Palestinian Energy &
Natural Resources Authority

Sustainable Energy Policy in Palestine

ESCWA – Cairo

14-16 May 2017

Eng. Ayman Ismail

The energy situation in the state of Palestine and future strategy

Palestinian Energy &
Natural Resources Authority

- *Current situation*
- *Future strategy*
- *Samples of executed & ongoing projects*

The Palestinian Energy and Natural resources Authority (PENRA)

Palestinian Energy & Natural Resources Authority

- Established in 1995, managing the energy sector in Palestine, it supervises the following institutions:

PERC: PALESTINIAN ENERGY REGULATORY COUNSIL

PEC: PALESTINIAN ENERGY and ENVIROMENT REASERCH CENTER

PETL: PALESTINIAN ENERGY TRANSMISSION LIMITED

PENRA has reorganized the institution working through:

- The issuance of the electricity law in 2009 which specifies the responsibility of each party operating in the sector
- The issuance of renewable energy and energy efficiency law in 2015
- Development of general Policies in energy sector
- Improvement Plans

Main Palestinian Figures

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West Bank

- Population: **3.04** Millions
- Energy consumption/Year: 4490 GWh **“1250 KWh/per capita”**

Gaza Strip

- Population: 2 Millions
- Energy consumption/Year: 1517 GWh “798 KWh/per capita”

Demand, Availability & Trend

West Bank

Peak Demand	Current available	Estimated need in 2020
930 Mwatt	880 Mwatt	1197 Mwatt

Gaza Strip

Peak Demand	Current available	Estimated need in 2020
470 Mwatt	223 Mwatt	688 Mwatt

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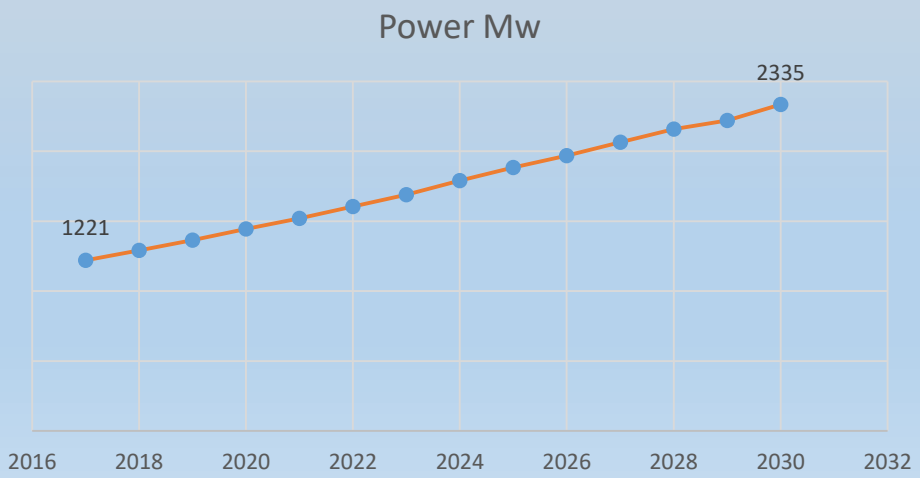
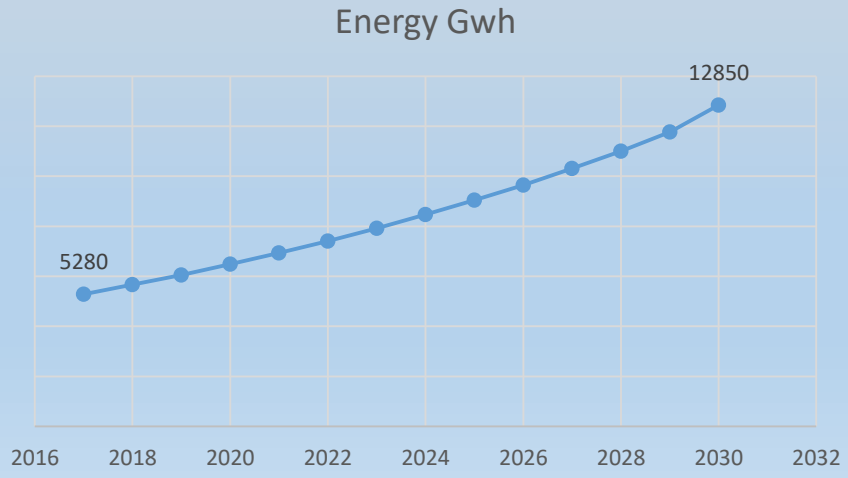
Power demand increase trend



