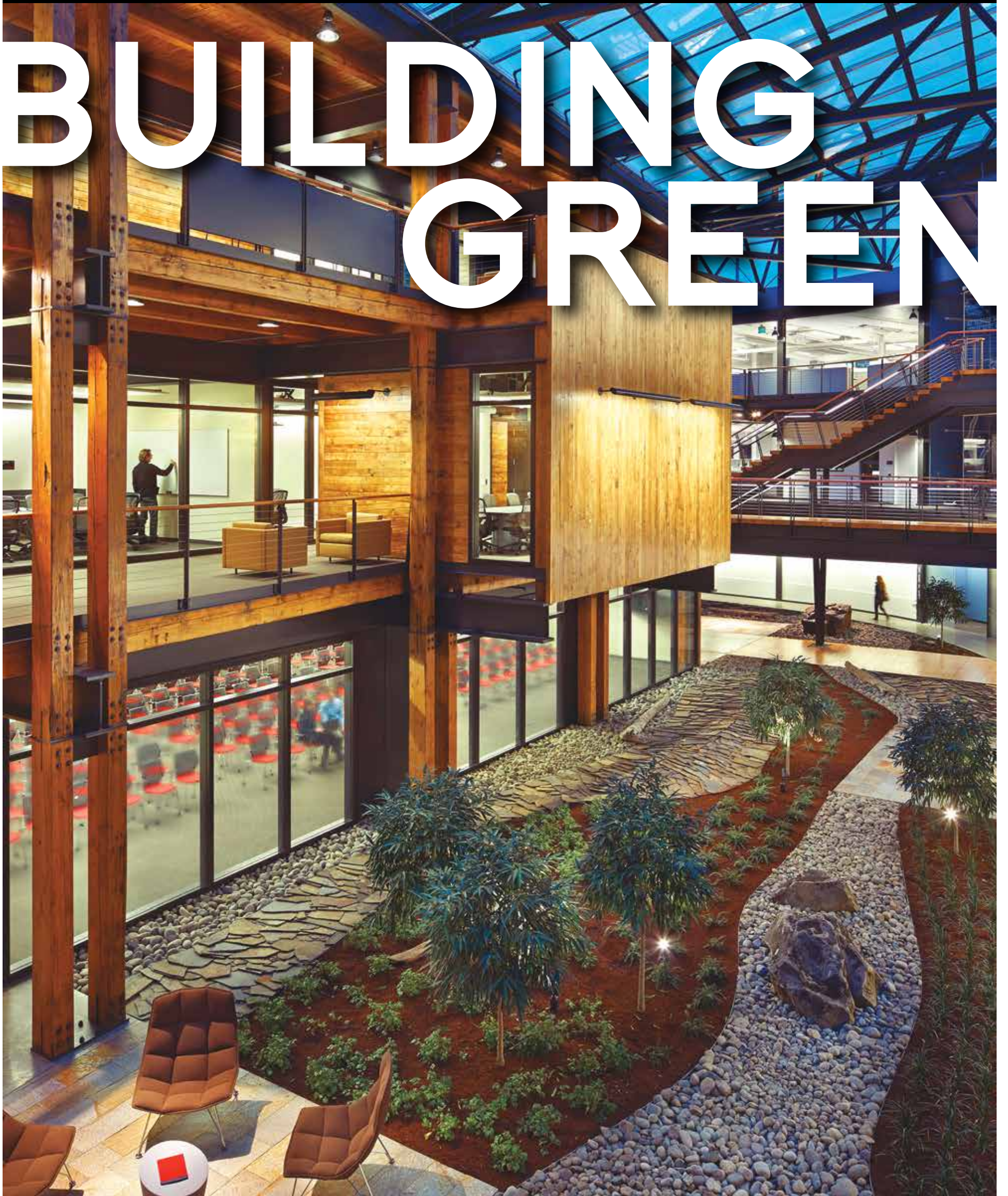


BUILDING GREEN



ENERGY TOOLS THAT COULD CHANGE THE GAME

Two Northwest startups have developed novel technologies to track energy use, promote building upgrades and encourage savings.

Washington state is laying the legislative rails for a transition to a low-carbon economy, as demonstrated most recently by Gov. Jay Inslee's call for a carbon cap-and-trade program to limit carbon dioxide emissions.



BY THULASI NARAYAN PALADINO AND CO.

The governor quotes studies conducted by the Western Climate Initiative that state by reducing carbon emissions through market mechanisms, Washington would benefit from a net increase of 19,300 jobs and increased economic output of \$3.3 billion by 2020.

Several Northwest startups are poised to transform the energy-efficiency market, contributing to those impressive job growth and economic impact stats. Among them are Portland-based Ener-

gyRM and Seattle-based buildpulse, each of which has introduced a game-changing product. EnergyRM's DeltaMeter lets utilities pay for measured energy savings. Buildpulse lets building managers quickly identify issues with control systems, regardless of the system type.

Room for improvement

A city of Seattle benchmarking report gave insight into how improving buildings can lead to reduced carbon emissions, and more specifically, which buildings have the most opportunity to improve. The worst energy performers are buildings built between 1960 and the 1990s.

These buildings are typically low or mid-rise commercial and multifamily buildings. They may have limited or outdated heating, cooling, ventilation and lighting equipment and controls, which often require capital investment to upgrade. They also likely look "well loved" and don't command market rate rents.

Under a pilot program Seattle City Light is paying owners of the Bullitt Center for its energy savings. A Portland company developed an energy meter that tracks the savings.



PHOTO BY BENJAMIN BENSCHNEIDER

To be attractive targets for energy-efficiency investment, a rapid assessment of the business case

is needed, followed by savings from low-hanging-fruit projects to build confidence towards (and perhaps fund) spending on deeper retrofits.

This where the Smart Buildings Center comes in. The Smart Buildings Center in Seattle is a nonprofit organization that supports growth and innovation in the Northwest's energy-efficiency industry. The center was partially funded through the state of Washington as a vehicle for the market-based change.

One of the center's primary goals is to increase building owner and investor confidence in energy projects by catalyzing the shift from predicted to measured energy savings. The center is funding studies that allow building owners to access the latest energy-efficiency technology while sharing the risk associated with using new products and approaches. The intent is to create a hub for knowledge transfer that both advances energy savings for the region as well as creates new jobs in the energy-efficiency field.

Identifying savings

Buildings from the 1960s-1990s are diverse in the way they are heated and cooled, and the way the heating and cooling equipment is operated.

Many of these buildings have controls systems ranging from basic thermostats to pneumatics to early direct digital control. This mixed bag means they become energy hogs because they likely aren't performing the way they are meant to — such as heating

and cooling spaces at the same time or with equipment starting and running outside of the normal occupied hours.

Seattle-based buildpulse is developing Web-based analytics software that can tap into your existing HVAC controls, regardless of system type, and identify issues and potential savings. What is unique about their approach is the speed at which information is gathered and the ability to run standardized queries on the systems remotely.

At most of the education buildings analyzed with buildpulse's building runtime report, owners have identified that heating and fans run on average one to two extra hours beyond the occupied schedule (and sometimes all night and weekends). Reducing energy use during these unoccupied hours saves about 12 percent of their HVAC costs.

Once you have identified how you want the building to operate and understand how it is actually performing, the energy savings come from closing the gap between the two. However, utilities normally only provide incentives for capital-intensive measures, and the owners may not be willing to invest, especially where the building lease would share the savings with the tenants.

Thinking back to our problem-child buildings, there are usually opportunities to "close the gap" that come from tuneups rather than capital investment.

For example, rescheduling heating and ventilation systems

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SIX REASONS DEVELOPERS SHOULD BUILD NET-ZERO APARTMENTS

Super-efficient apartments aren't part of Seattle's building boom, but more attention to cost could make a difference.

Would you design your new building to reduce energy use by at least 80 percent if you could maintain an acceptable return on your upfront investment?

We believe that most developers would answer, "Yes!" and have no problem building net zero-ready buildings, provided they could achieve their financial objectives.



BY TIM WEYAND
NK ARCHITECTS

The Seattle metro area built 8,600 apartment units in 2014 and has 50 multifamily projects at various stages of construction, and nearly none of them will meet net-zero energy (NZE) or Passive House qualifications.

While this growth is impressive, we're left wondering: What's preventing our city from building high-performance apartment buildings?

