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The photovoltaic way

Speeding up relief, recovery and reconstruction in post-war Gaza

23rd-24th of February 2015, Cairo, Egypt

Energy Shortages

- The Gaza Strip is heavily affected by energy shortages since 2006
- Private and public buildings, schools, public areas, *streets and hospitals* only have electricity for 4-6 hours per day
- Unreliability of the services
- Dramatic effects on healthcare
- Energy obtained with fossil fuels is unaffordable
- Illumination with candles: fires in private housings

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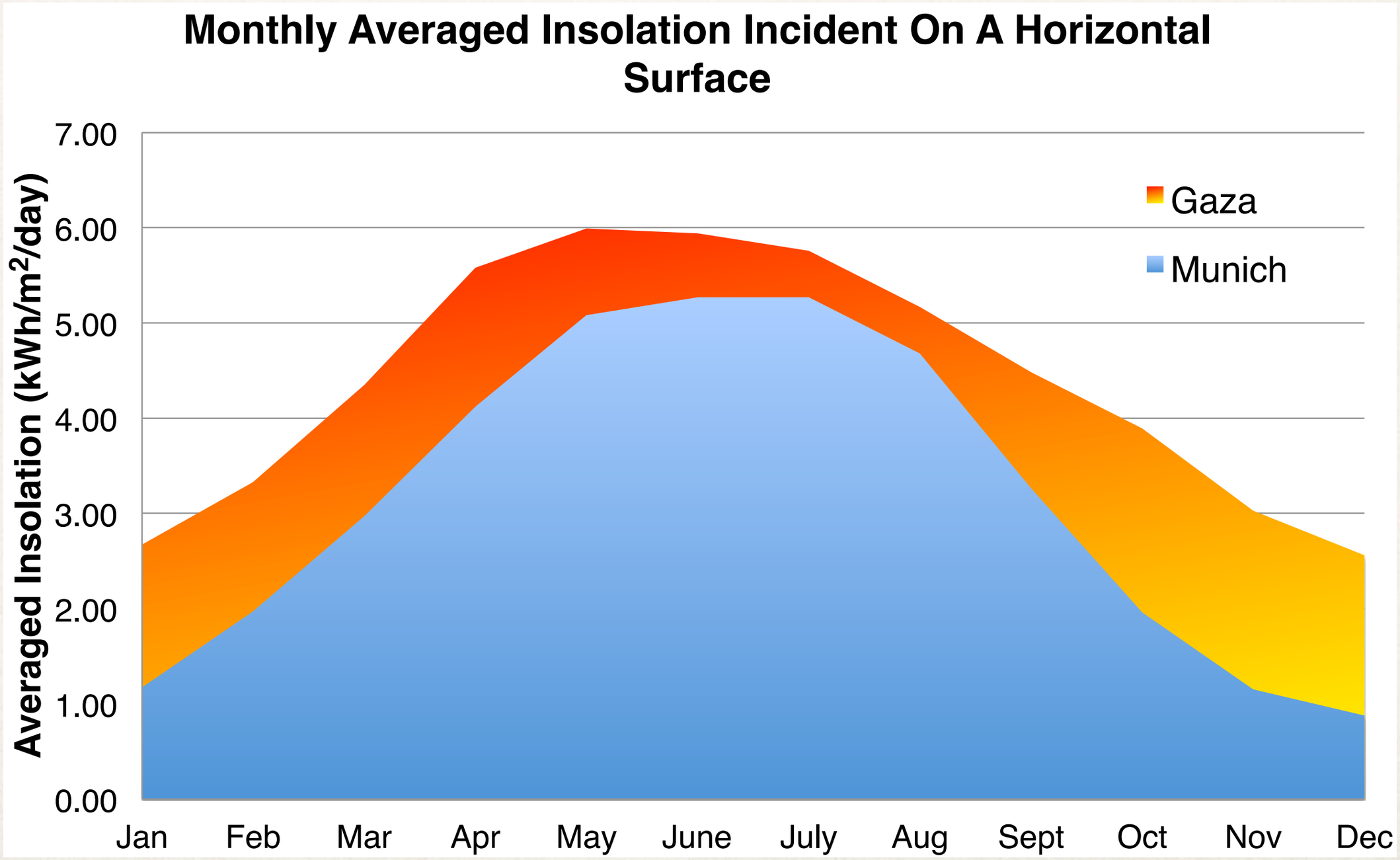
Why Photovoltaic



