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Increased Use of Renewable Energy

Depletion of reserves of fossil fuels and concerns about greenhouse gases guarantee an ultimate major role for renewable energy in the United States. The rate of transition to a different energy economy will be dependent on many factors such as competitive costs, international crises, and public opinion. Crises come and go. Public opinion heats and cools. Federal appropriations for solar energy rocketed in about 1980, then fizzled. The major lasting shifts in modes of energy production will occur as renewable energy becomes cost=competitive in application after application.

During the past 10 years costs of some of the devices for exploiting renewable energy have dropped substantially. Reliability has improved. This progress was made abundantly evident at a biennial meeting of the International Solar Energy Society. The meeting, held in Denver, Colorado, 19 to 23 August, was attended by more than 1400 participants including representatives from about 50 countries.

Trends in applications of photovoltaics (PV) and wind energy are particularly interesting. Both are already cost competitive in some situations. Their technology continues to be improved at an impressive rate, and further advances seem ensured.

The cost of photovoltaic electricity is still considerably greater than that generated in coal-fired stations. However, in many circumstances PV is the practical energy source. It is of great convenience in consumer products including calculators, watches, and trickle chargers. It is increasingly being used around the world in remote locations. The PV devices are manufactured and sold at a profit without subsidy. Increasingly, major public utilities are using PV in their operations. Engineers employed by Pacific Gas and Electric of California have installed PV energy sources at 700 locations. Some of these have been on towers of high voltage transmission lines. Costs of a step-down transformer exceed those of a PV installation.

Kurt Yeager of the Electric Power Research Institute said that at least two dozen U.S. utilities are now using PV in their operations. He further stated that on the basis of utility surveys the PV applications by electrical utilities could amount to 40,000 installations over the next 5 years. This statement is a great testimonial to the perceived reliability of PV. Electric utilities are extremely cautious about adopting unproven equipment. Good experience with PV now and soon would make them receptive to enlarged applications later when the cost of PV electricity drops further as it likely will. It is now 25 to 30 cents per kilowatt hour (kWh). Yeager has said that once the cost falls to 10 to 20 cents/kWh a variety of grid-connected applications will become cost effective.

The day when PV can become a major quantitative contributor to the power grid is distant. Prospects for a large role for wind power are more immediate. Reliability of windmills has been substantially improved. Costs of generating power have been reduced. In the early 1980s there was excessive optimism for wind power. Performance of the early installations proved disappointing. Lifetimes of the equipment were limited. Costs of maintenance were excessive. But during the 1980s costs of wind energy decreased by a factor of 3 to 4. Now in areas where the annual average wind velocity is 13 miles per hour the cost of generating electricity is 7 to 9 cents/kWh. In locations where the velocity averages 16 mph the cost is 6 cents/kWh. The total wind-generating capacity in the United States exceeds 1600 megawatts. Today's turbines, which average about 100-kW capacity, can be installed for \$1000/kW. New generating units are being installed because the cost of their electric output is competitive (without subsidy) with other local generators. Today almost all the wind power is being generated in California. However, a new variable-speed turbine is being developed that will increase energy capture, lower costs to 5 cents/kWh, and introduce new flexibility in siting. Some regions of the Great Plains could become major power producers. About 90% of U.S. wind power potential lies in 12 north central and western states.

The climate for sustained growth of renewable energy seems excellent. World wide interest and activity are increasing. In the United States rapid improvements in cost-cutting technologies are being made. Funding for R&D is improving. Federal appropriations for renewable energy that hit a low in fiscal 1990 are now increasing. The Electric Power Research Institute is fostering renewable energy. Some companies active in renewables are showing a profit.—PHILIP H. ABELSON