In fact, the city of Seattle's Climate Action Plan calls for all-NZE new buildings by 2030 and carbon neutrality by 2050. Considering an average 30-year life cycle of our building infrastructure, we need to be build-

ing NZE buildings now to meet these targets. So how can we do this?

Meeting of the minds

To clearly identify the hurdles and industry perceptions, we assembled last fall a group of about 35 local building-industry specialists — developers and contractors, city officials, utility representatives and energy modelers — to discuss how we can work together to radically improve the energy efficiency of new and existing buildings towards the goal of a carbon-neutral city. The group agreed that more NZE-ready development at all scales is immediately needed to stay on track with the city's Climate Action Plan.

The discussion centered on the real estate pro forma as a mechanism to enable NZE-ready buildings, with the assumption that more such buildings will be created if their pro formas pencil.

There was consensus that compelling pro formas will motivate the construction of more NZE projects, and agreement that more analysis is needed in several areas of NZE-ready project feasibility, including construction cost premiums, buyer/tenant demand, marketability,

financing, and incentive opportunities.

What can be done

The following summarizes the group's six conclusions on what it's going to take to encourage the industry to build higher-performing, energy-efficient buildings today:

- **Clarify construction cost premiums:** Lack of trade knowledge and training for building NZE-ready buildings along with uncertainty of cost premiums associated with these buildings are among the top hurdles communicated by developers and builders.

- **Get appraising, underwriting and banking on board:** A key factor in building high-performance buildings is the upfront capital increase required to cover the higher costs of energy-efficient materials, systems and labor.



Cascade Built recently completed View Haus 5, a five-unit townhouse project in Madison Valley built to meet Passive House standards.

PHOTO BY AARON LEITZ PHOTOGRAPHY

NET-ZERO — PAGE 10

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ON THE COVER

Federal Center South in Seattle's Sodo neighborhood used 40 percent less energy in its first year of operation than similar-sized office buildings. It was awarded a LEED platinum rating in 2014.

PHOTO BY BENJAMIN BENSCHNEIDER/ZGF ARCHITECTS

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HOW DO YOU MEASURE THE VALUE OF A GREEN BUILDING?

Focus on what you can quantify, such as higher rent and lower cost to operate.

The Joseph Arnold Lofts sold in last May, setting a regional record for price per square foot. In October, The Martin apartments sold for a record price per unit. In December, Stone34 went for \$70.1 million.



BY MYER HARRELL
WEBER THOMPSON

There is something missing from these headlines and those of many other recent property sales.

The Martin is a LEED gold building. The Joseph Arnold Lofts is Green Globes certified. Stone34 participated in Seattle's Deep Green Pilot Program, designed to aggressively reduce energy and water use.

The question is, what was the impact of sustainability on these record sale prices, and how do we measure this impact so we can replicate it?

Design interventions around site, water, energy, materials and indoor environment have made many buildings more durable, efficient and healthy. They are better buildings in many ways for tenants, owners and investors. But there isn't a reliable way to quantify how much better, and what specific financial value sustainable features add.

Certification is one approach to making a case for green, and

perhaps the best place to start comparing properties.

According to CoStar's summary of their often-cited 2008 study "Commercial Real Estate and the Environment," LEED buildings showed rent premiums of \$11.33 per square foot over non-LEED buildings and have 4.1 percent higher occupancy. Rental rates in Energy Star buildings represented a \$2.40 per square foot premium over comparable non-Energy Star buildings and had 3.6 percent higher occupancy. Energy Star buildings sold an average \$61 per square foot higher, while LEED buildings demanded \$171 more per square foot.

While not necessarily showing causation from green building to value, the above nationwide statistics are impressive and difficult to ignore.

In Seattle, we have a unique challenge with these certifications. Our aggressive local energy code means new code-compliant buildings often automatically qualify for base-level certifications, making these certifications less of a market differentiator.

Measuring value

A 2013 guide by the Appraisal Institute and the Institute for Market Transformation presents a framework for the economic value of green buildings using four components: revenue, operating expenses, occupancy, and

The Terry Thomas, a green office building in South Lake Union, was fully occupied throughout the real estate bust.

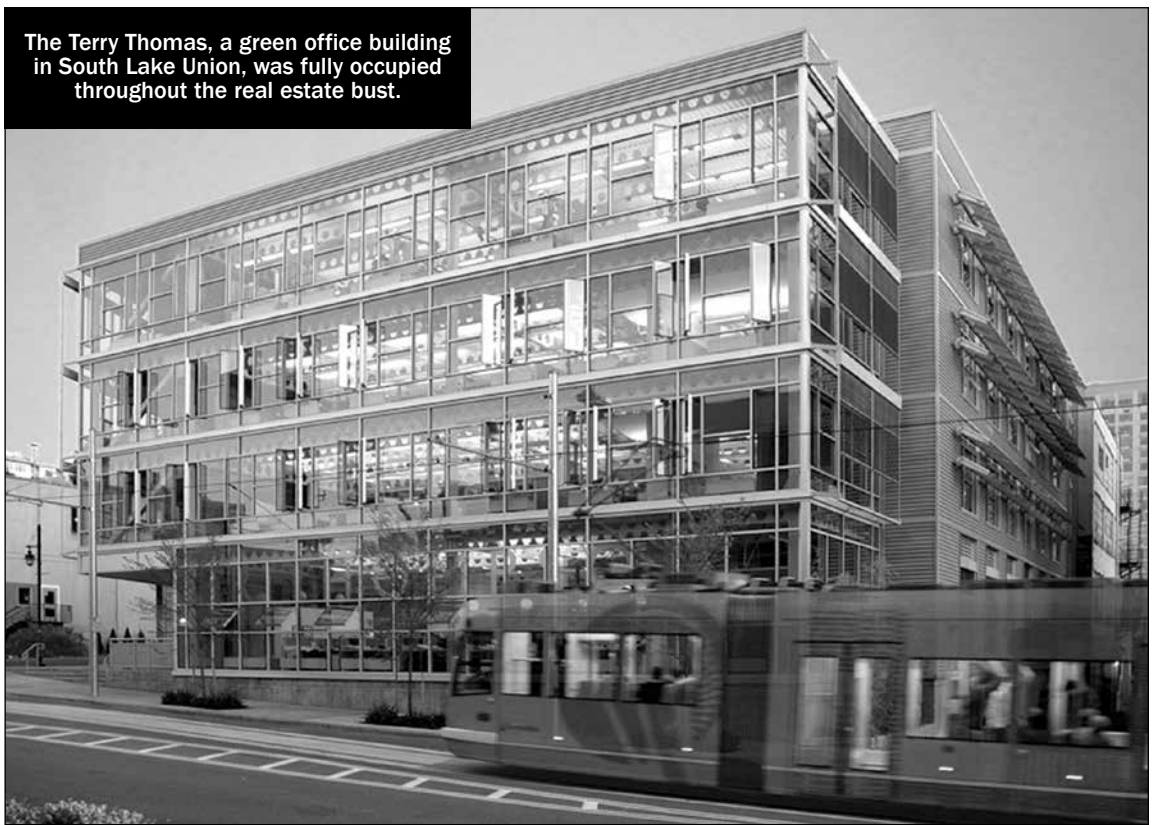


PHOTO BY GABE HANSEN

risk. (The publication is available online at bit.ly/1AgkFmA.)

These components translate the "softer" aspects of green buildings into more substantial metrics like rent premiums, increased tenant retention, lower vacancy, higher-quality tenants, quicker absorption, operational savings and market advantage. A building developer or owner can use these to understand how a building's green aspects impact value — this approach has been long overlooked.

Revenue and operating expenses are direct and obvious components. A careful tracking of more efficient utilities, such as electricity and water, can translate into lowered operating expenses for a long-term building owner.

But it is unclear whether an owner's promise of lower utility bills for tenants yields higher rents. So we have what is known as the "split incentive": less inclination to favor operational performance in design, resulting in less tangible impact of green features to net operating income — a key factor determining a building's total value.

Occupancy and risk are two components also readily understood in our market. Intuitively, a green building — such as one with abundant daylight, reducing the need for artificial lighting — will attract higher-quality tenants and longer, more favorable leases. In the long term this means the building can mitigate changes in consumer preferences, new laws, utility prices and economic downturns — therefore mitigating risk.