Energy consumption increase trend



Geopolitical Palestinian features

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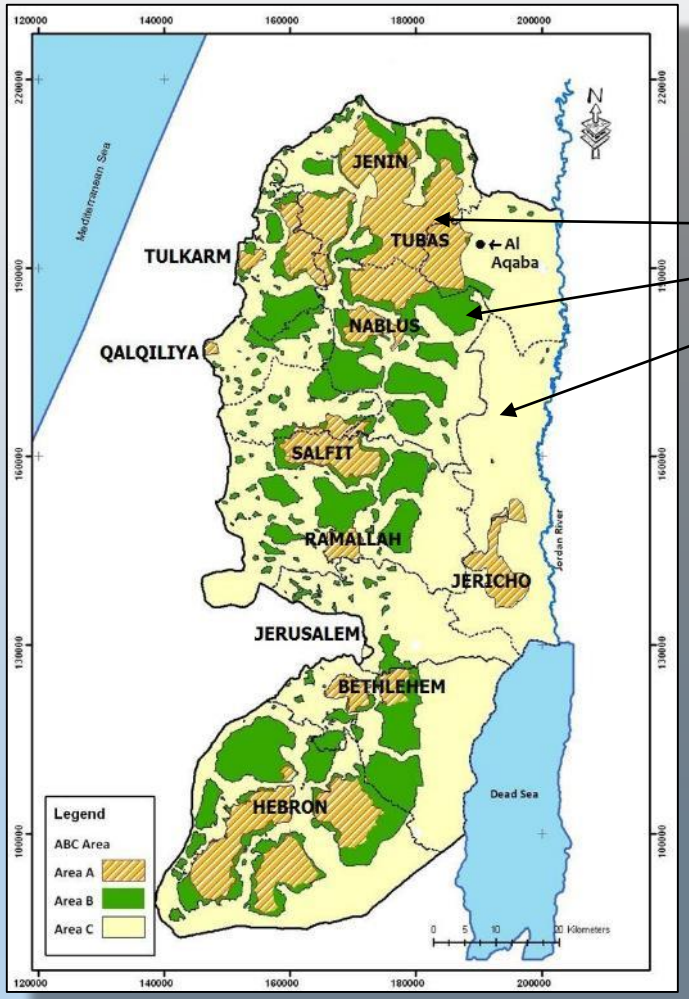


The west bank is divided into 3 areas (Oslo AGR): A, B, C

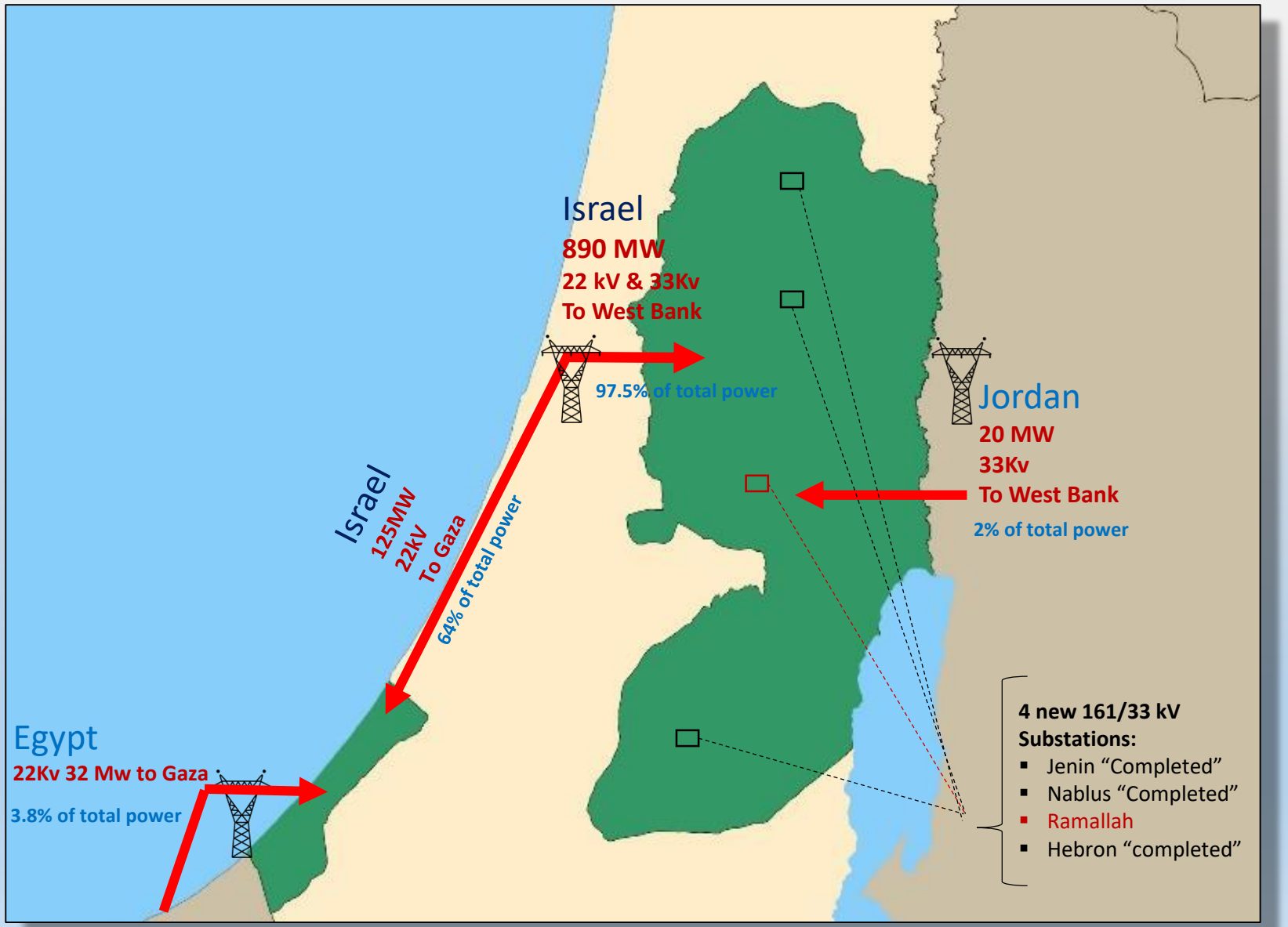
- Area A: civil and security control by Palestinian Authority
- Area B: civil control by the Palestinian Authority and joint Israeli – Palestinian security control
- Area C: Full Israeli civil and security control

The Israeli occupation obstacle most of the Palestinian authority plans for the development of energy sector

Territorial discontinuity between the different areas and with Gaza creates multiple difficulties

Israel Targets international -Funded Green Infrastructure for Demolition , and Obstacle the electricity transmission & supply to Bedouin areas

