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Japan Pushes Zero-Energy Structures

BY TATSUO ITO

YOKOHAMA, Japan—The latest green building doesn't just have solar panels on the roof. It has them on three sides, too.

Taisei Corp., a Japanese construction company, says its office here south of Tokyo cuts energy use by 75% compared with a typical office and generates its power entirely through solar panels, pointing the way to a new era of zero-energy structures that generate as much energy as they use.

The experiment has drawn support from Prime Minister Shinzo Abe's administration. The government is struggling to replace energy from nuclear-power plants, which once provided nearly one-third of the nation's electricity but now are offline after the 2011 Fukushima Daiichi nuclear accident.

"Zero-energy buildings could be one of the key pillars for our growth strategy," said Kimihiro Hashimoto, director general of the land ministry's housing bureau, adding that Japanese contractors could use their technology to win business overseas.

The technology is still expensive, and it isn't available for general customers yet. Taisei acknowledges that for now, the extra cost is more than building owners could save through lower energy use.

"It's like a concept car," said Taisei President Takashi Yamauchi during a June event at the three-story building. "We're looking to raise the cost-performance of this building so that we'd be able to tell our clients their initial investment could be recouped later."

The side solar panels from Mitsubishi Chemical Corp., known as organic photovoltaic solar cells, convert sunlight less efficiently into electricity and cost more to produce than regular solar panels. Those cells—light, thin and bendable—can be used on buildings in places where ordinary panels are hard to attach, according to Mitsubishi Chemical, which hopes to put them into mass production next year.

Japan first set goals for zero-energy buildings in 2010. In April, Mr. Abe's cabinet reaffirmed the goal of making all new public buildings zero-energy by 2020, with a similar goal for private buildings by 2030 on average. Other na-

tions have embraced the concept, and the European Union has set 2020 as a target for buildings to be "nearly zero-energy." The U.S. Energy Department has established an aggressive goal to create the technology and knowledge base for cost-effective zero-energy commercial buildings by 2025.

Analysts call the Japanese targets challenging, but companies have begun responding. "The bar is high, but the goal isn't unrealistic," said Tadashi Mizuishi, a consultant at Nomura Research Institute. In May 2013, contractor Shimizu Corp. completed what it described as the first zero-energy building in Japan, supplementing solar panels with other renewable sources at the rural headquarters of a religious group.

Taisei wants to extend the concept to crowded urban areas and create buildings that generate all their own energy.

Conservation is the biggest part of the zero-energy plan. Taisei says its office in Yokohama uses about one-quarter of the energy of typical offices. In addition to familiar technologies such as motion sensors for lighting, the office has sensors that determine the wind direction and advise workers when they could cool off by opening a window.

Masaharu Seki, a Taisei architect, said it was "meaningless" to insist on gaman— the traditional Japanese virtue of suffering hardship without complaint— because customers don't like it. "That's why there are various devices that can make people comfortable," he said.

The air conditioning comes from the floor, not the ceiling, and each desk has its own individual unit, so workers can fine-tune the amount of air and direction. On a visit on a recent sweltering day, the building was cool and pleasant inside.

Solar panels on the roof and sides generate power, and batteries store the excess so the lights can stay on at night and on rainy days. The building is still connected to the electric grid, sending power at times and drawing power when needed. Taisei says the building, which opened in May, is on track to have net zero energy usage in its first year of operation.

Elsewhere in Japan, Kajima Corp. says it wants to build a mediumor high-rise zero-energy office building by 2020. Obayashi Corp. is researching a "life-cycle zero-energy building" that takes into account all the energy used in construction and materials production.

This Taisei office in Yokohama uses solar panels on the sides and roof.

The issue for now is cost. Taisei hasn't disclosed how much it spent to build its Yokohama office, but officials say the company wants to get the price of a zero-energy building down to just 20% more than an ordinary building by 2020. The office project got support from a government-affiliated body that paid twothirds of the cost of Mitsubishi Chemical's solar panels.

One way to lower costs is to make the side solar panels more efficient. Currently, they only convert about 5% of the incoming solar energy into electricity, a figure Taisei would like to see rise to about 20% by 2020.

Nomura Research Institute's Mr. Mizuishi said it would take time for building owners to understand zero-energy buildings, which may take many years to recoup upfront costs. Nevertheless, he said Japanese companies could take the lead in subtropical Asian markets. Nomura predicts that the Asian market will account for about half of the global zero-emission-building market by 2030, while Europe and the U.S. accounted for 70% in 2010.