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# 12

## Green Strategies for Facility Managers

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# How Water Efficiency Creates Resilient Facilities

Sustainability and resilience are natural allies. Water efficiency, an increasing priority for facility managers, unquestionably helps make facilities more resilient in the face of extreme weather or natural disasters.

**BY ELIZABETH BEARDSLEY**

As building owners and facility managers plan and prioritize capital improvements, resilience during extreme weather, power interruptions, and other events has become a priority. Not only can such events pose risks to buildings, but also they can present risks to occupants and sustained business operations, and can have offsite impacts. Defined as “the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events,” resilience is a process as much as a state of being. For building owners and facility managers, resilience must be more than a buzzword. Rather, this conceptual goal should be used to guide strategic planning and continuous improvement. With this lens, building owners and facility managers can systematically foresee potential

hazards, and take steps to prepare for response, harden their facilities, and mitigate to reduce the risks to life and property.

The link between sustainability and resilience is well established. Inherently, high-performing buildings and facilities that use fewer resources will be better positioned to withstand and bounce back from adverse events. And integrated design and performance-based operations further facilitate intentional resilience outcomes.



The Eurobusiness office in Curitiba, Brazil, marries water efficiency and resilience by treating 100 percent of its wastewater onsite.

PHOTO: USGBC



Water management falls within this nexus, and presents an area worthy of increased attention. Natural disasters, such as hurricanes, extreme storms, and earthquakes, can interrupt the supply of safe, potable water and the operation of sewer systems. For example, Superstorm Sandy affected 690 drinking water and wastewater utilities across 11 states and Washington, D.C. Water and wastewater system interruptions to a facility can occur from pipe breaks due to washouts, up-rooted trees, etc. And these could result in sewage spills or low water pressure. Additionally, properties can face distinct risks of flooding from storms, as well as structural failures (e.g., pipe or levee breaks associated with disasters, such as earthquakes, man-made events and accidents, or failures).

Building owners and facility managers have opportunities to enhance their buildings' resilience to these risks by reducing reliance on public water systems, as well as improving management of water on site. [Read more »](#)

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# 10 Keys to Monitoring-Based Commissioning Success

To cut out energy waste and keep a building optimized, follow these 10 best practices to continuously monitor and commission your building.

**BY CHRIS WILSON & JIM VALLORT**

When it comes to optimizing building efficiency, it's the low-hanging fruit that often results in the greatest payback over time. In fact, the Lawrence Berkeley National Laboratory (LBNL) estimates that anywhere between 5 and 30 percent of a building's energy use is wasted due to faults and errors in operations. These are not difficult to fix when facilities personnel can detect them in real time. That's where monitoring-based commissioning comes in.

Monitoring-based commissioning is a service and proactive, preventive maintenance tool that continuously improves building operations over time. Leveraging automated fault detection and diagnostics software, which provides actionable information on building faults and opportunities for continued systems optimization in real-time, monitoring-based

commissioning has been proven to:

- Reduce building energy consumption and cost, including operations and maintenance. Operational costs are typically reduced by three to five percent annually when the facilities/operations team is able to focus on more pressing issues.
- Improve occupant comfort. HVAC-related occupancy complaints can be reduced by as much as 40 percent.
- Prolong mechanical equipment life by implementing low-cost operational improvements.

A building automation system isn't enough. The BAS controls the building's equipment to satisfy given parameters. These



The Shirley Ryan Ability Lab, a 1.2 million-square-foot rehabilitation research hospital in Chicago, achieved success applying monitoring-based commissioning to new construction.

DESIGN: HDR | GENSLEER; PHOTOGRAPHY: COPYRIGHT 2017 MICHAEL MORAN

may or may not take into consideration an equipment's optimized state. Automated fault detection and diagnostics software integrates into the BAS and identifies anomalies in the operation of building equipment that aren't detected by the BAS. A "smart" alarming tool, fault detection and diagnostics software will pinpoint faults and provide suggested resolutions the moment they occur.

Getting started with monitoring-based commissioning requires three things: an engaged building operations team, a look into the local utility program to help offset first costs, and an understanding of the building's annual energy spend. Best practices to implementing monitoring-based commissioning include considerations for choosing the right automated fault detection and diagnostics software for any facility. [Read more »](#)

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# Is Solar PV a Good Investment for Your Building?

With prices still dropping rapidly, and PACE and green leases gaining momentum, solar is making more sense on both owned and leased buildings.

