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An International Partnership for Solar Power

In the near future solar energy systems for generating small amounts of on-site mechanical or electrical power could play a substantial role in world energy affairs. The technologies of photovoltaic cells, solar collectors coupled with heat engines, and wind generators are poised for major cost reductions. A comprehensive study* by the congressional Office of Technology Assessment says that on-site solar power systems have the potential to be competitive with central utility power in the United States within 10 to 15 years. But solar power is at present too expensive in the industrial countries that have the expertise for immediate exploitation. What is lacking is the prospect of a market large enough to justify mass production, which in turn would accelerate cost reductions.

In many parts of the developing world, however, on-site solar power systems are competitive today and the potential is enormous. They could have an immediate impact on unelectrified rural areas, where most of the world's people live (96 percent in Africa). Shaft power for pumping water or grinding grain is fundamental to extending the human ability to do work, and electricity for refrigeration or educational television sets could markedly improve the quality of village life. Developing countries are desperately seeking independent, nonpetroleum energy sources, but they do not yet have the capability to implement solar power technologies by themselves.

The economics are instructive. The cost of utility power in the United States averages 3 to 10 cents per kilowatt hour. It runs as high as 45 cents/kwh in urban areas of developing countries. In rural areas, however, power is available only from diesel generator sets at $1/kwh or more, or from primary batteries at about $12/kwh. Complete solar-thermal power systems costing about $4 per peak watt and capable of providing electricity at less than $4/kwh are already available. Photovoltaic systems costing $1 to $2 per peak watt are expected by 1980. The OTA report says that solar devices capable of providing on-site power at much less than $1/kwh could be produced in the next few years.

Solar energy devices have long been proposed as appropriate technology for the developing world. What is less widely appreciated is that they constitute an appropriate, and important, technology for the developed world too. Both stand to gain from a rapid reduction in the costs of solar power, and a cooperative effort would facilitate the process. The analogy that suggests itself is the worldwide effort that led to the high-yield grains of the Green Revolution.

Initially, for example, industrial countries could stimulate their fledgling solar industries by making solar power systems available to developing countries on liberal terms, comparable to those provided in the past for nuclear power systems. France is already marketing a subsidized solar-powered irrigation pump to a dozen countries, and the Mexican government is considering purchase of 1000 units or more. If developing countries are to be the test-bed for solar power, however, they must be actively involved in setting up the programs and choosing the technologies.

As solar technologies begin to mature, developing countries might well choose to set up their own manufacturing plants. Such countries would have complete control over an inexhaustible energy source and a considerable measure of energy self-sufficiency, for perhaps one-tenth the cost in capital and skilled human resources required to establish an indigenous nuclear industry and extend urban power grids into the countryside. The existence of the solar alternative might also provide the best means of limiting nuclear proliferation.

The opportunity is here. But a solar partnership would be more credible to developing countries if the United States were to endorse on-site solar power as an important element in its own energy future and to play an active role in making the technology available to others.—ALLEN L. HAMMOND

**Application of Solar Technology to Today's Energy Needs* (Office of Technology Assessment, Washington, D.C., June 1977).