Palestinian Energy and Natural Resources Authority

Palestine Solar Initiative

Project Document

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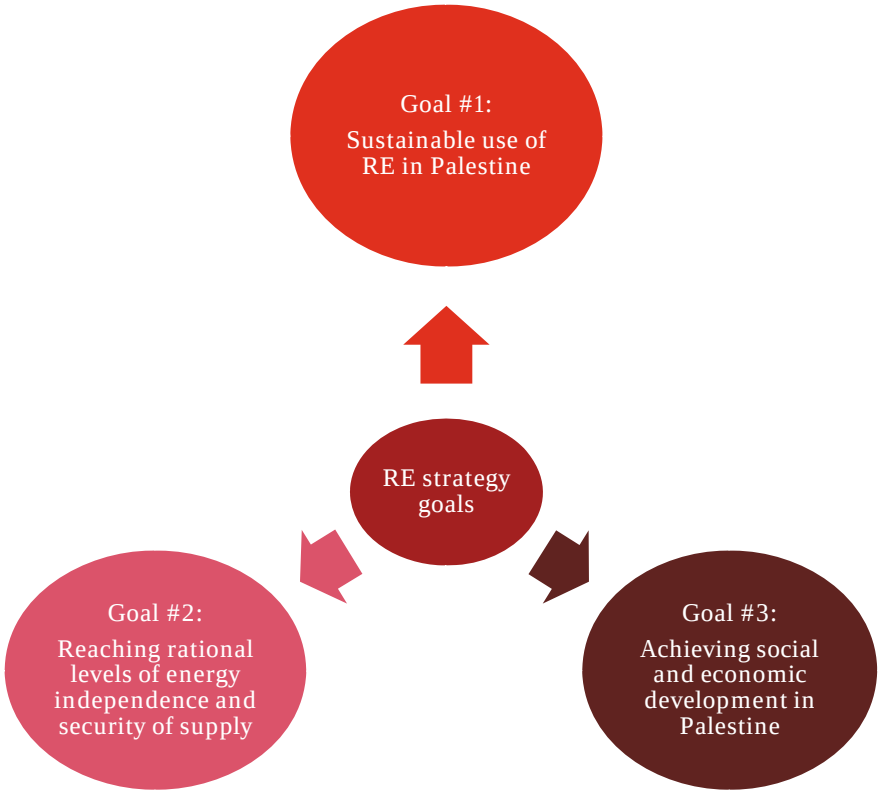
Contents

1. Executive Summary

Renewable energy is an appropriate option for serving Palestine's energy needs. Therefore, PENRA set forth a renewable-energy strategy to encourage RE deployment in Palestine.

- Electricity is one of the major problems facing the Palestinian Authority specially as the PA satisfies the majority of its electricity needs through imports, depending mainly on Israel (even though there is a power-generation plant in Gaza). Despite the plans to build more power generating units in the West Bank, Palestinians are still very dependent on importing electricity.
- Renewable energy had always presented a good option to enforce energy security and interdependency in countries. As Palestine does not have many resources such as gas or fossil fuels, it's even more difficult to achieve energy security for the country. Therefore, **the Palestinian government had set a goal in which 10% of electricity generated in Palestine is going to be generated through renewable resources by the year 2020.**
- PENRA's vision for a renewable energy (RE) strategy emerged from the fact that Palestine is endowed with renewable-energy sources for electricity generation that are not being used due to the high-risk and absence of a legal framework. Moreover, with the expected growth in electricity consumption in Palestine, renewable-energy facilities are needed to help achieve security of supply.
- The overall goals of PENRA's RE strategy are depicted in the graph below.

Overall goals of RE strategy



As part of the overall RE strategy, the Palestinian Solar Initiative (PSI) aims at achieving a target of 5MW RE generation by 2015, through installing PV panels on the rooftops of Palestinian households.

- Based on the results of previous studies commissioned by PENRA, Solar energy is the RE application that is most convenient to Palestinian circumstances and needs. Therefore, PENRA focused on this RE technology when setting its RE capacity targets. As part of its concentration on solar RE, PENRA set up the Palestinian Solar Initiative (PSI).
- The initiative's target is to achieve 5MW of solar RE by 2015 through installing PV panels on the rooftops of Palestinian households throughout the West Bank. In addition, the initiative will include capacity building and training component for all the relevant stakeholders and the preparation of required detailed studies and documents necessary for the implementation the overall RE strategy.
- The rationale behind PENRA's solar power initiative is as follows:
  - Spreading the technology and know-how within the Palestinian society.
  - Getting international accreditation in the global RE society through hosting a "loud" kick off for the initiative.
  - Encouraging the Palestinian people to use RE technologies, namely PV panels, which will drive their prices down.
  - Achieving environmental benefits resulting from the reduction of CO2 emissions in Palestine.
  - Achieving political benefits through gaining independence from Israeli energy sources.
  - Building the Palestinian people RE knowledge and capacity in order to be able to produce PV panels locally in the future.

RE potential in Palestine

The RE strategy identified the different renewable technologies that can be exploited in Palestine up to 2020.

RE Technology	2015 Capacity (MW)	2020 Capacity (MW)
On ground PV	5	25
PV small	5	20
CSP	5	20
Biogas landfill	6	18
Biogas animal	0.5	3
Small-scale wind	1	4
Wind mills	2.5	40
Total (MW)	**25**	**130**

Palestinian Solar Initiative Plan

Location	Installed Capacity (MW)
Northern West Bank	1.5
Central West Bank	2.0
Southern West Bank	1.5
Total (MW)	**5**

Pre-emptive actions have been made in terms of determining the main risks associated with the PSI and the means to mitigate them.

- PENRA is aware of the risks that emerge with an investment as large as that needed for implementing the PSI. The table below depicts the main risks associated with the PSI.
- In order to overcome those risks, PENRA assigned risk mitigation actions to each potential risk facing the initiative (please refer to the risk assessment section)

Key risks associated with the PSI
The PA will not be able to honor its commitment to funding the initiative.
Other parties (such as Discos) will not be willing to participate in the initiative.
The amount supplied to the Grid will exceed the planned amount and thus, the liability will increase in an unexpected manner.
Participants will not have an equal opportunity to participate in the program.
Participants may be encouraged to buy low quality systems to make the utmost use of the subsidy and payback period.
System may be destroyed or lost, and thus investment amount will be lost.
The investor will not be able to honor his/her or her commitment to purchase the system.
The market will not have the skills and capabilities needed to implement the initiative.
The public may not be interested to join due to lack of awareness of the benefits of the program.

A total capital investment of approximately USD16.0m will be required to implement the PSI. Moreover, the needed capital subsidy to support the initiative is estimated at 47% of total capital investment.

- The PSI aims at installing 5kWp PV panels on the rooftops of Palestinian households throughout the West Bank. Each kWp has a capacity of 1,500kWh. Thus, the overall objective of 5MW RE generation by 2015 will be achieved.
- The table below (first one) illustrates the main Capex assumptions associated with the PSI.
- It is estimated that a total capital subsidy of USD7.5m or USD7.5k per household (47% of capital investment) will be required in order to make the PSI attractive and financially viable.
- The table below (second one) illustrates the exact breakdown of the proposed capital subsidy.

