

Empowered: Choices & Challenges in Energy Efficiency

Welcome to our Yardi Thought Leadership Series addressing issues on the cutting edge of real estate operations and investment. This article explores how the transformation of the nation's electrical system is shaping new strategies and creating unprecedented possibilities for efficiency.

Topics discussed include:

- Major changes in the grid and their implications for owners, property managers and asset managers
- Operational, regulatory and technological trends influencing efficiency
- Best practices for selecting solutions that reduce costs, boost net operating income and enhance values

This is a pivotal time for energy strategies in the commercial real estate industry, which is both a catalyst and a beneficiary of historic change. A menu of low-cost options that were not viable as recently as a decade ago is now available to property owners and managers, and further innovations are on the way.

These tools and strategies can substantially reduce a property's energy consumption, boosting efficiency and enhancing the bottom line. It is no longer far-fetched to imagine a future in which large numbers of buildings could, in effect, serve as their own power plants and depart the grid entirely. In the not-too-distant future, emerging energy technologies may give owners the opportunity to become self-reliant and sell power back to the grid. The result would be a surge in NOI for commercial owners.

That promising future is on the horizon, yet most commercial properties will remain part of the grid for the time being. Rapidly changing trends

still pose a distinct challenge for owners, asset managers and property managers alike. Looming large among those challenges: formulating energy plans that suit today's conditions while still remaining mindful of emerging new paradigms for energy sourcing and delivery. A growing body of evidence strongly suggests that a well-planned energy efficiency strategy can cut operating costs, improve NOI and boost asset values.

Grasping the Grid

Understanding the importance of today's changes requires an understanding of the nation's electrical grid, which encompasses some 3,200 utilities. The system boils down to three basic components: fossil-fuel and renewable production sources, known collectively as generation; transmission lines that convey electricity to metropolitan areas and other distribution points; and local distribution systems that deliver electricity to commercial and residential customers.



Multiple forces are reshaping the U.S. electrical grid, creating unprecedented opportunities to operate properties efficiently. (Photo: Con Edison)

On the surface, this appears to be a highly efficient way to deliver some \$400 billion worth of energy annually. The grid's uptime is a remarkable 99.97% and, adjusted for inflation, prices are slightly below where they were in 1960. According to the U.S. Energy Information Administration, commercial and residential buildings account for 40% of total consumption, split roughly evenly between the two sectors. The commercial sector alone accounts for 18.2%.

But operational, regulatory and technological cracks are developing, portending major changes to the grid and to the options available to every stakeholder in the U.S. commercial building industry, from investment, ownership and development to building management and the tenants they serve.

Wanted: Increased NOI

While inflation-adjusted power prices have not increased substantially in many years, the cost still accounts for a large share of property operating budgets. "Next to taxes and debt service, neither of which are controllable, utilities are the highest expense for commercial buildings, and they are controllable," observes Matt Eggers, vice president of Yardi Energy. "If you are attempting to reduce operating expenses and increase income, utilities are at the top of the list."

Energy users are also paying for downtime, Eggers adds. "Much of the grid's energy generation capacity gets used only a handful of days a year,

when demand is very high—as little as 10% of the time," he points out. "And yet, the consumer is paying to build, maintain and run these 'peaker' plants which sit idle for 330 days per year."

On the regulatory front, momentum is on the side of renewable resources and expanded options for end users. Since 2006, a federal investment tax credit has served as a primary engine for expansion of solar energy nationwide. The initiative covers 30% of the cost of a solar system as a tax credit back to the system's owner. Since the solar investment tax credit's introduction, commercial solar installation has increased more than 1,600%, according to the Solar Energy Industries Association (SEIA), a national trade group. In addition, 10 states and 29 municipal governments now require at least some buildings to track and report energy consumption data using ENERGY STAR® Portfolio Manager®. This data may be used by tenants, lenders, vendors and regulators to account for utility costs and energy efficiency in their decisions.

There are, of course, established programs to aid owners and asset managers in their energy-reduction initiatives. Close to 500,000 buildings—representing about half of the nation's commercial property space—have used the ENERGY STAR Portfolio Manager benchmarking tool, according to the Environmental Protection Agency (EPA). ENERGY STAR-enabled assets can realize decreased operating costs of 11% over one year and a five-year decrease of 28%.

