The Overall strategy for Renewable Energy in Palestine

Energy sector is the backbone of the economy in all countries, where providing power services especially electricity will contribute in achieving development goals of countries in many fields such as trade, agriculture and important social services like education and health care.

One of the main obstacles that most of the government in the developing countries encounter is how to improve the efficiency and the degree of reliability of energy supplied while making modern energy services available to all people and affordable at the same time, and because of the huge unmet demand for energy and the volatility of energy prices in the recent period, ensuring the availability and security of energy supplied at reasonable prices has become the cure issue in the development of energy policy.

Accordingly, the Palestinian Energy Authority has prepared a strategy for renewable energy as an important part of the resources matrix, where Palestine needs clean and more secure supply of electrical power. The Palestinian Energy Authority has developed a clear goal for the year 2020 is as follows:

To attain 240 GWh gradually (at least) to generate electricity from different renewable resources which is equivalent to 10% of the power that will be produced locally by 2020, according to the strategic plan of the energy sector.

The estimated exploitation of renewable resources (thermal) is about 18% of the total current energy consumption in Palestine, which represents 2287 GWh (of the power produced) which will be used in particular in heating and thus, the dependence on renewable energy will reach 25% of the power produced by the year 2020.

To achieve this goal, this strategy requires:

1- Apply the necessary regulations and legislations for the development and promotion of the use of this technology.

2- Securing a funding sources to cover the required costs and provide incentives for private sector investors.

3- Approving a plan to develop local human resources to be capable of manufacturing, installing and managing the renewable energy systems.

4-Applying the Palestinian solar initiative (PSI) for the period between 2012-2015

5-adopting a development plan for the renewable energy resources until 2020.

Based on the assessment studies of renewable energy resources conducted by the energy authority, the required technology needed have been identified in terms of application and investment until 2020, according to Table (1).

Technology used	2020 (MW)
On Ground PV	25
Rooftops PV (Palestinian Solar Initiative)	20
Concentrated solar power plants	20
biogas from landfills	18
biogas from animal waste	3
Small-scale wind	4
Wind Farms	40
Total	130

It is noted from the table above that the dependence on solar energy sources represented 50% of total capacity, so this strategy contained the initiative of solar energy in order to disseminate and promote the use of renewable solar energy technology to generate electricity.

The institutions that will participating in order to achieve this goal:

- Cabinet (cabinet)
- The Palestinian Energy Authority
- Ministry of Finance
- PERC
- The Palestinian Energy and Environment Research Centre
- Electricity distribution companies
- The private sector, which constitutes a key role in reaching this goal
- Institution for Standards and Metrology
- Universities and research centers

Implementation stages of this strategy:

Stages of implementation is divided into two phases:

• The first phase, which is considered the starting point in the promotion of renewable energy technologies and their uses through:

-Conducting feasibility studies, preparation of tenders, especially in emerging markets such as Palestine, where such studies will promotes awareness campaigns and training activities

- Implementation of projects with small capabilities

- Implementation of the Palestinian Solar Initiative (PSI)

The second phase, which comes after the maturity of the domestic market towards renewable energy technologies and their applications, through the implementation of projects with high capacity enables us to reach the desired goal by the year 2020.

1. The first phase of the Renewable Energy (2012-2015):

This stage involves dealing with different kind of renewable energy that can be used directly within the possibilities that are available which include solar energy, wind power and biogas produced from landfills and animal waste.

Based on the studies conducted by the Palestinian Energy Authority, first phase options has been identified for renewable energy, which extends until 2015, as shown in Table (2)

Technology Used	MW (2012-2015)
On Ground PV	5
Rooftops PV (Palestinian Solar Initiative)	5
Concentrated solar power plants	5
biogas from landfills	6
biogas from animal waste	0.5
Small-scale wind	1
Wind Farms	2.5
Total	**25**

The Palestinian Solar Initiative:

The first phase will include an unprecedented initiative to spread the concepts of solar energy which is called the Palestinian Solar Initiative (PSI). This initiative consists of three phases over a period of three years from the mid-2012 until mid-2015. This initiative aims to set up small businesses with a capacity up to 5 kW for each project to be installed on the roofs of homes to achieve 1/2 MW from the 100 homes in first half and expand the project up to generate one and a half MW during the following year. In the last year of the project it will generate 3 MW extra to reach a total of 5 MW at the end of three years. Nearly 1,000 homes, distributed 30%, 40% and 30% in northern, central, and southern West Bank, respectively, in addition to 400 homes in the Gaza Strip when it is possible.

Every citizen shall install this system in his home will attain a preferable electricity tariff produced from solar cells, according to the incentive bonuses set forth in Annex No. (1).

Appendix No. (2) contains the procedures that should be applied for the implementation of the Palestinian Solar Initiative (PSI).