Initiative CAPEX assumptions for 5kWp standard installations

Assumptions for 5kWp	
Load hours PV (Hour)	1,500
MW Capacity PV	5.00
Number of households	1,000
Cost for 1 kWp PV (USD/kWp)	3,200
Size of PV per household in kWp	5
Total CAPEX in USD	**16,000,000**

Subsidy split	
Investment subsidy USD/kWp	1,500
Investment subsidy program in USD	7,500,000
Subsidy	47%
Investment subsidy household in USD	7,500
Total Cost Per Initiative in USD	16,000
Investment per household after subsidy in USD	8,500

Based on the base case scenario, the required FIT will amount to roughly ILS 0.54/kWh. This will result in an IRR of 8.57% and approximately USD9.2k of net income for each participating household over the 20 year project lifetime

- The tables below (first one) depict the feed-in tariff and net customer income based on the base case scenario.
- According to the base case scenario, the feed-in tariff (FIT) required to cover customer's investment after the subsidy is approximately ILS0.54/kWh (approximately USD0.14/kWh).
- A base case payback period (8 years) would result in an equity IRR of 8.57% over the 20 year equipment lifetime. It is worth noting here that the system, based on its specifications, may result in a longer lifetime which would result in a higher income to participants and accordingly a higher IRR.
- The table below (second one) calculates net customer income resulting from applying the PSI in its base case scenario (both before and after the 8 year payback period).
- Within the 8 year payback period, total customer revenue (resulting from selling produced energy at the FIT amount) will amount to approximately USD8.5k, meanwhile total customer expenses (resulting from consuming electricity from IEC at the residential rate) will amount to approximately USD4.0k. Thus net income within the 8 year payback period will amount to approximately USD4.5k.
- After the payback period and for the remaining 12 years of equipment lifetime, consumer revenue (resulting from selling energy at the FIT and covering operating expenses) will amount to about USD10.8k, while consumer expenses (resulting from consuming electricity at the residential rate) will amount to nearly USD6.0k. Thus the consumer will be saving approximately USD4.8k over the 12 year period. Adding consumer savings to actual income, total income per consumer (household) from the PSI will amount to approximately USD9.3k.

Base Case FIT and 20 year equity IRR	
Desired Payback Period (Years)	8
Initial investment by consumer	(1,700)
Required FIT (based on payback period) USD	0.14
Required FIT (based on payback period) ILS	0.54
Equity IRR (20 years)	8.57%

Calculation of customer income-base case

Payback period (years) 8	USD
Consumer Revenue	8,500
Consumer Expenses	4,013
Net Income Excluding CC	**4,487**
After PBP Consumer Income	10,830
Consumer Expenses	6,019
Net Savings after payback period	**4,811**
Total Income	**9,298**

2. Introduction

2.1. Palestine's Renewable Energy Strategy

Introduction

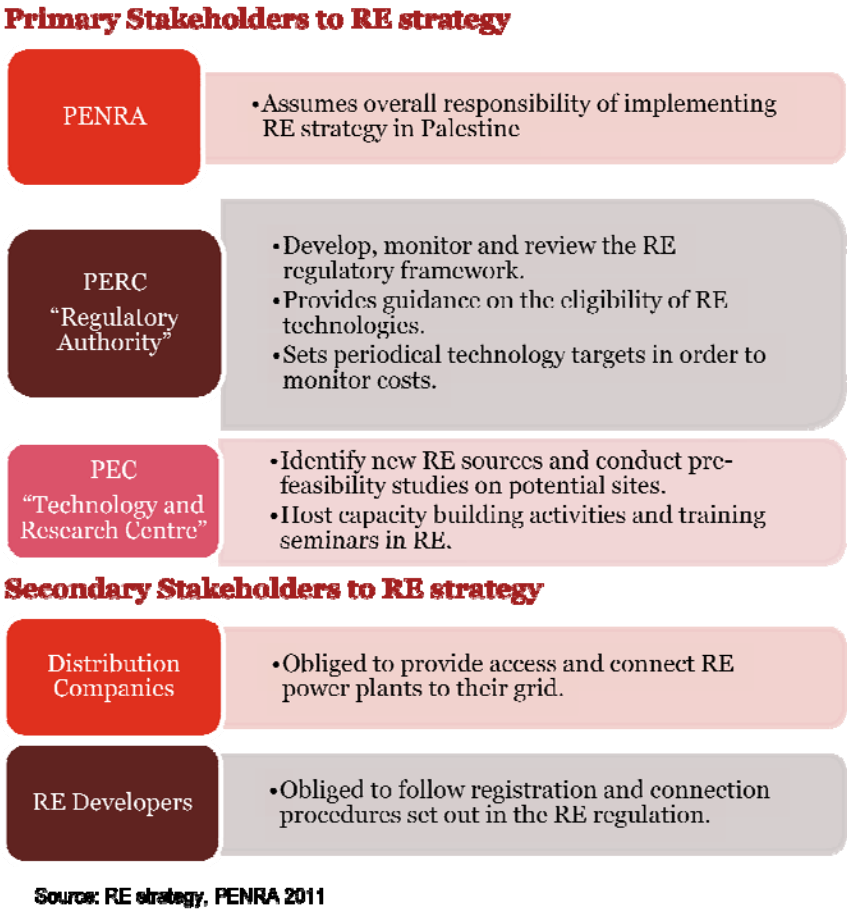
PENRA's vision for a renewable energy (RE) strategy emerged from the fact that Palestine is endowed with renewable-energy sources for electricity generation that are not being used due to the high-risk and absence of a legal framework. Moreover, with the expected growth in electricity consumption in Palestine, renewable-energy facilities are needed to help achieve security of supply.

Barriers to RE in Palestine

- PENRA identifies the following barriers to RE development in Palestine:
  - Absence of clear financing mechanisms;
  - Legal and regulatory barriers;
  - Positive externalities of RE generation in Palestine are not being considered;
  - Incomplete data on RE sources;
  - Political concerns;
  - National laboratories are not internationally accredited for RE technologies; and
  - Insufficient professional skills in the RE sector.
- Despite the barriers to RE development, there are multiple concerns about the current energy situation in Palestine:
  - The increase in fossil-fuel prices which lead to an increase in energy prices.
  - Uncertainty about the availability of non-renewable energy sources due to Palestine dependence on Israel for energy supply.
  - The increase in social awareness about the negative effects of non-renewable energy generation.
- In response to the mentioned barriers and concerns, PENRA set forth RE strategy with **two main purposes**:
  - The RE strategy provides the basis for planning, implementing and monitoring RE deployment in Palestine.
  - The RE strategy provides a roadmap for allocating external financing sources needed in the short-term.

With respects to RE development in Palestine, PENRA identified the main and secondary stakeholders and assigned them with their respective roles and responsibilities.

- Since the process of RE development in Palestine is still at its early stages, the commitment of the main stakeholders and the settlement of institutional arrangements are of utmost importance to strengthen the process.
- PENRA assumed the overall responsibility of implementing the RE strategy in Palestine, while assigning stakeholders with specific roles and responsibilities that serve the overall objective of policy coordination, integration and consistency.
- The illustrations below depict the primary (first illustration) and secondary (second illustration) RE stakeholders identified by PENRA and their respective roles and responsibilities.



Source: RE strategy, PENRA 2011

PENRA's RE strategy supports the overall Palestinian energy sector development strategy. Moreover, the RE strategy aims at promoting private sector investments in RE projects.

- In August 2009, the "2013 energy sector development strategy of Palestine" was adopted. This strategy was the building block upon which the RE strategy was founded.
- The main issues addressed in the Energy sector development strategy include:
  - Diversification of energy sources in order to ensure security of supply and meeting the expected increase in energy demand in the future.
  - The development of the infrastructure required for energy transmission in sufficient quality and quantity.
  - The efficient participation of public and private institutions in the development of the Palestinian energy sector.
  - Training of the staff directly working in the energy sector (mainly in technical areas) in order to achieve efficiency within the RE field.
- PENRA's RE strategy aims at providing support to the overall Energy sector development strategy. In this regard, the RE strategy aims at:
  - Motivating new entrants in the power-generation market.
  - Promoting alternative energy sources.
  - Setting efficient regulatory framework and funding mechanisms with regards to RE development in Palestine.
- PENRA is well aware that the private sector and private investors have a vital role in RE development. However, the participation of the private sector in funding RE development is highly tied to the financial potential of the sector which in turn is tied to the amount of renewable energy actually consumed in Palestine.
- In this regard, and in order to motivate private sector investments in renewable energy, PENRA identified the following measures required to increase private investment and RE consumption in Palestine:
  - Identify and disclose renewable technology's potential, targets and planning conditions. This will help in analyzing and foreseeing the profitability of investment in the RE sector.
  - Implement and continuously improve the regulatory and institutional framework surrounding the RE sector in order to raise interest in RE investments.
  - Establish clear and defined financing and fiscal mechanisms that will affect RE investments.
  - Raise public awareness surrounding the benefits of RE in Palestine.
  - Build required capacities in various institutions and promote R&D activities and international cooperation, this includes developing pilot projects and training programs.