Main Energy sources (Purchased)



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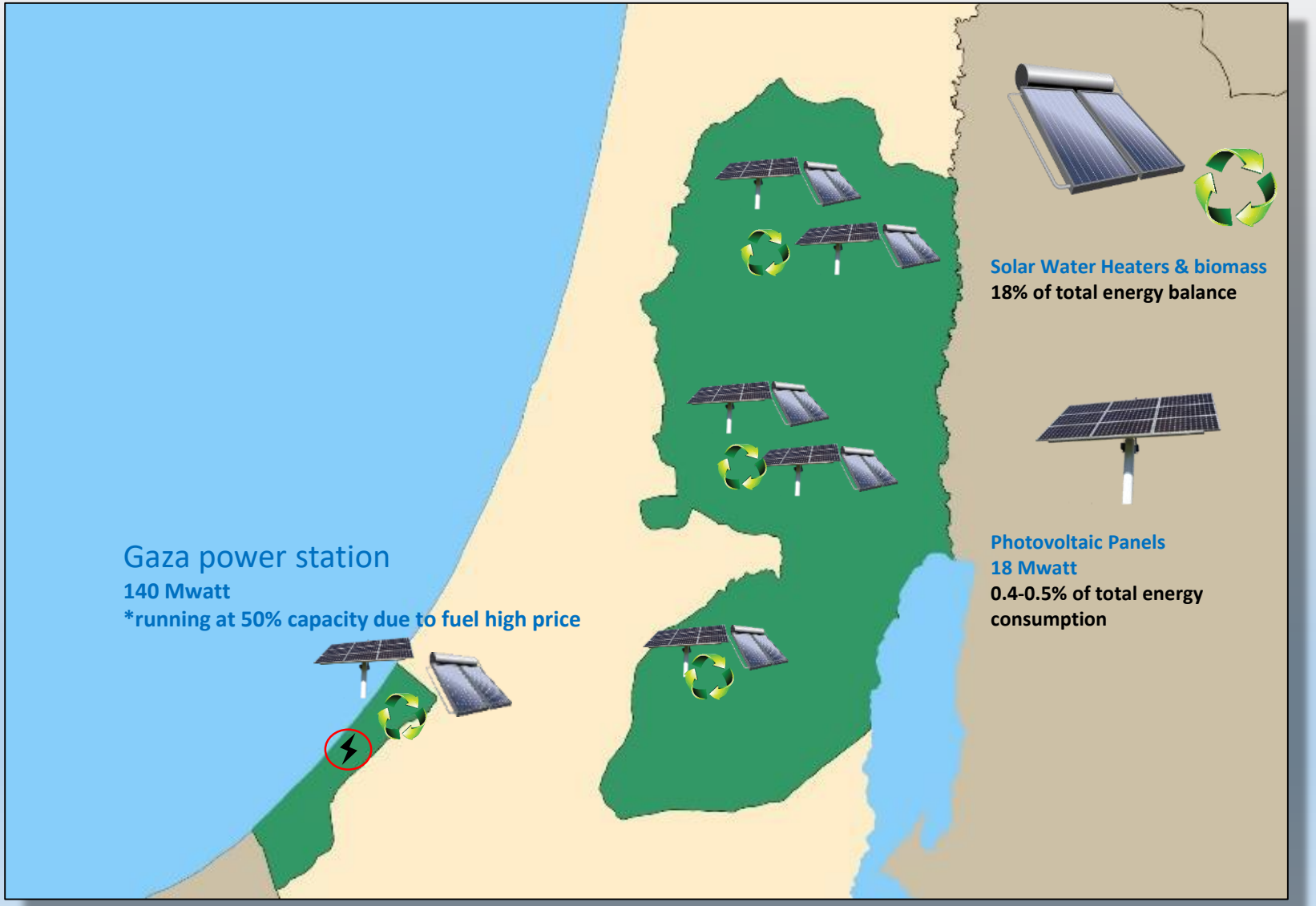
Power shortage due to:

- Limited power purchased from Jordan and Egypt
- Main power imported via Israel at very high cost (97.5% west bank total consumption) and (64% of Gaza Total consumption) year 2015
- Limited domestic power generation due to lack in infrastructures and high fuel cost
- High Technical &non technical losses

Main Energy sources (Palestinian Domestic Production)

