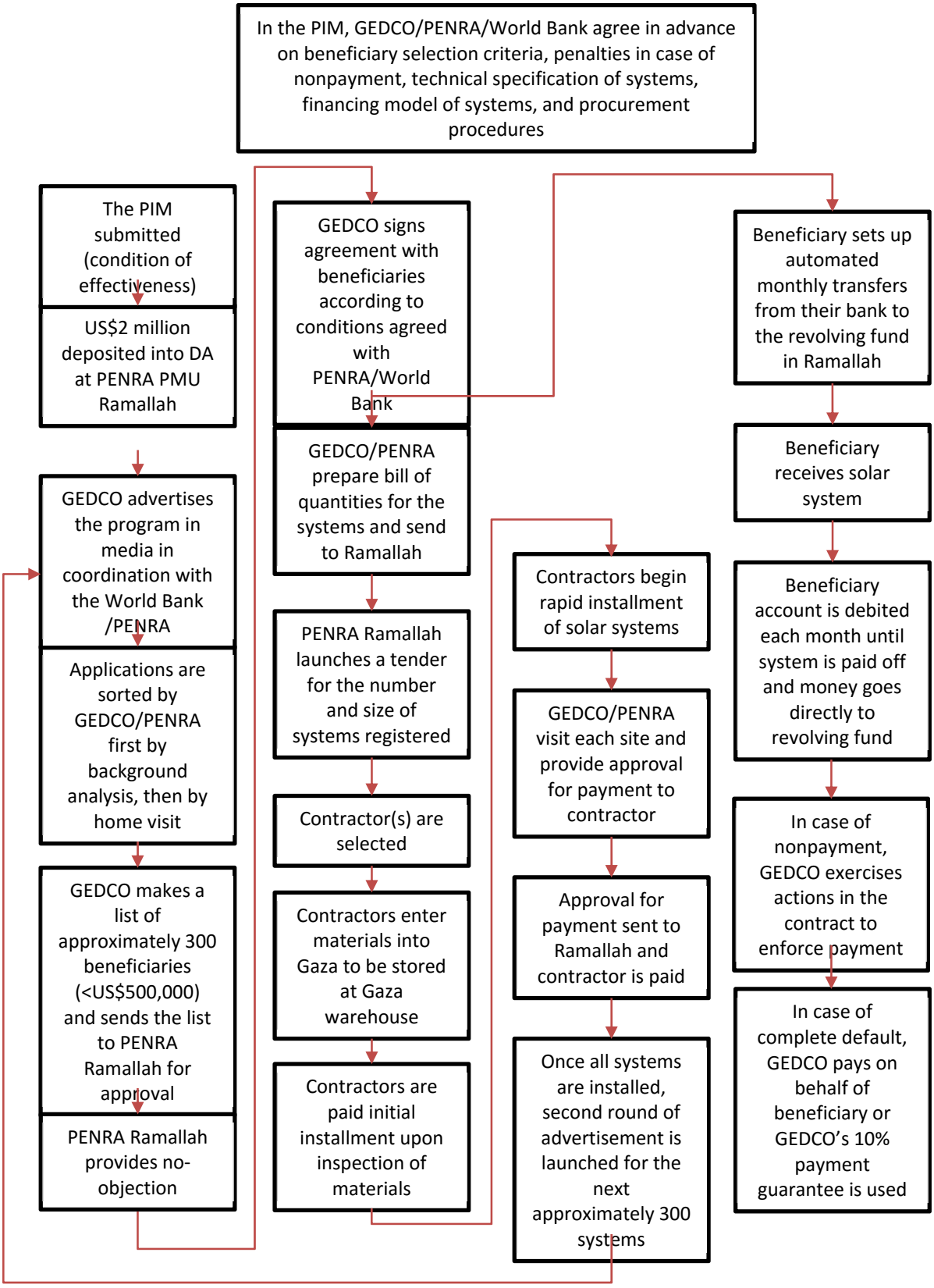
up-front bank guarantee, valid for the life of the project, and cover the full amount of loans that are deemed defaulted according to a clear protocol to be explained in the PIM. This mechanism ensures that GEDCO will be diligent in selecting beneficiaries and following up on nonpayment issues.

36. **Revolving fund management.** The revolving fund would be managed by PENRA's PMU. The PMU already has experience working with a revolving fund, as part of an energy efficiency project led by the AFD. A controller from the MOF would monitor the revolving fund for transparency and coordination.

37. In case the solar program cannot be implemented in Gaza due to deteriorating political or security conditions, the project will be restructured and the funds will be used instead for solar systems in the West Bank.

38. **Procurement**. The program will follow the same procurement mechanism used for existing programs such as the GENRP. The initial US$2.5 million would be deposited in the DA at PENRA Ramallah. No funds would, at any point, flow through Gaza or GEDCO. The system specifications will be designed jointly between GEDCO, PENRA, and the World Bank. The program will be rolled out in phases so that each subsequent phase includes lessons learned from the previous round. For each round, GEDCO will advertise the program and accept and sort applications together with PENRA team in Gaza. Once the number and sizes of systems are known, a tender would be launched for selection of the contractor. The contractor will supply the material and carry out the relevant installations. As systems are installed, GEDCO and PENRA Gaza teams will carry out inspections and provide no-objection to PENRA Ramallah to pay the contractor. The procurement and FM flow charts are outlined in figure 2.2

Figure 2.2. Procurement and Financial Management Flow Charts



39. **Material entry into Gaza.** Coordinator of Government Activities in the Territories (COGAT) approvals is needed for material entry, specifically of batteries, which are a dual-use item, into Gaza. If a green signal is not given, then rooftop solar systems without battery backups will be installed, which will allow a larger number of rooftop solar systems to be implemented because of reduced system costs. If a green signal is given, but material entry becomes difficult, there are existing mechanisms that can be followed to facilitate material entry, including the GZRM which has already coordinated the entry of material for similar projects.

40. **Program costs.** Following GEDCO's existing rooftop solar program, the winning contractor's bids was US$4,400 for a 3 kWp system, US$2,673 for a 2 kWp system, and US$1,831 for a 1 kWp system (all systems include only 1.5 year warranty), for an average of US$1,540 per kWp. Under the new rooftop solar program proposed here, the system costs may be different as the lessons learned from GEDCO's existing designs are incorporated and as the Programmatic Technical Assistance helps optimize the designs for quality and cost. In addition, the new systems should provide a 2-year warranty on all parts and installation as opposed to GEDCO's 1.5 years of warranty.

41. **System sizing.** The PCBS reported that average monthly household consumption in Gaza for 2015 was 265 kWh per month; however, considering suppressed demand (due to lack of available electricity) and inflated demand (due to overconsumption stemming from nonpayment), it is estimated that the actual monthly consumption would be 36[21] percent higher at 360 kWh per month. To meet half of this average demand from a solar system (assuming that the other half will be met by the grid through the 8ON-8OFF power schedule), a rooftop solar system of 1 kWp size would be required. Vendors in Gaza state that 2 kWp and 3 kWp systems are also in demand for consumers with higher monthly demands ranging from 700 to 1,100 kWh per month, respectively.

42. **Affordability.** Household expenditure surveys from Gaza were analyzed to identify the monthly income for each 10 percent (decile) of the population, where each decile represents 31,000 households. Internationally, an acceptable threshold for how much a household should be spending on electricity is 5 percent of the monthly income. The monthly affordable threshold, for electricity payments per decile, are shown in table 2.2.

Table 2.1. Affordability Limit for Monthly Electricity Bill Payment per Decile

Income Deciles	1	2	3	4	5	6	7	8	9	10	Total
Affordability[a] (US$)	17	27	35	42	49	58	67	81	102	168	51

Note: a. Affordability is defined as 5 percent of household expenditures as of 2016.

43. **Payback scheme.** Experience from Lighting Africa projects indicates that shorter payback periods are better as they decrease the chances of nonpayment. On the other hand, longer payback periods reduce monthly payments and allow a wider range of income classes to participate. GEDCO's current plan opts for an 18-month payback period. Under this plan, only the top 20 percent of consumers would be able to participate in the program as the monthly payments for the smallest 1 kWp system would be over US$100 per month. Instead, if a 48-month payback period is adopted, the top 80 percent of consumers can participate in the program with the monthly payments for 1, 2, and 3 kWp system being US$38, US$56, and US$91 per month, respectively, which is significantly more affordable.

[21] Based on the SED study, Gaza has large suppressed demand due to the rolling blackouts but also inflated demand due to the overconsumption stemming from nonpayment.