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Why Photovoltaic

- The sun shines in Gaza on average 360 days per year for about 12 hours a day
- Photovoltaic (PV) plants with ***careful material choices*** are ***reliable and robust***
- A PV plant ***lasts at least 30 years***
- The energy production is ***constant*** on average and is ***predictable*** (HOMER simulation package)
- The total cost of a PV plant is comparable to that of powering a building 24/7 for less than one year using a petrol generator
- Eco-sustainable: environmental care

Challenges to be faced

- Energy Storage: Gaza does not have an accumulation point
- *Off-grid* systems are in general more expensive than *on-grid* systems
- Planar PV plants require vast surfaces

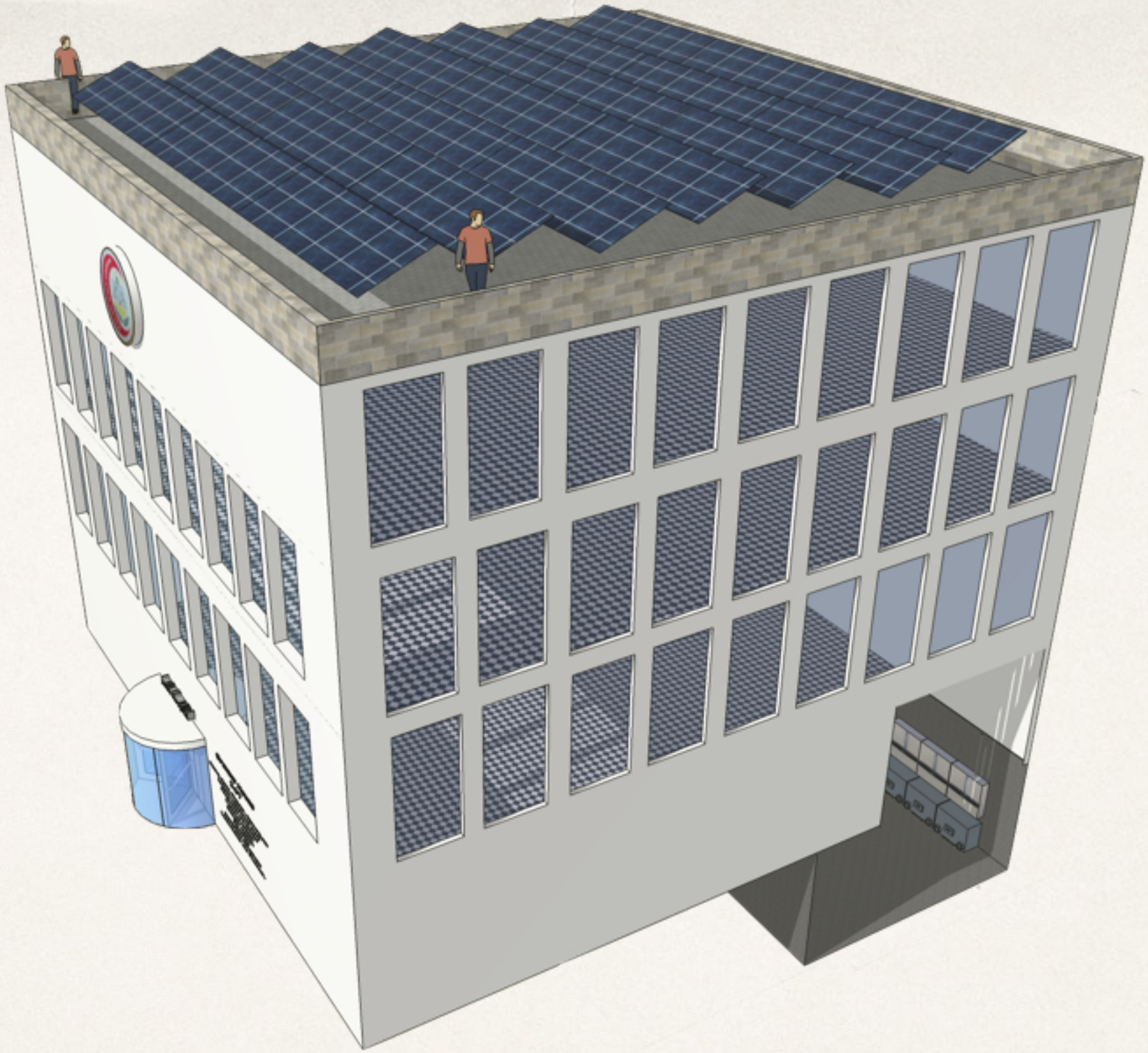
Advantages and possible solutions

- Off-grid systems make buildings completely autonomous and independent

- An overestimation of the battery storage allows for backup systems

- If no horizontal space is possible for a solar plant or a solar factory: Photovoltaic Trees

- Tree of Light as a path between technology and environment.



Case Study One: The Jenin Charitable Hospital - Gaza

A Success Story

Co-funded by the Fondazione Vik Utopia Onlus

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Jenin Charitable Hospital, Gaza