Palestinian Energy &
Natural Resources Authority



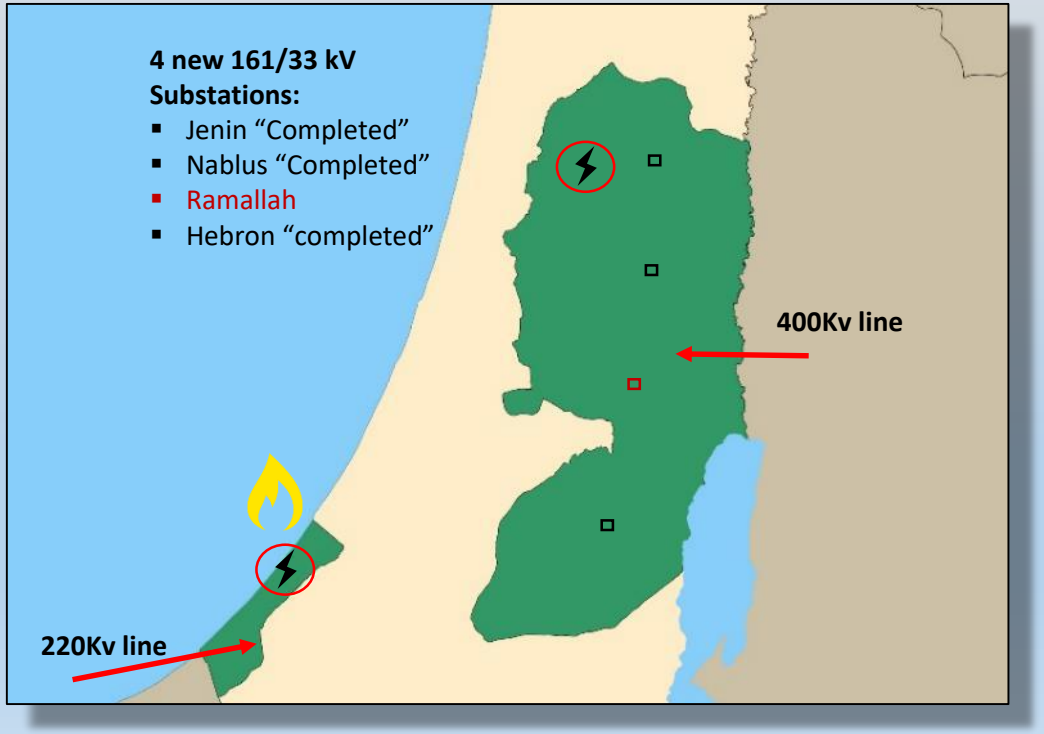
Solar Water Heaters & biomass
18% of total energy balance

Photovoltaic Panels
18 Mwatt
0.4-0.5% of total energy consumption

The Palestinian strategy for energy independence 2017-2022

Palestinian Energy & Natural Resources Authority

- Improve the national power production and better exploit national recourses
- Increase renewable energy recourses reducing environmental impact
- Improve energy efficiency through increasing awareness and reducing losses
- Increasing Energy security through diversification of import resources
- Continuous institution reforming



- **4 new substations (161/33 Kv) already under completion + additional 2**
- **Upgrade Jordan supply by a new 400Kv line (150 Mwatt)**
- **Upgrade Egypt supply by a new 220Kv line (150 Mwatt)**
- **Upgrade Gaza power station to 420 Mwatt**
- **New Power Station in Jenin 450 Mwatt**
- **Upgrade Middle voltage grid**

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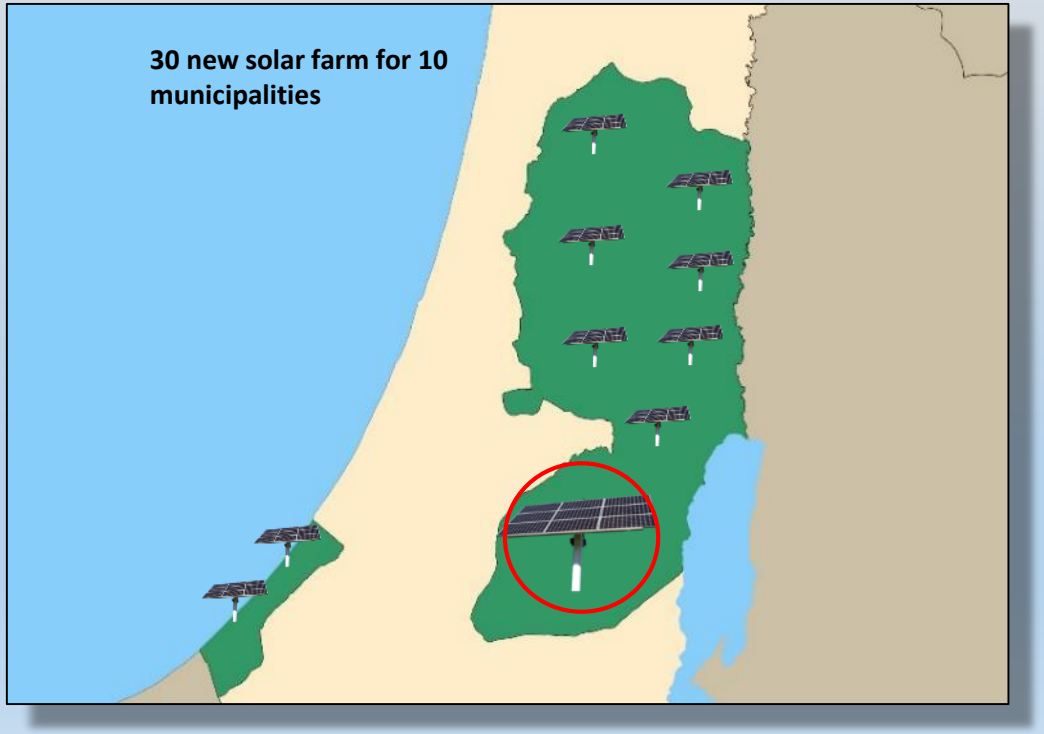
renewable energy &Energy efficiency law Issued in 2015



The strategy requires:

- Application of necessary regulations & legislations for the development and promotion
- Securing funding sources
- Develop local human resources capable of manufacturing, installing and managing the renewable energy systems
- Applying the Palestinian solar initiative PSI
- Adopting a development plan for the renewable energy resources

Applications and investments up to 2020:

- **On Ground PV: 25 Mw**
- **Rooftop PV (PSI): 20 Mw**
- **Concentrated solar power plants: 20 Mw**
- **Biogas from landfills: 18 Mw**
- **Biogas from waste: 3 Mw**
- **Small scale wind: 4 Mw**
- **Wind farms: 40 Mw**