Table 2.2. Monthly Payments for Solar System Based on Size (US$)

Payback Period	18 months	24 months	36 months	48 months	60 months	CAPEX
3 kWp	243	182	122	91	73	4,378
2 kWp	148	111	74	56	45	2,673
1 kWp	102	76	51	38	31	1,831
0.5 kWp	42	31	21	16	13	750

Note: Assuming 0 percent interest rate; CAPEX = Capital Expenditure.

44. **Typical appliances.** A list of typical appliances that each solar system can support is provided in table 2.4. As part of GEDCO's existing rooftop solar program, the contractors provide awareness and education on energy efficiency and demand-side management. As part of this new rooftop solar program, this aspect should be further developed to increase longevity and sustainability of the systems.

Table 2.3. Typical Appliances Supported by a Solar System

	Watts (Average)	0.5 kWp System		1 kWp System		2 kWp System		3 kWp System	
		No. of Appliances	Power (W)	No of Appliances	Power (W)	No. of Appliances	Power (W)	No. of Appliances	Power (W)
Phone charger	5.5	1	5.5	2	11.0	2	11.0	2	11
LED light bulb	8.5	8	68.0	15	127.5	15	127.5	20	170
Ceiling fan	50.0	1	50.0	1	50.0	2	100.0	2	100
25" color TV	150.0	1	150.0	1	150.0	2	300.0	2	300
Fridge/freezer	275.0	0	0.0	1	275.0	1	275.0	1	275
Laptop computer	75.0	1	75.0	1	75.0	1	75.0	2	150
Stove	1,000.0	0	0.0	0	0.0	0	0.0	1	1,000
Space heaters	2,000.0	0	0.0	0	0.0	0	0.0	0	0
Water boiler	2,500.0	0	0.0	0	0.0	0	0.0	0	0
Washing machine	500.0	0	0.0	0	0.0	1	500.0	0	0
Total power system capacity[a]			349.0 350.0		689.0 700.0		1,389.0 1,400.0		2,006 2,100

Note: a. 30 percent lower than rated capacity.

45. It should be noted that up to 10 years ago, Gaza enjoyed the same 24-hour electricity supply as Israel currently enjoys. Therefore, people's household appliances are typical of urban contexts. Figures 2.3 and 2.4 show the variety and prevalence of appliances used in households in Gaza according to a 2016/2017 Local Government Performance Assessment Survey of 1,019 households.

Figure 2.3. Appliances Used by the Bottom 40% in Gaza (2016/2017)

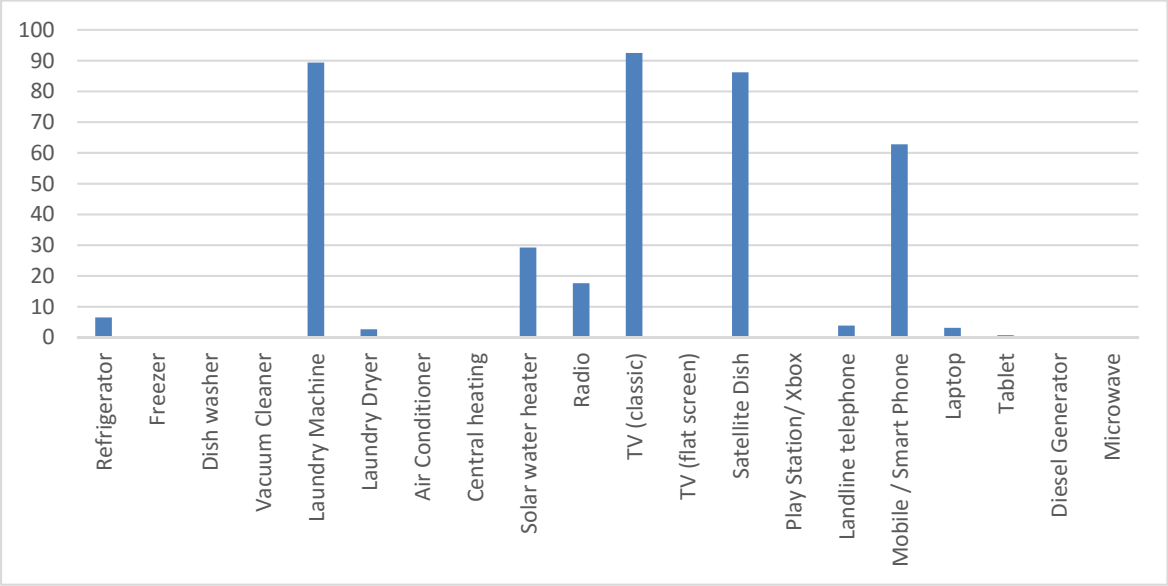
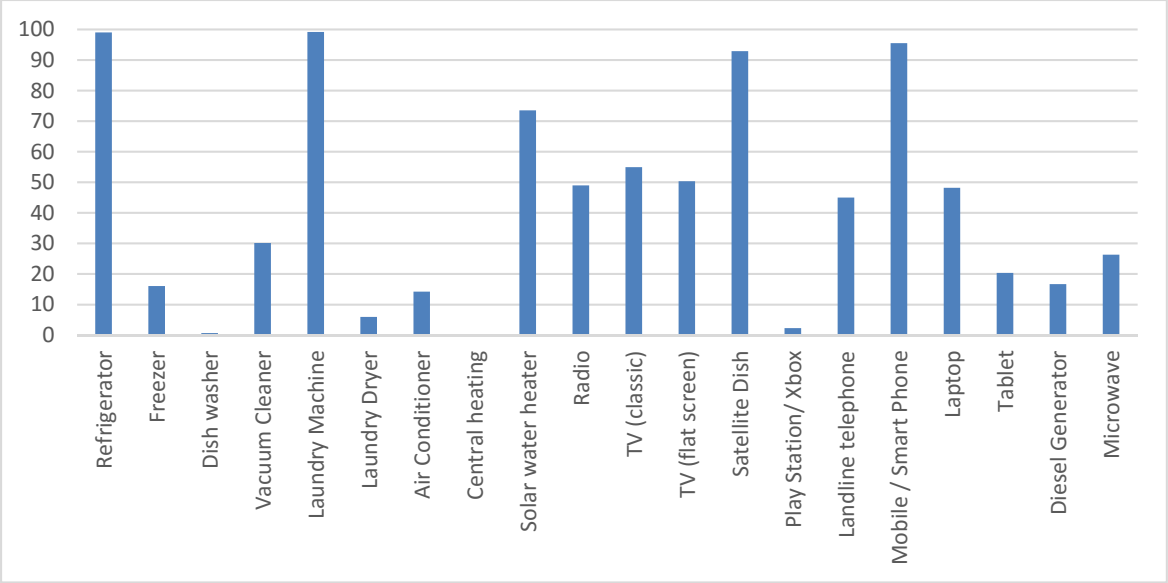


Figure 2.4. Appliances Used by the Top 60% in Gaza (2016/2017)



46. **Technical specifications.** Rooftop solar systems are composed of PV panels, inverters, and batteries. According to GEDCO, the batteries are sized small to increase affordability but can provide 6 hours of electricity at 200 W load during blackouts. Systems are designed to augment the grid electricity and provide a cheaper, more reliable, and independent alternative to backup generators. The inverter is programmed to automatically switch between solar, grid, and battery, based on a preprogrammed prioritization order. Lessons learned from GEDCO's ongoing rooftop solar program will be used when designing the technical specifications of the new program.

47. **Levelized costs.** The levelized cost of energy for small household generators in Gaza ranges from US$0.7 to US$1.7 per kWh depending on the size and type of fuel. This does not include the cost of having to replace the generator every few years due to extensive wear and tear. Between 2011 and 2015, the

average cost of grid electricity charged to consumers by GEDCO was US$0.14 per kWh. The levelized cost of energy for the 1, 2, and 3 kWp rooftop solar systems will range from US$0.11 to US$0.15 per kWh (assuming a 12-year project life, 5 percent discount rate, and battery replacement every 4 years equal to 30 percent of the cost of the system). This analysis shows that rooftop solar systems are well on their way to becoming on par with grid electricity in terms of costs; however, generators are 5–12 times more expensive than grid power.

48. **Warranty, repair, and maintenance.** As part of GEDCO's ongoing rooftop solar program, only 1.5 years of warranty is provided; however, under the new program, 2 years of full warranty, including parts and services, should be provided. In case of armed conflict, the risk of damage is borne by the consumer and it is recommended that systems are designed to be easily dismountable if they need to be brought inside the house to avoid collateral damage during conflict. During the initial two-year warranty period, the contractor will provide all parts and services necessary to ensure that the system is running smoothly. The tender package will specify that the selected contractor will need to have a full-time presence in Gaza to provide rapid service delivery for consumers. Once the two-year warranty period is over, to increase sustainability of the systems, if components need to be replaced after the guarantee period, such as drained batteries, beneficiaries might be able to return the component to GEDCO and request for purchase of new components and pay through the revolving fund mechanism[22] during the life of the project. This ensures quality supply and installation for the beneficiary's system as well as a trusted payment mechanism.