- PENRA set out three main goals to be achieved by the RE strategy. These goals are depicted in the graph above.
- **Goal #1: Promoting a sustainable use of RE in Palestine, under the framework of a sustainable energy market and through active private investment**
    - PENRA identified the following measures needed in order to accelerate implementation of RE technologies and encourage private-sector involvement in RE:
        - Gather careful data on the potential of each RE resource and develop an meticulous estimation on the potential installed capacity of different RE technologies.
        - Create a project management unit (PMU) that monitors and evaluates the progress of implementation.
        - Strengthen the legal environment in order to remove barriers of introducing a Palestinian RE sector.
        - Study and implement international best practices for RE installation, monitoring and equipment.
        - Develop an appropriate wheeling rate for end consumers in order to support the deployment of RE facilities.
        - Support RE facilities through enforcing priority connection or guaranteed grid access.

The RE strategy also aims at achieving rational levels of energy independence and security of supply, in addition to contributing to social and economic welfare in Palestine.

- Under goal #1, PENRA will play an institutional role by supervising the whole program, coordinating and establishing relationships between local actors in addition to focusing on international cooperation. On the other hand, PEC will play a technical role by supervising implementation, capacity building and technical monitoring.

- **Goal #2: Reaching rational levels of energy independence and security of supply through the development of reasonable financial and fiscal instruments for the RE sector in Palestine**

  - The implementation of this goal will diminish industry risk and is critical for deployment of RE facilities, under goal #2 PENRA will have to deal with the following issues:

    - Facilitate the creation of an investment climate that attracts local and foreign investors.
    - Implement a stable regulatory framework that provides financial support to the development of RE in Palestine.
    - Set and review technology targets periodically.
    - Assess the availability of public resources and review pricing and regulatory mechanisms.
    - Introduce suitable fiscal incentives.
    - Monitor the registry with the deployment of RE facilities.

- **Goal #3: Contribute to social and economic development of the Palestinian people**

  - PENRA is aware of the effect of RE in promoting social and economic welfare in Palestine. This will be done through the development of a localized component industry and local human resources capable of efficiently managing RE production and usage.

  - Under goal #3, PENRA addressed several activities including:

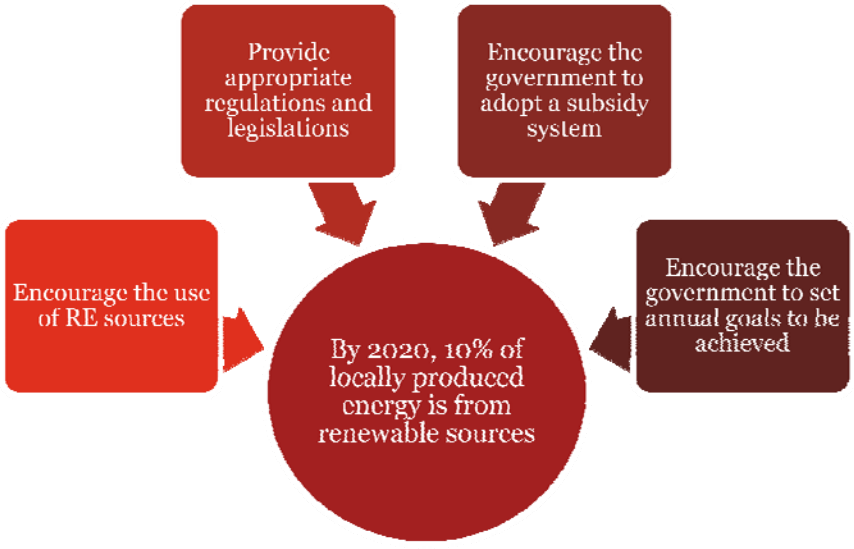
    - Knowledge dissemination and capacity building on settlement, management and operation of RE generation. Different mechanisms were identified to achieve this target, including promoting RE knowledge, raise public awareness on the economic and social benefits of RE, persuading the government to carry out RE training seminars and educational programms and promoting communication and interaction between local and national authorities.
    - Development of standards, codes and certifying labels in order to enhance sustainable development of RE technologies.
    - Promoting public and private R&D on RE usage through the use of donor funds, this includes creating an enabling environment, facilitating research

activities and conducting pre-feasibility analysis to assess the viability of investments.

It is important to encourage the usage of RE sources and provide appropriate regulations. Moreover, the government should adopt a subsidy system and set annual goals in order to achieve the 10 year RE target.

- The objectives of the Palestinian energy sector so far have been to ensure the security of supply and minimizing the dependence upon foreign sources.
- PENRA's RE strategy defined targets aims at supporting the overall objectives of the energy sector. Therefore, the RE strategy set targets to increase the generation of RE's penetration in the Palestinian energy mix and enhancing energy independence.
- The 10 year targets for RE in Palestine are illustrated in the graph below.
- PENRA states in its RE strategy that *"It is important to work on encouraging the usage of RE sources and provide respective regulations and legislations; moreover, the government should adopt a subsidy system for the producers of the kind of energy, while setting specific annual goals to be achiever, so as to yield 10% of locally produced total electric power consumption by 2020."*
- It is important to point out that, with the increasing energy consumption, PENRA's 10% target in 2020 equals to about 240GWh.

The 10 year target of RE strategy



Source: RE strategy, PENRA 2011

The RE strategy is connected to several other policies and strategies that together work to achieve the higher purpose of social, economic and environmental welfare in Palestine

In order to develop the RE strategy and the means necessary for supporting the implementation of RE technologies, PENRA addressed several issues including:

- **Integration of the RE strategy with other social, economic and environmental policies and strategies**
    - PENRA is aware of the necessity of collaborating with different sectors in the Palestinian economy in order to achieve RE targets. The graph below depicts the inter-relationships between the RE strategy and other planning policies in Palestine.
- **Setting out an enabling environment for RE deployment**
    - The high upfront costs associated with RE technologies make them uncompetitive with conventional sources in the short-run. Thus the establishment of a suitable environment (through financial support and fiscal instruments) is important for stimulating the deployment of RE technologies.
    - Moreover, many RE sources in Palestine are untapped due to the risk perceived by potential investors both in regards to the technologies themselves and to Palestine in general.
    - Therefore, PENRA has taken the responsibility of diminishing these risks by undertaking pilot projects and creating an appropriate environment surrounding RE technologies.
- **Laying down the appropriate institutional arrangements between stakeholders.**

2.2. PSI in the framework of Palestine's RE strategy

- As part of its RE strategy, PENRA set out RE capacity targets to be achieved through the installations of various RE technologies (solar, wind and bio gas). The capacity targets were set for two intervals; 2012-2015 and 2016-2020.
- The table below depicts the RE capacity targets to be achieved for both intervals.
- According to PENRA's RE target, total RE capacity by 2015 will amount to 25MW. RE from solar power as a percentage of full RE capacity in 2015 will amount to 60% of total RE potential.
- As for the 2020 target, total RE capacity will amount to 130MW distributed as follows;
    - 50.0% from solar sources (on ground PV, small PV and CSP)
    - 16.2% from bio gas sources (landfill and animal)
    - 33.8% from wind sources (small-scale wind and wind mills)
- As solar energy is the RE application that is most convenient to Palestinian circumstances and needs, PENRA focused on this RE technology when setting its RE capacity targets. As part of its concentration on solar RE, PENRA set up the Palestinian Solar Initiative (PSI).

RE potential in Palestine

RE Technology	2015 Capacity (MW)	2020 Capacity (MW)
On ground PV	5	25
PV small	5	20
CSP	5	20
Biogas landfill	6	18
Biogas animal	0.5	3
Small-scale wind	1	4
Wind mills	2.5	40
Total (MW)	**25**	**130**

The Palestinian solar initiative aims at achieving a 5MW RE capacity from PV panels installed on the rooftops of Palestinian households throughout the West Bank.