- Built in 2010-2011, opened in 2011
- Equipped with modern machines funded by many international NGO's*
- Serves a population of 200.000 inhabitants in the Al-Shijajia district
- Lower prices than other clinics and offers unique services (free psychological support to children)
- ***Prior to the S4P plant could offer its services for only 4 hours a day due to energy shortages***

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**Music for Peace - Italy, Human Appeal International, Qatar Charity, Norwegian People Aid (NPA), Islamic Relief Worldwide, Welfare Association, UNDP.*

Problems to be solved

- The whole structure has a consumption of 20KWH
- To grant its functionality, the operation rooms need a backup system
- Need for a complete reconstruction of the electrical network (off-grid system)

Solution

- Photovoltaic plant made of 52 panels with a peak production of 300KWP each
- 4 smart inverters to administer the network: distribute the produced energy between the hospital and the batteries
- Battery pack made of 16 batteries of 3500 AH

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A modular plant: modulus one ON

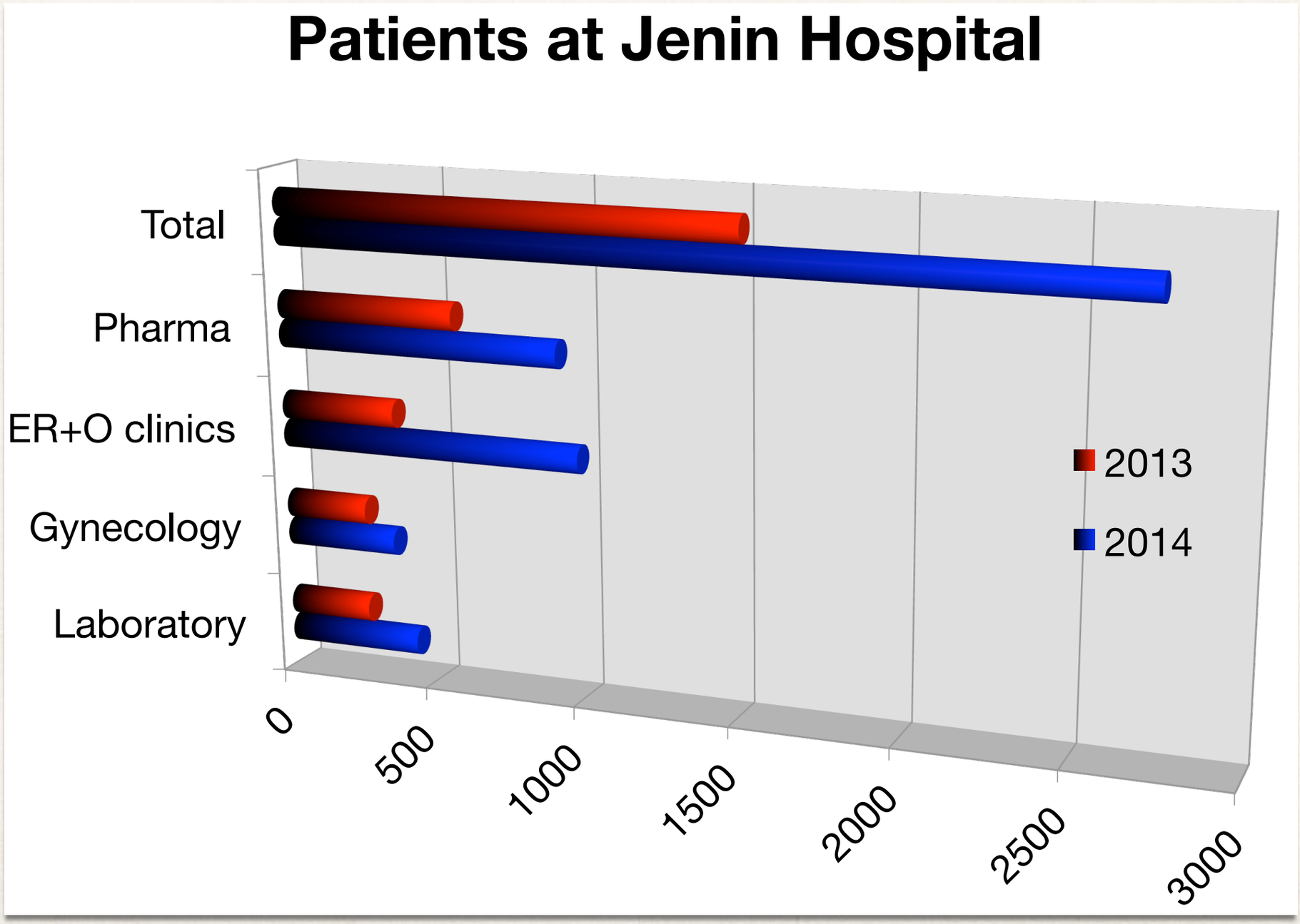
- Sunshine4Palestine designed a modular plant to be installed on the structure.