49. **Battery recycling.** Gaza has traditionally had a very active vehicle repair sector; however, interviews with local electricians highlight that no lead acid recycling plants exist in Gaza. On the other hand, exporting lead acid batteries out of Gaza for recycling in Israel is deemed to be difficult due to security concerns by COGAT. In the longer term, it would be useful to consider the creation of a lead acid recycling sector in Gaza. The benefits would include job creation and improved environmental impact for both the rooftop solar, and transport sectors. In this initial pilot, incentive mechanisms must be set up to ensure that depleted batteries would be returned to the contractor at the end of life. This can be done by requesting a small deposit at the start of the program, which would be paid back to the consumer upon the return of the depleted batteries. This mechanism would help consolidate the used batteries in one place for further processing and would act as a model for other vendors in the sector. The consultant recruited under the Programmatic Technical Assistance supporting this component will propose the details of the mechanism.

50. **Lessons learned from previous rooftop solar PV projects in the West Bank and Gaza.** The only major past initiative in the WB&G residential rooftop solar sector was launched by PENRA in 2012, called the Palestinian Solar Initiative. This program aimed to install 1,000 on-grid rooftop solar systems in the West Bank and 400 in Gaza, with a range of 1–5 kWp each, for a total installed capacity target of 5 MW by 2015. Under the plan, residents sold excess power to DISCOs at a high feed-in-tariff which allowed them to reduce their payback period from 25 years to approximately 8 years. The PA was required to pay DISCOs the difference between the cost that they would traditionally pay to purchase power from IEC (approximately ILS 0.4 per kWh) and the feed-in-tariff (initially ILS 1.07 per kWh in 2012). Due to budget constraints, as time passed, the PA could not pay the DISCOs this difference between the IEC rate and the feed-in-tariff and so they began to decrease the feed-in-tariff rate. By 2014, the feed-in-tariff rate had reduced to ILS 0.54 per kWh, which is on par with DISCO retail tariffs and no longer attractive to consumers. As of Q1 2017, only 300 out of the 1,000 planned installations in the West Bank were

[22] The PENRA-GEDCO Agreement and the Project Implementation Manual will provide further details.

completed. Because the systems are 'on-grid', and the grid in Gaza is only available 50 percent of the time at best, the program did not take off in Gaza.

51. **Other planned rooftop solar PV projects in the West Bank and Gaza.** A list of existing solar projects in Gaza is provided in table 2.1. The table shows a tenfold increase in the volume of rooftop solar systems post the 2014 conflict. The table also shows that the majority of funds have gone to schools and hospitals as donations. In addition to these existing projects, the Palestinian Investment Fund (PIF) plans to roll out 35 MW of solar programs, called the Noor Palestine Solar Fund. The program aims to install 15 MW of ground-based PV farms for the commercial sector and 20 MW of on-grid rooftop solar systems benefiting from a feed-in-tariff but with no storage (5 MW for residential, 5 MW for public sector, and 10 MW for businesses). The program is being rolled out in the West Bank in the first quarter of 2017 and is planned to be rolled out to Gaza at a later stage. As part of this program, the PIF is extending a line of credit to local banks, who are matching PIF funds and then extending financing agreements to qualified clients through 6–12-year payback periods. This business model could work very well in the West Bank although it may be more difficult to adopt in Gaza if the rooftop solar systems are only on-grid.

Component 4: Technical Assistance, Capacity Building, and Project Management (US$0.7 million)

52. This component will finance salaries and operational expenditures of the PMU for two years. The PMU is located at PENRA's offices in Ramallah. The PMU staff will be integrated in PENRA's payroll after two years to ensure the project's sustainability. This component will also finance training for DISCOs, PERC, PETL, and PENRA.

Annex 3: Implementation Arrangements

WEST BANK and GAZA: Electricity Sector Performance Improvement Project

Project Institutional and Implementation Arrangements

1. PENRA is the executing agency of the project. The agency's technical and implementation capabilities were evaluated during project appraisal. PENRA hosts a PMU which has successfully executed the previous World Bank-financed Electricity Utility Management Project that closed in September 2016. The PMU core team comprises an interim Project Director, Procurement Officer, Accountant, Project Engineer and two engineers to provide procurement support. The PMU ensures coordination with the PETL, PERC, and the DISCOs on all equipment and technical assistance to be provided under the project. Salaries paid to PETL staff under the project are subject to PENRA's administrative and staff regulations.

2. The primary responsibilities of the PMU include the following:

- Providing assistance to PENRA on overall project management and implementation supervision
- Preparing bidding documents for procurement packages and executing bidding process
- Monitoring and reporting project performance against the agreed indicators
- Preparing and submitting progress reports to the MOF, PENRA, PETL, PERC, DISCOs, the World Bank and all other financing agencies, as required
- Managing the financial aspects of the project
- Preparing and submitting Interim Financial Reports (IFRs) and disbursement forecasts to the World Bank
- Organizing external yearly audits of project financial statements, including expenditures made through the DAs and statements of expenditure (SOEs)

Project Implementation

3. The estimated period of project implementation is six years. PENRA, with the assistance of the PMU, will be responsible for the implementation of all project components.

Financial Management, Disbursements and Procurement

Financial Management

4. The proposed project will be implemented by the existing PMU located at PENRA's headquarters in Ramallah. PENRA, currently handling the implementation of the ongoing GENRP, will be responsible for record keeping and overall FM. The PMU is adequately staffed with an FM team experienced in implementing similar projects under the World Bank's FM guidelines, policies, and procedures. The PMU will be responsible for handling the FM and disbursements aspects for this project, including preparing and issuing the operating budgets, and all the progress and IFRs and annual audited financial and technical audit reports. It will also be responsible for contract management including the review and approval of

consultants' deliverables and the receipt/inspection and acceptance of goods and works, while the release of payments to the consultant/supplier/service provider/contractor in accordance with the signed contract and maintaining related financial records will be conducted by the financial controller at PENRA.

5. The FM risk is assessed as High due to the operations of the revolving fund. The following is a list of potential risks and mitigating measures:

- The political situation and the imposed access restrictions to Gaza may affect the physical and financial progress of the operation as well as the verification of physical progress on the ground.

- The nature of the project, which involves large contracts, may encourage collusive behaviors. The PMU technical team will review and approve project payment requests before further processing to provide assurance that payment-related activities correlate to goods actually supplied and installed and to physical progress on the ground.

- Limited revolving fund portfolio-related controls. The technical team will review beneficiaries' eligibility criteria before granting loans. The eligibility criteria will be approved by the World Bank and reflected in the POM, which will include, among others,

    - Historical electricity consumption patterns,

    - Payment history,

    - Absence of record of illegal electricity grid connections, and

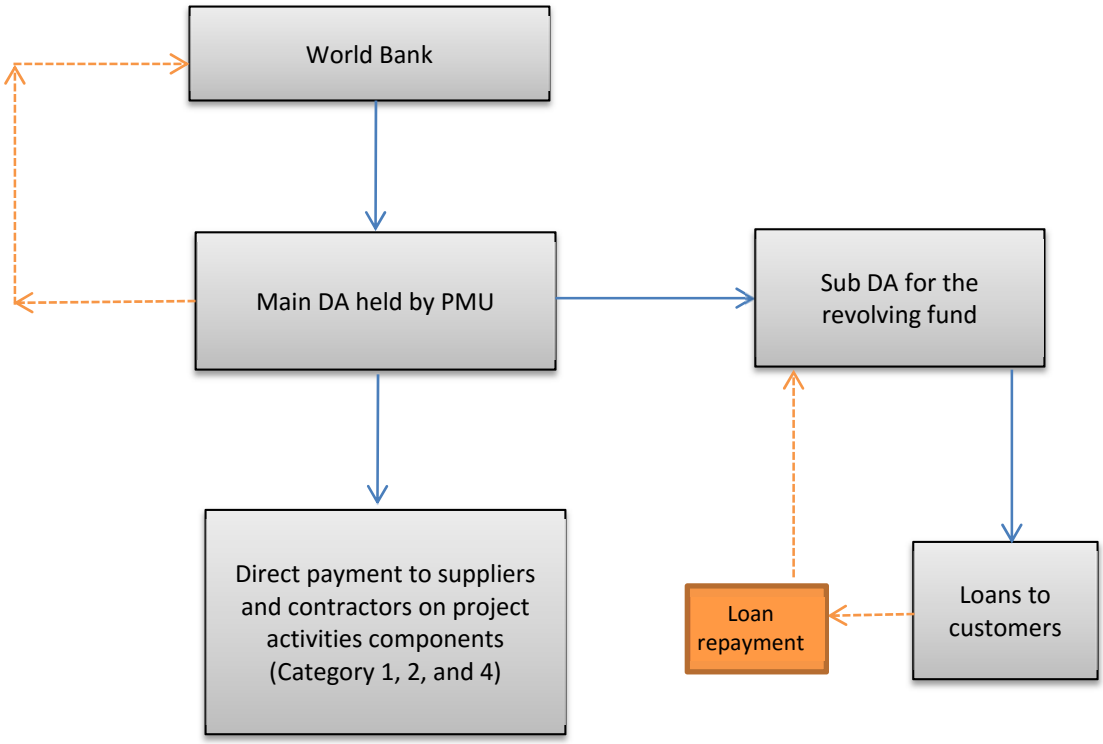
    - Loan repayments deducted automatically from beneficiaries' bank accounts.