**BY ALISA PETERSEN & LAURIE STONE**

On-site solar PV systems can be a great investment for commercial buildings of any size, based on economics, visibility, and employee attraction and retention. Yet many building owners and facility managers are wondering if it's a wise decision to invest in on-site solar now.

The cost of solar has decreased rapidly, with commercial solar prices dropping 66 percent since 2010. These low prices can be made even lower by taking advantage of the investment tax credit (ITC). This tax credit is a dollar-for-dollar reduction in the income taxes that a person or company would otherwise pay the federal government. But companies that apply for the ITC should act quickly. While it is currently at 30 percent of the total solar electric system cost, it will decrease to 26 percent by 2020, 22 percent by 2021, and only 10 percent for 2022 and beyond.



With these low costs, the levelized cost of energy, or the average amount that you will pay for each unit of electricity that your solar system will produce over its lifetime, is between \$0.06/kWh and \$0.08/kWh including the federal ITC. With the average commercial utility rate in the United States at \$0.1053/kWh, a solar system will be cost effective for many locations around the country.

But cost isn't the only reason to invest in on-site solar. Having solar on your building lets everyone know that your company is walking the talk when it comes to sustainability goals, which is hard to showcase with efficiency and off-site solar. It can also help attract and retain employees, as 90 percent of people now say they wish to work for a company with a strong green reputation. [Read more »](#)

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# **How To Select High-Performance HVAC Systems**

Sustainability is a high priority, but selecting HVAC means meeting the needs of a facility efficiently and effectively now and well into the future.

**BY JIM NEWMAN**

Selecting an HVAC system type for any building can be a simple or complex process based on the purpose or function of the building and the guiding parameters for the project. Projects can run the spectrum from being straightforward applications such as a shipping warehouse that can typically be driven by low initial cost or reduced maintenance concerns, all the way up to complex applications such as hospitals and laboratories that carry an increased level of demands, a variety of required thermal conditions, and a requirement for reliability. While most design situations might already have a preferred HVAC option based on the project type or building owner preference, these may not provide the optimum solution for a specific project. That optimum solution is a high-performance HVAC system.

When the words “high-performance HVAC system” are mentioned, building owners may automatically think of



an isolated focus on energy efficiency and sustainability. While a high-performance system will seek to maximize sustainability, that is not always going to be the top priority. A high-performance HVAC system is one that is optimally designed not only to meet the day one requirements but to

remain a strategic solution through continued operation and maintenance.

Building owners can benefit from a high-performance design approach that can effectively evaluate and communicate the trade-offs associated with design strategies and technologies to reach an optimal solution. Design that truly performs for the building owner arises from a collaborative and integrative design approach that leverages the knowledge and experience of all project team members including building owners, facility staff, and end-users, as well as designers and builders. High-performance design energizes collaboration and integration across all the design team disciplines to deliver a project design that is not only environmentally conscious and can create environments that address the wellbeing, comfort, and productivity of its occupants but one that truly fits with the owner's financial and operational needs. [Read more »](#)



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# NYC Law Aims to Cut Building Greenhouse Gas Emissions

The Climate Mobilization Act is a sweeping effort to reduce carbon emissions. Here's why FMs nationwide should take note.

**BY JEFF RIOS & CHARLIE MARINO**

Facility managers and building owners should have more than a passing interest in New York City's push to slash carbon emissions, requiring an ambitious effort to retrofit existing buildings. The largest city in the United States has ushered in a new era of sustainability, and other municipalities across the nation are likely to follow suit.

Passed by the New York City Council and enacted into law in April 2019, "The Climate Mobilization Act" – a key part of achieving NYC's ambitious "80x50" goal – is a package of bills designed to curb carbon emissions in the city 40 percent by 2030 and 80 percent by 2050. As the legislation takes hold, and new questions arise about the future of design and building management, it's imperative for building owners and developers to look for forward-thinking and sophisticated solutions.

A key requirement is that existing buildings over 25,000 square feet must comply with greenhouse gas emission targets determined by New York City Department of Buildings occupancy groups.



The new greenhouse gas emissions limits will transform the way building owners, facility managers, engineers, energy experts, and other architecture, engineering and construction professionals approach projects, and it is essential to embrace these future challenges and opportunities.

One of the biggest changes will be the likely push toward “electrification.” The emission factors outlined in New York City’s law for each fuel source (electric, natural gas, fuel oil and steam) show electric as the highest emitter per Btu. While outdated and crude sources of electric heat (electric resistance heating) are not an improvement, electric heat-pump heating technology is more carbon efficient. Evaluating electric options will be key; so will considering current and potential utility rates and emissions contributions.