- One out of three moduli activated in two subsequent steps

- First part of modulus I installed ~186% increase of the patients treated by the ER, the Gynaecology department, etc (May 2014)

- Modulus I completely activated ~ 170% increase of the patients treated by the whole structure (December 2014)

May 2014 vs May 2013



January 2015 vs January 2014

- The first modulus is now fully operative.
- The ***whole*** structure operates for 17 hours a day ***completely off-grid***
- ***All of the clinics, the equipment and the operation room are active***
- Jenin Charitable hospital cured ***170 % more patients in January 2015 with respect to in January 2014***

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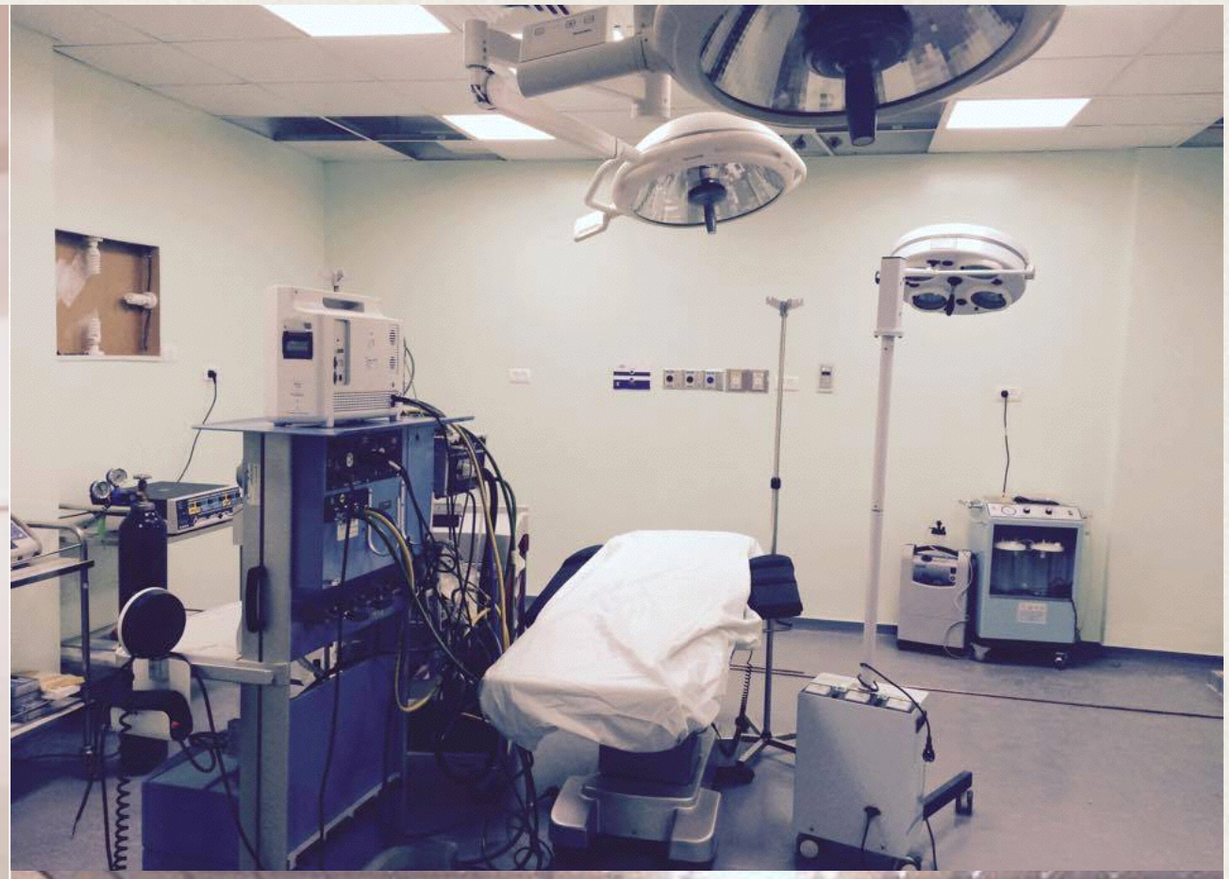
Costs and comparisons

- The complete first modulus is now operative: ***<u>17 hours of continuative functionality of the hospital</u>***

- ***<u>Complete independence</u>***

- ***<u>Modulus I: 50K $</u>*** ~ 360 days of electricity 17h per day with a fuel based generator.
  To compare, an ultrasound machine costs about 80K $



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Vision of Moduli II and III

- Modulus II: Extending opening hours 24/7

- Modulus III: Distribute the excess energy produced in the local network

- Jenin Charitable Hospital as a Source of energy.
  Public buildings used to produce and distribute energy

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Moving to Public Spaces