- Risk of late and non-repayment of loan obligations by customers causing loss of principal amount of the revolving fund. GEDCO will provide 10 percent up-front bank guarantee based on the value of each tender, valid for 48 months. GEDCO will also cover 100 percent of all loans that are deemed defaulted. In addition, there will be a well-designed borrower screening and close monitoring, through producing portfolio reporting that accurately reflects the status and monthly trends in delinquency, on time.

6. **Nature of a revolving fund.** A revolving fund is a continuing and non-lapsing authorization to make payments out of the Grant fund for asset purchases. The World Bank responsibility for the revolving fund ends on project closure. However, a strong governance arrangement at the implementing entity should be maintained so that the revolving fund continues to operate properly after project implementation (closure).

7. **Budgeting and flow of funds.** A project budget and detailed disbursement will be prepared by project appraisal, and based on the Procurement Plan and implementation schedules, the project budget will be consolidated by the PMU for all projects components. Advances on Components 1, 2, and 4 will be channeled to a main DA opened by the MOF and managed by the PMU, in a commercial bank acceptable to the World Bank (in Ramallah). Additionally, Component 3 (revolving fund) grant will flow from the main account to another sub DA, and loan repayment will also be deposited to this subaccount. No funds will be channeled to Gaza, and the revolving fund, including loan repayments, will be completely managed by PENRA. Figure 3.1 presents the funds flow for the project.

Figure 3.1. Funds Flow for the Project



8. **Internal control.** Project control procedures will follow the PENRA internal control procedures. The PENRA internal control procedures are summarized as follows: (a) PMU technical team review and approval, (b) Procurement Officer review and approval and Financial and Administrative Manager review and approval, and (c) MOF financial controller review. Moreover, internal control over the project, including the revolving fund, will be detailed in the FM Policies and Procedures Manual to make sure that there are clear roles and responsibilities and segregation of duties.

9. **Accounting and reporting.** The revolving fund will be accounted for as a separate accounting entity. The accounts should be kept on an accrual basis so that expenditures can be related to revenues and assets made subject to good accounting control. The PMU will keep adequate records and implement proper procedures to ensure that

- Expenditures are made only for goods and services required to accomplish the objectives of the fund;
- Rates charged for services provided are related to the costs of providing them; and
- To help accomplish these objectives, the record-keeping guidelines will be outlined in the comprehensive financial policies and procedures manual. More specifically, revolving funds require
    - A general ledger including all asset and liability accounts;
    - A detailed accounts receivable subsidiary ledger with financial claims on third parties, which should be reconciled to the general ledger control account at the end of each accounting period;

- An aged accounts receivable report, which should be produced monthly from the detailed records for review and follow-up of overdue accounts;

- Detailed inventory records, which should be reconciled to periodic physical counts and at the end of each accounting period, to the general ledger balance; and

- Detailed fixed asset records, which should be reconciled to periodic physical counts and to the general ledger balance.

10. **Reporting requirements.** The PMU will be responsible for preparing the following financial reports. These statements must be prepared in accordance with generally accepted accounting principles applied on a consistent basis and are subject to audit.

- Statement of financial position
- Statement of results of operations
- Statement of changes in financial position

11. In addition, the PMU will prepare quarterly IFRs and will be submitted to the World Bank not later than 45 days after the end of the reporting period. IFRs will be comprehensive and cover all aspects of the project and not only the portion related to the World Bank.

12. **Annual external audit.** The project's financial statements will be annually audited by a qualified independent auditor acceptable to the World Bank, in accordance with internationally accepted auditing standards and ToR acceptable to the World Bank. In addition to the financial audit, the recipient shall submit a technical audit report which shall be done in accordance with the International Standards on Auditing 620. The audited financial statements and the technical audit report for each such period shall be furnished to the World Bank not later than six months after the end of the period. Among other requirements, the auditor will be required to

- Ensure that revolving find beneficiaries have been selected in compliance with eligibility criteria;
- Ensure that contracts have been awarded in accordance with World Bank Procurement Guidelines and procedures; and
- Conduct field visits to West Bank and Gaza inventories to count, reconcile, and verify procured assets.

13. **Involvement of the State Audit and Administrative Control Bureau (SAACB).** To prompt good governance over the revolving fund after project closure, it is envisaged that external audit assignment will be handed over from the private audit firm to the SAACB at Year 3 or 4 of the project life. This will ensure continued auditing of the revolving fund after project closure.

14. **Staffing.** The PMU financial team will be responsible for managing the Grant resources and all related financial transactions. The PMU includes a Finance Director and two accountants with relevant accounting background and experience in handling the FM and disbursements aspects of World Bank-funded projects. The PMU FM staff is familiar with the World Bank FM and Disbursement Guidelines.

However, FM performance has been moderately satisfactory. Due to the requirement of the FM management of the revolving fund, FM capacity may require strengthening with regard to staffing and training.

15. **Supervision plan.** The proposed project has a High FM risk rating before mitigating measures. The project is implemented by PENRA PMU with sound capacities. Hence, consistent with the risk-based approach to supervision, the supervision activities will consist of field visits to the PMU and GEDCO, supplemented by desk reviews of external audit reports, quarterly financial reports, and inquires with the project staff, as needed. The World Bank will carry out field FM supervision mission at least once every four months. The FM supervision mission will assess the adequacy of the FM arrangements at the PMU. As and when required, other FM supervision tools such as SOE reviews and joint missions with procurement will be used in an effort to periodically monitor the adequacy of FM arrangements.

Disbursements

16. A U.S. dollar DA will be opened by the MOF and will be operated and managed by the PMU. Deposits into, and payments from, the DA will be made in accordance with the provisions that will be stated in the Grant Agreement and as will be outlined in the World Bank 'Disbursements Guidelines for Projects'. Disbursements from the World Bank's Grant will follow the transaction-based method, including advance, direct payments, reimbursement, and special commitments. The initial deposit into the DA will be based on a six-month forecast prepared by the PMU and submitted with the withdrawal application. Subsequent disbursements into the DA will be based on SOEs and accompanied with withdrawal applications, reconciled bank statements, and copies of all bank statements. The supporting documentation for requests for direct payment should be records evidencing eligible expenditures (copies of receipt and supplier's invoices).

Procurement

17. Procurement for World Bank-financed project components shall be carried out in accordance with the World Bank's Procurement Regulations for IPF Borrowers, dated July 2016, which covers procurement of goods, works, non-consulting services, and consulting services in Investment Project Financing. Furthermore, the PA Public Procurement Law No. 8 of 2014 entered into effect on July 1, 2016. Specific components of the national procurement system (for example, national standard bidding documents, single procurement portal, and the complaint handling mechanism) which would be acceptable for use in the project, shall be identified as they become available. The 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants', dated October 15, 2006, and updated January 2011, shall apply to the project.

18. PENRA, through the PMU, will continue to hold the overall responsibility for procurement following the same arrangements in place for the GENRP. More specifically, PENRA will act as the World Bank's counterpart for all procurement aspects of the project. PENRA will carry out procurement in close coordination with the PETL PERC, GEDCO, and other DISCOs who shall take the lead on technical aspects of procurement, starting with the definition of the requirements, specifications, ToRs, and so on up to the inspection of goods and the review of consultants' deliverables and for subsequently advising PENRA to release payments to suppliers/consultants in accordance with the signed contracts.