This happened with The Terry Thomas office building in South Lake Union. The 40,000-square-foot building, which relies on natural ventilation, cooling and daylighting, weathered the storm of commercial vacancy rates many office buildings experienced in 2010-2012 as it remained fully occupied.

The monetary value is there.

The quality of the space contributed to attract tenants. The difficult part is extracting the value specific to green measures from other complex factors.

There is much to be done to establish the dollars-per-square-foot value of sustainable strategies in buildings. If done well, these strategies could alter the development landscape, reshaping

Offices in Terry Thomas are naturally lit and ventilated.

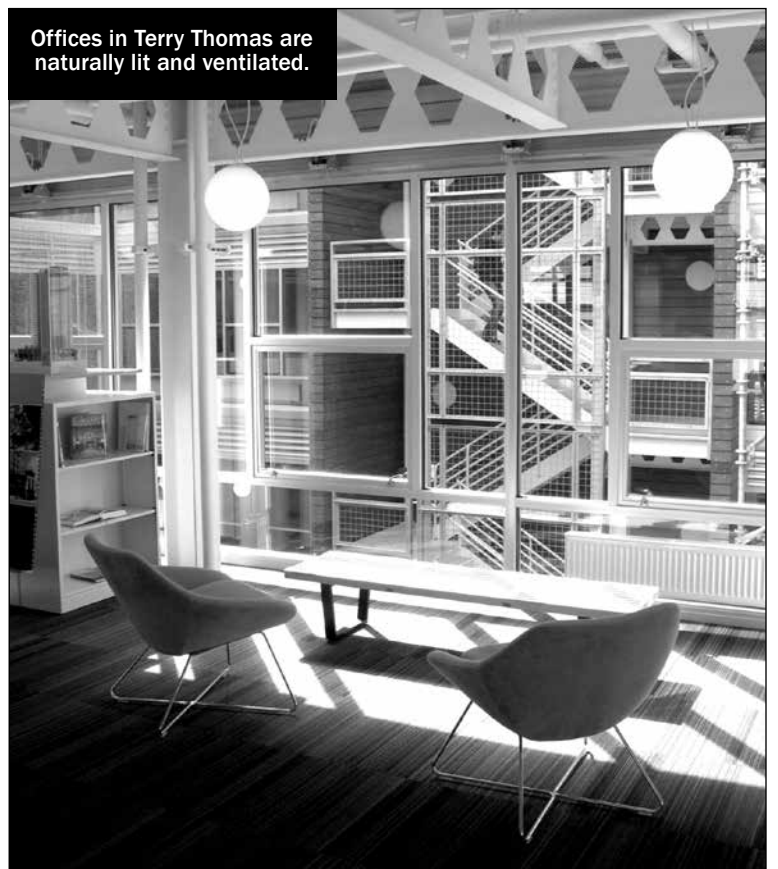


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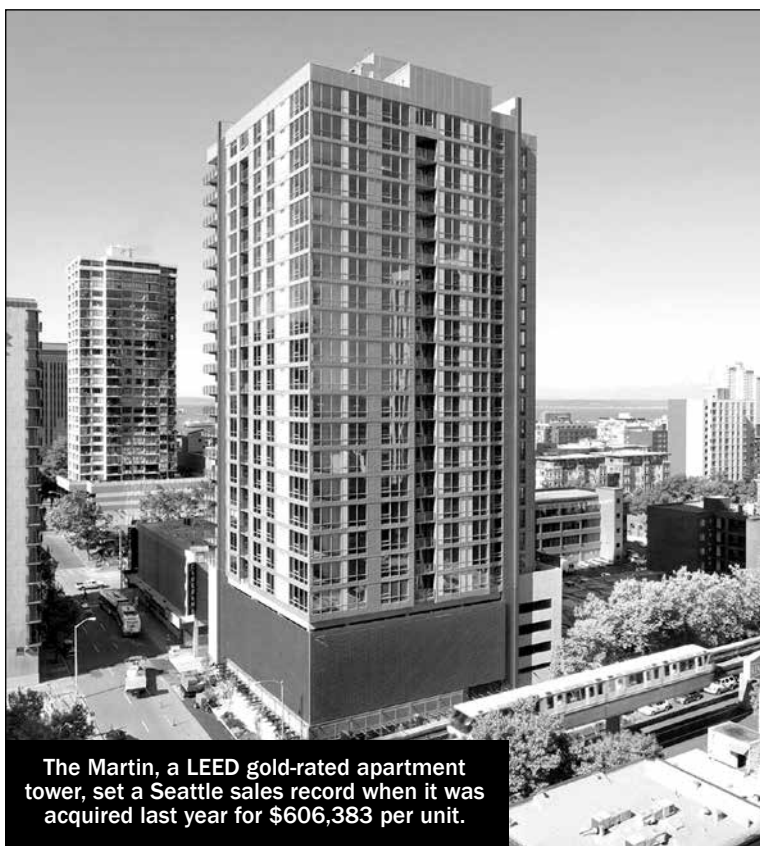
ing goals set early in project formation.

Share the data

When we talk about “the business case for green” to our clients, partners, investors and lenders, we must resist being complacent with vague descriptions of green marketability and the triple bottom line. While valid and essential aspects to the green building movement, these arguments fall short when the tools and data are at hand to present a more specific and impactful business case for green: dollars per square foot of asset value.

Once we can articulate this value proposition, we streamline the course to the broader ambitions that can currently seem out of reach: standard carbon-neutral new construction in 2030 (The 2030 Challenge), or carbon-neutral municipalities by 2050 (Seattle’s 2013 Climate Action Plan).

At the outset of projects, we must recognize how sustainability measures directly impact a project’s pro forma. The hard data needs to form cohesive arguments for reducing expenses, increasing revenue and otherwise adding value in buildings. When we succeed in this effort, we must share our data to better inform the marketplace and make it easier for the next project team to make similar arguments.



The Martin, a LEED gold-rated apartment tower, set a Seattle sales record when it was acquired last year for \$606,383 per unit.

PHOTO COURTESY OF VULCAN REAL ESTATE

The goal is to promote “green,” not just as good marketing, or even because it’s the right thing to do, but because it makes good financial sense.

Myer Harrell is director of sustainability and a senior associate

at Weber Thompson, a Seattle-based architecture, interior design, landscape architecture, and community design firm. He was named the AIA Seattle Young Architect in 2011, and is a former board member for the Cascadia Green Building Council.



The Joseph Arnold Lofts is the first Seattle apartment tower to receive a Green Globes certification. Last year it sold for \$68 million.

PHOTO COURTESY OF THE SCHUSTER GROUP



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HOW TO CONVINCE A REALIST IT MAKES SENSE TO GO GREEN

Some owners see green projects as too costly. But a bit of extra spending now can yield big savings in the long run.

How do design professionals and policymakers frame the issues surrounding sustainable design, construction and operation to more effectively inform business owners, developers and public agencies about the benefits of sustainable projects?



BY DJ DEAN
KPG

As architects and engineers, we work with clients every day on projects with and without sustainability goals.

A few public agencies in our region have mandatory sustainability requirements, such as LEED silver, gold or even platinum. At the other end of the spectrum we find clients that are positively averse to LEED because they believe attention to sustainability will increase their capital improvement costs. Finally, there are clients who are somewhere in between — they philosophically agree with the concept of sustainability but specific sustainability metrics are not part of their project require-

ments.

Unfortunately, the power of the sustainability message gets diluted when it becomes about making a statement, proving a point, challenging conventions or even checking a box for meeting an imposed project requirement. For the forward-thinking, idealistic client, sustainability is about making the world a better place for future generations. For the business-oriented, realistic client, sustainability must be about the bottom line.

This latter group of clients is the primary target for advancing sustainability in a profound and meaningful way.

A few strategies

Make no mistake — how architects and engineers design buildings and shape building sites directly affects operation and maintenance costs. It is critical for designers to embrace this and for building owners to be enlightened about how it affects their bottom line.

Our industry must openly address the pros and cons of sustainable strategies and what they mean to our clients' capital



KPG designed an environmentally friendly remodel of this Tacoma Solid Waste Management building.

PHOTO COURTESY OF THE CITY OF TACOMA

improvement and operating budgets. This requires honest discussions and a clear understanding of what it means to own and operate a sustainable building and site.

