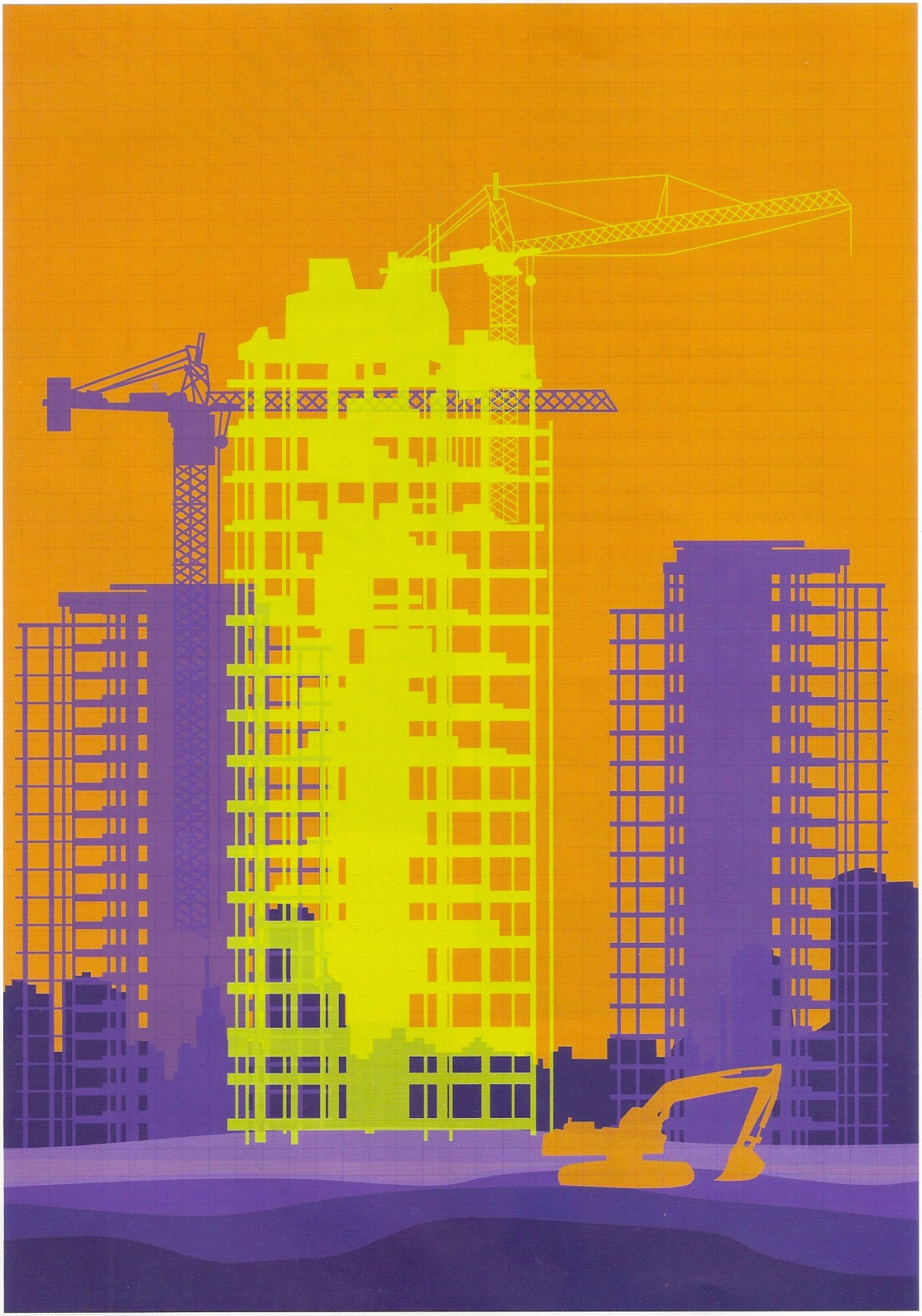

ELEMENTS FROM SHUTTERSTOCK

sustainable SKYLINE

New high rises coming to Sacramento will test the limits of what's possible in commercial-building energy efficiency

by **STEVEN YODER**

When it comes to low-carbon construction design, flashy new tech products get the most attention: solar roof tiles, algae-growing building materials, solar tracking mounts that follow the sun, skyscraper-mounted wind turbines and so on.

But on commercial buildings, what actually cuts carbon the most are its plain-vanilla basics, known as the passive elements. Those include the materials used in the walls, windows and roof, and how the building is oriented — for example, when planning a rectangular building, it's best if the long side faces south. "A really efficient exterior means the mechanical systems like the heating, cooling and lighting don't have to work as hard," says Ray Nalangan, a senior architect with SMUD.

Two new State buildings in downtown Sacramento will push the envelope for what's possible in sustainability, utilizing passive elements and smart planning in the process. And those projects will spin off valuable lessons for other developers and building owners as they plan new projects or retrofit existing structures.

New construction efforts offer a big advantage since energy efficiency can be incorporated from the design stages, making these two building projects prime

1215 O Street project rendering

candidates for smart planning. The new structure at 1215 O Street will house up to 1,150 employees from three State agencies. And the P Street building will sit on the lot between 7th and 8th and O and P streets. At 20 stories, it will be more than twice as big as the O Street structure and be home to about 3,500 employees from eight agencies along with an onsite child-care facility for up to 120 children.