New York State has set ambitious targets for future renewable energy on the grid that serves New York City. If and when these targets are met and the grid gets ‘cleaner,’ with electricity production from renewables increasing, this will have an impact on the corresponding greenhouse gas conversions and emissions limits set forth in the bill. [Read more »](#)

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# **Sustainability Is a Growing Factor in Snow and Ice Melt Choices**

Facility managers are increasingly trying to reduce the environmental harm caused by the use of salt to remove ice.

**BY ROBIN SUTTELL**

Calling commercial ice and snow removal a slippery slope might be the ultimate dad joke, but in reality, the issue is no laughing matter.

Sustainable measures for removing snow and ice have become increasingly important. Traditional rock salt harms vegetation and contaminates waterways. It can also have a detrimental effect on wildlife and pets.

While doing nothing is better for the environment, it’s not an option for facility managers. Improperly treated entrances, sidewalks, and parking lots are personal injury lawsuits and workers compensation claims waiting to happen. Ice and snow removal is a must.

There are two schools of thought when it comes to sustainable snow-and-ice removal. One is a conservation approach that



focuses on using a “responsible amount of salt rather than the typical waste that’s experienced throughout the industry,” says Phil Sexton, CEO of WIT Advisers. Brine and pre-wetting equipment are two ways to reduce the amount of salt needed, he says.

The other approach is to use products that don’t contain chloride, in order to reduce contamination, oxygen depletion, and harmful algal growth in waterways. These products have become more sustainable by offering superior performance with less environmental harm, Green Seal’s vice president of marketing and communication, Taryn Tuss notes.

Green Seal recently certified one liquid ice melt for environmental innovation. The product is a chloride-free product that uses a potassium-formate blend to break down the hydrogen bond that forms when water freezes, Tuss explains. “It removes thin layers of ice and snow and prevents new ones from accumulating up to a freezing point of minus 30 degrees Fahrenheit so there’s no sacrifice in performance to achieve environmental benefits,” she says.

There’s also a safety feature. Some chloride-free ice melt products use an ionic melt rather than the traditional one requiring heat exchange, says Nate Clemmer, CEO of SynaTek Solutions. [Read more »](#)



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# Explaining Experiential Design's Benefit for Healthcare Facilities

Not a new concept, and long proven successful in retail, experiential design is making its way into healthcare facilities, partly because it dovetails nicely with sustainability.

**BY STEPHANIE L'ESTRANGE**

Multiple studies have established that an attractive and soothing healthcare environment can have a positive effect on healing. This extends far beyond simply having an attractive view out a large window, or the streaming sunlight that goes with it. A higher aspiration is to create a comfortable, serene space populated with natural elements that contribute to the tranquility.

The materials selected should be warm, comforting, and should plainly communicate that they were responsibly chosen for their sustainable attributes. A bamboo patient blanket branded with the hospital name is one example. Another would be plaques that greet patients, visitors, and staff, informing them about the composition of design elements and where they were sourced. Immersive rooms could feature multimedia

presentations about the hospital's corporate responsibility policy or construction process.



A truly healing space should also offer user choice and customization through sustainable material selections and technology. An example is a tunable LED light fixture that can emulate natural light while automatically changing color to match the circadian rhythms of our sleep patterns. Other examples include adjustable exterior shades, customizable views on in-room screens, bed linens made with sustainable and renewal materials, well-supported renewable energy programs, and user informational campaigns.

As appealing as these features are today, they will grow in



importance. Anecdotal evidence suggests that millennials and other post-Boomer generations — who will soon comprise the majority of patients, doctors, nurses, and designers — are more concerned than their predecessors that the places they frequent promote green practices. This population demands a low-waste lifestyle, and to reduce their carbon footprint. They also want a place that feels like home, where they have control.

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# **How Cool Roofs Promote Energy Savings, Cooler Cities**

The bottom line on cool roofs is that by reflecting heat, and emitting absorbed heat, they keep building cooling costs lower, and city ambient temperatures lower.

**BY LOREN SNYDER**

Any airline passenger seated in a window seat during the 1980s would have looked out the window on approach to their destination and — if they noticed roofing at all — would have noted that the building roofs were dark colored. That's changed during the last four decades. Today, that same passenger would now note that many roofs now sport white- or light-colored roofing materials.