- The Palestinian solar power initiative's concept was formulated by PENRA as part of its RE strategy.
- The initiative's target is to achieve 5MW of solar RE by 2015 through installing PV panels on the rooftops of Palestinian households throughout the West Bank. The table below (first one) depicts the distribution of the 5MW RE capacity within different areas of the West Bank.
- The rationale behind PENRA's solar power initiative is as follows:
  - Spreading the technology and know-how within the Palestinian society.
  - Getting international accreditation in the global RE society through hosting a "loud" kick off for the initiative.
  - Encouraging the Palestinian people to use RE technologies, namely PV panels, which will drive their prices down.
  - Achieving environmental benefits resulting from the reduction of CO2 emissions in Palestine.
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  - Building the Palestinian people RE knowledge and capacity in order to be able to product PV panels locally in the future.

RE potential in Palestine

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Palestinian Solar Initiative Plan

Location	Installed Capacity (MW)
Northern West Bank	1.5
Central West Bank	2.0
Southern West Bank	1.5
Total (MW)	**5**

The PSI is supported by financial incentives that facilitate the initiative and shorten the pay-back period by more than one half.

- The Palestinian solar power initiative will be supported by subsidies and rebates that aim at encouraging people to install PV panels on their rooftops.
- Through the PSI, PENRA aims at shortening the pay-back period by more than one half for people installing PV panels. This means that the average 20 to 25-year pay-back period of regular PV installations will be reduced to around seven to eight years.
- Two kinds of subsidies were set in place to support the PSI; rebates and feed-in tariffs (FIT). The table below depicts the rebates and FIT's that are planned for the period between 2012 and 2014.
- The PSI will be subsidized by a 47% subsidy (approximately USD7.5m) and the participants will contribute the remaining 53% (approximately USD8.5m).
- It's worth noting that the planned rollout of the PSI is 100 households in the first year (2012), 300 households in the second year and 600 in the third year. The expected PV production within the rollout period is 750 MWh in 2012 going up to 7,500MWh in 2014 as the rollout period ends.

PSI First Three Year Rollout Plan

Year	MW	Cumulative MW	Household Rollout	Cumulative Households	PV Production MWh	Rebate (USD in 000's)
2012	0.5	0.5	100	100	750	750
2013	1.5	2	300	400	3,000	2,250
2014	3	5	600	1000	7,500	4,500
Total	**5**		**1000**		**11,250**	**7,500**

On Building PV & PSI Action Plan

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Approximate Capacity (MW)	1	2	3	4	5	6	8	10	12
Regulation										
Specific procedures for simple notification										
Appoint the responsible to provide information and assistance to potential applicants										
Information on authorization, certification and licensing applications and assistance										
Establish a one-stop shop for coordinating all steps										
Projects Development										
Demonstration programs										
Initial projects										
Regular projects										
Incentives										
FIT mechanism definition										
Consultation process										
Implementing body and monitoring authority to manage the financing scheme										
Capacity Building										
Teaching programmes for the training of RET installers										
Educational packages on RET										
Information documents targeting the general public										
Proposals of postgraduate thesis										
International cooperation in the fields of education and training										
Informative dossiers for the sector actors										
Technological Actions										
Monitoring and lessons learned										
Technical studies										
Technical specifications										

3. Implementation Arrangements

Details of the implementation plan

- Prior to the launch of the initiative, the PENRA should ensure the availability of all the funds required for implementing the initiative through signing binding agreements with donors and related governmental bodies such as the Ministry of Finance.

- Once completed, the next step will be signing a binding agreement between the PENRA and the DISCOs to ensure the full implementation of the initiative.

- Furthermore, PENRA should initiate discussions with Banks for ensuring the implementation of the Program. This step is needed to make sure that Banks will accept equipment as a form of collateral in case participants need loans.

- Based on PENRA's general policy, PERC, as the Palestinian Electricity Regulator, should use its authority to develop and publish regulations for the proposed small-sized power generation systems using photovoltaic technology to be connected to the power grid. The regulations should detail the requirements that need to be met by any prospect applicant to be eligible for participating in the program. The regulation should be published to the public and made available to all interested parties.

- Any individual who is in compliance with requirements of the above developed regulation would need a license for selling energy to an Electricity Distribution Company. PERC should provide all prospect participants with the licensing requirements and forms.

- The licensing process required for any participant consists of three stages as follows:

    - **Application for license in principle**. The participants shall submit their application to the DISCO in triplicate using the forms published from time to time. In their applications, the participants are required to meet certain pre-conditions such as ownership of the roof. The application shall be submitted to the DISCO and shall be reviewed by its professional team within the newly established renewable unit. Any application found to be appropriate by the DISCO shall be forwarded to PEC for authorization of the license. PEC will ensure the completeness, accuracy and reliability of the information provided in the application. After approval by PEC, the license would be submitted for approval to PENRA and would then become effective. Applications not found appropriate shall be forwarded to PERC along with documentation on why the application was refused. This step is necessary to ensure that all participants receive fair screening by the DISCOs and PEC.

    - **License in principle**. After review of pre-conditions, the participant shall be granted a license in principle, including progress milestones for a term of up to three months. The license in principle is the document which accompanies the participant in the installation phase of the system, and which constitutes the regulatory environment in which the participant operates - alongside the regulations. This license in principle contains milestones for project progress, and by complying with these milestones the license holder will eventually be granted a permanent license. Compliance with the milestones allows the participants to progress towards financial closing and eligibility for the tariff in conjunction with the total volume allocated for this initiative. The license in Principle will also include the system specifications developed by the PEC upon the completion of every milestone; PEC shall certify that the completion is in accordance with the outlined requirements.

    - **Permanent License.** After construction of the system, the participant shall contact the DISCO to connect his system with the power grid. The DISCO will run all required technical testing and connect the system to the power grid. Once completed, the system

owner shall be granted a permanent license for a 20-year term by the PENRA based on a recommendation from PEC.

- Upon the issuance of the license, and upon the submittal of official invoices from the supplier, the PENRA shall pay the supplier for the cost of the system within 28 days from receiving the invoice from the participant.
- After the complete installation, and once the systems are operating, DISCOs are required to report to PENRA on monthly basis the amount of electricity supplied to the network along with the payment of the bill by the DISCOs for the electricity supplied. Other reporting requirements will be detailed and agreed upon during the agreement phase in point 2 above.
- Within 28 days from receiving the invoice for the power supplied by participants and purchased by DISCO's, the PENRA shall arrange for the full payment of its obligation in accordance with agreement to be signed between the DISCO's and the PENRA as mentioned in point 2 above.

4. Economic and Financial Analysis

Costs are based on actual market prices

All prices for the tariff calculation are based on actual market prices. A comparison between EU and US was performed. A split of the crucial components for inverters, batteri and controller were collected.