Total = 130 Mw

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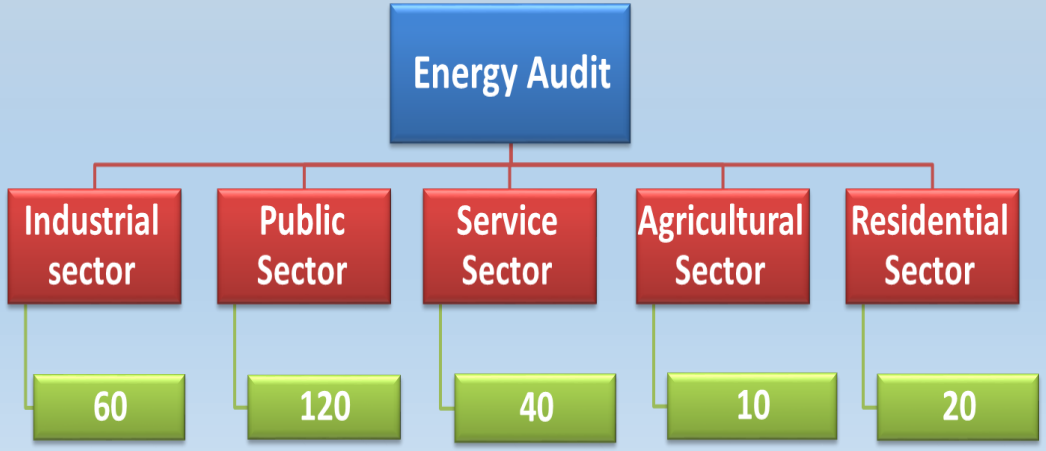
Energy efficiency & renewable energy law Issued in 2015

- **Phase I (2012-2014): 43GWh**
- **Phase II (2015-2017): 137GWh**
- **Phase III (2018-2020): 204GWh**



- Promote efficient energy policies
- Convert lighting to more efficient systems by using led for domestic and industrial
- Energy Audit for industrial & commercial
- Revolving fund for energy efficiency projects
- Reduce technical and non technical losses
- Reduce the total energy consumption of 5% (384 GWh) within 2020

Main Results of EE Economic Analysis

Capital investment: **347** MUSD

Peak energy savings: **881** GWh equivalent/year

Present value of financial savings : **1,020** MUSD

Present value of economic savings: **1,175** MUSD

Each kWh saved needs in average an investment of **0.05** USD

Total emissions (Co_2) avoided: **614,000** Ton/year

The Palestinian strategy for energy independence 2017-2022

Palestinian Energy & Natural Resources Authority

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Some implemented projects

Tulkarm & Jenin Hospital	Investment ($)	Actual IRR (%)	Actual PBP (Year)
12,000 L	174,785	28	4

Ministry of Education	Investment ($)	Actual IRR (%)	Actual PBP (Year)
1,590 Fixtr	65,826	29	3.18

Presidential Guard	Investment ($)	Actual IRR (%)	Actual PBP (Year)
5,000 L	56, 529	16.2	3.8

PEA Building	Investment ($)	Actual IRR (%)	Actual PBP (Year)
BMS	146,700	22	5

Palestinian potential solar energy

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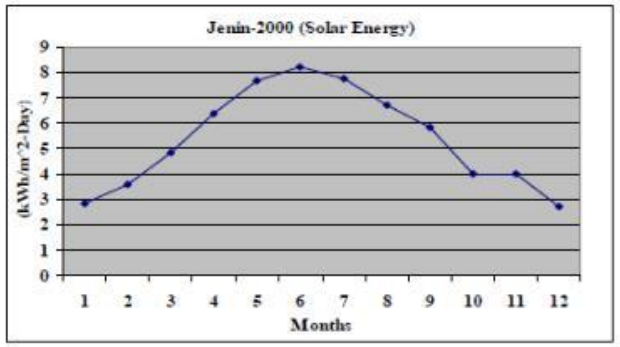
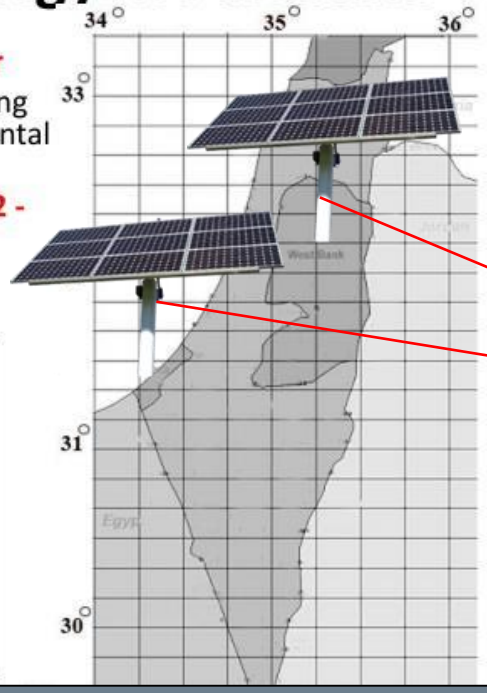
Potential of Solar Energy in Palestine

- it has about **3000 sunshine hours per year**
- annual average of solar radiation amounting to **5.4 kWh/m2 – day (19.44MJ)** on horizontal surface, which classified as a high
- **in December**, it amounts to **2.63 kWh/ m2 - day**.
- **In June: 8.4 kWh/m2 - day**





Year 2017

Total Installed capacity is:

18 Mwatt

30.6 Gwh/ Potential Year Production

(1700 kWh/kWp)

= 0.4-0.5% of total yearly energy consumed

Main Photovoltaic executed projects:

CZECH REPUBLIC DEVELOPMENT COOPERATION

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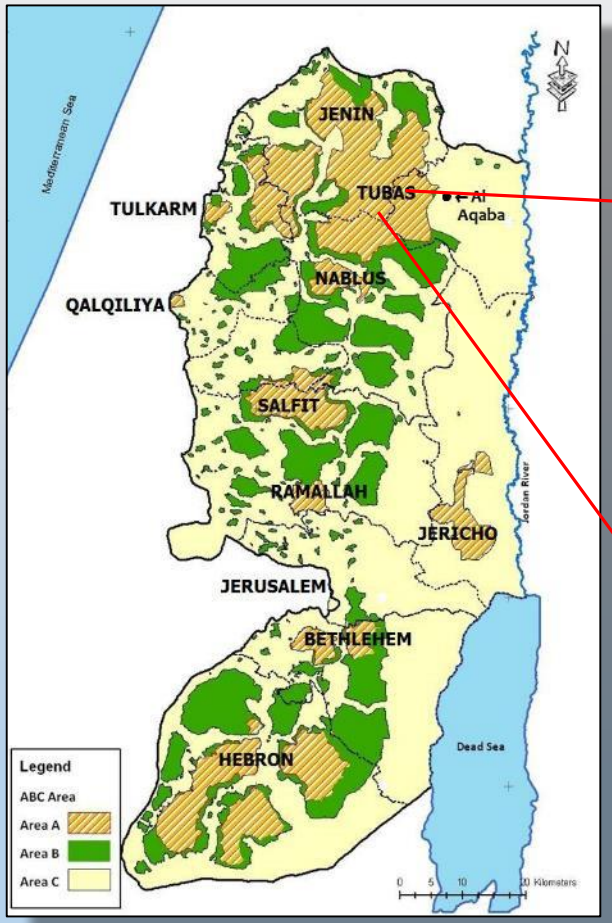
Toubas (West Bank)

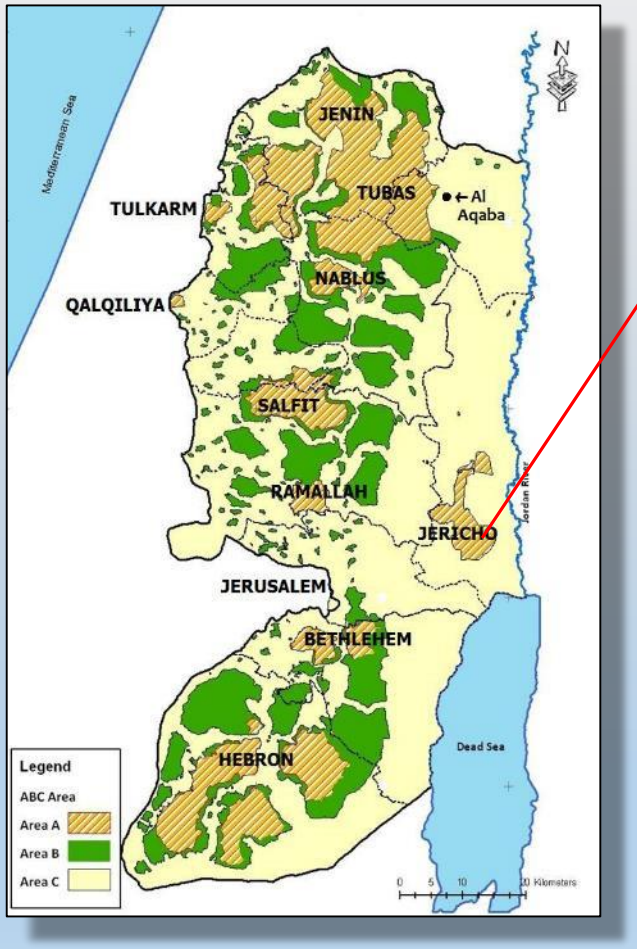


Year: 2012
Capacity: 470 KW
Donor: Czech Republic Development Cooperation
Project value: 1.150.000USD
Estimated production: 800.000 Kwh/Year
Reduced emission : 560 Tons Equivalent CO2

Year: 2012
Capacity: 17 Grid connected stations for agricultural use (5Kwp /Each)
+ 5 stand alone projects (3Kwp/each)
Donor: Czech Republic Development Cooperation

Main Photovoltaic executed projects

Jerico (West Bank)



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Year: 2010
Capacity: 300 KW
Donor: Government of Japan (JICA)
Estimated production: 422.000 Kwh/Year
Reduced emission : 290.6 Tons Equivalent CO2

Main Photovoltaic executed projects

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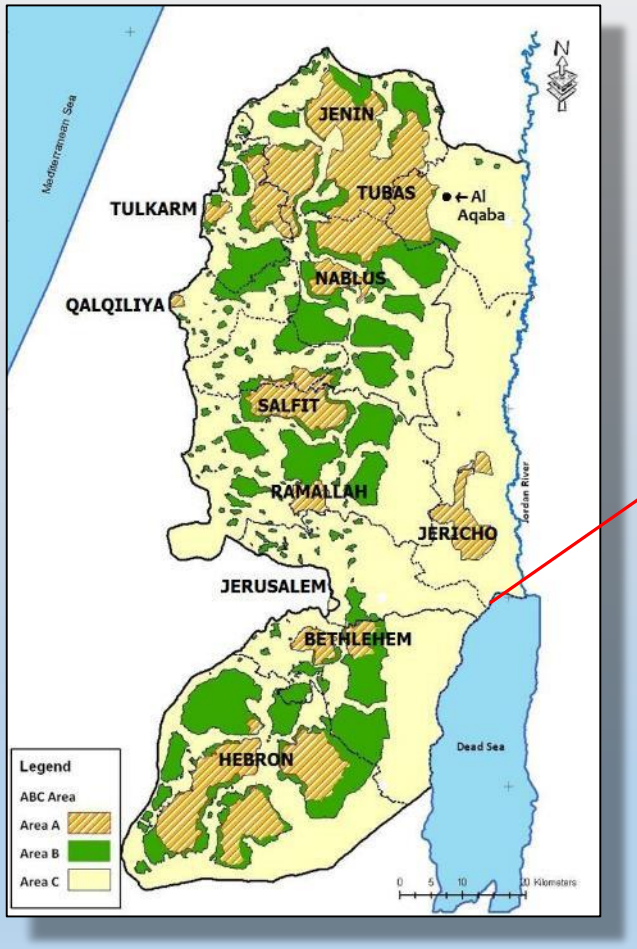
Dead Sea (West Bank)