19. An updated procurement risk and capacity assessment of PENRA was complete to identify potential risks and propose appropriate mitigation measures. The assessment concluded that the enactment of the new procurement law has brought substantial improvement to the legal framework for

public procurement on aspects related to efficiency, transparency, accountability, and integrity. However, implementation of various provisions of the law is still work in progress. Procurement performance for the GENRP has been moderately satisfactory. PENRA has significant experience in procurement implementation under the World Bank-financed projects; however, due to staff turnover, its capacity may require strengthening in terms of staffing and training. Some of the envisaged procurement packages, especially ICT, are rather complex and would require specialized skills.

20. The project will finance goods and information technology (solar panels, smart meters, hardware and software, and so on) and consultant's services (technical assistance, studies, external audits, and so on) for various project components. Based on the World Bank Procurement Regulations, PENRA shall be required to prepare and complete a Project Procurement Strategy for Development (short version). The strategy shall include (a) the project overview; (b) operational context, including governance, economic factors, sustainability aspects, and technology factors; (c) market research; and (d) implementation capacity. In addition, PENRA shall prepare a Procurement Plan for the first 18 months of project implementation. The Procurement Plan shall be approved by the World Bank before negotiations.

21. **Procurement risk is rated Substantial.** The World Bank Prior Review thresholds for Substantial risk rating projects are outlined in table 3.1. In addition to prior review, the World Bank will carry out two supervision missions a year, including one ex post procurement review.

Table 3.1. Procurement Prior Review Thresholds (US$, millions)

Type of Procurement	Prior Review Threshold
Goods, information technology, and non-consulting services	2
Consultants: firms	1
Consultants: individuals	0.3

Environmental and Social (including safeguards)

22. This project is classified as Category 'B' according to the World Bank Policy OP 4.01 (Environmental Assessment). Because the exact locations of subprojects will be fully determined during project implementation, an ESMF has been prepared and consulted by the client, approved by the World Bank, and disclosed both locally and atn the World Bank InfoShop on May 20, 2017. The ESMF identified the potential negative impacts of the investments during construction and operation, for example, noise, dust, interruption of services, health and safety risks, and waste disposal, among others. It includes proposed measures to mitigate the potential risks. It will also include screening methodology for subprojects against safeguards policies, a monitoring plan and implementation arrangements of the ESMF, and any capacity-building needs. A qualified environmental officer at PENRA/PIU will be hired and will be responsible for conducting subprojects screening, identifying environmental and social risks, liaising with the Environment Quality Authority as needed, and monitoring compliance of beneficiary DISCOs and their subcontractors with the provisions of the ESMF.

23. The project does not trigger the World Bank Resettlement Policy (OP 4.12). The project does not involve any civil work and under Component 3, Improving energy security in Gaza with solar energy, solar energy will be provided on the rooftops of existing household buildings. In addition, to ensure poor consumers are also able to participate, smaller solar PV systems will be provided at lower costs. Even though OP 4.12 (Involuntary Resettlement) was not triggered for the above reasons, since this is a Category B project, an ESMF has been prepared and the PIU environmental safeguards officers will screen all the subprojects for social and environmental compliance.

Annex 4: Implementation Support Plan

Strategy and Approach for Implementation Support

1. The project includes the implementation of (a) an RPP, that is, smart meters and AMI (Subcomponent 2.1); (b) MIS for selected electricity DISCOs (Subcomponent 2.2); (c) a pilot rooftop solar PV project in Gaza (Component 3) and supporting staff and operation cost for the PETL (Subcomponent 1.1.) and the PMU (Component 4); and (d) capacity building for PERC (Subcomponent 1.2).

2. The implementation of an RPP, MIS, and a pilot rooftop solar PV project in Gaza will be supported by consultancy services financed by the West Bank and Gaza Programmatic Technical Assistance (P162545), which will complement the project. The selected consultant will make an initial diagnostic of the existing meters in the selected DISCOs, focusing in particular on interoperability issues. This initial assessment will lead the consultant to propose the appropriate design and technical specifications of the smart meters and related AMI to be rolled out. The implementation of MIS will follow a similar strategy. Regarding the implementation of a pilot rooftop solar PV project, the consultant will propose the most appropriate technical specifications and provide monitoring support to the implementation agency during implementation.

3. The first two years of project implementation will require efforts to review technical, procurement, FM, and safeguard documents. Extra care will be taken in implementation of the project's Component 3 in Gaza. Detailed support from the World Bank team during project supervision is outlined below:

(a) **Procurement and technical.** The World Bank team will provide implementation support for (i) reviewing procurement documents including technical specifications and providing timely feedback and no-objection and (ii) monitoring procurement progress against the Procurement Plan developed by the PMU.

(b) **FM.** The World Bank team will provide implementation support for reviewing the project's FM system, including but not limited to accounting, reporting, and internal controls.

(c) **Environmental safeguards.** The World Bank safeguards team will provide implementation support for (i) preparation, as needed, of site-specific safeguards documents for the pilot rooftop solar PV project in Gaza; (ii) implementation of safeguards requirements through regular supervision missions, including site visits; and (iii) training on safeguards to PMU staff.

(d) **Implementation progress:** The World Bank will closely monitor the overall progress of project implementation, including implementation of RPP and MIS and the pilot rooftop solar PV project.

Implementation Support Plan

4. The proposed implementation support requirements are as follows:

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First 12 months	Monitor and assist in the procurement of consultancy services for Component 2 and 3 financed under the World Bank-executed Programmatic Technical Assistance	Procurement Specialist	1	None. All procurement will follow World Bank Group Guidelines.
		Power Engineer	1	
	Monitor and assist in the procurement of equipment for the PETL under Component 1	Procurement Specialist	1	None
		Power Engineer	1	
12–60 months	Support preparation of site-specific safeguards documents and supervise safeguards implementation	Environmental and Social Safeguard Specialists	2	None
	Monitor project management and supervise project implementation progress	Project Manager	1	None
		Power Engineer	1	
		Co-Project Manager based in local office	1	

Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Team Leader	10	3	HQ based
Co-Team Leader	8	0	Country based
Power Engineer	5	2	HQ based
Procurement Specialist	8	0	Country based
FM Specialist	4	0	Country based
Environmental Specialist	6	0	Country based
Social Specialist	6	2	HQ based
Operations Analyst	6	2	HQ based
Total	53	9	

Partners

Name	Institution/Country	Role
Norwegian Agency for Development Cooperation	Government of Norway	Partner and PID-MDTF donor

Annex 5: Economic and Financial Analysis

Electricity Sector Performance Improvement Project P148600

1. The economic analysis discusses the rationale for public financing of the project and the valued added from the World Bank support and presents the analysis of the project's development impact in terms of a quantitative and qualitative assessment of the expected benefits and costs. The economic analysis covers performance improvements and investments that will be undertaken under two components of the ESPIP. This economic analysis is consistent with the World Bank's guidelines on economic analysis of projects.

2. The economic analysis is structured in two parts:

- First, an economic analysis of improving energy security in Gaza with solar energy (Component 3)
- Second, an economic analysis of the RPP through the installation of smart meters and additional measures (Subcomponent 2.1)