In addition, the collected prices confirmed through the following sources:

- PVI, Austria (supplier and installer of total PV systems, prices asked loco Ramallah)
- Actual market prices of suppliers in Israel
- Kioto, Austria (supplier of complete modules, prices loco Tel Aviv)
- Energetica, Austria (supplier of complete modules, prices loco Israel)

In addition to the costs for the assets, the following price components were added:

- Costs for crane and transport
- Costs for mounting
- Costs for installation and connection

Module Pricing Trends per Watt peak			
United States	$2.42	↘	0%
Europe	€2.31	↘	-1%
Number of Prices <$2.00 or €1.54/Wp	313 (28% of survey)	⇧	11%
Lowest Mono-cSi Module Price	$1.28	→	0%
	€0.99	↗	9%
Lowest Multi-cSi Module Price	$1.14	→	0%
	€0.88	↗	2%
Lowest Thin Film Module Price	$1.15	↘	-3%
	€0.89	→	0%

Source: www.solarbuzz.com

Market prices of modules and components

	Unit	Jan 11	Feb 11	Mar 11	Apr 11	May 11	Jun 11	Jul 11	Aug 11	Sep 11	Oct 11	Nov 11	Dec 11	Jan 12
Module	US$/Wp (≥125 W)	3.38	3.29	3.19	3.12	3.11	3.10	3.02	2.84	2.65	2.6	2.49	2.43	2.42
	Euro€/Wp (≥125 W)	3.05	2.9	2.8	2.73	2.69	2.66	2.54	2.51	2.43	2.37	2.33	2.33	2.31
Inverter	US$/Continuous Watt	0.715	0.715	0.715	0.715	0.715	0.715	0.715	0.714	0.714	0.714	0.714	7.130	7.120
	Euro €/Continuous Watt	0.537	0.522	0.515	0.508	0.479	0.500	0.500	0.500	0.500	0.528	0.528	0.534	0.548
Battery	US$/Output Watt Hour	0.210	0.211	0.212	0.212	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213
	Euro€/Output Watt Hour	0.160	0.154	0.153	0.151	0.143	0.149	0.149	0.149	0.149	0.158	0.158	0.160	0.164
Charge Controller	US$/Amp	5.88	5.93	5.93	5.93	5.93	5.89	5.93	5.93	5.93	5.93	5.93	5.93	5.93
	Euro€/Amp	4.41	4.33	4.27	4.21	3.97	4.12	4.15	4.15	4.15	4.39	4.39	4.45	4.57

Key Assumptions

The tables on the next page depict the main assumptions adopted for calculating the required FIT for the PSI (base case scenario).

The base case assumptions include the following:

- A PV size up to 5kWp for each household.
- A subsidy of USD1,500/kWh.
- Installed PV capacity of 5MW by 2020 with a capacity of 1,500kWp/year per installed kWp of solar PV.
- A payback period of eight years was assumed for the base case.
- Retail electricity price of approximately ILS0.52/kWh for residential customers.
- The cost of changing the convertor (USD658), operating expenses (insurance of approximately USD32.0) and V.A.T (14.5%) are not considered as part of the cost or subsidy in the base case scenario.

General PSI Assumptions

Exchange Rate USD/NIS		0.26
Subsidy USD/kWp		1,500
Investment costs PV (USD/kWp)		3,200
Standard size per HH (kWp)		5
Installed PV MW in 2020		5.0
Number of Households		1,000
Capacity per kWp (kWh)		1,500
Cost of CO2 allowances USD/tCO2		7
Annual Maintenance Cost (USD)		-
Annual Insurance cost as percentage of Total Equipment value		1%
Price of Changing Converter (USD)	No	-
V.A.T	No	0.0%
Add Opex to Subsidy		No
Desired Payback Period		8
Inflation		0.00%
Average household consumption per year (kWh)		3,710

Source: Financial Model

Electricity Prices Assumptions

ILS

Purchasing price from IEC / kWh	0.380
Residential / kWh	0.520
Commercial / kWh	0.615

Source: Mercados

The total capital requirements for a decentralized Photovoltaic system of 5MW installed capacity are estimated at USD16.0m

- Total investments costs for decentralized photovoltaic power system of a 5MW installed capacity are estimated at approximately USD16.0m.
- Investments costs are based on the following set of assumptions:
  - 1,000 participating households;
  - A 5kWp system capacity for each household installation;
  - A total cost of USD3,200 per kWp installed.
  - 1,500 load hours per year for each 5kWp system.
- The cost for PV includes the cost for:
  - Panels
  - Inverter
  - Electric Equipment (cables, boxes, etc)
  - Aluminium Foundation
  - Construction and Permits
  - Shipping Cost
  - Installation cost
- Battery prices are not included based on the assumption that all power generated will be fed into the grid.
- OPEX, and based on a market survey, includes two components: Insurance and Maintenance. Maintenance basically represents cleaning cost of PVs. Internationally, special companies and for a fixed fee of approximately 75 USD/annum assumes the responsibility of cleaning the panels. In the PSI case, it is assumed to be zero and that households will handle the cleaning process by themselves. Part of the awareness campaign to be developed by PEC will ensure that participants are fully aware of the methods and benefits of cleaning their PVs.

CAPEX assumptions for 5kWp standard installations

Assumptions for 5kWp	
Load hours PV (Hour)	1,500
MW Capacity PV	5.00
Number of households	1,000
Cost for 1 kWp PV (USD/kWp)	3,200
Size of PV per household in kWp	5
Total CAPEX in USD	**16,000,000**

The total value of the suggested subsidy to cover the capital costs of PVs installations amounts to USD7.5m or USD7.5k per household

- The table below illustrates the exact breakdown of the proposed capital subsidy for renewable-energy solar systems in Palestine.
- In order accelerate the deployment of renewable energy in Palestine; a subsidy must be put into place to make PV installations financially feasible and attractive for Palestinian households.
- The commercial viability of PV systems requires financial incentives consisting of both a subsidy to cover a portion of the capital costs of solar systems as well as a Feed-in-Tariff for the sale of electricity generated by the system.
- It is estimated that a total capital subsidy of USD7.5m or USD7.5k per household will be required in order to make the proposed 5MW solar initiative attractive and financially viable.
- The total investment cost for a 5kWp system is estimated at USD16.0k per household. Based on a USD1.5k subsidy per kWp installed, each household will still have to contribute USD8.5k for each 5kWp solar system to be installed. This extra contribution is contingent on the household ability to sell electricity to the grid at an acceptable Feed-in-Tariff.
- Based on these figures, the percentage of capital subsidy for each solar system translates into 47.0% of the total system cost.

Subsidy split

Investment subsidy USD/kWp	1,500
Investment subsidy program in USD	7,500,000
Subsidy	47%
Investment subsidy household in USD	7,500
Total Cost Per Imitative in USD	16,000
Investment per household after subsidy in USD	8,500

The Palestinian solar initiative will contribute towards a substantial reduction in CO2 emissions whereas the total avoided costs of CO2 are projected to total approximately USD0.5m over 15 years

- The table below illustrates the total avoided costs of CO2 emissions resulting from the implementation of the Palestinian solar initiative.
- The avoided costs of CO2 emissions are expected to reach approximately USD7.2k in FY12F and will increase gradually to approximately USD36.3k in FY14F after which they will remain constant throughout the rest of the projection period (FY14F-FY26F). The avoided costs of CO2 were calculated based on a CO2 allowance of USD7.0 per each metric ton of carbon dioxide emitted from existing power generation fuel sources.
- The total level of CO2 emissions otherwise generated in case the solar initiative is not implemented is estimated to reach 71,622 metric tons over 15 years based on an emission's factor of 0.692 t/MWh.

CO2 calculation	FY12F	FY13F	FY14F	FY15F	FY16F	FY17F	FY18F
Electricity production (MWh)	1,500	4,500	7,500	7,500	7,500	7,500	7,500
CO2 (Ton)	1,038	3,114	5,190	5,190	5,190	5,190	5,190
avoided costs of CO2 (USD)	7,266	21,798	36,330	36,330	36,330	36,330	36,330

FY19F	FY20F	FY21F	FY22F	FY23F	FY24F	FY25F	FY26F
7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
5,190	5,190	5,190	5,190	5,190	5,190	5,190	5,190
36,330	36,330	36,330	36,330	36,330	36,330	36,330	36,330

Source: CDM prices, PwC Analysis

Base case results (1/2)

- The table below calculates total initiative cost based on the base case scenario (8 years payback period with no Opex, V.A.T or cost of changing convertor considered).

Total 20 years Initiative Cost in USD

Payback period (8years)

	USD
Cost of System	16,000,000
Add: V.A.T	2,320,000
FIT Net of Retail Price (FIT- Retail Price)	6,240,000
Technical Assistance & Capacity Building	1,500,000
Total Cost	**26,060,000**

Contributions

Government	
V.A.T	2,320,000
Total Government Contribution	**2,320,000**
Participants	
Participants share of System Cost	8,500,000
Total Participants Contribution	**8,500,000**
Donors	
Subsidy of initial investment	7,500,000
Subsidy of FIT (share)	6,240,000
Technical Assistance and Capacity Building *	1,500,000
Total Donor Contribution	**15,240,000**
Total Cost for the PSI Initiative	**$ 26,060,000**

Total initiative cost based on the base case scenario amounts to approximately USD 26 millions.