A U.S. Department of Energy (DOE) study released in May 2017 found that operating expenses at green properties were 17.6% lower than at conventional properties. In an equally compelling finding, the DOE study found that the positive effects extended to fundamentals: 6.2% higher occupancy, 4.3% higher rent per square foot, 8.4% higher market value, 28.8% higher NOI and a 6.9% per square foot reduction in rent concessions.

Influential as these regulatory and operational considerations are, technology may be the single most powerful change agent for the electrical distribution system. The plummeting cost of solar power and new tools for energy efficiency are undermining the grid's once-unchallenged position as a single-source supplier.

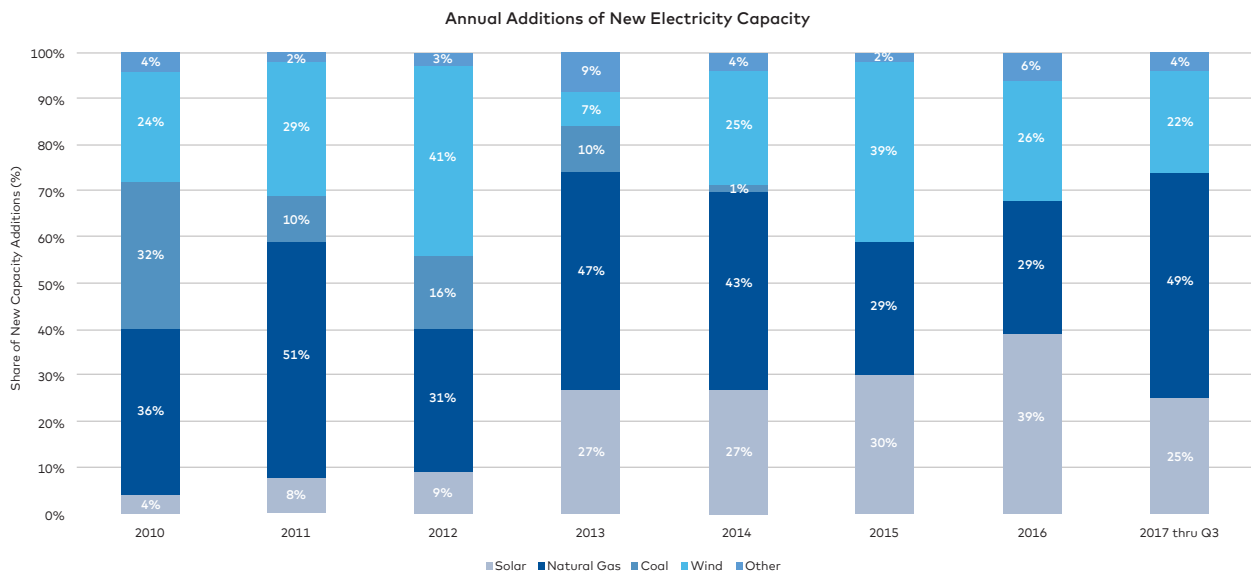
Costs Trending Down

Solar installations accounted for 30% of all new electricity generation capacity brought online in 2017, following a 39% share the previous year, the SEIA reported. Some fundamentals admittedly took a step back from years of unbroken improvement during 2017. For the first time in recent memory, installation costs ticked up during

the second half of 2017, largely in response to trade issues, which led to a year-over-year decline in new solar installations. Even so, the long-term direction remains positive. Installation costs have plummeted 70% since 2010, and solar generation capacity has increased 68% annually on average during the same stretch, the SEIA estimates.

"This cost decline continues at a rapid pace," Eggers reports, "and has now made solar the cheapest form of new generation in some markets around the U.S. and the world." According to the most recent analysis by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL), the installed cost of electricity for utility-scale systems declined 29% year-over-year during the first quarter of 2017, ranging between 5 cents and 6.6 cents per kilowatt-hour. Bloomberg New Energy Finance has released figures for 2018 showing that solar energy from rooftop solar systems is on pace for an 18% cost decrease over 2017.