In our experience, a few sus-

tainability strategies to consider for every project regardless of sustainability goals include:

- "Right-sizing" the program and site to build only what is necessary.
- Considering low- or no-maintenance materials and systems.
- Giving preference to passive systems over active systems.
- Prioritizing ease and frequency of maintenance in the decision-making process.

These strategies may appear basic or simple on the surface, but they present opportunities for great debate, design iteration and coordination issues that may push the envelope for many designers. Often the most cost-effective construction solution is the most cost-effective operation and maintenance solution.

Long-term savings

Does sustainable design and construction make financial sense?

The short answer is yes. Many sustainable design strategies result in positive budgetary effects that can be compounded with operationally minded design (design that prioritizes operational and maintenance needs).

This topic has been debated exhaustively and tends to revolve around life-cycle cost analysis and environmental cost. Unfortunately, life-cycle cost analysis is not a universally understood tool or concept, and can focus on details that skew the overall message.

If conceived in a responsible manner, and designers and builders do their job in an integrated fashion, building owners should expect to realize cost savings over the life of their building.

In most cases sustainability does in fact mean that more upfront capital improvement dollars are needed, although, when the budget is expanded to include ongoing ownership costs such as operation, maintenance and labor (staffing), our experience tells us that total cost of ownership can be significantly reduced.

Beyond ratings

It is important to note that sustainability goes well beyond the metrics of LEED and other sustainable rating systems.

Rating systems do not account for practices such as right-sizing facilities, which can be more effective at reducing the carbon footprint than other strategies tracked by sustainable rating systems. Critically analyzing the program and client needs in order to design and build only what is needed reduces material needs and site development costs.

The proper perspective is critically important. A building's often thin capital improvement budget has a direct impact on the operation and maintenance budget. But the operation and maintenance budget will continue to be tapped into for the life of facility, while the capital improvement budget is typically closed when construction is complete.

Operation and maintenance costs, not capital improvement costs, easily represent the largest expenses over a building's life. This makes them the biggest target for budget-reduction opportunities. If the appropriate strategies are prioritized and implemented, then sustainability can result in a facility that is



Sustainable building design through restoration.

project: Stack House



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GOAL OF CAPITOL HILL ECODISTRICT IS TO MAKE NEIGHBORHOOD GREEN

It supports sustainable projects that can work on a neighborhood scale, including the Northwest's first shared parking district.

The Capitol Hill EcoDistrict is a neighborhood-based sustainability initiative that serves the most densely populated urban village in the Pacific Northwest.

The EcoDistrict promotes and supports a holistic approach to growth that embraces many aspects of sustainability. The goal is to advance the health of the entire ecosystem.



BY MICHAEL MARIANO SCHEMATA WORKSHOP

The EcoDistrict is led by Capitol Hill Housing, a community development corporation

and public development authority. A steering committee composed of local community members works in partnership with local organizations to help ensure the EcoDistrict's efforts are relevant and effective.

Habitat and watershed don't necessarily follow the street grid or our definition of Capitol Hill as a neighborhood, so we have defined an EcoDistrict study area in order to assess its progress. The goals and objectives are grouped under eight performance areas: water, habitat, culture, energy, materials, transportation, health and equity.

The EcoDistrict Index helps track the progress towards achieving targets within the EcoDistrict. The first version of the index was developed with a task force of community members and technical experts to identify key performance metrics, establish baselines and develop a reporting system to share progress. Metrics were selected to be place specific, scale appropriate, measurable, immediately relevant and easy to communicate.

The EcoDistrict Steering Committee will present our progress to the Seattle City Council's Planning, Land Use and Sustainability Committee later this year.

In the meantime, we are making progress on a number of local community initiatives that span multiple EcoDistrict performance areas.

Neighborhood initiatives

Renewable energy is widely supported by Seattle residents, but installing a solar panel array on a home may not be feasible due to a number of challenges, includ-



A grassy planting strip (left) was replaced with a "pollinator-friendly" garden (right). It's part of a program that uses gardens to connect fragmented landscapes.

ing roof area, roof orientation and cost.

Capitol Hill Housing partnered with Seattle City Light to hold the first community solar project on an affordable housing project in Washington state. Participants in the community solar program can "subscribe" to receive the benefits of solar via systems built and maintained by Seattle City Light on the rooftop of a Capitol Hill Housing building.

Transportation is responsible for 40 percent of Seattle's greenhouse gas emissions. At the district scale, parking is one of the primary criteria for transportation decisions.

We identified district-shared parking as a system in which parking can be leased across buildings. Simple in concept, a daytime office worker and a local resident who parks at night can share one space rather than taking up two.

Our approach with Pike/Pine shared parking addresses off-street residential, off-street commercial, and the relationship of those to on-street parking. We have collected an extensive amount of parking-related data, reviewed shared parking strategies being pioneered around the world, and are now using this research to make district shared parking a reality in Pike/Pine.

Natural habitat needs to be expanded, as there has been extensive loss of open space and tree canopy due to construction on formerly undeveloped sites. The Pollinator Pathway is a public design initiative founded by artist Sarah Bergmann that con-

nects isolated landscape fragments with native plant focused, pollinator-friendly gardens in the planting strip of the public street right of way.

Grass or paving is replaced with habitat, enhancing the pedestrian experience. The first pathway connects Capitol Hill to the Central District by way of Columbia Street. The second pathway will connect the Seattle University campus to Cal Anderson Park, Lowell Elementary School, and Volunteer Park via 11th Avenue.

A cultural performance area is currently being developed for the EcoDistrict. The Capitol Hill Arts District was officially formed in late 2014 in response to recent losses of nonprofit, arts-focused organizations on Capitol Hill.

The arts are an integral and authentic experience of Capitol Hill, and are an expression of the rich diversity of the community. Residents and visitors are constantly immersed in the arts, and the EcoDistrict strives to enhance the visibility and long-term viability of arts and culture on Capitol Hill.

Building performance

Energy consumption of buildings account for the greatest percent of total energy consumption in the United States, more than either the transportation or industry sectors.

The Capitol Hill EcoDistrict has partnered with the Seattle 2030 District, a downtown-based nonprofit, to support owners and managers in improving the performance of buildings for Capitol

Hill 2030.

Rising utility costs and increasingly stringent building codes are driving building owners to improve the energy performance of their properties. Water supply and treatment costs are on the rise, so building owners are taking opportunities to increase building efficiency and encourage conservation by residents.

The Capitol Hill EcoDistrict is ultimately about those that live, work and play in the neighborhood. We are currently working on definitions and metrics for the "health" and "equity" performance areas to address, among other criteria, including social cohesion, personal well-being

ECODISTRICT — PAGE 10

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HOW TO TREAT STORMWATER IN URBAN AREAS — LIKE TOTEM LAKE

Retrofit projects will treat runoff in places such as Kirkland, Lacey and Olympia.



BY MELISSA
ENGLISH



DOREEN
GAVIN

AHBL

Polluted stormwater runoff is the largest threat to Puget Sound's water quality, according to the Puget Sound Partnership.

The state of Washington has mandated that Puget Sound be restored to a healthier condition by 2020. The work will be carried out through the Puget Sound Partnership's "action agenda." Its strategic initiatives include a focus on stormwater management for basins and watersheds.

The urbanization of watersheds has caused degraded water quality, deteriorated habitat and increased flood flows. As rivers and streams continue to

fall short of water quality standards, communities have shifted away from efforts to control point sources of pollution, such as from factories and wastewater plants, to efforts to reduce non-point sources of pollution. For urban watersheds, this means better treatment of stormwater runoff, often through retrofit projects of previously developed lands.

Watershed-scale stormwater planning provides a useful framework to integrate the many state and federal regulatory drivers that communities face surrounding clean water.

Stormwater management at the watershed scale is dictated by the Washington State Department of Ecology's Phase I and Phase II municipal stormwater permit. Each permittee is required to participate in the development of strategies to prevent future impacts and address existing impacts.

As with any mandate, funding is always a concern. Fortunately, Ecology was selected by the U.S. Environmental Protection Agency as a lead organization in the watershed protection and res-



Kirkland's Totem Lake area was developed without stormwater treatment. Flooding and water quality problems limit development there.

PHOTO COURTESY OF NHC

toration area of emphasis. With this selection came grant funding through the National Estuary Program (NEP) to fund watershed

protection and restoration projects.