With the exception of incentives for the Palestinian solar initiative, the first phase also contain preferable tariff specific to each type of power plants and year of operation, which is reviewed annually by PERC.

a list of feasibility studies has been identified, preparation of tenders for the implementation and the creation of projects that must begin during the year 2012-2015 as shown in the first phase of renewable energy, where this work will be performed by PEA with the assistance of external consultants specializing in these subjects.

Table (3) shows the required studies and cost:

Renewable energy technology	**Feasibility study**	**Cost (USD)**
On Ground PV	Identifying locations	10,000
	Preparing tenders and performing feasibility study	20,000
Rooftops PV (Palestinian Solar Initiative)	Conduct an energy audit on the 1000 list of candidates	15,000
Concentrated solar power plants	Solar radiation Atlas	30,000
	Study of power lines	50,000
	Preparing tenders and performing feasibility study	150,000
biogas from landfills	Preparing tenders and performing feasibility study	80,000
biogas from animal waste	Assessment and Awareness	10,000
	Field inspection	100,000
	Preparing tenders and performing feasibility study	45,000
Small-scale wind	Identifying locations	5,000
	Preparing tenders and	30,000

	performing feasibility study	
Wind Farms	Wind Atlas	150,000
	Identifying locations	5,000
	Preparing tenders and performing feasibility study	15,000
Total		**725,000**

The cost of the implementation of projects in the first phase will be through private sector investment against the purchase of energy produced in a preferable tariff

The cost of the implementation of projects in the first phase will be through private sector investment in-exchange of purchasing the electricity produced at a preferable tariff for each technology according to its type as well as any other incentives, which can be provided by the government in this field so that they are feasible to the investor.

Table No. (4) shows the total cost of the first phase projects (million dollars), depending on the readiness of the above-mentioned studies:

Renewable technology		2012	2013	2014	2015	Total
On Ground PV	Cost	2.8	4	5.3	8	20.1
	MW	0.7	1	1.3	2	5
Rooftops PV (Palestinian Solar Initiative)	Cost	1.35	5.4	5.3	9	22.5
	MW	0.3	1.2	1.3	2	5
Concentrated solar power plants	Cost	0	0	6.75	20	20
	MW	0	0	0	5	5
biogas from landfills	Cost	0	0	0	8.4	8.4
	MW	0	0	0	6	6
biogas from animal waste	Cost	0	0.158	0.316	0.316	0.79
	MW	0	0.1	0.2	0.2	0.5
Small-scale wind	Cost	0	0.45	1.35	2.7	4.5
	MW	0	0.1	0.3	0.6	1
Wind Farms	Cost	0	0	2.7	4.05	6.75
	MW	0	0	1	1.5	2.5
Total		4.15	10.008	16.416	52.466	83.04
		1	2.4	4.3	17.3	25

2. The second phase of the Renewable Energy (2016-2020): -

The second phase of renewable energy will commence after evaluating the first phase and the Palestinian market in terms of the application and use of renewable energy technology. This will open the door for private investors to invest in this sector through preferable tariff and incentives that will be approved by the government, which in turn will help to some extent to reach the potential target in 2020.

Table No. (5) shows the capabilities that will be performed to implement the second phase:

Technology Used	**MW**
On Ground PV	20
Rooftops PV (Palestinian Solar Initiative)	15
Concentrated solar power plants	15
biogas from landfills	12
biogas from animal waste	2.5
Small-scale wind	3
Wind Farms	37.5
Total	105

The implementation cost of the second phase of renewable energy will be as set out in Table No. (6) knowing that the project was assessed based on the current cost. Annually, there is a steady decline in the price of this technology, according to the maturation of this technology. Therefore, the prices listed may be 20-30% less than expected.

Renewable technology		2016	2017	2018	2019	2020	Total
On Ground PV	Cost	8	12	20	20	20	80
	MW	2	3	5	5	5	20
Rooftops PV (Palestinian Solar Initiative)	Cost	13.5	13.5	13.5	13.5	13.5	67.5
	MW	3	3	3	3	3	15
Concentrated solar power plants	Cost	0	20	0	0	40	60
	MW	0	5	0	0	10	15
biogas from landfills	Cost	0	0	8.4	0	8.4	16.8
	MW	0	0	6	0	6	12
biogas from animal waste	Cost	0.79	0.79	0.79	0.79	0.79	3.95
	MW	0.5	0.5	0.5	0.5	0.5	2.5
Small-scale wind	Cost	2.25	2.25	2.25	2.25	4.5	13.5
	MW	0.5	0.5	0.5	0.5	1	3
Wind Farms	Cost	13.5	13.5	20.25	27	27	101.25
	MW	5	5	7.5	10	10	37.5
Total		38.04	62.04	65.19	63.54	114.19	343
		11	17	22.5	19	35.5	105

Reduction on preferable tariff rates of the electricity produced from renewable energies:

The purchase prices of electricity generated will be determined from renewable energy projects that can be linked to the distribution network and the technology used. The tariff prices are annually reviewed because of the continuing decline in the price of renewable energy systems. In the case of not being able to review the annual reduction, the rate as set forth in Table (7) will be applied