*The technical assistance and capacity building includes:

- Preparation of the necessary feasibility study and complete tender documents for building the 5 MW on ground PVs.
- Preparation of the necessary feasibility study and complete tender documents for building the 5 MW CSP.
- Preparation of Palestinian wind Atlas and Solar Atlas.
- Energy audit for all PSI participants.
- Creation of Renewable Energy Units within the different DISCOs.

- Training for PENRA, PEC, PERC, DISCOs and suppliers on PV related issues.
- Public awareness campaign.
- Running costs for the Project Management Unit " PMU RED" within PENRA that will handle and monitor the daily operations related to the implementation of the initiative

Base case results (2/2)

- The tables below depict the feed-in tariff and net customer income based on the base case scenario.

Base Case FIT and 20 year equity IRR	
Desired Payback Period (Years)	8
Initial investment by consumer	(1,700)
Required FIT (based on payback period) USD	0.14
Required FIT (based on payback period) ILS	0.54
Equity IRR (20 years)	8.57%

- According to the base case scenario, the feed-in tariff (FIT) required to cover customer's investment after the subsidy is approximately ILS0.54/kWh (approximately USD0.14/kWh).
- A base case payback period (eight years) would result in equity IRR of 8.57% over the 20 year equipment lifetime.
- The table below calculates net customer income resulting from applying the PSI in its base case scenario (both before and after the eight year payback period).
- Within the eight year payback period, total customer revenue (resulting from selling produced energy at the FIT amount) will amount to approximately USD8.5k, meanwhile total customer expenses (resulting from consuming electricity from IEC at the residential rate) will amount to roughly USD4.0k. Thus net income within the eight year payback period will amount to approximately USD4.5k.
- After the payback period and for the remaining 12 years of equipment lifetime, consumer revenue (resulting from selling energy at the FIT) will amount to nearly USD10.8k, while consumer expenses (resulting from consuming electricity at the residential rate) will amount to approximately USD6.0k. Thus the consumer will be saving about USD4.8k over the 12 year period. Adding consumer savings to actual income, total income per consumer (household) from the PSI will amount to approximately USD9.3k.

Calculation of customer income-base case for 20 years

Payback period (years) 8	USD
Consumer Revenue	8,500
Consumer Expenses	4,013
Net Income Excluding CC	**4,487**
After PBP Consumer Income	10,830
Consumer Expenses	6,019
Net Savings after payback period	**4,811**
Total Income	**9,298**

Scenario summary

- The table below summarizes the key indicators for the base case scenario in addition to a scenario with V.A.T addition and without Opex.
- In the "no Opex, no V.A.T" scenario, FIT decreases from approximately ILS0.87/kWh to approximately ILS0.44/kWh as the payback period increases from 5 years to 10 years. Meanwhile IRR decreases from 17.38% to 5.14% as the payback period increases from 5 years to 10 years.
- In the "no Opex, add V.A.T" scenario, FIT decreases from approximately ILS1.11/kWh to approximately ILS0.55/kWh as the payback period increases from 5 years to 10 years. Moreover, IRR decreases from 17.82% to 5.72% as the payback period increases from 5 years to 10 years.

Scenario Comparison

Payback Period (Years)	5	6	7	8	9	10
No Opex,No V.A.T, Subsidy USD1.5k/kWp						
Cost per kWp	3,200	3,200	3,200	3,200	3,200	3,200
Subsidy per kWp	1,500	1,500	1,500	1,500	1,500	1,500
FIT (ILS)	0.87	0.73	0.62	0.54	0.48	0.44
IRR	17.38%	13.64%	10.81%	8.57%	6.71%	5.14 %
Residential sale price (ILS)	0.52	0.52	0.52	0.52	0.52	0.52
Generation Capacity per kWp (kWh)	1,500	1,500	1,500	1,500	1,500	1,500
Profit per 1500 kWh	308	251	211	181	157	138
No Opex, add V.A.T , Subsidy USD1.5k/kWp						
Cost per kWp	3,664	3,664	3,664	3,664	3,664	3,664
Subsidy per kWp	1,500	1,500	1,500	1,500	1,500	1,500
FIT (ILS)	1.11	0.92	0.79	0.69	0.62	0.55
IRR	17.82%	14.10%	11.30%	9.09%	7.26%	5.72 %
Residential sale price (ILS)	0.52	0.52	0.52	0.52	0.52	0.52
Generation Capacity per kWp (kWh)	1,500	1,500	1,500	1,500	1,500	1,500
Profit per 1500 kWh	401	329	277	239	208	184

- The table below summarizes they key indicators for the "add Opex, no V.A.T" scenario and the "add Opex, add V.A.T" scenarios.
- In the "add Opex, no V.A.T" scenario, FIT decreases from approximately ILS0.95/kWh to approximately ILS0.52/kWh as the payback period increases from 5 years to 10 years. Meanwhile IRR decreases from 19.43% to 7.75% as the payback period increases from 5 years to 10 years.
- In the "add Opex, add V.A.T" scenario, FIT decreases from approximately ILS1.19/kWh to approximately ILS0.64/kWh as the payback period increases from 5 years to 10 years. However, and just as in the "add Opex, no V.A.T" scenario, IRR decreases from 19.43% to 7.75% as the payback period increases from 5 years to 10 years regardless of the changes in investment costs and FIT.

Payback Period (Years)	5	6	7	8	9	10
Add Opex, no V.A.T , Subsidy USD1.5k/kWp						
Cost per kWp	3,200	3,200	3,200	3,200	3,200	3,200
Subsidy per kWp	1,500	1,500	1,500	1,500	1,500	1,500
FIT (ILS)	0.95	0.81	0.70	0.63	0.57	0.52
IRR	19.43%	15.78%	13.06%	10.93%	9.20%	7.75%
Residential sale price (ILS)	0.52	0.52	0.52	0.52	0.52	0.52
Generation Capacity per kWp (kWh)	1,500	1,500	1,500	1,500	1,500	1,500
Profit per 1500 kWh	340	283	243	213	189	170
Add Opex, add V.A.T , Subsidy USD1.5k/kWp						
Cost per kWp	3,664	3,664	3,664	3,664	3,664	3,664
Subsidy per kWp	1,500	1,500	1,500	1,500	1,500	1,500
FIT (ILS)	1.19	1.01	0.87	0.78	0.70	0.64
IRR	19.43%	15.78%	13.06%	10.93%	9.20%	7.75%
Residential sale price (ILS)	0.52	0.52	0.52	0.52	0.52	0.52
Generation Capacity per kWp (kWh)	1,500	1,500	1,500	1,500	1,500	1,500
Profit per 1500 kWh	433	361	309	271	240	216

Sensitivities

- The tables below summarize changes in FIT (in ILS) and IRR as the payback period increases from 5 years to 10 years and as the subsidy increases from 0 to USD1,500/kWp.
- The required FIT (in ILS) decreases as the payback period increases, moreover the FIT decreases as the subsidy amount increases.
- IRR decreases as the payback period increases, moreover IRR increases as the subsidy amount increases.