The State of California has set a high bar for how these buildings will use energy. In its specifications for O Street, the State's Department of General Services required an "energy use index" of 28. That index measures the energy use per square foot, something like gallons per mile for a car. For most buildings, it's 80-100, says Nick Docous, board chairman and civic practice lead at Lionakis, which is a partner on the O Street project. But the O Street building will have a rock-bottom EUI of 23.

When Are Energy Upgrades Worth It?

Among states, California ranks second in the U.S. (behind Massachusetts) for its energy-efficiency policies, says the nonprofit American Council for an Energy-Efficient Economy. So incentives are everywhere for businesses planning a new construction or upgrade. But which investments are worthwhile?

The federal Energy Star program offers several detailed online calculators to help building owners and managers crunch the numbers on those decisions. A "cash flow opportunity calculator" assesses how much new energy-efficiency equipment can be purchased given the anticipated savings, determines whether that equipment should be financed or paid for in cash, and assesses when the purchase should be made given the current interest rate. A "financial value calculator" lets companies use the prevailing price/earnings ratio to estimate how an investment in energy-efficient upgrades will affect a firm's market value. And a "building upgrade value calculator" lets building owners and managers analyze the overall financial impact of energy-efficiency improvement projects.

As for rebates, municipalities offer a few of them. For example, Sacramento and Roseville provide business rebates for new water-saving equipment purchases.

But most rebates come courtesy of utilities. For example, SMUD's Savings by Design program offers financial incentives for investments that exceed a minimum threshold — generally they have to perform 10 percent better than the state's Title 24 building standards. SMUD helps the customer with the design analysis for the new investment, and its incentives are designed to make the outlay pay for itself within three to five years, says Ray Nalangan, a senior architect with SMUD.

The utility's Complete Energy Solutions program targets small and medium-sized businesses. The utility does an energy audit of existing facilities to identify areas of potential savings, helps owners find approved contractors to install any recommended upgrades, oversees their installation and offers rebates that average 60 percent of the cost.

And SMUD's Express Energy Solutions program for commercial, industrial and multi-family businesses lets the customer identify energy-efficiency upgrade equipment they'd like to install and offers a rebate of up to $20,000. (Rebates requests of more than $5,000 require the utility's pre-approval.)

Its passive elements will be a big reason why. The structure will run lengthwise east to west and be made of poured-in-place concrete, says Docous. Concrete retains energy better, so once a concrete structure gets to the right temperature, it stays there longer than those of steel or fiberglass. On the southern exposure, a fixed sunscreen called a brise soleil will open and close to let the building collect heat when it's cold and shade it when it's warm.

But it's the solar mechanical elements that will shrink these buildings' carbon footprints to zero. Under an agreement between DGS and SMUD, the buildings will get some of their electricity needs met by offsite SMUD-generated solar and some from solar panels on their own roofs. Inside, other mechanical elements will crank up how efficiently that energy is used. For example, "chilled-beam" air treatment systems in many ceilings will take rising warm air, run it over a chilled-water coil and drop it back down as cool air, says Chris Barker, engineering department manager at Airco Mechanical, a partner on the O Street project. That system allows the office space to stay at the right temperature with far less piped-in air, he says.

State energy requirements mean private developers and other contractors will be watching with interest. The California Energy Efficiency Strategic Plan requires all new commercial construction to be zero net energy by 2030 and half of all commercial buildings to be retrofitted for ZNE by that year. (ZNE means that all of a building's energy needs are met by renewable sources.) Half of new state-owned buildings starting design after 2020 and all new State-owned buildings and major renovations starting design after 2025 must be constructed as ZNE.

Dave Pixley, president at Applied Energy Innovation in Folsom says that as companies think about how to get there, they should con-

P Street building rendering

SOURCE: DEPARTMENT OF GENERAL SERVICES

sider equipment that could cut how much power their buildings need in the first place. Consider transformers, which take electricity coming into a building and convert it to lower voltages for the equipment and systems inside. Most transformers are inefficient, Pixley says. They are necessarily massively oversized to make sure they have ample capacity. But at the low loads they handle, they run at only 80-85 percent efficiency. Higher-end transformers run far more efficiently at those loads and can cut 5-8 percent off electricity costs, he says.

And a power-conditioning technology that his company sells is designed to improve the quality of the electrical signal coming into a building — signal quality can be affected by many things, among them being near the end of an electrical-line run or operating lots of high-end loads like motors, he says. The signal-regularizing equipment, called a universal shunt efficiency system, can deliver a 5 to 20 percent savings on electricity in higher cost utility regions, Pixley says.

All of that means there are many routes for getting to ultra-efficient commercial structures. Nalangan is excited by the O and P Street projects because they'll showcase the most forward-thinking ideas in commercial-building sustainability and generate data critical to designing more low-carbon buildings down the road. Nalangan, who spent 14 years at private companies before joining SMUD, says that when he was in private practice, "You'd have great ideas that were hard to move beyond the design phase because there were constraints. These projects will make us a smarter organization." ■

Steven Yoder writes about business, real estate and criminal justice. His work has appeared in The Fiscal Times, Salon, The American Prospect *and elsewhere. On Twitter @syodertweet and at stevenyoder.net.*