Year: 2014
Capacity: 710 KW
Financed by: United Arab Emirates
Total Cost: 993.800 USD

Main Photovoltaic executed projects

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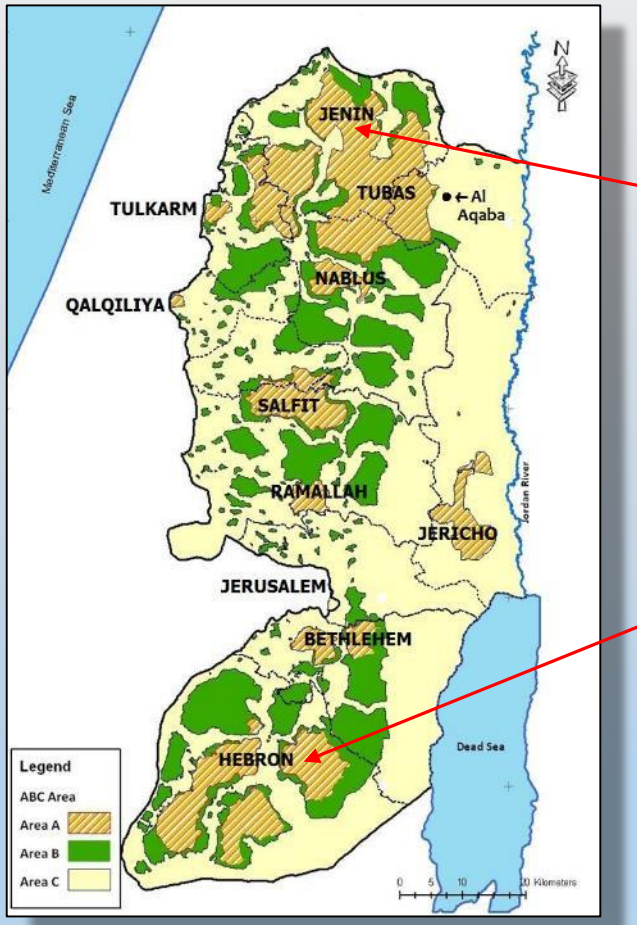
Jenin & Hebron University (West Bank)



Year: 2014
Capacity: 70 KW
Donor: United Arab Emirates

Year: 2014
Capacity: 220 KW
Donor: United Arab Emirates

Year: 2015
Capacity: multiple for 100 Bedouin families
Donor: Emirati Red Crescent

Main Photovoltaic executed projects

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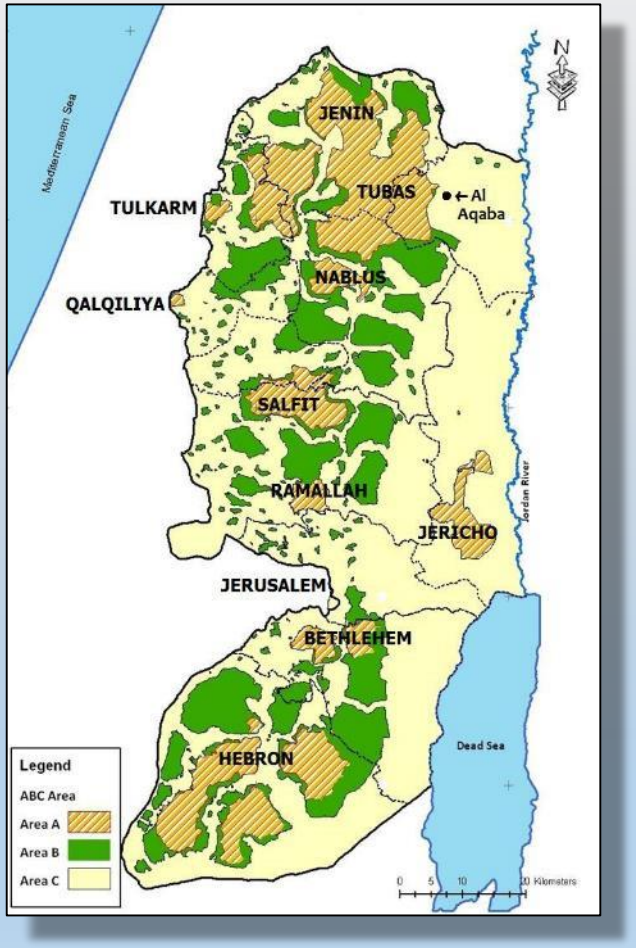
Other Projects (West Bank)



- ***Capacity: 70 KW (Ramallah NPA building)***

- ***Multiple schools in west bank and Gaza strip (up to***
- ***100 PV systems)***