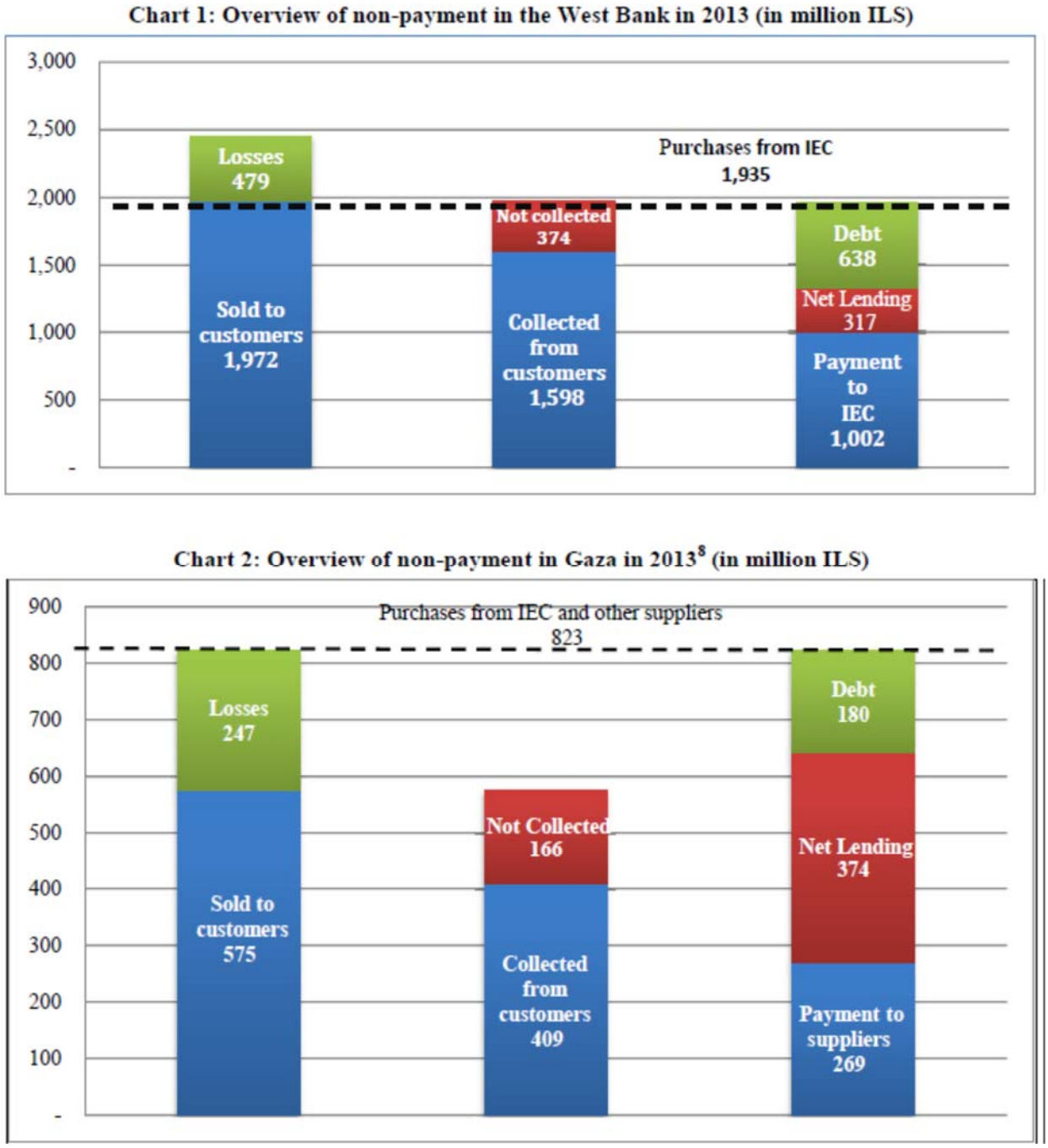
Rationale for Public Sector Provision/Financing

3. The Palestinian territories are highly dependent on energy imports from neighboring countries due to the lack of domestic energy resources. IEC is the largest supplier of electricity providing the territories with around 88 percent of its total electricity consumption. In 2013, 4,778 GWh was imported from IEC, amounting to ILS 2.4 billion (US$660 million). Alongside the steady increase in electricity consumption, nonpayment for electricity imported from IEC has increased over the past few years, amounting to 58 percent of its total cost (equivalent to ILS 1,407 million or US$381.3 million in 2013).

4. Nonpayment of IEC's electricity bills by Palestinian electricity distributors, including municipalities, village councils, and DISCOs remains a key challenge to the electricity sector and to the overall fiscal position of the PA. Outstanding payments owed to IEC are either: (a) deducted from the PA's clearance revenues by the Israeli MOF and registered as 'Net Lending 3' or; (b) are accumulated as debt owed to IEC. Net lending reduced the PA's available revenues by an estimated ILS 1 billion in 2012 (US$280 million), representing 13.5 percent of the PA's total revenues.

5. Electricity losses were high at 23–30 percent between 2010 and 2013. In 2013, electricity losses caused significant revenue loss to Palestinian distributors—estimated at ILS 726 million (US$201 million). Due to high electricity losses, revenues from invoiced amounts to end customers in the West Bank were only able to cover the cost of electricity purchased from IEC and did not cover the electricity distributor's operating and investment costs. The amount invoiced to customers in Gaza only accounted for two-thirds of the electricity purchases for Gaza while one-third of the purchased quantity (ILS 247 million) was lost either as a technical or a nontechnical loss.

Figure 5.1. Overview of Nonpayment in the West Bank and Gaza in 2013 (in ILS, millions)



Source: World Bank, "Assessment and action plan to improve payment for electricity services in the Palestinian territories - Study on electricity sector contribution to net lending", ACS9393, 2014.

6. PENRA initiated several measures particularly targeted at reducing electricity nonpayment. These measures include amendments to the Electricity Law covering punitive actions for electricity theft. While the initiatives introduced by PENRA may have a positive effect, additional measures and investment are needed, to justify public sector financing.

7. Gaza suffers serious supply constraints due to shortage of electricity from Israel and Egypt and shortage of fuel for the GPP. Rolling blackouts typically provide only 8 hours of power supply followed by 8 hours of power cuts. During winter and summer peak conditions, power has been reduced to 3–4 hours per day, leading to protests and citizen unrest. On various occasions, Qatar and Turkey have extended emergency financial support to provide diesel and operate the GPP.

8. Alternative solutions to provide more sustainable supply options, such as increased imports from Egypt and Israel, and expansion and rehabilitation of the GPP to run on natural gas have been explored, with little progress to date.

9. Solar power can potentially become one of the solutions for Gaza's energy crisis. However, public provision is necessary to pilot and implement a suitable business models for solar energy, which can crowd-in and mobilize additional sources of finance.

Value Added of the World Bank Support

10. Investments aimed to improve sector performance, reduce losses, and deploy solar PV systems need to be managed effectively to be successful in fragile and conflict-prone areas. The World Bank Group can play a valuable role in this transition by:

- Providing a set of sustainable energy solutions to be proposed by the World Bank and other donors;
- Making concessional financing available for imperative power system improvements;
- Building upon the implementation arrangements with PENRA and GEDCO that were used in the World Bank-funded GENRP project to effectively implement this new project according to the World Bank's fiduciary policies;
- Providing technical assistance and capacity-building support to the implementation of a complex project in a fragile environment; and
- Sharing international knowledge, best practices, and experience in similar environments.

Counterfactual to the ESPIP

11. In Gaza, as service provision deteriorates, self-generation of electricity is becoming increasingly important and urgent. In the short term, the project is expected to displace the use of diesel from power generation while increasing the availability of the supply during blackouts. In the medium and long term, solar power is expected to be a complementary measure to other solutions such as the construction of new lines to increase imports from Israel and the conversion of the GPP to gas.

12. Reducing West Bank and Gaza's energy poverty should indeed account for the fact that energy infrastructure and security are interrelated. Moreover, at the heart of this linkage are key concepts such as self-sufficiency, redundancy, resilience, diversity of supply, storage, decentralization, and interdependence.

Cost-Benefit Analysis of Improving Energy Security in Gaza with Solar Energy (Component 3)

13. The economic viability of the project is assessed through a cost-benefit analysis. Net benefits for the project are calculated by comparing total system costs and benefits for the 'with project' and 'without project' scenario. A range of scenarios and sensitivities that meaningfully reflect the uncertainties of key input variables are evaluated. The analysis includes a consideration of the relevant environmental externalities, particularly GHGs.

14. Given the fragile situation in Gaza and uncertain developments in the sector, valuation of the 'without project' scenario poses methodological challenges. To quantify the project's benefits in monetary terms, the following simplifying assumptions are made:

- The project would displace diesel self-generation.
- The project would displace electricity imports.
- Considering ongoing uncertainties, a sensitivity analysis on the 'without project' assumptions is performed.

15. The economic analysis is made for a solar system of 1 MW that includes batteries for storage.

Project Costs

Rooftop PV Costs

16. Rooftop solar systems cost on average US$1,500 per kWp, including supply and installation. Operation and maintenance costs entail battery replacements every four years and sum up to 30 percent of the initial costs (for each replacement).

Project Benefits

Capacity Factor

17. According to the global solar atlas and considering Gaza's geographical location, the solar power output of photovoltaic electricity is 1,648 hours per year, equivalent to a capacity factor of 18.8 percent. The analysis considers a degradation of PV output of 1 percent per year.

Avoided Cost of Diesel Power Self-Generation

18. According to the SED study, generator acquisition in Gaza was 37 percent in 2011 and dropped to 20 percent in 2013 due to high fuel costs. Engine efficiency is assumed to be 2.5 kWh per L based on data from the SED study. This is equivalent to fuel consumption of 0.4 liters per kWh.