In a sign of the times, Otero County Electric Cooperative in New Mexico recently signed a solar power purchase agreement for 4.5 cents per kilowatt-hour, the lowest in the U.S. as of the end



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One telling measure of solar power's rise is its increasing share of new capacity. As recently as 2012, solar installations accounted for only 9% of new electric generation; in every year since 2013, its share has reached at least 25%. In 2016, new solar installations led all other energy sources for the first time, accounting for 39% of new capacity. Sources: GTM Research, Solar Energy Industries Association.

of 2017, according to the Rocky Mountain Institute, a nonprofit advocate for market-based sustainable energy solutions and an adviser on the deal. The plummeting cost of solar power is one factor cited in the recent bankruptcy of utility FirstEnergy's generation unit which will lead to the closure of several uncompetitive coal and nuclear power plants.

Solar power is only one aspect of a fully self-sustaining building energy system. Other forces disrupting the power grid include energy efficiency, fuel cells, demand response technologies, battery storage, electric vehicles and micro-grid technologies. Many of these categories have yet to achieve the broad application of solar power, but if current advancements continue, these areas will contribute greatly to alternative energy options and potentially enable owners to become self-sufficient and even provide services to the grid at a profit.

New Distribution Complexities

David K. Owens, former executive vice president for the Edison Electric Institute, a large utility trade group, underscored the potential for buildings to make money from energy services during a Wall Street briefing a few years ago. "The ability of customers and other entities to self-generate, sell and store power and to provide other services to the energy grid will affect the future electric distribution system profoundly," stated Owens.

"These changes are transforming the distribution grid from a one-way delivery system to a more

complex distribution network that customers and other entities will use in different ways," he continued.

The transformation Owens predicted will be hastened by a technology that is just beginning commercial deployment. "Battery technology is essentially where solar was a dozen years ago," Eggers explains. "So we can see its eventual adoption. Early adopters will, as Wayne Gretzky once said, 'skate to where the puck is going to be.'" Among the early adopters of battery storage are Hawaii, California and New York, which share similar conditions of high-priced power, incentives to support the technology and requirements for utilities to use it.

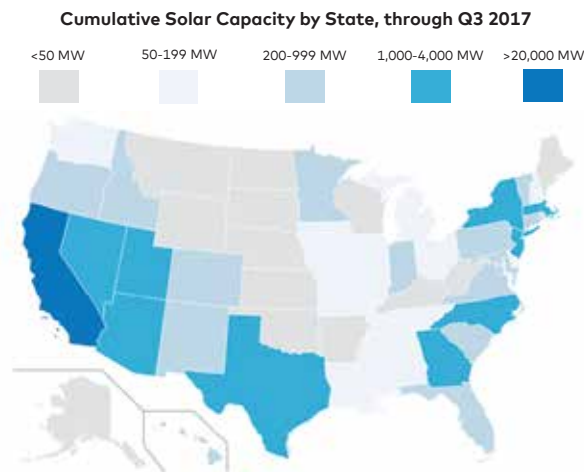
Innovative Technology Drives Efficiency

While the economics of solar power have improved dramatically, driving major gains in deployment, other technologies are having a significant impact by reducing building energy demand. For example, automated software systems can supercharge energy savings by optimizing building start-up time, adjusting dozens of system setpoints every 30 seconds based on real-time comfort needs and detecting and eliminating anomalous usage such as after-hours air conditioning.

HVAC optimization systems are often designed for buildings 150,000 sq. ft. and up, but smaller properties and spaces can also generate substantial energy savings, without systems that

TOP 10 STATES

1. CA: 20,163 MW
2. NC: 3,785 MW
3. AZ: 3,336 MW
4. NV: 2,585 MW
5. NJ: 2,234 MW
6. MA: 1,898 MW
7. TX: 1,847 MW
8. UT: 1,566 MW
9. GA: 1,505 MW
10. NY: 1,176 MW



While California has traditionally dominated the U.S. solar market, with 35% market share in 2016, other markets are continuing to expand, including Minnesota, Utah, Florida and Texas. As the price of solar continues to fall, new state entrants will grab an increasingly larger share of the national market. Sources: GTM Research, Solar Energy Industries Association.



are too expensive. Smart thermostats managed remotely through cloud-based software and automatically adjusted using smart algorithms yield significant savings with low implementation costs. "For example, Yardi Pulse Central Control includes smart thermostats, scheduling capabilities and can also function as a lighting control system, which for one well-known retailer resulted in a 14% reduction in energy costs and 15-20% reduction in maintenance costs by providing HVAC system diagnostics," shares Eggers.