Stormwater retrofits

Two communities covered under the Phase II permit, the city of Kirkland and Thurston County, were each awarded NEP grants administered through Ecology.

The projects that were funded were stormwater retrofits within basins that had documented water quality issues. Kirkland and Thurston County each selected the consultant team of AHBL and Northwest Hydraulic Consultants to identify stormwater retrofits using a basin-wide approach for two distinctly different watersheds.

Thurston County's project evaluated the sensitive Woodard Creek Basin that drains to a protected shellfish district, Henderson Inlet. Urban land uses, with the residential, commercial, and industrial development concentrated in Lacey and Olympia, cover 16 percent of the drainage basin, with the remaining areas being more rural in nature. Its primary water quality issue is bacteria.

The city of Kirkland's project focuses on the Totem Lake sub-basin, which was developed between the 1960s and 1980s without the benefit of stormwater treatment. It is part of the larger Juanita Creek Basin and one of the most densely developed portions, with residential

and commercial uses. High flows have caused flooding and water quality problems and limit the ability of the area to receive more of Kirkland's anticipated growth.

While the two basins are quite different, the AHBL-NHC team determined that the following six-step framework was adaptable to each project.

Six-step framework

1. *Define watershed restoration objectives.* First, the shortcomings of the existing basin and stormwater system must be understood.

Many sources are available, including previous characterization studies, water quality assessments, drainage complaints and documented reports of flooding. The goals for the retrofits will then center around three primary areas: water quality (i.e., reduce pollutants of concern), physical/hydrological (i.e., reduce flood damage), and community (i.e., increase downstream shellfish harvesting opportunities).

2. *Apply GIS-based desktop analysis to evaluate sites with restoration potential.* With basins covering hundreds to thousands of acres, using a systematic desktop analysis with existing GIS datasets is a key to efficiency.

The desktop analysis begins by defining the types of retrofit site parcels, like existing stormwater

"We see ourselves as sustainability strategist, ready to dial up the creativity early...when *anything is possible.*"



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SEATTLE IS CLAMPING DOWN ON WASTE FROM CONSTRUCTION AND DEMOLITION

New rules mean most materials have to be recycled instead of sent to the landfill.

Over 396,000 tons of construction and demolition (C&D) debris was generated in Seattle in 2013.

There are alternatives to simply treating this debris as garbage. As landfills continue to close and we become more concerned about sustainable building and reducing greenhouse gas emissions, it should not be a surprise that the city of Seattle is implementing recycling regulations to bring about change.



BY DAN MCAULIFFE
UNITED RECYCLING & CONTAINER

quickly to achieve high recycling results.

Some materials aren't recyclable yet because markets remain undeveloped or contamination makes them difficult to recycle — for example, carpet, insulation, asphalt shingles and painted gypsum wallboard. Some renovation or demolition job sites contain hazardous or special waste materials that need to be handled separately (lead-painted wood or plaster, asbestos floor tiles or siding, etc.).

Over the last several years, as LEED and Built Green projects have become more common, awareness regarding recycling C&D debris has increased, but not to the level that the city of Seattle is now requiring.

City requirements

The Seattle City Council adopted a goal of recycling 70 percent of construction waste by 2020 — the driving force behind the new requirements. We are confident this is achievable.

Seattle Public Utilities, tasked with helping the city to reach this goal, is doing the following:

- Certifying the recycling levels at several mixed-waste recycling facilities that receive and process C&D materials from projects in Seattle.
- Requiring that building permit-holders for each new construction, remodeling and demolition greater than 750 square feet file a waste-diversion report to show compliance with the disposal bans.
- Prohibiting disposal of specific materials (including asphalt paving, concrete, bricks, metal, cardboard, new construction gypsum scrap and clean wood). These materials must be recycled and may not be placed in containers for disposal in landfills. This is a phased approach over several years. Future bans include tear-off asphalt shingles, and carpet and plastic film wrap.

Seattle Public Utilities continues to roll out their comprehensive program to educate builders, contractors and homeowners about the requirements and their options for recycling, as well as work closely with local recyclers to ensure the materials are processed to comply with their regulations.

The first year a requirement is in place for a banned material, SPU focuses on education. After the first year, SPU can impose fines if significant amounts of recyclables are found in disposal

Recyclable waste

C&D materials consist of debris from building, remodeling or demolishing a building, as well as from heavy industrial projects like bridge replacements, airport upgrades and road construction. C&D can also include materials from industrial, manufacturing and warehouse operations.

The majority of these items fall into the categories of wood, gypsum, metal, aggregate, plastic and cardboard — materials that can be and should be recycled. In fact, the amount of debris generated during construction of a new building can be more than the occupants of that building are likely to throw out during multiple years of occupancy.

All-in-one container

Most of us are accustomed to having recycling and compost bins at our home, in addition to our garbage bin. In most cases, the recycling bin is larger than the garbage bin!

On a construction site the same can happen, except a garbage container might not even be needed. As long as 90 percent of the materials are recyclable, the rest of the debris can also be placed in the container and transported to a recycling facility.

Using one container for all of the materials is often referred to as co-mingled recycling. The recycling facility sorts the materials and extracts the recyclable materials mechanically. The goal for a recycling facility is to find end uses and markets for as many of the materials as possible, as well as stay current on new industry products and adapt

Phased Landfill Disposal Bans for Construction Sites (2012-2017)

Material	2012	2013	2014	2015	2016	2017
Aggregates (Asphalt, Concrete & Brick)	Educate	Enforce	→	→	→	→
Cardboard			Educate	Enforce	→	→
Metal			Educate	Enforce	→	→
New Gypsum Wallboard Scrap			Educate	Enforce	→	→
Wood (Clean, Unpainted & Untreated)				Educate	Enforce	→
Asphalt Roofing Shingles				Educate (July)	Enforce (July)	→
Carpet					Educate	Enforce
Plastic Film Wrap					Educate	Enforce

Seattle Public Utilities is phasing in new waste disposal bans. The utility emphasizes education over enforcement the first year. SOURCE: UNITED RECYCLING & CONTAINER

containers or transfer station loads.

Certified facilities

As part of their effort, SPU developed a program to certify recycling activities for receiving and processing facilities to dem-

onstrate compliance with their requirements. To earn their certification the facilities must be permitted by the local health jurisdiction, submit reports to SPU, and participate in independent testing of the residuals from sorting operations. The testing is to ensure that the materials

going to a landfill do not contain a significant amount of banned materials.

Contractors who use a certified facility, either by having their materials hauled by the facility or self-hauling the materials to the

WASTE — PAGE 11

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NET-ZERO

CONTINUED FROM PAGE 3

Although these capital cost premiums are modest — 5-10 percent of hard costs — underwriters must recognize the total value of high-performance buildings, including lower utility bills, lower vacancy rates, lower turnover, and the preference of businesses, employees and residents to choose the best buildings to live and work in.

Appraisers will need to look to the few local projects achieving this standard of building, including the Bullitt Center, the greenest office building in the world, and Cascade Built's View Haus 5, a Passive House-constructed townhouse project, as early comps. Banks need to identify what they need (if anything) to raise their debt allowance to offset early NZE-ready construction costs.

• **Reward actual energy savings:** Increased NZE construction cost premiums of about 5-10 percent means increases in equity and debt. This, in turn, means modest infusions of revenue are needed to bring returns in line with investor expectations.

For example, a \$10 million NZE project with \$1 million revenue would require approximately \$50,000 though annual revenue infusion to achieve the same return on investment as a code-minimum energy project. We believe about half of the needed revenue will come from utility cost savings, and initially the other

half should include property tax abatements and utility rebates.

As construction cost premiums decline over time through competition and energy code requirements, and as the total market value of high performance is recognized by the market, these incentives can be rolled back.

• **Marketability:** Poll after poll tells us that renters and home buyers care more about their own health and living a sustainable life than they do about the technology that makes these possible.

Marketing high-performance homes needs to deemphasize technology in favor of simple messages about quality that speak to people's real concerns. Why should they care? It's about better indoor-air quality, a better lifestyle, exciting and cutting-edge homes, great daylighting, a savings on utility bills — all pointing to a better future.

• **Bolster energy codes:** Today's building codes, while better than those that allowed homes to be built without any insulation, are antiquated given that we know today how to achieve carbon-neutral buildings. A performance-based code that encourages education and innovation in the industry could help drive the necessary change.

