

Hybrid Wind-Solar Power System for Village Lighting, Occupied Palestinian Territories

Themes

- ★ Renewable energy
- * Innovative technology applications
- ❖ Technical capacity development
- ❖ Institutional capacity development
- ❖ Awareness, culture, and practices
- * Gender equity and empowerment (MDG 3)
- * Health (MDGs 4-6)

PROJECT DATA

Name: Providing Innab Alkabeera village with lighting by promoting solar energy technology

Grantee: Union of the Palestinian Agricultural Relief Committee (PARC), West Bank (NGO)

Location: West Bank, Occupied Palestinian Territories

SGP contribution: \$45,600

Start Date: November 1999

ENERGY OVERVIEW

Energy Resources: sun and wind

Technology: solar-wind hybrid

Application: lighting (public and domestic), TV, radio, refrigeration, washing machine, and public phone

Sector: residential, public

Cost to consumers: at least \$3,300 paid by the community for installations, daily use of electricity also paid for by consumers

Total power provided: 17-18 kW (9 kW wind, 7 kW photovoltaics, and 1-2 kW diesel generator)

Households Served: 10 homes (100 inhabitants), a mosque and a school

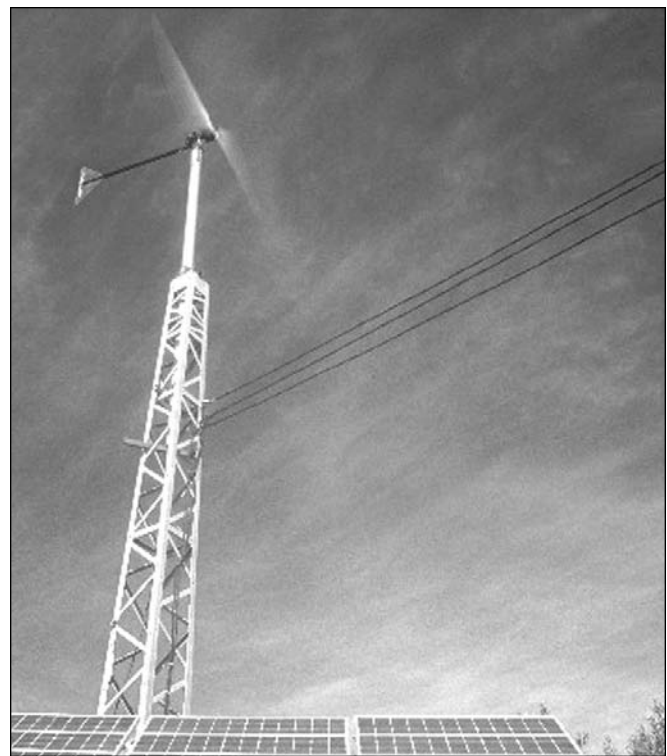
BACKGROUND

The area of the Occupied Palestinian Territories is one of the most densely populated regions in the Middle East. Approximately 15% of the communities in the West Bank and Gaza are not connected to the electricity grid, and electricity is expensive for those who are connected. This project targets a small, 100-person Bedouin community in Innab Alkabeera, which is located in Hebron, the southern area of the Palestinian Authority, along the border with Israel. Although this community was established in 1948, prior to implementation of this project residents still relied on kerosene lamps and a diesel generator for their energy needs. The diesel generator only provided enough power for 3 hours of electricity per day. The village also lacks most other types of infrastructure, including water supply, a sewage system, and paved roads.

PROJECT DESCRIPTION

Overview

The project assisted this community in building and operating a



A hybrid wind-solar power system provides lighting to Bedouin community in Innab Alkabeera (Hebron, Occupied Palestinian Territories).

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solar-wind hybrid power system to meet most of the village's energy needs. The work was completed with strong community cooperation and contribution, facilitated by a five-member committee. In addition, the project incorporated energy efficiency awareness into its project plans, to ensure that the community would get the most possible use out of the energy generated. Finally, the project plans include efforts to share this idea with other nearby communities.

Implementation

The community formed a five-member committee, which included one woman, to facilitate cooperation between the community and PARC with the technical expertise. This committee helped choose the necessary land for building the power station and negotiate the agreement of land owners to extend the mini-grid through their lands, and contribute manual labor to complete the project. The community also contributed over \$3,300 to help cover construction costs, paid in several installments. However, for those who worked to build the system, for example by helping to dig holes in which to stand the wooden poles to string distribution wires, the project paid wages or counted that work as part of their contribution. PARC trained two members of the committee to maintain the station, and to respond to any emergencies. If maintained properly, the system is expected to last 25 years. Finally, PARC conducted a workshop in the village about energy use, with the goal of encouraging the most efficient use of the limited energy made available by this system.

Community members also pay for the electricity they use, as

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calculated by the meter in their house, which provides an additional incentive to conserve the power. These payments are used to cover maintenance and replacement of the battery in the system every three years. The community has also agreed to gather the equivalent of at least \$100 via electricity payments, and these funds will be used for other development needs in the community. Innab Alkabeera has many infrastructure needs, including a water supply system, a sewage system, and paved roads.

