

Focus | ENERGY

SOLAR'S GROWTH UPENDS STATE'S POWER SYSTEM



FILE PHOTO: GETTY IMAGES

Solar panels cover the roof of a Sam's Club store in Glendora. Installations by California solar customers have increased tenfold since 2006.

Producing electricity from sunlight has taken off, and California's utilities are struggling to cope with big changes.

By MATTHEW L. WALD
THE NEW YORK TIMES

Solar power is growing so fast in California – with installations by customers increasing tenfold since 2006 – the renewable energy source is turning the state's power system upside down.

HOW IS CALIFORNIA MANAGING THE SURGE IN SOLAR POWER?

In a twist that is being closely watched by power companies around the country, California utilities will install massive banks of batteries and other devices to store the power surplus created by solar panels in the afternoon, when the sun's rays are strong. The batteries are then to begin discharging power into California's electric grid in the early evening, around sunset, when the solar generation of energy dies down but demand rises as millions of people arrive home and turn on air-conditioners, televisions and other electricity gobblers.

The new system is the opposite of an idea utilities have considered for years: Use batteries to store power at night from traditional sources, like natural gas and coal, and run them down in the peak heat of late afternoon.

"It is the reverse of the way we've always thought of storage," Gregory Reed, director of the Electric Power Initiative at the University of Pittsburgh.

WHY IS INCREASED POWER STORAGE SO CRUCIAL?

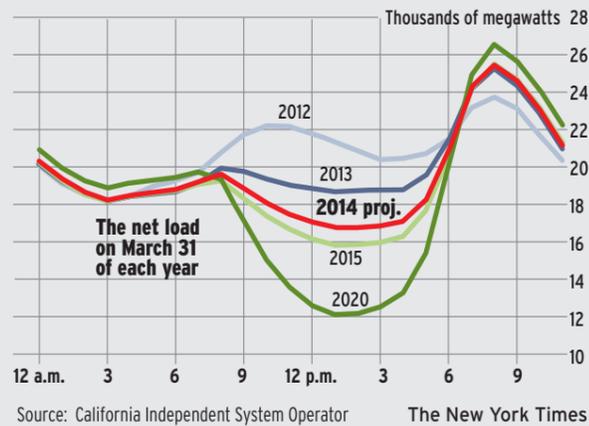
A critical purpose of the storage – which was ordered by the California Public Utilities Commission – is to allow generators, which in California run largely on natural gas, to keep operating in the late afternoon, when the output from solar panels eliminates the need for their electricity.

With so many solar panels in California, "we may find ourselves in periods of time when we have oversupply, overgeneration," said Clyde Loutan, senior adviser for renewables integration at the Cali-

SOLAR POWER RESHAPES THE CALIFORNIA GRID

The growth in solar power will make sunset a challenge for the power grid, as solar generation drops off just as demand rises, grid officials say. The nonsolar part of the system will have to increase generation rapidly. Energy storage would allow some generators to keep running at peak solar hours, so the curve is not so steep.

CALIFORNIA'S ELECTRICAL GRID THROUGHOUT THE DAY



BETTING ON BATTERIES

The relatively new idea of using batteries – which could be bundled in packs, each about the size of an 18-wheel truck trailer – to store electricity during the day and discharge it in the evening is aimed at coping with rapid changes in supply and demand. The expense of the batteries, possibly in the billions of dollars for California, has limited their use.

But booming solar power in California has changed the equation and made the California Public Utilities Commission take a different path.

fornia Independent System Operator, which runs the state's grid. That is just as destabilizing as shortage, he said.

The point of keeping the generators running is that they will be needed immediately after the sun sets, but the problem is that they cannot start instantly. By 2020, planners estimate, it will be difficult to balance supply and demand at sunset because the combination of the sun setting and evening demand picking up will create the instant need for a vast amount of power. The system would have to double its output in about three hours, faster than it can now manage.

The problem is acute in California because the demand for power is concentrated in a narrow, coastal band that runs north and south. The sun sets on all of it at about the same time.

This curve of the demand for electricity, formerly undulating like ocean waves, is projected to take an extremely steep pitch up every day around sunset, into a shape that industry insiders call the "duck chart" because a chart produced by the California Independent System Operator resembles the profile of a duck.

WHAT ABOUT THE COST OF EXCESS CAPACITY?

The Public Utilities Commission did not cite a cost estimate, but said it anticipated the price for storage would fall as storage equipment manufacturers developed new products to meet the mandate. It is not clear how costs would be shared among all rate payers and companies or individuals who have put solar power on the grid. Already, energy can be stored as heat or cold.

The utilities commission's order for storage, which will be phased in starting in 2014, represents shifting needs, said Laura Wisland, a renewables specialist at the Union of Concerned Scientists. "We're shifting from a need for capacity on the system to a need for flexibility on the system," Wisland said.

Some of the storage need could be met by the batteries in electric vehicles, said Ufuk Topcu, a specialist on storage and grid dynamics at the California Institute of Technology in Pasadena. But that would require more electric cars than are now on the road.

But none of this is bad news, Wisland said. "The duck chart is illustrating that solar is doing its job," she said.



FILE PHOTO: MICHAEL GOULDING, ORANGE COUNTY REGISTER

Eric Overton of SolarCity brings solar panels up to the spot where they will be installed on the roof of a Westminster house in 2008.

WHY IT MATTERS

While having a surplus of energy due to the rapid growth of solar power in California seems like a positive development, if not carefully managed, the extra capacity has the potential to destabilize the state's power grid.