Renewable technology	Capability	Reduction rate (%)
On Ground PV	15-50 KW	5
	50-5 MW	5
	More than 5 MW	4.5
Concentrated solar power plants	5 MW	3
	20 MW	3
Wind energy	1 MW	2
	More than 1 MW	2
biogas from animal waste	All possibilities	2

The implementation of the above-mentioned stages is the responsibility of all parties and institutions involved in achieving the desired goals. In where the role of these parties include the following:

- PEA will develop the policies and laws on renewable energy
- PERC will issue the Feed-in-Tariff (FIT) for each type of renewable energy technology as PERC is the only body authorized to do so
- PERC calculates the FIT where it enters into force after the approval of the Cabinet.
- The Cabinet agree on the legislation and regulations necessary for the development and promotion of the use of this technology in addition to the proposed FIT.
- Upon the decisions of the Cabinet, the ministry of finance is set to accredit the source of funds needed to cover the required cost for incentives and feed in tariff appropriate for the private sector investment.
- PERC and in coordination with the Palestinian Energy and Environment Research Centre monitor and review the development of renewable energy generation on regular basis.
- Palestinian Energy and Environment Research Centre and in coordination with PEA will prepare the necessary studies and preparation of tenders for the establishment of the proposed projects and this is also conducted through external technical consultants.
- Palestinian Energy and Environment Research Centre follow up the implementation of various renewable energy projects through the technical supervision on the implementation of these projects.
- PERC has to public their actual sales for all renewable energy plants and make this information available and accessible to stakeholders
- PERC works on taking the right decision to solve any conflict or disagreement that may occur between the electricity sector subscribers.
- Private sector investors concentrate their investments on this sector depending on the feed-in-tariff designated by the cabinet.

- Universities and through related research centers offer the needed information to conduct studies and prepare tenders.
- Electricity Distribution Companies and Electricity Transmission Companies sign purchasing contracts with the electricity producers according to the installed capacities.
- Electricity Distribution Companies and Distribution Network Operators have to commit to payments made to all of the qualified renewable energy generation plants, as a monthly payment is set according to the applied tariff system.

Feed in tariff for the Palestinian solar Initiative

The concept of the Palestinian solar Initiative has been drafted as part of the renewable energy strategy for PEA and PERC

The initiative aims to achieve a 5 MW of solar energy renewable by 2015, through the installation of solar cells on the roofs of 1000 houses throughout the West Bank. And it will be distribute 5 MW of renewable solar energy in different regions of the West Bank according the following table:

MW	Location
1.5	North WB
2	Center WB
1.5	South WB

The reasons behind the Palestinian natural resources initiative is as follows:

1-Increase technology awareness

2-Attaining international support especially from the he communities that are interested in renewable energy

3- To encourage the Palestinians on the use of renewable energy technologies

4- reduce carbon dioxide emission in Palestine

4-Political benefits, to get independence from the Israeli power sources

5- Increase the knowledge of the Palestinians in the field of renewable energy

The following table shows the feed in tariff for the Palestinian solar Initiative (tax exempted)

Value	Feed In tariff (NIS/kWh) according to the pay back period	
	8 years	10 years

0 $/W	1.07	0.82
1 $/W	0.71	0.56
1.5 $/W	0.54	0.44
2 $/W	0.38	0.31

Incentives

1-Tax exemptions

2-additional support

3-Buy all energy produced at a preferential rate

Appendix Number (2) :

Procedures of Applying the Palestinian Initiative for Solar Power.

1. Any subscriber wishing to install Photovoltaic's to generate electricity and wishes to get into a contract with the Electricity Distribution Companies selling them electricity has to commit to the following steps:

• Initial application: where the subscriber has to submit an application requiring the installation of PV's and contracting with the Electricity Distribution Company to sell it electric power, the application has to come supported with documents proving the adequacy of the applicant as he has to comply with the initial conditions stated by PERC. The renewable energy employees at the DisCo then examine the application and make sure it fulfils the terms and conditions. If the application is found to be fulfilling all the requirements it is sent with all its appendices to the Palestinian Energy and Environment Research Center for further examination and assuring that it fits the initiative included in the strategy.

• Getting the initial approval: following to testing and passing the application the applicant gets an initial approval showing the future conditions he has to commit and attain to in a period no longer than three months. The initial approval is considered to be the main document that keeps to the subscriber during the preparation and installation of the system and when it is applied, the document assures that the subscriber is committed to the organizational and legal conditions asserted.

• Getting the final approval: once the system is installed the subscriber then calls the Electricity Distribution Company to have them examine the system for final testing and connect it to the distribution network, The Electricity Distribution Company then signs a power purchasing contract with the subscriber and notifies the Palestinian Energy and Environment Research Center.

.2. When the actual electricity generation begins, the Electricity Distribution Companies has to inform PEA with information regarding the amounts sold from subscribers to the DisCo's on regular basis along with the monetary value to that electricity.