

Renewable Energy Contribution to Energy Independency in Palestine

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July 2016

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Introduction

The objective of this presentation is to discuss challenges facing the Palestinian energy sector, and evaluate the renewable energy potential in meeting part of the energy demand. In Palestine 100% of the fuels and more than 90% of the electricity supply imported from Israel.

Renewable energy can offer Palestine many benefits which will not only revolve around the reduction of conventional energy consumption and reducing harmful emissions, but most importantly will improve the mix of available energy.

Part 1: -Geography & Climate

- Palestine is located on the western coast of the Mediterranean Sea, west of Jordan .
- The Palestinian territories consist of two geographically separated areas (Gaza strip ,west Bank).
- Elevation ranges from 350 m below sea level in the Jordan Valley to sea level along Gaza Strip seashore, exceeding 1000m above sea level in some locations in the West Bank .
- Area West Bank : ~ 5665 km sq.
- Area Gaza Strip : ~ 365 km sq.
- Climate conditions vary widely
- The coastal climate in Gaza Strip is humid and hot during summer and mild during winter, relative humidity (67% - 75%)
- Hilly areas of west Bank , cold winter and mild summer with relative humidity (51% - 83%)
- In Jordan Valley and Jericho hot summer and warm winter

Regional



West Bank



Gaza Strip



Part 1 : Population (2015)

- West Bank: 2,765,000
- Gaza Strip: 1,647,000
- Total : 4,412,000
- Rural Population: 25%
- These numbers include Palestinians in Palestinian territories only .
- The whole Palestinians in the world are more than 10 m concentrated in Israel, Jordan, Syria , Gulf Countries , exe....

Age	West Bank	Gaza Strip
0-14	43%	48.5%
15-65	53%	48.8%
65 - above	3.5%	2.6%

Part 1 : Economy

- Palestine possesses limited natural resources
- Only in Dec 2000 natural gas discovered by British Gas along the shores of Gaza strip, and recently in West Bank
- Industrial sector occupies only 15% of the economic activity (agricultural production, shoes, clothes ...).
- Remittances from abroad play a large role in the total income, beside labor in neighboring countries

Gross Domestic Production (GDP) – 2014	12.738 m \$
Gross Domestic Product Per Capita - 2014	2965.9 \$
Access to Electricity - 2015	97.7%

Part 2 : Electric Power System

- Israel Electric Corporation supplies electricity to the Palestinian Territories by 33, 22KV lines.
- West Bank :1100 MW, Gaza Strip: 300MW (supply capacity)
- Five distribution companies (Gaza, Hebron, South, Jerusalem and North Electricity Distribution Company) in addition to Tubas area (company) , the Municipalities and local councils in the north purchase electricity from IEC and distribute it to the consumers.
- M.V connection had been established from Egypt to Rafah (south of Gaza) – 17MW.
- Another M.V connection had been built from Jordan to Jericho in West Bank – 20MW.
- Generation stations, only in Gaza 140MW capacity, 60 MW operation .
- Access to Electricity – 2015 : 97.7%

Part 2 : Electrical Sources

Generation:

- In 1999, the Palestinian Electric Corporation was established, 33% of its assets belong to public sector, 67% to private sector shareholders. The total capacity is 140 MW (Now 60 MW).
- Small Villages, not connected to IEC or Palestinian grid use small generation units and some industrial loads like stone cutters, wells,

Importation:

- The only source is Israel (IEC), more than 90% of the Palestinian needs is imported from IEC.
- At the end of 2006, two other agreements were done, one with Egypt to supply Rafah (south of Gaza) by 33KV O.H line – 17MW (connected), and the other agreement is with Jordan to supply Jericho in the West Bank by 33KV O.H line – 20MW.

Part 2 : Consumption

Main types of consumption:

Large communities (main cities, Nablus as an example)

Total	Residential	Industrial	Commercial	Services	W. Pumps	Street lights
100%	52%	16%	9%	8%	11%	4%

Small communities

Total	Residential	Industrial	Commercial	Others
100%	80%	5%	5%	10%

Part 2: General

Electricity Letter of Policy:

- Since the formation of Palestinian Energy Authority (PEA) in 1994, the agency formally responsible for sector development.
- Letter of sector policy in 1997 became the main guide to PEA, the core elements of the letter are:
 1. Rehabilitating networks and extending services to un served areas.
 2. Separating policy and regulatory from commercial functions.
 3. Encouraging private sector participation (generation & distribution).
 4. Establishing transmission company (public).
 5. Increasing the efficiency of the system.
 6. Developing pragmatic tariff system, permit full cost recovery and promote commercial viability of sector enterprises while at the same time providing for life – line rates for needy customers.
 7. Establishing new autonomous and commercial oriented distribution companies.

Part 2: Regulation

Palestinian Energy Regulation Council (PERC)

- PERC is a key component.
Independent body responsible to the Palestinian Authority, and responsible for:
- Protecting the interests of the consumers.
- Meeting the social objectives.
- Ensuring that utilities are achieving a reasonable return of investment.
- Authorizing and licensing the construction, operation decommissioning of facilities ... generation, transmission ...

Part 2: Fuel

Palestinian Petroleum General Institution was established in 1994.

- Independent body responsible for oil, petroleum and petrochemical products.
- In 1997, the law for institution was issued.
- The PA imports **all** petroleum products from Israel and distribute them locally.

The core duties of the Institution are:

1. Meeting the local demand.
2. Meeting the strategic reserve of the products.
3. Establishing a distribution system that covers all the territories.
4. Studying the possibility of establishing a refinery.
5. Monitoring the specifications and measures.
6. Developing the local source.

