

Getting Real on Wind and Solar

By James Schlesinger and Robert L. Hirsch

Why are we ignoring things we know? We know that the sun doesn't always shine and that the wind doesn't always blow. That means that solar cells and wind energy systems don't always provide electric power. Nevertheless, solar and wind energy seem to have captured the public's support as potentially being the primary or total answer to our electric power needs.

Solar cells and wind turbines are appealing because they are "renewables" with promising implications and because they emit no carbon dioxide during operation, which is certainly a plus. But because both are intermittent electric power generators, they cannot produce electricity "on demand," something that the public requires. We expect the lights to go on when we flip a switch, and we do not expect our computers to shut down as nature dictates.

Solar and wind electricity are available only part of the time that consumers demand power. Solar cells produce no electric power at night, and clouds greatly reduce their output. The wind doesn't blow at a constant rate, and sometimes it does not blow at all.

If large-scale electric energy storage were viable, solar and wind intermittency would be less of a problem. However, large-scale electric energy storage is possible only in the few locations where there are hydroelectric dams. But when we use hydroelectric dams for electric energy storage, we reduce their electric power output, which would otherwise have been used by consumers. In other words, we suffer a loss to gain power on demand from wind and solar.

At locations without such hydroelectric dams, which is most places, solar and wind electricity systems must be backed up 100 percent by other forms of generation to ensure against blackouts. In today's world, that backup power can only come from fossil fuels.

Because of this need for full fossil fuel backup, the public will pay a large premium for solar and wind -- paying once for the solar and wind system (made financially feasible through substantial subsidies) and again for the fossil fuel system, which must be kept running at a low level at all times to be able to quickly ramp up in cases of sudden declines in sunshine and wind. Thus, the total cost of such a system includes the cost of the solar and wind machines, their subsidies, and the cost of the full backup power system running in "spinning reserve."

Finally, since solar and wind conditions are most favorable in the Southwest and the center of the country, costly transmission lines will be needed to move that lower-cost solar and wind energy to population centers on the coasts. There must be considerable redundancy in those new transmission lines to guard against damage due to natural disasters and terrorism, leading to considerable additional costs.

The climate change benefits that accrue from solar and wind power with 100 percent fossil fuel backup are associated with the fossil fuels not used at the standby power plants. Because solar and wind have the capacity to deliver only 30 to 40 percent of their full power ratings in even the best locations, they provide a carbon dioxide reduction of less than 30 to 40 percent, considering the fossil fuels needed for the "spinning reserve." That's far less than the 100 percent that many people believe, and it all comes with a high cost premium.

The United States will need an array of electric power production options to meet its needs in the years ahead. Solar and wind will have their places, as will other renewables. Realistically, however, solar and wind will probably only provide a modest percentage of future U.S. power. Some serious realism in energy planning is needed, preferably from analysts who are not backing one horse or another.

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