It can be argued that one large code change requiring better energy performance rather than many incremental

changes will be less confusing and allow industry to adapt more efficiently. Establishing a new baseline that encourages everyone to learn the same techniques and methods will create demand for the same types of products.

Following in the footsteps of Sam Rashkin, chief architect for the U.S. Department of Energy's Building Technologies Office, let's make NZE-ready the future standard of building quality and make buildings that "live better, work better, and last better."

• **It needs to become the new normal:** Getting to NZE is currently incremental. To be successful, it will take extra work and elimination of the "it can't be done" mindset. We have the tools to change direction and make NZE-ready the minimum building standard, but it won't happen unless we work together, lead the change and ultimately make healthy, high-performance buildings the new normal.

We have an opportunity. The opportunity to welcome new residents to our fast-growing city with high-performance homes that set a benchmark for the future of building and construction everywhere. We have an opportunity to offer a better lifestyle and a better outlook, and we believe the way forward is to create a pro forma that pencils.

Tim Weyand is CEO of NK Architects.

REALIST

CONTINUED FROM PAGE 6

closer to being self-sufficient.

The expected result of facility self-sufficiency is lower operation and maintenance costs, which can reduce the lifetime O&M budget exponentially.

We encourage designers, developers and owners to embrace undefined or vague sustainability goals. A sensible project approach, void of often improperly imposed sustainability requirements, is an opportunity to shape a building and site that an owner's budget can benefit from and occupants will thrive in.

A positive sustainable design, construction and operation experience makes for happy owners, resulting in more sustainable project opportunities.

DJ Dean is the principal architect at KPG, an interdisciplinary design firm with offices in Seattle and Tacoma.

ECODISTRICT

CONTINUED FROM PAGE 7

and affordability.

We welcome community feedback, comments and support for the EcoDistrict work and look forward to sharing successes learned on Capitol Hill with other communities working to improve livability in their urban villages. More information can be found at www.capitolhillecodistrict.org

Michael Mariano is a founding partner of the architecture and urban design practice of Schemata Workshop, and co-chairs the Capitol Hill EcoDistrict Steering Committee.

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WASTE

CONTINUED FROM PAGE 9

facility, are considered in compliance with the SPU requirements. If the contractor uses a non-certified facility, the contractor is required to submit supporting documentation regarding their recycling efforts to demonstrate compliance.

Because SPU requires reporting to track the recycling rate at each certified facility, there is public transparency about how efficiently materials are being processed. People can make more educated decisions about where they choose to recycle their materials.

In Western Washington, there is not currently another entity besides SPU gathering and sharing the recycling rates of facilities. This level of visibility is a monumental shift for the industry.

Widespread influence

Whether or not LEED or Built Green is involved in a project, the city of Seattle and Seattle Public Utilities are demonstrating that a change in requirements will

make a positive impact on construction and demolition debris-handling practices and our environment. Their regulations and implementation method facilitates education, which ultimately means fewer recyclables ending up in our landfills.

The effect of Seattle's new regulation is likely to reach well outside of its city limits. Once contractors start recycling debris for their projects in Seattle, they will understand their options and the benefits for both them and their customers, and will continue to prioritize recycling at their other projects.

The city of Seattle took a risk to be the first entity to challenge status quo in Washington. Which corporation, developer, city or county will be next to implement a similar requirement?

Dan McAuliffe is the president of United Recycling & Container, a recycling facility and recycling hauler serving King and Snohomish counties for nearly 20 years.

ENERGY TOOLS

CONTINUED FROM PAGE 2

to operate only during the times the buildings are occupied is a great way to save energy. And because occupancy patterns change month by month and year by year, there is an opportunity to revisit this energy-saving measure periodically to confirm the building is operating as efficiently as possible.

Meet MEETS

At the net-zero Bullitt Center, Seattle City Light and the building owners are pioneering a potentially game-changing power purchase agreement termed MEETS, or metered energy efficiency transaction structure. City Light pays the building owner for energy saved against a baseline, similar to the credits that homeowners receive when solar panels on their roof generate more energy than the house is using.

Making this incentive structure a reality relies on sophisticated technology that identifies how multiple factors (such as occupancy, schedule or weather) impact energy consumption, and comparing that to how the building actually performs at the utility meter.

By understanding the environmental factors that influence energy consumption, the utility knows it is paying for real energy savings rather than incidental savings coming from fewer occupants being in the building or

unseasonably mild weather.

The DeltaMeter from EnergyRM is that technology bridge between the super-efficient office building and utility in the Bullitt Center.

Rob Harmon, president and CEO of EnergyRM, sees the DeltaMeter as a way to "enable a true 'pay-for-performance' market, including long-term power purchase agreements that will allow deep energy efficiency retrofits to join wind and solar as at-scale solutions for our energy system."

The DeltaMeter operates in a transparent way so that the utility knows how the calculations are being done and can confirm to their board or shareholders that the savings are real.

At scale, this type of technology would allow owners of 1960-1990s buildings to bank utility incentives for whatever combination of energy savings technology or tuneup measures they decide are appropriate for their building. This additional cash flow may ultimately allow them to fund the capital upgrades needed to significantly reduce carbon emissions in Washington's building stock.

Thulasi Narayan is a manager with Paladino and Co. Paladino is collaborating with the Smart Buildings Center in Seattle to evaluate new energy-efficiency products and tools.

STORMWATER

CONTINUED FROM PAGE 8

facilities, right-of-way segments or pollution hot spots. Because this GIS analysis can create a pool of hundreds of potential sites, additional criteria for each type of retrofit parcel are created, such as eliminating parcels with critical areas.

Using this process on Woodard Creek took the potential retrofit sites from 400 to 66.

3. *Conduct site feasibility and detailed restoration assessments on sites identified during the GIS analysis.*

Once the potential retrofit sites are identified, the field work begins. The detailed site assessment includes a field investigation by experienced stormwater engineers based upon pre-established feasibility criteria. Collecting stakeholder input at this stage is also important because residents often have valuable information about the sites.

Next, screening factors are developed with scores in order to qualitatively rank the sites. For Totem Lake, screening factors included infiltrative capacity of the soil and ownership of the parcels (city-owned vs. private).

Once the potential sites are scored, those with the best scores continue on in the prioritizing process.

4. *Develop location-specific retrofit concepts.* Now that the scoring process has produced the most promising sites, a conceptual stormwater retrofit design is identified.

Inputs to determine which best management practices are appropriate include the area available on the parcel, upstream tributary area, soil type and site observations from the field investigations in step 3. Best management practices may include bioretention with infiltration, bioretention without infiltration, vegetated filter strips or others.

5. *Evaluate location-specific retrofit concepts.* This step evaluates if the retrofit design will meet the basin retrofit objectives in step 1.

Because both Woodard Creek and Totem Lake had water quality goals to reduce pollutants, a model was used to calculate expected pollutant loads and their anticipated reductions based on the best management practice selected.

The goal for Totem Lake is also to reduce flooding, and so a hydraulic model was developed to calculate the reduction in flow from the various retrofit alternatives.

6. *Rank projects and select a preferred list of capital improvement projects for pre-design.* The final ranking of the top sites that remain occurs in this step.

For Woodard Creek, land ownership and pollutant load reduction were among the final criteria. Public land ownership presented a better near-term opportunity to implement the retrofit for Thurston County. However, in Totem Lake, Kirkland was open to approaching private landowners to consider a partnership to accomplish the retrofit.

Thurston County and Kirkland's efforts to address stormwater issues are paving the way for a sustainable approach to planned redevelopment. Through a six-step site selection and pre-design process, these two projects provide the foundation for a functional stormwater retrofit program that addresses current problems while best taking advantage of local conditions and opportunities.

Melissa English is marketing director at AHBL and Doreen Gavin, a civil engineer, is president of the firm. Both have a keen interest in stormwater management.

