Letters

Photovoltaics

Colin Norman, in his article "A cloudy forecast for solar cells" (News and Comment, 19 Oct., p. 319), writes that "the [photovoltaic] industry is in trouble." He cites the increasing world market share gained by the Japanese industry and the recent exit of a few American firms from the industry as evidence. There is, however, evidence to the contrary.

When we compare photovoltaics to other technology development paths and take a longer perspective, we see, contrary to Norman's view, a strong pace of progress. In a normal technology growth pattern, initial discovery is followed by grand predictions, unforeseen problems, and eventual slow progress toward market maturity. This pattern is consistent with many technologies, including automobiles, airplanes, computer chips, and calculators. These technologies took 30 to 50 years to develop to maturity. Some observers predicted in the 1970's that terrestrial photovoltaics would develop completely in a 10-year period. They foresaw an unrealistically aggressive annual growth rate of 100 percent and an annual price reduction beyond that expected from a normal learning curve.

When measured in absolute terms, the progress in photovoltaics has been substantial. Sales by U.S. firms are increasing at an average rate of 25 percent per year, from $75 million in 1980 to $150 million in 1983. If measured by the peak power capacity of photovoltaic cells, the growth rate is 50 percent per year. This growth is continuing in 1984 and, more important, it is becoming less dependent on direct federal purchases. Technical and cost improvements are equally impressive. System conversion efficiency has increased from 5 percent to nearly 10 percent. Costs have dropped by a factor of 10 since 1974, as rapid a pace as that achieved in the case of calculators. Today, devices with an efficiency of 18 to 20 percent are being produced, warranties of 10 years are being offered, and energy costs on a life-cycle basis are cheaper than energy costs of delivered diesel fuel in many locations in the world.

Even the perceived Japanese threat needs close scrutiny. It is not realistic to expect the United States to maintain a 90 percent market share in a competitive world marketplace. In many cases, including photovoltaics, the United States begins with total dominance of a world market, but eventually there is an equalizing effect. In the microprocessor chip industry, for example, the United States once held a 90 percent market share. That has now stabilized at 53 percent, as compared with 39 percent in Japan. Such foreign competition is healthy: it forces all competitors to be more efficient and effective. Photovoltaics is no exception. Evidence suggests that the U.S. market share in photovoltaics will level off at 50 to 55 percent.

This is not to say that we should not worry about the future. Photovoltaics is a science-based industry, unlike agriculture or coal mining, which depend on physical resources. If we do not develop the scientific base for photovoltaics, there will not be a thriving industry 10 years from now. It takes time to understand the basic science. That is why there is a role for government. Each of the many research paths being pursued carries substantial risk. Furthermore, those that are successful must be transferred to production-line reality with concurrent demand to create process efficiencies.

The federal government, in cooperation with the photovoltaic industry, is addressing these problems. Our efforts are continuing to improve new technologies and to develop state-of-the-art products that will serve the U.S. power market as an option which is reliable, reasonable in cost, and, most important, can be installed quickly in small increments.

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It is certainly true that there has been impressive progress in both sales and technology development in photovoltaics. That is why I described the industry as being in the paradoxical position of meeting most of its targets, yet facing serious economic problems. The problems stem from raising enough capital to develop and produce the next generation of cells at a time when photovoltaics can compete with alternative energy sources only in limited markets, when the tax credits are about to expire, when federally financed demonstration projects are likely to dry up, and when firms in most other countries are enjoying government incentives of one form or another. The federal R&D program has certainly done much to keep the U.S. industry in the technological forefront, but virtually every witness at recent congressional hearings argued that additional government support—for example, extending the tax incentives or financing more demonstration projects—will be critical for many companies in the next few years. The photovoltaic industry thus provides an interesting battleground for opposing views on the appropriate federal role in assisting an important high-technology industry.—COLIN NORMAN

Of State Taxes and Schools of Engineering

John Walsh (News and Comment, 23 Nov., p. 947) writes that New Jersey has no state income tax. As a former employee of Governor Brendan Byrne, in whose administration a state income tax was in fact, established, and as a current taxpayer in New Jersey, I can authoritatively state that New Jersey does in fact have a state income tax. As a person with many professional acquaintances on the Princeton University faculty, I can also authoritatively state that Princeton does in fact have an engineering school, although it does not have a medical or a law school.

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Anthropos and *Ursus*

That Ralph A. Nelson *et al.* (Reports, 16 Nov., p. 841) made "anthropometric measurement" on "wild black" bears (binomial classification not given) is a barefaced implausibility. Although we may feel a kinship toward (teddy) bears, *anthropos* (man) is not quite the same as *Ursus* (bear).

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