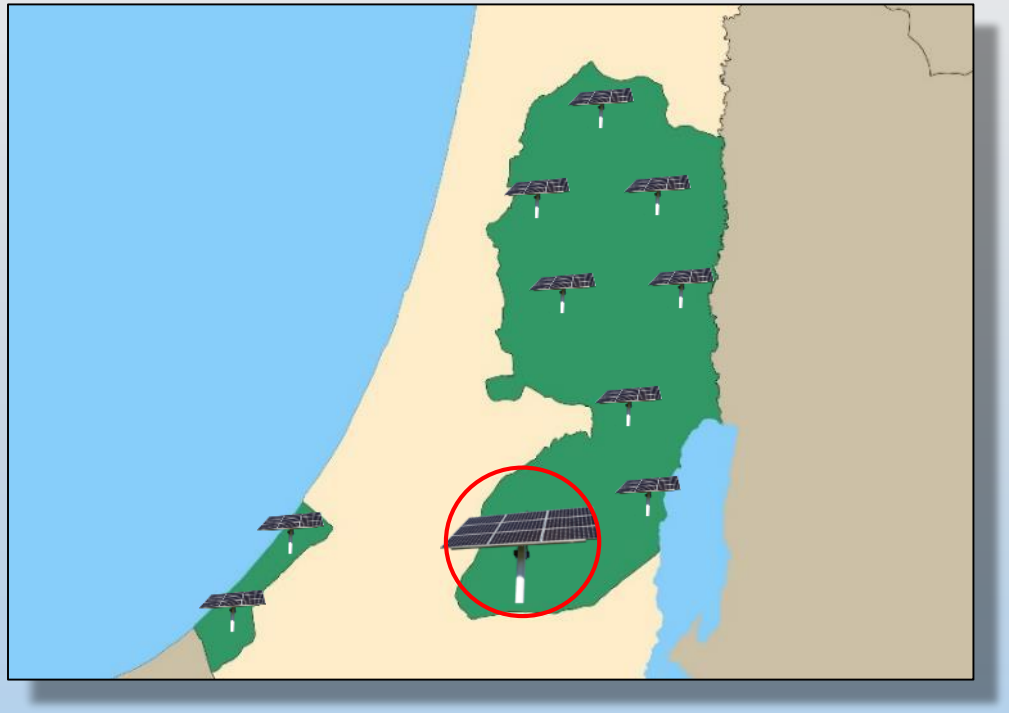
- ***Multiple hospitals in west bank and Gaza strip: 5 hospitals***
- ***and 8 schools in construction stage (Czech donor)***

- ***Multiple stand-alone projects for Bedouin areas where Israel obstacles the transmission and supply of electricity***

Future and ongoing Projects

Palestinian Energy & Natural Resources Authority

10 new solar farms in different municipalities



- 10 new solar farm (10 Mw /Each)
- 30 Mwatt new solar farm in Bani Na'im / Hebron
- 82 school projects 5-15 kw /Each
- Solar water heaters for hospitals & public offices
- 300 Houses with FIT agreement already connected and further 700 to be installed (The Palestinian solar Initiative for domestic roof top PV systems): 5 Mw in 3 years

8 issued temporary licenses for new PV solar farms (1-8 Mw) :

- 3 Toubas
- 1 Nablus Area
- 2 Hebron
- 1 Qalqilya

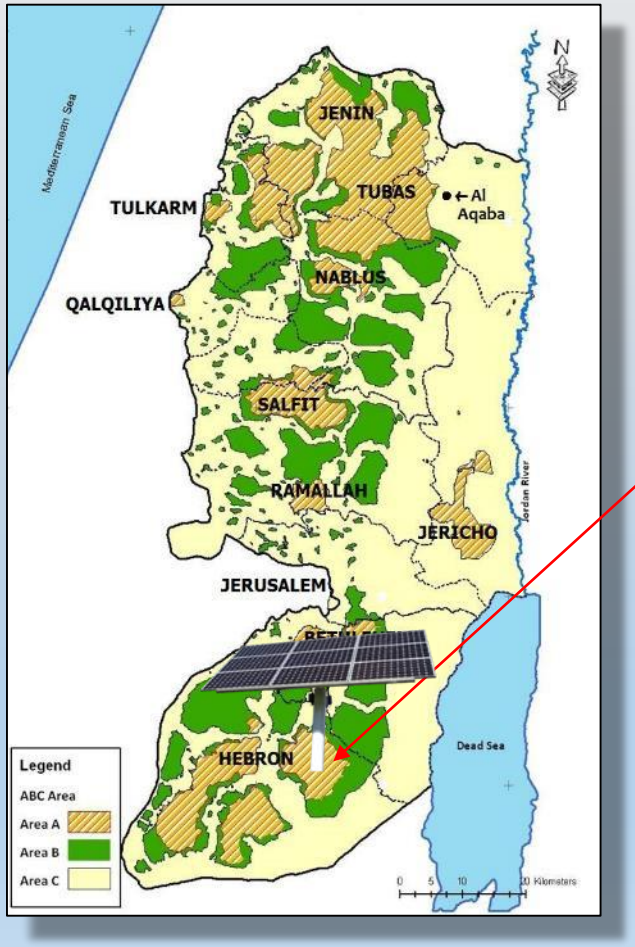
1 Temporary license for new Biogas power station in Hebron

Feed in Tarif Grid connected houses in west bank and Gaza

Future and ongoing Projects

Palestinian Energy & Natural Resources Authority

Bani Na'im project



- Land taken area: 504.100 m2
- Solar Radiation: 2058.3 Kwh/m2/Year

- Main features:
  - 96320 Polycrystalline PV modules 315Wp/each
  - 28 "1000 kVA" type transformer 33/0.315 kV
  - 28 "1 Mwatt" (2 x 500 kW) type inverter

- 28 power generation units
- 171 PV Arrays

Estimated generation for the first year:

52.958 Mwh (1% of total energy demand)

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PENRA

Thanks…