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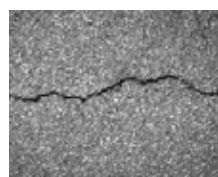
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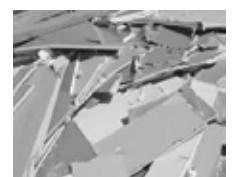
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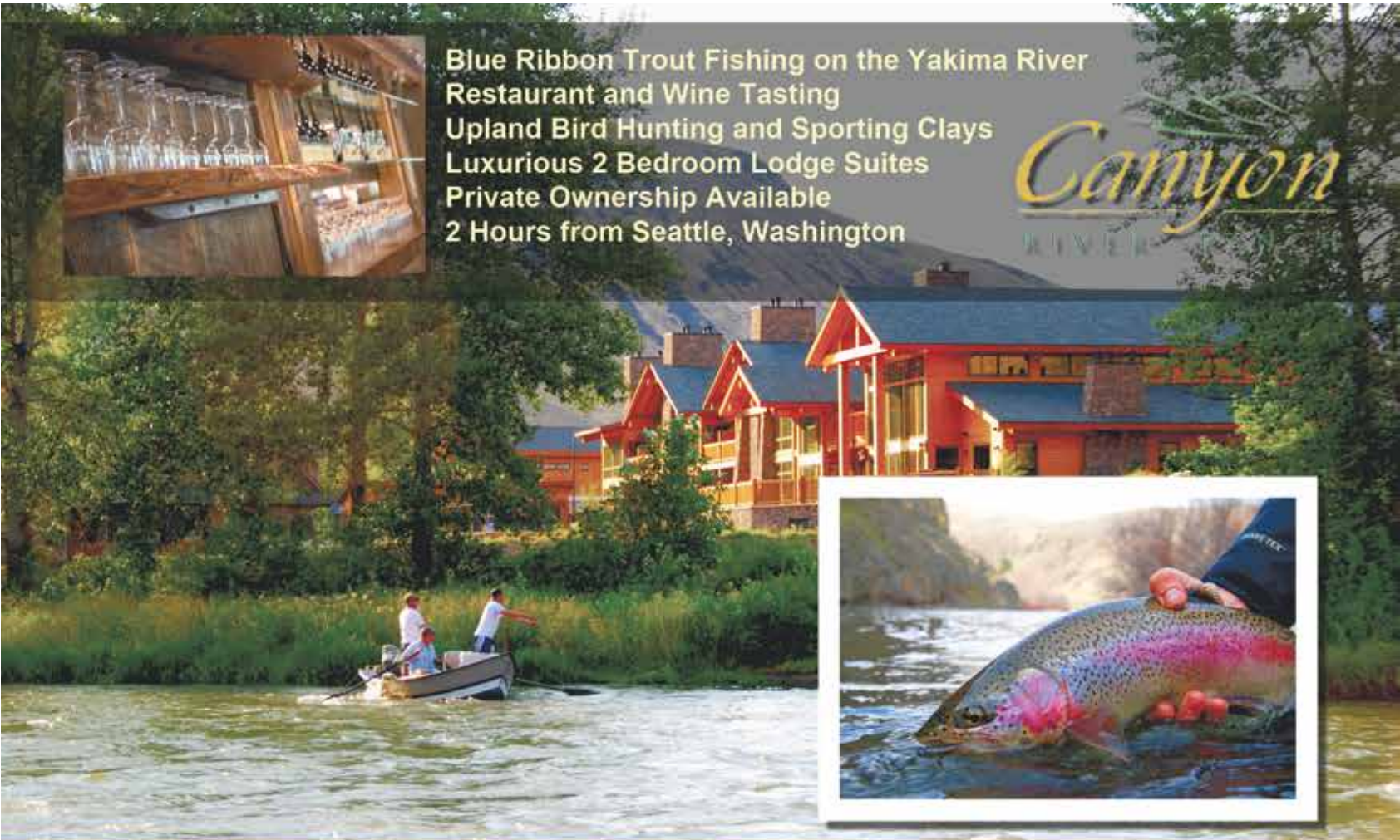
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HOW TO MAKE A BETTER BUSINESS CASE FOR GOING GREEN

Poor communication between business leaders and real estate investors could be holding back sustainable development.

What do investors and CEOs have in common? Both groups see sustainability as a clear competitive advantage for businesses, according to a 2014 study from the Principles for Responsible Investment (PRI).

However, the study also discovered a major disconnect in business leaders' abilities to communicate to investors how sustainability translates into business value. Only 38 percent of CEOs surveyed believe they can accurately place a business value on sustainability and just 7 percent of investors are in agreement.



BY STUART HAND
MULVANNYG2
ARCHITECTURE

If business leaders can't find a better way to quantify and communicate this information, this issue will likely hinder the progress and profitability of sustainable development.

Read the study online at bit.ly/1zXUpwU.

This topic is particularly relevant in the greater Seattle real estate market, where many developers are seeking ways to add value and attract more business through sustainability. There aren't many places like Seattle, where you can say that LEED silver certification is becoming more of a market expectation than a striking differentiator. Seattle and



Seco Development's Hotel at Southport in Renton started construction last fall. The project is seeking a LEED designation.

IMAGE COURTESY OF MULVANNYG2 ARCHITECTURE

Washington state rank in the top 10 for certified projects and registrations, according to the U.S. Green Building Council.

What these developers and investors understand is that sus-

tainability produces tangible business results. This occurs through better stakeholder engagement, longer-term orientation for projects, increased user satisfaction, and enhanced communication through measurement and disclosure of information such as energy use.

Further, an organizational focus on sustainability can create opportunities to attract better employees, strengthen ties with the community, and foster a culture of continuous improvement. The global nonprofit organization CDP reports that businesses that are actively managing and planning for climate change report an 18 percent higher return on investment than those that are not.

So why are business leaders struggling to discuss the value of sustainability with investors? There are many factors at play, from a lack of consistent metrics and information to "greenwashing," or the deceptive use of sustainability claims.

Making the business case for sustainability to real estate investors requires narrowing your focus on communication, investing in the right people, and becoming engaged in policymaking.

Clearer communication

In order to better communicate with potential real estate

investors it's important to first cultivate a common language. To do this, the development community needs to work together to track and communicate a shared set of metrics around sustainability that can build a foundation for the conversation about value.

The need for this foundation was highlighted at a recent NAIOP Washington event during a discussion about an important metric to real estate investors: property valuation. The issue at hand was that the appraisal community is lagging behind the sustainability movement, and measures that go beyond complying with the energy code often go unnoticed in valuing a property.

In order for properties to be appraised and compared more appropriately, sustainability metrics must be treated with the same rigor and consistency as other financial measures. In the recent PRI study, 47 percent of CEOs reported that they routinely incorporate sustainability issues into discussions with financial analysts — while only 27 percent of investors said they have experienced this.

Developers and building owners can start this process by quantifying metrics related to the impact of sustainable features — such as tenant retention and

occupancy rates — to help create consistency and fair comparison in the valuation process.

Below are several other metrics suggested by the PRI that can help communicate the value of sustainability to potential investors:

- Sustainability-advantaged growth: Measuring a company's revenue volume and growth rate from projects they define as sustainably advantaged in comparison with their predecessors and/or competitors

- Sustainability-driven productivity: Measuring the aggregate financial impact on a company's cost structure as reported by the company from all sustainability-related initiatives in a given time period

- Sustainability-related risk management: Measuring sustainability performance over time on the critical metrics that a company (often in consultation with stakeholders) believes pose meaningful risk to revenue and reputation

Growth, productivity and risk are common components of most investor models. Incorporating sustainability into the assessment of these factors is one way to drive clearer communication based on a common language.

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WHY GREEN BUILDING HAS HIT THE WALL, AND WHAT TO DO ABOUT IT

Owners and developers would prefer a certification process that's simpler, cheaper and more useful.

Green building activity has peaked in the U.S. at about 4,500-5,000 projects per year, as measured by newly registered LEED, Green Globes and Living Building Challenge projects.

That represents less than 0.1 percent of the total U.S. commercial building stock of 5 million buildings. If one assumes that the U.S. adds about 1 percent to the building stock (by number) each year, it's clear that we are falling behind in our efforts to green the U.S. building stock.

Looked at another way, despite all of its manifest success, LEED has certified fewer than 0.5 percent of the U.S. commercial buildings in 15 years of hard work (about 25,000 buildings) and less than 3 percent of the 85 billion square feet of commercial buildings (measured by area). There is NO WAY that the current system of building certification can reach the U.S. Green Building Council's (and the Green Building Initiative's) stated objective of fundamentally transforming the built environment.

Is green worth it?

Having spent 15 years promoting the LEED system, until I took over as head of the Green Building Initiative a year ago and began to promote the Green Globes rating system, I have considerable experience with this subject.