Street illumination in refugee camps with the Trees of Light

Collaboration with Liter of Light NGO, UNRWA patronage

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Public Places - Street Illumination

- Refugee Camps (Beach Refugee Camp and Rafah)
- No space for an extensive PV plant
- Tree of Light (Photovoltaic Tree)
- LED illumination - reduce the energy need

Increase awareness on PV power

- Partnership with **Liter of Light NGO** (*winner of the **Zayed Future Energy Price 2015***)
- Creation of a Laboratory where self-made PV lamps in a bottle will be made
- Creation of a micro-economy: artisans can create and sell the bottles
- Workshops from technicians to teach how to make bottles (***UNRWA pledge***)

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Sunshine4Palestine: who are we

Dr. Barbara Capone
CEO and Project Leader
Ph.D Physics (Cambridge, UK)
Fellow Austrian Academy of Sciences

Eng. Haitham Ghanem
Project Manager
Engineer (Birmingham, USA)
Bachelor Physics (Gaza, Palestine)

Dr. Ivan Coluzza
Project Coordinator
PhD Physics (Amsterdam, NL)
University Assistant, Vienna, Austria

Dr. Emanuela Bianchi
Technical Consultant
PhD Physics (Rome, Italy)
Researcher FWF, Vienna

Eng. Dr. Peter van Oostrum
Technical Consultant
PhD Physics (Utrecht, NL)
University Assistant, Vienna, Austria

Arch. Safaa Ghanem
Technical Consultant
Architect (Gaza, Palestine)

Dr. Patrizia Cecconi
Humanitarian Impact S4P Projects
Social Scientist (Rome, Italy)

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