Building engineers can further drive down costs by installing modern and efficient products that tie into the overall building automation system. Energy-saving steps that can be taken at the property and portfolio include:

- Controls that adjust lighting levels in response to daylight, which can generate 40% to 60% savings. Sensors can be installed inside or outside the space and connected to a main control system.
- Condensing boilers, which can achieve efficiency as high as 98%. On-demand water heaters or tankless natural gas units can yield 25% savings compared to conventional domestic hot water systems.
- Double- or triple-pane glass with insulating gas (argon or krypton) and increased roof insulation.

Owners might find it difficult to justify the cost of capital-intensive upgrades in some buildings, but even such low-tech devices as revolving doors can "reduce the amount of unconditioned air entering the building by a factor of eight when compared with standard swinging doors," NREL estimates.

But products and systems alone will not achieve NOI gains without good management and good management doesn't require a capital spending plan. Energy-efficient operations and maintenance can trim energy bills between 5% and 20%, according to NREL, which recommends attention to basics like calibrating system sensors, replacing air filters, cleaning coils, periodically retro-commissioning equipment, detecting leaks, monitoring oil levels and verifying the operation of system components. Fault detection and diagnostic software systems make this maintenance easier and more efficient. These tools quickly identify the most important issues so that building staff can prioritize their work and fix issues before comfort problems or large energy losses arise. Active optimization software helps to maintain building operations despite constant changes in the building, reducing the need for retro-commissioning and saving energy along the way.



The ROI of an Intelligent Building:

- 20-40% energy usage reduction
- 8-9% operating cost reduction
- 7.5% building value increase

Through an automated building control process, owners and managers can improve performance and operational efficiency, as well as increase system ROI over the entire building life cycle. Source: Honeywell, McGraw Hill Construction Smart/Market Report.

Training is also a key component to success, with tools and resources offered by industry associations like BOMA International's BEEP® 2.0 (BOMA Energy Efficiency Program, Version 2.0) including courses on benchmarking, performance

and planning that members can take in the comfort of their own office.

Energy Management Software at Work

As with broad-based studies, results from individual properties demonstrate the value of well-executed energy efficiency strategies. The recent upgrade of an iconic 54-story New York City commercial office building provides a good example. The 1.9 million-square-foot, Class A property maintains weekday operating hours of 6 a.m. to 7 p.m. and is cooled by two steam chillers and two electric chillers with variable frequency drives, combined with a primary/secondary chilled water system that has variable speed pumps. The interior spaces in the building are served by variable volume air handling units. In 2016, building ownership installed Yardi Pulse, an intelligent HVAC energy optimization platform. To maximize efficiency, the system sends temperature, pressure and speed setpoint adjustment signals to fans, pumps and chillers every 30 seconds.

After initial installation and three seasons using the platform, the annualized estimated savings for electricity and steam totaled 7% of HVAC spend, more than 24% higher than initially proposed and equating to savings of approximately \$0.10 per square foot. The return on the owner's upfront \$159,270 investment was 99%, with simple payback achieved in 1.2 years and a five-year internal rate of return of 74%.

Investment Imperatives

Amid an upsurge of new opportunities in energy efficiency, embracing innovation in this area is becoming an investment imperative. A growing number of corporate occupiers are

folding sustainable operations into their mission statements, itself a major consideration for landlords.

"A company acknowledging sustainability in their mission statement or strategy is often an effect," says Eggers. "The cause may be the groundswell of investors who are demanding increased sustainability. They see increasing consumer and employee demand for sustainability, and many believe that carbon regulation is inevitable. Companies that take that into account now will perform better over the next five years."

One measure of this imperative is the Global Real Estate Sustainability Benchmark (GRESB). More than 850 property companies and funds—representing in excess of \$3.7 trillion in assets under management—take part in the real estate assessment sponsored by GRESB, an industry association dedicated to improving the sustainability performance of real estate assets. GRESB assesses the sustainability performance of real estate and infrastructure portfolios and assets worldwide.

New technologies that illuminate energy consumption and cost drivers can help property managers understand and make informed decisions about their conservation and efficiency efforts. Payoff comes in the form of reduced energy costs, compliance with regulatory and stakeholder expectations and fewer occupant complaints. The capabilities enabled by new energy management technology have the potential to impact all stakeholders positively—tenants who can understand their consumption and thus control it; owners who can run their business more competitively; and investors who get better returns from efficiently operated properties.

Learn more at Yardi.com/SmartEnergy



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