That change is important, because during the last 20 years, awareness of the energy impact of roof choices has led to a revolution in roofing materials.

While cool roofing isn't new, interest in energy savings has resulted in changes in building code requirements, particularly in the southern United States, where energy use for cooling occupied space is far greater than heating costs.



Roofing can be made cool via a membrane, a reflective coating, or — in the case of steeper roof slopes — reflective shingle and tile products.

Ultimately, the aim of cool roofing is to achieve both high albedo and high emissivity. Albedo measures the extent to which a roofing material reflects solar light, thereby helping mitigate unwanted heat gain.

Emissivity is the ability to release heat absorbed from infrared solar energy. According to Energy Star, “highly emissive roof products can help reduce the cooling load on the building by releasing the remaining heat absorbed from the sun.” [Read more »](#)

In fact, use of cool roofing materials during the last two decades has spread to all climate zones in the United States, reaping varying levels of energy savings.

The prescription for cool roofing materials in cooling-dominated climates is easy to understand when building owners consider the benefits of cool roofs, especially for flat-roofed buildings and low-slope roofing.

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# New Era of Utility Incentives: EV Charging, Energy Storage

Utility incentives for technologies like electric vehicle charging stations and energy storage are gaining swift momentum. Here's how FMs can best take advantage.

**BY MARYELLEN LO BOSCO**

In California, the three largest investor-owned utilities (Southern California Edison, San Diego Gas & Electric, and Pacific Gas and Electric) have approved \$1 billion in utility investments for charging stations for electric cars, trucks, buses, airport equipment, cranes, and the like, says Max Baumhefner, senior attorney for the climate and clean energy program at the Natural Resources Defense Council. “There are programs that target workplaces, apartment complexes, multifamily housing locations, and any other places where people will be parked for a long time so you can get a good charge,” Baumhefner says. “There’s a whole host of programs trying to provide charging infrastructure for bigger vehicles, such as delivery trucks, school buses, and transit buses.” Similar programs have been approved across the nation, says Baumhefner.

Another \$1 billion in programs is additionally being considered by the California Public Utilities Commission, inclusive of infrastructure at workplaces, multi-unit dwellings, and other long-dwell-time locations. In such instances, the utilities install the electrical infrastructure, and most programs issue a rebate to the customer for purchasing the charging stations. “Sometimes the utility owns the whole thing, particularly in segments where it has been difficult to get people interested, such as apartment complexes with few charging stations or in disadvantaged communities,” Baumhefner explains. Sometimes larger rebates are available for underserved markets, in which half or all the cost for a charging station is covered by a rebate.

Nick Nigro, founder of Atlas Public Policy, says that the tent for transportation electrification is getting much bigger, expanding from passenger vehicles to medium- and heavy-duty trucks and buses. According to Nigro, the investor-owned utility market provides incentives for charging stations, education, and even vehicles in some cases. “These programs are diverse, widespread, and cover most regions of the country. Last year about 40 filings or proposals were initiated across the country, by 19 utilities, in 10 states,” Nigro says.

Baumhefner says the rapid growth of the EV (electric vehicle) market has pushed more workplaces to deploy charging stations, which in turn encourages people to buy more

EVs. Installing charging stations at workplaces makes sense because that is where cars are parked for the longest period of the day outside the home. “EVs are big batteries on wheels, and they can help soak up solar generation, but only if they are plugged in when the sun is shining,” Baumhefner says. Sometimes grid operators may get more solar energy during a particular time period than they can use and have to spill or waste it. Baumhefner says that while some excess can be stored in batteries, cars serve as effective batteries on wheels that can soak up the excess solar and wind energy when they are parked for long periods of time. [Read more »](#)



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# Using CFD Analysis to Prevent HVAC Equipment Oversizing

Understand these best practices in using CFD to achieve high-performance, energy efficient HVAC systems.

**BY MILES MARTSCHINK, JR.**

What do complex spaces in buildings have in common with Formula 1 race cars, America's Cup yachts, spaceships, and jet fighters? Increasingly, it may be that all have the opportunity to use computational fluid dynamics (CFD) to optimize design of complex architectural spaces.

Today, CFD has been refined and perfected to a point where it can be delivered in a user-friendly manner that makes the tools accessible to a much wider audience. In the past, CFD analysis was only considered for use in the design of commercial buildings when the success or failure of a system's performance could impact the life and safety of the building's occupants, such as operating rooms, science labs, and the design of smoke evacuation systems, as well as in data centers. In today's world, CFD can be used to aid more commonplace design in commercial buildings and help

to reduce energy consumption and improve overall building performance.