Part 2 : Impact of political situation

Stage 1: 1967-1994

- 6/1967 Israel occupied West Bank and Gaza.
- Israel was fully responsible for all sectors including energy.
- Purely self financed electrical projects.
- Cocktail – legal situation, inherited laws from Otman empire, Egypt, Jordan and hundreds of Israeli military orders.
- IEC build medium voltage lines to supply the settlements.
- Main cities and villages were connected to IEC grid.

Part 2: Impact of political situation

Stage 2: 1994 – now

- 13/9/1993 Palestinian – Israeli declaration of principles laid the base for the development of autonomous self- governing body for West Bank and Gaza.
- 4/1994 Protocol on economic relations.
- 5/1994 Gaza and Jericho agreement.
- 9/1995 Palestinian – Israeli interim agreement signed (Oslo 2) which gave the Palestinians responsibility over West Bank And Gaza (cities excluding Jerusalem) and also gave civil rights in Area B, while area C remains under Israeli jurisdiction.
- 9/2000 second Intifada began with its damaging characteristics to the electricity grid.
- More than 20 m \$ was the direct damages between 9/2000 and the end of 2003.
- Most of rehabilitation and development projects financed by the donors were stopped and replaced with emergency programs.

Oslo II, 1995



Palestinian Academic Society for the Study of International Affairs (PASSIA)

Part 3 : Solar energy - potential

The main renewable energy sources considered to have potential in Palestine is solar energy.

- 3000 sunshine hours per year.
- Average solar energy is between 2.63KWH/m² -day in December to 8.5 KWH/m²-day in June.
- Annual average is 5.4KWH/m²-day.
- As area of Palestine is relatively small, solar radiation does not vary widely.

Annual average KWH/m² – day- West Bank

Jenin	Jerusalem	Jericho	Bethlehem
5.69	5.37	5.45	5.69

-Part 3 : solar energy - Present use

Photovoltaic panels

- Around 6000KW on - grid were installed – end of 2015
- Less than 500 KW off – grid were installed – end of 2015
- Palestinian Solar Energy Initiative: incentive to the first 1000 house on grid project.
- Ongoing projects
- More than 45 local contracting companies were established during the last five years.

Part 3 : solar energy - Present use

Solar water heaters:

- More than 67% of the Palestinian houses have solar water heaters.
- More than 90% of the units are produced locally by 24 factories.
- July/2000, mandatory test for quality according to ISO standards was adopted by Palestinian Standards Institute (computerized lab for the efficiency of the flat plate, collectors and lab for testing material, water leakage and insulation).
- The efficiency of installed system (Flat plate System) drops sharply by time because of: Poor quality of the systems, high percentage of calcium contents of water, broken glasses ...
- Developing the system will encourage the industrial sector
- The average cost of locally produced unit is (350-600\$)
– two flat plates, payback period: 2.5 years

Part 3 : Wind energy - Potential

- Palestine can be considered as a country of moderate wind speed.
- Coastal region (Gaza) has very low wind speed (2.5-3.5)m/s.
- Hilly regions have annual average (4-6)m/s.
- Jordan valley (Jericho) has very low wind speed (2-3)m/s.
- Recently, five modern meteorological stations were installed in W.B
- Collected data shows that some areas could have considerable wind energy potential.

Part 3 : Wind energy – Present use

- Successful example is the installation of wind turbine in Palestine, at the Al-Ahli hospital in Hebron (225 K), that provides about 40% of all the hospital's energy needs
- Lack of technology and experience

Two issues to be resolved:

- 1) Determining the exact potential of wind energy by installing more modern computerized stations in all Palestine.
- 2) Considering the market penetration barriers:
 - Finance.
 - Processing or hiring the land for installation of turbines.
 - Availability of electrical networks in the project area.
 - Lack of experience in the wind energy field.

Part 3: Biomass, Solid Waste - Potential

- Palestine is an agricultural country.
- The reject of olive oil pressers is remarkable material to be taken.
- Animal drug is important energy material It is being used as fertilizer.
- More, data collection is needed.
- More than 1.0 million tons/year of solid waste disposed of unprotected landfill.

Part 3: Biomass- Solid Waste Present Use

- Wide usage of biomass energy in various forms especially in rural areas.
- Proposed projects such as Jenin landfill.
- One biodiesel factory
- Environmental standards must be first priority.
- Following advantages are reasonable (protection of land, water resources, recycling and reduction in the overall waste volume).
- It is recommended to divide Palestinian Territories into four geographical areas to collect solid waste
West Bank (north, middle, south), Gaza strip

Part 3: Geothermal Energy

It has been proven that it has enormous potential as a source of energy for heating and cooling. A pilot project on a residential building in the West Bank city of Ramallah by a company named 'MENA Geothermal' provided evidence of the major reduction in energy costs paid for heating and cooling by more than 70% with a payback period of 4.5 years.

Part 4 : Palestine and the Paris Agreement -2015

- As Palestine is one of the most needing communities to be involved with Paris Agreement – 2015 (Climate Change) by contributing to activities and programs following the implementation of the agreement and reflecting them on short, medium and long term strategic plans to achieve social and economical sustainable growth.
- Palestine can participate in both mitigation and adaptation activities ,
- Although Palestine and many developing countries are not big contributors to gas emissions, they can play considerable role using their human resources and knowledge

Recommendations

Under this difficult and complicated status in Palestine, we have to work hardly to get sustainable energy supplying, to support national sustainable development by:

1. Completion of developing the relative laws and bylaws.
2. With its high potential to generate energy from renewable sources, Palestine could reduce its vulnerability to political, economic and security shocks. Renewable energy could lay a foundation both for a future, sustainable state and for future energy relations with neighbor countries based on interdependence instead of dependence.
3. Focus on the international and regional cooperation (Paris Agreement –Climate Change
4. Capacity building programs.
5. Targeting applicable and accountable goals in national plans



Thank You