



RENEWABLES FOR SUSTAINABLE
VILLAGE POWER

PROJECT BRIEF

Photovoltaic Electricity in Egypt

by Roger Taylor and Fuad Abulfotuh 12/97

Background

Presently, centers for electrical power distribution along the Nile include a 500-kV transmission line from Aswan to Cairo, a 220-kV transmission line in Cairo and Lower Egypt, and 132-kV transmission lines in Upper Egypt. These distribution systems and lower voltage (66-kV) transmission lines generally do not reach remote, isolated villages in regions such as the Sinai.

The social and economic impacts that result from the lack of electrical power in rural areas have sparked an intensive effort to bring electricity to Egypt's rural areas. The World Energy Council 2 reports that new, single-family homes in much of Egypt's rural territories, that are more than half a kilometer from existing electric lines, are more cost-effectively served by solar energy than by extending the electric grid. Even diesel is more expensive than solar energy in these instances. A diesel-generator of equivalent capacity has a life-cycle cost almost twice that of a photovoltaic (PV) system. Thus, there exists an opportunity for Egypt and neighboring countries to provide cost-effective PV electrical generating capacity to those living beyond a reasonably priced electrical grid.

Scope

The U.S. Department of Energy's National Renewable Energy Laboratory (NREL), the New and Renewable Energy Authority (NREA) of Egypt, and other local and international organizations took the first step in an effort to initiate renewable energy programs in Egypt. The programs include several projects to enhance and strengthen Egyptian understanding and capabilities in rural and remote electrification.

To help the decision-making process and to enhance the awareness level of renewable energy applications in remote and rural areas, two conferences were organized jointly by NREL and NREA in Cairo, Egypt. The First International Conference on Solar Electricity, Photovoltaics and Wind, was held in October of 1994 and the second was held in April 1996. The conferences provided a real-time forum for interactions between PV and wind technology manufacturers/suppliers and technology users, interested researchers and government/

industry decision makers, making possible discussions about near-term deployment of renewable energy systems. The two conferences also offered an opportunity to identify the most feasible and cost-effective applications and methods of setting up the technologies in developing countries, particularly the Middle East region. Delegates from more than 30 countries actively participated at the conferences through official meetings with the Minister of Electricity and Energy, Head of NREA, meetings with USAID-Cairo, and other dignitaries, academics, and industrial contacts. Eight project proposals, combined with the joint effort and including financial and human resources, were submitted to various financing organizations for possible funding.

A PV water pumping system was installed on a small farm (15 acres). The system is powered by a 3-kW stand-alone PV system and used for irrigation on the farm 70 miles northwest of Cairo. It was financed through a private sector financing company. The effort was coordinated by NREL through a local NGO. The long-term objective of the project is to prove the economic viability of PV without a subsidy.

A collaborative project for placing PV electricity systems in the Sinai region of Egypt has been proposed by NREL and the Egyptian Rural Electrification Authority (REA). They are working in cooperation with the Renewable Energy and Environment Society, and the NREA. The proposal addresses the critical rural electrification needs in Egypt, specifically in the remote villages of Sinai and along the northern coast of Egypt. Individual residences will receive solar home power systems. In addition to the solar home systems, each chosen village will be evaluated for the possibility of a village community water pumping system.

Using PV for rural electrification is a departure from the utility's normal line extension activities. This pilot project will demonstrate the technical and economic feasibility of providing basic electric service to customers well beyond the area covered by economical extension of power lines. The project is not only a technical demonstration project, but more importantly, it is a model for establishing a financing scheme

where farmers repay the cost of the PV systems over an extended period of time (8–10 years). Information acquired from the project will help to answer the following questions:

- How stand-alone PV service compares (technically and economically) to conventional utility line extensions for rural electrification in Egypt
- How do the economics of PV compare to power provided by on-site diesel generation for new and existing loads
- What is the optimum mix of domestic (Egyptian) and imported (U.S.) components
- What is required for the REA to be interested in providing this type of service, and how will providing the PV service affect utility operations
- Will Egyptian Electric Authority (EEA) and REA accept financing of the capital cost of PV service as an option to conventional line extensions
- Can EEA and REA be effective institutional mechanisms for implementing solar-based rural electrification?

NREL Contacts

Web site: <http://www.rsvp.nrel.gov>

Roger Taylor
phone: (303) 384-7389
e-mail: roger_taylor@nrel.gov

Fuad Abulfotuh
phone: (303) 384-6601
e-mail: fuad_abulfotuh@nrel.gov

Produced by the National Renewable Energy Laboratory, a U.S. Department of Energy national laboratory.

Printed with renewable source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste.

NREL/FS-510-24193