The design of energy efficient HVAC systems has been greatly enhanced through the use of energy modeling, which allows a simulation of the building, weather, and internal conditions over an entire year. This holistic approach greatly aids in macro-level decision-making for HVAC systems; however, it has its limitations when it comes to optimizing spaces with unique architectural features.

All HVAC load calculations are based on the assumption that the space, or thermal zone, can be modeled with the air being well mixed. This assumes that the temperature of the air is uniform throughout the zone (ASHRAE, 2017). Under this assumption, common features of air distribution — such as stratification, thermal buoyancy, and convection currents — are all disregarded in even the most accurate load calculations. But complex architecture can create situations where “best practice” assumptions for airflow no longer apply. A simple analysis can show how CFD can reduce the overall cooling demand by optimizing air distribution in a space. [Read more »](#)



# How Retrocommissioning Leads to Long-Term Energy Efficiency

A recent study shows that retrocommissioning leads to persistent energy savings in commercial buildings.

**BY SARANYA GUNASINGH, MELANIE LORD, & SCOTT HACKEL**

Retrocommissioning (RCx) in existing buildings is a process that aims to capture lost savings from inefficient building management practices. A bundle of energy efficiency measures that will augment building operation and save energy is installed during the RCx process. However, there is very little information on how long these energy efficiency measures will continue to provide savings over time, a quality referred to as persistence.

To understand how RCx measures perform years after the RCx effort is complete (persistence in savings), we conducted a field study to evaluate persistence in RCx measures. We identified 28 separate buildings that were past RCx participants in the ComEd RCx energy efficiency program.





Based on data gathered from interviewing site personnel on building operation and maintenance, we analyzed key metrics that influence persistence of energy savings from RCx. Here are four noteworthy observations:

1. Persistence was significantly higher in sites where facilities personnel had received some training on the RCx measures, compared to sites where the personnel received no training at all.
2. Buildings where the BAS system was managed by an external contractor showed higher persistence than buildings with BAS and energy managed by the facilities staff. Facilities staff are faced with occupant comfort requests and system maintenance priorities that need immediate attention. RCx measures were often overwritten while facilities staff catered to these high priority situations.
3. Buildings that had major retrofits after the RCx was completed saw a dip in energy savings persistence. Building and HVAC retrofits typically involve reconfiguring the existing zoning patterns and possibly, addition of new building equipment. Often RCx measures were overwritten or deleted from the BAS system after a major retrofit, causing a loss in energy savings.
4. Frequent staff turnover was another factor that negatively influenced RCx persistence.

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# Two Trends Are Boosting Sustainability in Buildings

A focus on wellness and advances in smart building technology are both reinvigorating justifications for investment in sustainability.

**BY EDWARD SULLIVAN**

For the past 25 years, a focus on sustainability has slowly but steadily reshaped the way commercial and institutional buildings are designed and operated. But sustainability is only one of the forces transforming buildings.

Today, facility managers interested in sustainability should also be thinking about two other trends that work in tandem with green design. One is the growing emphasis on occupant health and wellness. The other is the rapid gains in smart building technology.

Occupant health has been a key principle of sustainable design since the beginning of the movement. But in the past few years, as organizations have recognized the importance of occupant experience, interest in health and wellness has



climbed. That's great news in its own right, but also for the fact that it may offer facility managers one more argument for sustainability. Implementing health and wellness measures, also presents the facility manager with a good opportunity to begin the conversation about other sustainability measures. The other development I mentioned — advances in smart building technology — is opening the door to new levels of sustainable performance.

Design tools like energy modeling and computational fluid dynamics make it possible to move past conventional rules of thumb for the design of building systems — rules that can lead to oversized systems that waste both money and energy. Smart building systems and devices enable facility managers to gather, analyze, and act on information about how the building is actually performing. By uncovering hidden problems, this intelligent technology can help reduce costs and energy consumption.

For those of you interested in learning more about smart, healthy buildings, the NFMT Orlando conference and exposition will feature a Smart Healthy Buildings pavilion on the exhibit floor, as well as a range of sessions on smart technology and occupant experience. The event runs November 13-14 at the Orange County Convention Center in Orlando, Fla. Visit [NFMT.com/Orlando](https://www.nfmt.com/Orlando) for more information. [Read more »](#)