FIT and IRR sensitivities to changes in Payback period and subsidy level

FIT sensitivity to PBP and subsidy (assuming no V.A.T and no Opex)

	5	6	7	8	9	10
0	1.64	1.37	1.17	1.03	0.91	0.82
$1,000	1.13	0.94	0.81	0.71	0.63	0.56
$1,500	0.87	0.73	0.62	0.54	0.48	0.44
$2,000	0.62	0.51	0.44	0.38	0.34	0.31

IRR sensitivity to PBP and subsidy (assuming no V.A.T and no Opex)

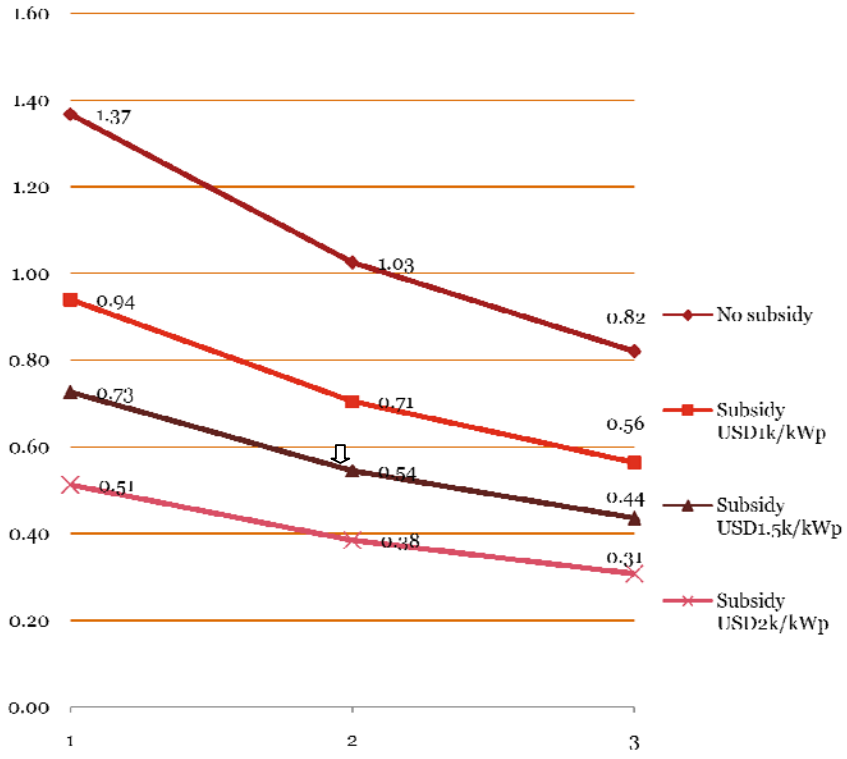
	5	6	7	8	9	10
0	18.35%	14.65%	11.88%	9.69%	7.90%	6.39%
$1,000	17.85%	14.13%	11.33%	9.12%	7.29%	5.75%
$1,500	17.38%	13.64%	10.81%	8.57%	6.71%	5.14%
$2,000	16.52%	12.72%	9.84%	7.53%	5.61%	3.96%

It is worth noting that with higher subsidy comes a lower IRR. This is due to the fact that IRR is directly related to participant's income. The higher the subsidy, the lower the FIT which means lower income for the participant and thus a lower IRR.

Summary of Feed-in-Tariff requirements according to the level of capital subsidy

- The graph below illustrates feed-in-tariff requirements for different payback periods and different levels of capital subsidies to be applied towards the installations of solar systems.
- As depicted in the chart, the required Feed-in-Tariff drops in value as the amount of capital subsidy is increased and as the target payback period is extended.
- A capital subsidy of USD2,000 results in the lowest Feed-in-Tariff requirements (ILs0.51, ILS0.38 and ILS0.31 for target payback periods of 6, 8 and 10 years respectively).
- The decision not to offer capital subsidies for the installation of solar power systems will negatively affect the financial feasibility of the Palestinian Solar initiative. This can be associated to the resulting high Feed-in-Tariff requirements which are considered unaffordable to the Palestinian government and to the distribution companies.

FIT requirements based on different subsidy programmes and payback periods



5. CO2 Reduction Expected Benefits

Implementing the PSI would reduce CO2 emissions by 5.190 tons of CO2. If the program is only installed in the Household sector, the CO2 Emissions within this sector could be reduced by 3.12%

- The assessment of CO2 in Palestine indicates that there is approximately 3.500.000 tons of CO2 in total based on 2009 data from PCBS.
- 49% of these emissions are generated from households. Within the electricity sector, 66% of the CO2 Emissions are coming from the Households.
- **A 5 MW program would reduce the CO2 emissions by 5.190 tons of CO2. If the program is only installed in the Household sector, the CO2 Emissions with in this sector could be reduced by 3.12%.**
- The total impact to the total national CO2 emissions would be 0.21%

6. International experience

International experience and best practices reveal that the gradual deployment of renewable technologies is the best approach to catalyzing sustainable energy in developing countries

- The Palestinian solar power initiatives aim to achieve a gradual deployment of renewable-energy technologies in Palestine until the local electricity markets become ready to absorb large-scale grid-connected electricity production.

- Utilities in developing countries and Palestine are not geared to manage dispersed small-scale generation units at a large scale. Therefore, it is wise to scale up the use of renewable-energy technologies at a gradual pace in order allow utilities to adapt to a new energy system where they have to deal with multiples generators and producers.

- In addition, unambiguous support by local governments is of utmost importance. In many cases, deployment of renewable-energy systems has been seriously hampered by ambiguity of local politicians in their policies and actions.

- Despite all the benefits of renewable energy, the intermittent nature of certain sources such as wind or solar calls for developing diversified systems that aim to maximize the contribution of renewable-energy sources but that also use clean natural gas and/or biomass power generation to provide base-load power in the absence of wind and sun.

- Installing renewable-energy systems requires certain technical experience that is currently not available on a large scale in the local market. Gradual deployment can be implemented in parallel to vocational training, capacity-building activities and other educational instruments after which large-scale deployment can be made possible.

- The viability of renewable-energy projects in Palestine is closely tied with the level of incentives the PA can afford to offer in order to encourage private investment in clean energy. The socio-economic situation and unpredictable political context in Palestine do not permit the government to offer unlimited financial incentives and other means of support for renewable, for the time being. What is more, studies illustrate that the cost of producing energy from renewable sources will reach parity with energy produced fossil fuels in a few years, which could eliminate the need for incentives in the long-run altogether.

- According to a World Bank study on the design and performance of policy instruments to promote the development of renewable energy in developing countries, policy sequencing is critical for policy effectiveness: the existence of basic legal and regulative preconditions, as well as institutional and administrative efficiency are crucial to the effectiveness of RE policy. For example, legal and regulative frameworks for grid connection and integration, resource and land use and/or the allocation of permit rights must be in place before RE policy is introduced, and the process of granting permits should not create bottlenecks. In other words, the focus of policy must not be on meeting high targets but should rather focus on the efficient scale-up of renewable.

- Policy interaction and compatibility need to be considered: The coexistence of policy instruments has the potential to result in complex interactions and unintended effects. Thus, by gradually deploying renewable, policy makers need to assess the compatibility among policy and regulatory mechanisms and gather lessons in order to avoid conflicts and errors in future RE schemes. It is also vital that individual policies are coordinated with the wider set of conditions that impact the energy market.

- Policy and regulatory design are dynamic processes: Developing countries haves tested distinctive types of instruments to support RE development (policy shifts) and many are now using both price and quantity setting instruments to support different segments of the RE

market. In many countries, feed-in tariff policies (FITPs) have required successive adjustments based on market dynamics. Therefore, smaller scale deployment of renewable at the initial stage is a wise strategy in order to assess market factors that could force policy changes in the future.

- While green growth in developing countries and Palestine is necessary to minimize climate-change impacts on a global level, other more pressing developmental priorities compete for the use of budgetary resources, concessional finance and official development assistance. This limits the amount of official assistance that can be offered to renewable by the Palestinian government, especially in light of continuous changes in development priorities and the need for emergency interventions.