19. Price of diesel for power generation depends primarily on the Blue tax applied, as shown in table 5.1:

Table 5.1. Price of Diesel for Power Generation

Blue Tax Consideration	Price of Diesel (ILS per L)	Price of Diesel US$ per L)
No exception	5.121	1.348
50 percent Blue exception	3.442	0.906
100 percent Blue exception	1.763	0.464

20. Tax consideration differs between the economic and financial analysis. The payment of tax is a financial but not an economic cost: it does not involve the use of resources, only a transfer from the power generation owner to the Government.[23] Therefore, the Blue tax is considered in the financial analysis but not in the economic analysis.

Avoided Costs of IEC Electricity Imports

21. A value of 0.13 US$ per kWh is used in the economic analysis. This does not include value added tax (VAT).

Improved Reliability and Availability of Supply

22. The rooftop PV project component, although a pilot, contributes to advancing solutions to the ongoing electricity crisis. The proposed project will improve electric power service reliability, resulting in benefits across end consumers. Activities related to manufacturing need reliable power for workshops and equipment. Commercial sector (including the service sectors and retail) need reliable power for lighting, heating, cooling, and operating computers and business equipment. These benefits are significant but are difficult to quantify ex ante and hence, not considered in this analysis.

Avoided Global Environmental Damage Cost

23. The rooftop PV project results in reduced global externalities given that solar power replaces thermal generation. IEC's power generation capacity is reliant on fossil fuels and its grid emission factor is 0.564 according to the IGES Grid Emission Factor Database. For diesel, an emission factor of 2.69 kg CO_2e per Lis considered. Consistent with World Bank guidance on the social value of carbon, carbon emission reductions are valued in the base case at US$30 in 2015 and increasing to US$80 in real terms by 2050 (table 5.2). The low (US$15 in 2015 increasing to US$50 in 2050) and the high paths (US$50 in 2015 increasing to US$150 in 2050) for the social value of carbon suggested in the World Bank guidance are used for sensitivity analysis.

[23] Refer to the World Bank Handbook on Economic Analysis of Investment Operations on the treatment of taxes in economic and financial analysis.

Social Costs of Carbon (US$ per tCO_2e)

Table 5.2. Social Costs of Carbon (US$ per tCO_2e)

	2015	2020	2030	2040	2050
Low	15	20	30	40	50
Base	30	35	50	65	80
High	50	60	90	120	150

Source: World Bank.

Non-Quantified Benefits

24. The proposed program is also expected to have a number of additional benefits which are either uncertain or difficult to quantify such as (a) energy security and self-sufficiency, (b) employment generation, (c) learning and economy of scale benefits, which can help facilitate further reductions in cost of PV. These benefits have not been included in this economic analysis.

25. It has been often asserted that a higher share of renewable energy improves energy security and that this benefit is hard to be captured by a conventional cost-benefit analysis. Historically, energy security has been flagged as a major public policy problem[24] and defined by governments in different ways.

Economic Analysis

Data and Assumptions

- **Discount rate.** 6 percent, with a sensitivity analysis using 3 percent and 9 percent discounting.
- **Energy displacement.** 1 kWh of electricity from solar PV leads to a reduction of 0.7 kWh in energy imports and 0.3 kWh in self-generation (diesel).
- **Price of diesel.**[25] US$0.453 per L(no Blue tax is included in the economic analysis).
- **Diesel engine efficiency.** 2.5 kWh per L.
- **Fuel costs of running diesel genset.** 18.6 cents per kWh.
- **Time frame.** 2018–2043.

Table 5.3. Other Data

Solar PV Costs	Unit	Value	Source/Notes
CAPEX	US$ per kW	1,500	
Capacity factor	Percent	18.8	Solar Atlas

[24] Joskow, P. 2009. "The US Energy Sector, Progress and Challenges, 1972–2009." *Journal of the U.S. Association of Energy Economics* 17 (2) August.

[25] It should be noted that the economic analysis takes the perspective of the society. Following best practice, and contrary to the financial analysis, taxes are not included in the economic analysis because they are a transfer within the society.

Solar PV Costs	Unit	Value	Source/Notes
Degradation of PV output per year	Percent	1.0	World Bank India PV project
Battery replacement costs:	30% of CAPEX every 4 years		
Without Project Costs			
Displacement of IEC imports	Percent	0.7	Source/Data
Displacement of self-generation	Percent	0.3	
Costs of IEC electricity imports	US$ per kWh	0.1348	Excludes VAT
Diesel fuel consumption for self-generation (L per kWh)	L per kWh	0.4	SES study
Price of diesel (US$ per L)	US$ per L	0.464	Without taxes
GHGs			
IEC Grid emission factor (tCO2e per MWh)		0.564	IGES Grid Emission Factor
Diesel emission factor (kgCO2e perL)		2.69	EIA

Results

26. **The economic analysis shows that the proposed project is economically feasible.** Considering positive GHG externalities, it has an EIRR of return of 11.7 percent and NPV of US$0.8 million. If GHG externalities are not considered, the EIRR will drop to 7.2 percent and NPV to US$0.15 million.

27. **The economic evaluation adopts a conservative approach to the estimation of benefits.** In particular, a number of benefits which are difficult to quantify such as energy security and learning which can help facilitate further deployment of solar PV have not been included in the economic analysis. It is hence quite likely that the EIRR of the proposed project would be higher than the estimated results of this analysis.

Sensitivity Analysis

28. Sensitivity analysis on the discount rate used shows that the project reaches positive NPV for discount rates of 11.7 percent and below. A discount rate of 9 percent results in NPV of US$0.3 million, whereas a discount rate of 3 percent leads to an NPV of US$1.5 million (with GHG externalities included).

Table 5.4. Sensitivity on Discount Rate (US$)

	3%	6%	9%
NPV without GHG	671,637	154,792	−178,607
NPV with GHG	1,572,077	796,935	301,819

29. **Social value of carbon.** Sensitivity analysis using the low case (increasing from US$15 per ton in 2015 to US$50 in 2050) and high case (increasing from US$50 per ton in 2015 to 150 in 2050) social values of carbon recommended by World Bank guidance affects the returns of the project significantly.

Table 5.5. Sensitivity on Social Costs of Carbon

Social Value of Carbon	NPV	EIRR (%)
Low Case	536,438	10.0
Base Case	796,935	11.7
High Case	1,300,846	14.6

Cost-Benefit Analysis of the Revenue Protection Program (Subcomponent 2.1)

30. The RPP aims to meter and bill every unit of electricity consumed (kWh) on a permanent basis. The strategy is to target high-value segments to maximize the value of smart meters. The RPP is expected to bring down nontechnical losses attributable to large and medium customers.

31. The economic analysis focuses on the RPP for HEPCO. High-value segments in HEPCO include commercial and industrial consumers that represent 59 percent of electricity sales and 28.2 percent of the connections. Full revenue protection requires the installation of 5,449 smart meters.

32. Two types of benefits can be associated to reducing nontechnical losses. First, revenues from high-value customers will increase. This is primarily a financial benefit for HEPCO. It would generate a welfare gain to the society at large—and therefore also translate into an economic benefit—when HEPCO applies the increased revenues to continue investing in improving service quality and expanding electricity access. Second, smart meters influence consumer behavior, resulting in energy savings.

33. With smart meters, consumers become more aware of their consumption and the cost, and they are motivated to use electricity more efficiently. Reasonable estimates for the reduction in consumption attributable solely to smart meters would be a 2 percent reduction in overall consumption for domestic consumers and 1.5 percent for commercial and industrial consumers. Smart meters also encourage shifting consumption from peak to off-peak time when a time-of-day tariff is in place.

5.1 Results

34. The economic analysis shows that the smart meters program is economically viable with high rates of return in three DISCOs. This is because the smart meters are installed for high-value consumers, where even small gains in energy efficiency (that is, 0.5 percent reduction in energy use) result in positive NPV and high EIRR. Table 5.6 summarizes the results of the economic analysis for each DISCO.

Table 5.6. Analysis of Smart Meters Component

DISCO		IRR (%)	NPV (US$)
JDECO	No GHGs	54	1,148,629
	With GHGs	64	1,452,992
HEPCO	No GHGs	38	251,793
	With GHGs	46	334,770
NEDCO	No GHGs	46	261,125
	With GHGs	56	336,416
SELCO	No GHGs	−1	−15,018
	With GHGs	4	(3,617)
Combined JDECO, HEPCO, NDECO and SELCO	Without GHGs	47	1,646,528

DISCO		IRR (%)	NPV (US$)
	With GHGs	56	2,120,561

Note: Consumer's response to the installation of smart meters: 0.5% electricity savings rate.

