Study finds cloudy outlook for solar panels

February 21 2008

Despite increasing popular support for solar photovoltaic panels in the United States, their costs far outweigh the benefits, according to a new analysis by Severin Borenstein, a professor at the University of California, Berkeley's Haas School of Business and director of the UC Energy Institute.

"Solar photovoltaic (PV) is a very exciting technology, but the current technology is not economic," said Borenstein. "We are throwing money away by installing the current solar PV technology, which is a loser."

In his January working paper, "The Market Value and Cost of Solar Photovoltaic Electricity Product," Borenstein also found that, even after considering that the panels reduce greenhouse gases, their costs still far outweigh their social benefits.

The bottom line, Borenstein argues in his paper, is that solar PV panels are not ready for widespread installation. Rather than subsidizing residential solar PV installations, as many states do, he favors more state and federal funding for research and development.

"We need a major scientific breakthrough, and we won't get it by putting panels up on houses," he said in a recent interview on campus. "It is going to come in the labs."

Solar photovoltaic panels generate more power on summer afternoons when the sun is shining most intensely, which is also when the value of electricity is higher for most U.S. electricity systems, Borenstein noted.

Proponents of the devices have pointed out that most previous analyses fail to address that fact. Borenstein uses actual wholesale electricity prices and simulated data to calculate how much that timing enhances the value of solar photovoltaic panels.

He found that the favorable timing of solar PV production increases its value by up to 20 percent. However, the premium value of solar PV could be from 30 percent to 50 percent higher if U.S. systems were run with less capacity and prices were allowed to rise as demand increases at different times of the day, said Borenstein, who has long advocated for such variable time pricing. He noted that U.S. systems typically operate with excess capacity and that consumers pay the same price for electricity at all times of the day.

"Basically, the benefits of solar PV are undermined by the way most grids are run today," Borenstein said.

He noted that utilities are slowly moving toward operating with less excess capacity and time-varying pricing for residential customers, and that these changes are expected to be in place for customers to opt for on a voluntary basis in California by 2012. "When that happens, the value of solar will go up," Borenstein said.

His analysis deconstructs the argument that solar panels produce power at the location of the end-user and therefore can reduce the costs of transmission and distribution infrastructure investments. Examining 26,522 solar PV systems in California, Borenstein found they are not concentrated in locations where they would reduce transmission congestion and reduce the need for investment in transmission infrastructure.

"Solar PV is not clustered in the most valuable locations," his paper concludes.

Borenstein took his analysis a step further by calculating the discounted net present value (a financial tool to calculate the value of a dollar in the future compared to its value now) of power produced by a 10 kilowatt solar photovoltaic system and then compared that to the cost of installing and operating such a system over its lifetime. He found the cost for an installation ranges from nearly $86,000 to $91,000, while the value of the power produced ranges from $19,000 to $51,000.

Under the most extreme assumptions (a 5 percent annual increase in electricity costs and 1 percent interest rate), the cost of solar PV is about 80 percent greater than the value of the electricity it will produce, Borenstein found. Under more likely scenarios about interest rates and electricity cost increases, the cost of a solar PV installation today is three to four times greater than the benefits of the electricity it will produce, he said.

Given that a coal-fired electricity generation plant produces about 1 ton of carbon dioxide per megawatt hour, Borenstein estimated that the price of greenhouse gas reductions would have to range from about $150 to $500 per ton of greenhouse gases to make the current solar PV technology a worthwhile investment when greenhouse gas reductions are considered.

But Borenstein noted that policymakers are considering a far lower price - $20 per ton of greenhouse gases - as the maximum that industry could be charged in proposed tradable emissions permit programs. Borenstein's paper is online at www.ucei.berkeley.edu/PDF/csemwp176.pdf .

Source: By Ronna Kelly, UC Berkeley