Technology

The system is a solar/wind hybrid, and the power station is located within the community. There are 42 photovoltaic panels, set on concrete bases, which generate 7 kW. The wind generator, at a height of 15m, generates 9 kW. The old diesel generator is also connected to the system. The entire power station, therefore, produces 17-18 kW. The community built a control room, which contains the photovoltaic generator and a storing unit for 24 batteries with a capacity of 840 amps. The community also built a single-phase distribution network, using eleven wooden columns and cables, instead of uncovered wires, to improve security. There are 3 distribution lines, and each is connected to a separate generator so that when one or two fail, the third one is still supplying electricity. Households have had to rehabilitate old and incomplete indoor wiring. Each household has an automatic switch to prevent electricity use that exceeds 500 W, and a meter to monitor use. The meters are intended both to track electricity use for monthly payments and in order to warn those who have, on average, over-consumed electricity over the past year. Each household uses energy-efficient 15W light bulbs.

Environmental Benefits

Global: This project reduces greenhouse gas emissions by reducing the community's reliance on diesel and kerosene for energy services. Currently, 80% of the community's energy needs are met by the solar-wind hybrid system.

Local: Reduced use of diesel leads to less local air pollution.

Livelihood Benefits

Health: The introduction of the renewable power system has allowed the community to begin to refrigerate food and medicine items on a more regular basis. Today, the community has five shared refrigerators that operate for 24 hours. In addition, the reduced use of kerosene for lighting means better indoor air quality.

Education: The local school now has light, as well as a photocopier, which improves children's ability to study and learn.

Information access: The new power system enables the community to access television and radio, thereby improving their connection with the outside world.

Community building: The mosque now has power, making it possible to use a microphone for the call to prayer, and for prayer sessions to be held in the evenings.

Security: With lighting, community members feel safer moving around at night.

Beneficiaries

The 100 residents of the community are the primary beneficiaries of this project. Lighting is provided in households, the school and the mosque. Refrigeration is available to all via 5 shared refrigerators. Television, radio and a public phone are also powered by the system.

Capacity Development

The Palestinian Agricultural Relief Committee (PARC) held a 3-day workshop in May 2000 for women only. They were trained in understanding which appliances use the most energy, and how to choose energy saving ones. They also learned how to use devices that measure the electricity used by individual devices in their houses so they can know how best to conserve energy.

The five-member community committee that works with PARC has improved its capacity to understand and maintain the new power system. It is not clear, however, to what extent this project has improved their overall capacity for project management; the new infrastructure may make it possible to attract new investment in the community that was not possible before.

Partners

PARC's partnership with the community was formalized through the establishment of the community committee. This mechanism appears to have been effective at mobilizing community support and contribution to the project. PARC signed agreements with the village committee to ensure that responsibilities, including financial payments, were clear to everyone. PARC has sought to empower this community to manage the power system on its own.

LESSONS LEARNED

Environmental Management

This project is one of the first examples of solar-wind hybrid energy systems in the Middle East. Because of the dual power sources and the use of batteries, the power station can provide electricity 24 hours a day, compared to the diesel system, which allowed use only three hours per day.

Another key aspect of the project was its incorporation of energy efficiency techniques and incentives. Efficiency in energy use was not only promoted through special training; community members are charged by how much energy they use, and there is no minimum fee, as in the case of grid-connected customers. Therefore, families who conserve electricity can realize savings on their electricity bill.

Barrier Removal

Technical: This project has implemented a new technology in only one village. An important lesson that emerged in the implementation of this project was that the implementing NGO should have a basic amount of expertise in the technology being implemented in order to guide the project. Whether or not technical barriers are reduced through this project depends upon whether or not the experience in this village

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makes it easier for other villages to adopt similar technology. PARC, the grantee, has taken steps to familiarize local technicians with this power system, to ensure that they will be able to handle maintenance, and will also help them in dealing with future systems that are established.

Institutional: The project has successfully established a community committee to help administer the new power system. SGP documents indicate that one important lesson learned through this project, which was implemented in future projects, was that it is important for community members to contribute financially to the project in order to increase their ownership of the effort. Thus, both establishing the community committee and setting the financial contribution were important aspects of this project.

It is likely that over time, the new committee will help facilitate better management of the community's energy resources, given all the emphasis on efficient energy use. In addition, the new committee is laying the groundwork for other development projects by collecting and saving payments from electricity use.

Information/awareness: The project conducted a workshop in the community about efficient energy use. One lesson learned through this project was the importance of involving youth in such outreach efforts. A survey would need to be conducted to verify the effectiveness of this workshop in terms of changing energy use practices.

Gender: Women's participation was particularly important in this project, since they are the primary users of electrical appliances in the community. One member of the five-person com-

munity committee was a woman, which was a significant achievement in this community. PARC also held a workshop specifically for women, advising them on how to conserve energy and what refrigerators to buy.

Scaling Up

Following this project, SGP has funded another project in the Palestinian Territories that is designed to improve access to electricity by installing photovoltaic panels in the Al-Aqaba village located in the northern border area of the West Bank. It seeks to provide solar energy to 10 houses, a school, a women's charity and the village's main street. This project will also serve to demonstrate the potential of renewable energy in this area. On a larger scale, the GEF Focal Point at UNDP/PAPP has expressed interest in preparing a proposal to use solar energy to meet the needs of the 15% of Palestinians who are not connected to the electric grid.

SOURCES CONSULTED

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