35. GHG emission reductions are about 16,000 tons of CO2e, according to table 5.7:

Table 5.7. GHG Emission Reductions

	Total GHGs
JDECO	10,324
HEPCO	2,814
NEDCO	2,554
SELCO	387
TOTAL	16,079

36. Other customer societal benefits are avoided capacity costs, avoided generation capacity costs, enhanced customer service, billing accuracy improvement, informed decision on energy usage, reduced consumption on inactive meters, supply reliability, environmental preservation through reduced peak time usage, increased safety for meter readers and field services personnel, and job boost to local economy.

Financial Analysis

Rooftop Solar Component

37. The financial analysis of the project uses the economic analysis as a starting point but with the following key differences:

- GHG externalities are not included.
- Taxes on fuel are included.
- VAT on electricity sales (from imports) is included.
- A higher discount rates is used: 12 percent.

38. From a financial viewpoint, the project is viable under multiple scenarios. This reflects, in part, the high taxation of diesel through the BLUE Tax. Table 5.8 summarizes the results of the financial analysis under different financial discount rates.

Table 5.8. Financial Analysis - Sensitivity on Discount Rate

Discount Rate (%)	NPV (US$)	EIRR (%)
9	1,651,168	23.3
12	1,071,957	23.3
15	663,216	23.3

Increased Revenue Collection with Smart Meters

39. Smart meters provide a range of financial benefits to DISCOs by enabling reading, remote connection/disconnection of customers, remote modification of contractual considerations, detection of meter adulteration and energy theft, network optimization to reduced technical losses, and others.

40. In the absence of trials and pilot tests, this study evaluates the financial benefits to the utility under a number of assumptions. Table 5.9 shows the amount of savings for HEPCO when the system losses are improved 0.5 percent per year. In this situation, the project can be very attractive for the DISCO, because the loss reduction in the first two years are above the costs of the meters installed.

Table 5.9. Financial Savings with Revenue Collection Program in JDECO

		2018	2019	2020	2021	2022	2023	2024	2025
Annual electricity purchases	MWh	2,377,782	2,472,894	2,571,809	2,674,682	2,781,669	2,892,936	3,008,653	3,128,999
System Losses Base Scenario	%	24	24	24	24	24	24	24	24
System Losses Project Scenario	%	24	23	22	21	21	20	20	20
Total Power Sales (base scenario)	MWh	1,807,115	1,879,399	1,954,575	2,032,758	2,114,068	2,198,631	2,286,576	2,378,039
Total Power Sales Project	MWh	1,807,115	1,904,128	2,006,011	2,112,999	2,197,519	2,314,349	2,406,923	2,503,199
Total Power Sales Difference	MWh	—	24,729	51,436	80,240	83,450	115,717	120,346	125,160
Savings	US$		3,333,461	6,933,598	10,816,413	11,249,069	15,598,710	16,222,658	16,871,564

Table 5.10. Financial Savings with the RPP in HEPCO

		2018	2019	2020	2021	2022	2023	2024	2025
Annual electricity purchases	MWh	462,593	481,097	500,341	520,354	541,169	562,815	585,328	608,741
System Losses Base Scenario	%	20	20	20	20	20	20	20	20
System Losses Project Scenario	%	20.0	20.0	19.9	19.0	18.0	18.0	18.0	18.0
Total Power Sales (base scenario)	MWh	370,074	384,877	400,273	416,283	432,935	450,252	468,262	486,993
Total Power Sales Project	MWh	370,074	384,877	400,773	421,487	443,758	461,509	479,969	499,168
Total Power Sales Difference	MWh	—	—	500	5,204	10,823	11,256	11,707	12,175
Savings	US$		—	67,446	701,438	1,458,990	1,517,350	1,578,044	1,641,166

Table 5.11. Financial Savings with the RPP in NEDCO

		2018	2019	2020	2021	2022	2023	2024	2025
Annual electricity purchases	MWh	617,324	642,017	667,697	694,405	722,181	751,069	781,111	812,356
System Losses Base Scenario	%	20	20	20	20	20	20	20	20
System Losses Project Scenario	%	20.0	19.0	19.0	18.0	17.0	16.0	16.0	16.0
Total Power Sales Project	MWh	493,859	520,033	540,835	569,412	599,410	630,898	656,133	682,379
Total Power Sales Difference	MWh	—	6,420	6,677	13,888	21,665	30,043	31,244	32,494
Savings	US$	—	865,438	900,056	1,872,116	2,920,501	4,049,761	4,211,752	4,380,222
Savings	US$, millions	—	—	—	1.87	2.92	4.05	4.21	4.38

Annex 6: Gender Dimensions - Assessment and Actions

A. Gender inequalities in West Bank and Gaza

1. According to the WB&G GAP study FY15–17, gender inequalities are prevalent in education, health, employment, female entrepreneurship and access to finance, legal rights, political participation, and violence against women. Girls have a higher secondary (84 versus 77 percent) and tertiary school enrollment rate (59 versus 41 percent) than boys. While girls enjoy a higher enrollment rate, the WB&G GAP shows that women with tertiary education have a higher unemployment rate (82 percent) than men. While men with primary education have a higher unemployment rate (63 percent) than women. Women deal with cultural attitudes toward work and do not receive the same salary than their male colleagues. Owing to the discriminatory treatment of women in employment, women tend to focus more on home-based work, such as sewing, or on work that is close to the home, such as teaching and daycare services.

2. With 18 percent,[26] West Bank and Gaza has the lowest female labor force participation in the Middle East and North Africa Region, which has an average of 26 percent. Women's unemployment rate in 2013 was at 35 percent compared to 21 percent for men. Those women who have work are mainly found in services and agriculture. Because women's labor force participation is limited and not well perceived, female entrepreneurship would be an alternative solution. However, it is important to note that the low formal labor force participation rates for women in West Bank and Gaza attest to the fact that women tend to be segregated into marginalized sectors of the economy, notably the informal and domestic spheres.

3. Laws in West Bank and Gaza are not conducive for women's participation in public, political, or economic life. For example, only 13 percent of women are members of Parliament.

B. Summary of Gender-Differentiated benefits

4. Men and women play different gender-related roles in energy production, distribution, and utilization in households, communities, and the market. Improved, modern, and renewable energy can improve women's socioeconomic situation by reducing time spent on household chores and current energy practices, including fetching fuel for diesel generators. Introducing more efficient, cleaner, and renewable energy sources, through the installation of rooftop solar panels, can bring entrepreneurial and employment (both home based and outside the home) opportunities for both women and men. Improved energy security increases access of women and girls to media and may influence their knowledge on health, education, women's rights.

C. Examples on Integrating Gender Considerations into the Design of Energy Operations

5. **India - Grid-Connected Rooftop Solar Program (P155007)**, aims to provide equal opportunity to the entrepreneurs in a gender-balanced way so that female-owned businesses and female employees benefit from the opportunities offered in the overall value chain of grid-connected rooftop solar PV. Measures to be undertaken through the Technical Assistance component under this project include (a) gender-focused messages in advertisement campaigns to encourage participation of female-owned companies in the program and (b) training and workshops targeted at female grid-connected rooftop solar PV entrepreneurs.

[26] Labor force participation rate, female (percentage of female population ages above 15 years) (modeled International Labor Organization estimate); http://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS (accessed on April 21, 2017).

6. **Kenya: Off-grid Solar Access Project for Underserved Counties (P160009),** aims to contribute to closing the relevant gender gaps in Kenya, particularly in access to electricity, by: (a) ensuring women's access to solar products and cleaner and more efficient cook stoves, (b) increasing women's awareness about solar energy use and the productive uses of solar power, (c) ensuring women's participation in decision making around the installation and management of the solar systems, (d) providing women with employment opportunities in marketing and installation of solar products, and (e) mitigating potential risks such as displacement or gender-based violence that women might face due to project implementation. In addition, the project monitoring and evaluation system will adopt and integrate several results indicators to monitor and assess both progress in implementing gender-related activities and the project benefits for women and men.

D. Gender Action Plan

Gender Gap/Issue	Project Activity	Expected Direct/Indirect Impact	Funding Source
Improve energy security by providing rooftop solar PV to female-headed households and SMEs. Women tend to have less access to credit than men.	• Provision of solar rooftop PV • Targeted financing mechanisms	• Improved energy security • Better household management • Less household expenses for fuel • Reduced time to gather fuel for generator and hence more time for other activities	Trust Fund for West Bank and Gaza (TFGWB)
Promote female entrepreneurship and other types of income-generating activities	• Provide business, marketing, technical solar system repairs skills and access to credit training to female-headed households and SMEs benefiting from the solar energy pilot • Establish a network among female-headed households to share experience and business knowledge		Energy Sector Management Assistance Program