7. Expected Risks and Mitigation Measures

Risk mitigating measures and techniques were considered and incorporated in all plans to ensure acceptable level of risk

The following table summarizes the key risks and the key actions taken to mitigate those risks:

Risk	Mitigating Control / Procedure
The PA will not be able to honour its commitment to funding the initiative.	All relevant PA organs were involved in the decision making process and are aware of the future commitments.
Other parties (such as Discos) will not participate in the initiative.	The initiative will be in form of a legal document where participation is mandatory by law.
The amount supplied to the Grid will exceed the planned amount and thus, the liability will increase in an unexpected manner.	The contract will specify the maximum amount of production that the initiative will cover based on the studies performed.
Participants will not have an equal opportunity to participate in the program.	Two independent bodies (PERC and PEC) will monitor the decision making process and ensure the fairness of decisions.
Participants may be encouraged to buy low quality systems to make the utmost use of the subsidy and payback period.	Technical specifications will be developed to outline the minimum system requirements.
System may be destroyed or lost and thus investment amount will be lost.	All participants will be enforced to buy an insurance policy for the total amount of the investment.
The investor will not be able to honour his commitment to purchase the system.	No funds will be disbursed to any investor prior to that investor fully funding his/her share.
The market will not have the skills and capabilities needed to implement the initiative.	A full capacity development program will be launched prior to the official launch of the initiative.
The public may not be interested to join due to lack of awareness of the benefits of the program.	A large scale public awareness campaign will be launched to increase the public awareness.

8. Aspects of Donor Policies & Donor Harmonization

RE deployment can make a contribution to energy, environmental and economic policy in three interacting areas: energy security, reduction in CO2 emissions, environmental benefits, and economic development

Donor policies

- The peace process in the early 1990s and onwards led to a sharp focus on the developments of the situation in the Palestinian areas. It was understood by the international community that support had to be provided to develop Palestinian institutions, infrastructure and the economy. Such support was forthcoming from several countries and international institutions, to various sectors in Palestine. Both the donors and the Palestinian authorities expressed that the aim was to provide support that would benefit the Palestinian people.

Justification

- The intention of this Program Document is to propose a coherent program covering projects important to the continued development of the Palestinian electricity sector. The sector has experienced very significant successes with previous programs, to the benefit of the Palestinian people. There have also been setbacks, mainly the damages inflicted during incursions into the Palestinian territories and the imposed restrictions on movement of personnel and materials. This has, to some extent, diverted the sector's resources and delayed implementation of projects. However, all in all, donor funded projects have been completed as planned despite the difficult political situation. The Program proposed in this document represents sector's present priorities in the further improvement of the sector.

Gender issues

- The project is not designed with any particular effect on women, except the general positive effects from improved supply of electricity as they spend more time and work at home than men, so they will benefit from the safer and more reliable electricity supply.

- Renewable energy can bring significant economic, social and environmental benefits for developing countries in general and for Palestine, in particular:

Energy Security

- Energy security involves the provision of sufficient and reliable energy supplies to satisfy demand at all times and at affordable prices, while also avoiding environmental impacts. In light of the political context in Palestine and in relation to various instances of energy and electricity supply interruptions in the past, sustainable energy can certainly play a key role in guaranteeing energy security in the long-term. Availability, affordability and sustainability of energy supply are interlinked facets of overall energy security.

- Increasing the role of RE technologies can improve energy availability by providing improved diversity, and by providing a more distributed and modular energy supply that is less prone to interruptions. RE technologies reduce the need for fossil fuels, thereby reducing import bills and improving the balance of payments. Using indigenous supplies such as wind and solar also insulate economies from both risk of rising energy prices and short-term price volatility, something of significant importance to developing countries.

- Although RE technologies are often thought of as expensive options, several technologies, including wind power are now cost-competitive when the resource conditions are available. In addition, the cost of many other renewable-energy technologies, including PV is falling rapidly.

- Thus, RE technologies are becoming increasingly affordable, particularly when taking the full costs of the alternatives into account, including environmental costs, and when taking a longer-term view on rising and volatile fossil-fuel prices.

Reduction of CO2 emissions and environmental impacts

- RE technologies can play a key role in combating climate change, and they already deliver important CO2 emission reductions. The results of several life-cycle assessment studies indicate that RE technologies have a life-cycle CO2 emissions that are significantly lower than fossil-based technologies.

- In a study conducted by the International Energy Agency, it was estimated that the Middle East region can save around 48 Mt of CO2 emissions by incorporating renewable in their energy mix.

Economic Development

- RE technologies are able to contribute to sustainable economic development by allowing exploitation of natural but replenishing sources, providing fresh sources of natural capital. The technologies would allow a country like Palestine with good solar and wind resources, to exploit these resources as "new" assets to support their own energy needs. RE technologies may even allow countries to exploit RE resources with long-term export potential, by producing bio fuels in a sustainble manner, or by using high levels of solar radiation to generate exportable electricity via RE technologies, as proposed by the DESERTEC projects.

- The costs of importing fossil fuels and the increasing volatility of prices can depress economic development and growth. Developing countries without abundant domestic fuel resources spend even higher percentages of their GDP on net fossil imports. For such countries, fossil fuel import bills pose a serious impediment to economic development.

- Job creation is an important economic policy objective for all governments. Deploying RE technologies can lead to positive net employment effects. A study carried out by the United Nations Environment Programme (UNEP) concludes that "compared to fossil-fuel power plants, renewable energy generates more jobs per unit of installed capacity, per unit of power generated, and per dollar invested.

- Global RE markets can be expected to grow rapidly in the future due to climate change mitigation and energy security imperatives. Jobs created in this sector, therefore, have a sustainable long-term perspective, a key element to consider when appraising the labour market effect of government support policies.

Poverty Alleviation

- Renewable energy projects in many developing countries have demonstrated that renewable energy can directly contribute to poverty alleviation by providing the energy needed for creating businesses and employment. Renewable energy technologies can also make indirect contributions to alleviating poverty by providing energy for cooking, space heating, and lighting.

Education

- Renewable energy can also contribute to education, by providing electricity to schools. Renewable energy for cooking and heating can reduce the time that children spend out of school collecting fuel. In addition, the displacement of traditional fuels reduces the health problems from indoor air pollution produced by burning those fuels.

Health

- Renewable energy can play a key in promoting and protecting health. On one hand, sustainable energy can be used to power hospitals and clinics and allow them to operate in communities where electricity interruptions are considered common and frequent. On the other hand, the use of renewable energy can end the harmful effects of using fossil fuels and other traditional forms of energy for space heating and cooking whether in residential, commercial or industrial settings.

PENRA will work closely with all Donors to streamline the effort and ensure no duplication of Efforts takes place

Harmonized financing

- This will require mutual accountability between donors and PENRA. Given the possibility that many donors may participate in the financing of the initiative, PENRA will direct the donor aid and engage donors in concrete actions to improve the terms of aid to maximize the impact and to prevent duplication.
- PENRA demonstrated to donors through previous cooperation that it has the capability and the leadership for managing funds and harmonizing donor's aid.
- The template below will be used by PENRA for recording all donations received and ensuring that no funding will exceed the budget needed for implementing the program.

PSI component	Participants	Government	Donor 1	Donor 2	Donor n	Total
VAT exemption		2,320,000				2,320,000
Investment	8,500,000		X1	X2	Xn	16,000,000
FIT			Y1	Y2	Yn	6,240,000
TA & Capacity building			Z1	Z2	Zn	1,500,000
Total		2,320,000	T1	T2	Tn	26,060,000

Information & Reporting

- PENRA will put in place the necessary information and reporting systems to monitor the progress in the initiative and submitted to the donors on timely manner.

Appendix A. - Glossary of Terms

Term	Meaning
Capex	Capital expenditures
CC	Convertor cost
CSP	Concentrated solar power
DisCo's	Distribution companies
FIT	Feed-in tariff
FYxxx	Fiscal Year xxx
FYxxxF	Fiscal Year xxx Forecasted
GDP	Gross domestic product
GW	Giga Watts
HH	Household
IEC	Israeli electricity company
ILS	Israeli Shekel
IRR	Internal rate of return
kWh	Kilo Watt Hour
MW	Mega Watts

MWh	Mega Watt Hour
Opex	Operating expenditures
PA	Palestinian Authority
PBP	Payback period
PEC	Palestinian energy research centre
PENRA	Palestinian energy and natural resources authority
PERC	Palestinian electricity regulatory council
PMU	Project management unit
PPA	Power purchase agreements
PSI	Palestinian solar initiative
PV	Photovoltaic
R&E	Research and development
RE	Renewable energy
USD	United states dollar
V.A.T	Value Added Tax