I would be the first to proclaim that LEED has made a tremendously valuable contribution in improving the quality of many building materials (think paints, carpets, interiors, etc.), in promoting energy efficiency in new commercial buildings, and in changing the conversation around what constitutes a sustainable building. But I would also say that the Green Building Revolution, the title of my 2007 book, has hit the wall!

Add to this concern the pressing question: How do we "scale" the impact of green building in light of growing concerns about climate change, water scarcity and building resiliency (or risk profile, if you like)?

The more pressing question is: WHY hasn't the current system had more marketplace success?

Here is where LEED is most successful, by the numbers: in larger commercial offices in mostly the downtown areas of large cities; in corporate real estate; in "policy driven" markets (for example, the state of Washington requires all state-funded buildings to achieve LEED silver certification); and in "high-profile" projects of various kinds (think the Bullitt Center in Seattle, professional sports stadiums, etc.)

What's been left out? Most small offices (80 percent of commercial buildings in the U.S. are less than 100,000 square feet in area; 50 percent are less than 50,000 square feet); K-12 schools, most university buildings (other than policy-driven projects such as at the University of Washington); and almost all retail stores, health care facilities and the like. Collectively, these represent most of the U.S. commercial building stock.

One has to ask WHY? My answer is simple: Perceived benefits do not measure up to actual costs.

My own experience as a LEED consultant, as a speaker on green building for the past 10 years and as the author of 13 books in the field, confirms how difficult it is to sell green building certification to the person who "signs the front of the check."

Perceived benefits are slight: In most cases, the benefits include savings in energy efficiency that would be achieved in most cases without a green building certification, claims for improved employee health and productivity backed by weak empirical evidence, and better PR and marketing benefits for developers, etc.

Costs are real: Just the required commissioning services in LEED can add \$0.50-\$1 per square foot to the cost of a building. Add in the consulting costs, which can easily run into six figures, and one begins to understand why for most owners and developers pursuing green building certification, unless mandated by policy or driven by government incentives, is something for which they are increasingly saying deciding, "no thanks."

The 99 percent

What can be done? In my view, three basic elements make up the solution:

- **Cut costs:** We already know that we can deliver a quality sustainability assessment for a green building via the Green Globes system at one-third the cost of LEED by having a different delivery model, using third-party-trained assessors in the case of Green Globes.

- **Simplify the criteria:** LEED started as a simple system. I trained more than 3,000 industry professionals in LEED from 2001-2008. Over the years, the system has grown increasingly complex, costly and cumbersome, with hundreds of addenda to criteria, thousands of credit interpretations and hundred of alternative credits, all of which must be mastered by an army of consultants and accredited professionals.

My solution: let's go back to Sustainability 101: 60 percent of the points in LEED and Green Globes deal with just three issues:



The Joshua Green Building in downtown Seattle was renovated in 2009. The office and retail project received three Green Globes.

WALL — PAGE 19

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FEDERAL CENTER SOUTH TEAM FOCUSED ON RESULTS, NOT RATINGS

The Corps of Engineering headquarters is one of the GSA's most energy-efficient buildings, but a top LEED rating wasn't a goal.

The new U.S. Army Corps of Engineers' regional headquarters in Seattle recently received a LEED platinum rating from the U.S. Green Building Council, making it one of only a handful of platinum-rated buildings in the Northwest. It's also only one of the few platinum-rated buildings owned by the federal government. It's quite a feather in the cap.



BY STEVE NICHOLAS
HEERY INTERNATIONAL

1202, the new 209,000-square-foot office was built on a 4.6-acre brownfield site that was home to a 1940s wood and concrete warehouse.

The building includes some 200,000 board feet of structural timber and 100,000 board feet of wood decking salvaged from the old warehouse. The building's horseshoe layout maximizes space and natural light while the entrance faces a rain garden, a nod to the corps' mission as manager of the nation's waterways.

With an Energy Star rating of 100, it is also one of the most energy-efficient buildings in the U.S. Government Services Administration's portfolio. This building incorporates innovative integrated mechanical systems, a rainwater collection and reuse system, geothermal energy, thermal storage and underfloor low-volume HVAC systems. In short, it's a sustainability showpiece.

While it certainly deserves the LEED platinum rating for sustainability and energy efficiency, that was never the goal. In fact, the building's owner, the GSA, which functions as the government's landlord, had specified LEED gold, the second-highest rating in the USGBC system.

Jumping from gold to platinum wasn't an accident, however. Rather, it was an achievement based on three interconnected things: the owner wanted a high-performing building, the performance requirements supported that goal, and a high level of collaboration among team members helped deliver it.

In many of its recent building and renovation projects, the GSA has relied on its Design Excellence Program, which encourages high-performance buildings that help set new standards for

Federal Center South's horseshoe layout maximizes space and natural light.



PHOTOS BY BENJAMIN BENSCHNEIDER/ZGF ARCHITECTS

sustainability. In that regard, the GSA viewed this project as an opportunity to pursue innovation and push boundaries.

Performance goals

As in most construction projects, the building specifications are the controlling document. In the hands of many organizations, including the federal government, the technical documents can look a lot like rules and regulations. They specify materials, quantities, systems and even construction techniques.

For this project, however, we developed an owner's program of requirements (OPR) that set standards for what needed to be achieved. The OPR was a performance-based document, rather than a prescriptive one, and set a clear "destination" for the design-build team, while leaving it up to the team to determine the best way to get there.

The performance and warranty criteria outlined in the OPR were focused on making sure the building would be relevant for a long time — that it would be durable and functional for many years as well as cost effective to operate and maintain. Despite the recent pullback in energy prices, over the long term the cost of heating, cooling and powering a building is

Much of the wood was salvaged from an old warehouse that occupied the site.



expected to climb.

Perhaps the single criterion that had the greatest impact, and encouraged the highest degree of innovation, was the requirement — a performance goal — to exceed the ASHRAE 90.1 standard by 30 percent. ASHRAE 90.1 is a standard that

sets minimum levels of energy efficiency, and that one goal set the tone for a lot of the decisions that were made. After a full 12 months of actual use, the building exceeded that standard by 40 percent.

For instance, this project is one of the first in the region to

use structural piles for geothermal heating. Ground conditions required that the building rest on 18-inch pipe piles filled with concrete. After a round of tests to see if it was feasible, the design-builder ran geothermal

MAKING THE MOST OF YOUR ENERGY MODEL

An effective model can help building owners boost their energy efficiency and save money.



BY MICHELLE ROSENBERGER



AND NANCY HENDERSON

ARCHECOLOGY

A building's energy performance is a function of the interplay between the envelope and the mechanical and electrical systems. Climate and occupant behavior also affect the performance.

Tools to predict energy performance exist because each of these primary systems — the building envelope, HVAC and lighting — are designed by different consultants that may or may not understand the other two disciplines as well as their own or how they will ultimately interact in your building.

The first step in maximizing the energy performance of your

building's design is understanding the predictive tools at your disposal. On a typical project, tools for understanding relative energy use come in three possible flavors: energy code compliance calculations, a life-cycle cost analysis, or a whole-building energy simulation, commonly referred to as an energy model.

A project might have only one or all three of these permutations, but each of them is very different. Each of them has a particular purpose with benefits and limitations.

Energy code compliance

Obtaining a building permit for a commercial building usually requires a set of complex calculations specific to the building envelope to demonstrate compliance with the energy code.

These calculations are a series of spreadsheets that approximate the heat loss of the roof, floors, walls, windows and doors — components that make up the proposed building envelope. The spreadsheets list each building assembly and its associated R-values, U-values or F-factor, and cal-

Holland Partner Group saved \$200,000 using an energy model to help choose the windows for this project in South Lake Union.



PHOTO COURTESY OF WEBER THOMPSON

culate the weighted average heat loss of those materials compared with the code-allowed heat loss.

And that's all. These calculations do not incorporate HVAC and lighting systems, and as a result do not represent the anticipated energy performance of the building as a whole. There are

lighting and mechanical energy code requirements, but those are often handled separately by the electrical and mechanical engineers.

Life-cycle cost analysis

In our region, owners often

elect to have the general contractor provide design-build mechanical and electrical instead of having an engineering firm do a full design. This often means mechanical and electrical deci-

ENERGY MODEL — PAGE 19



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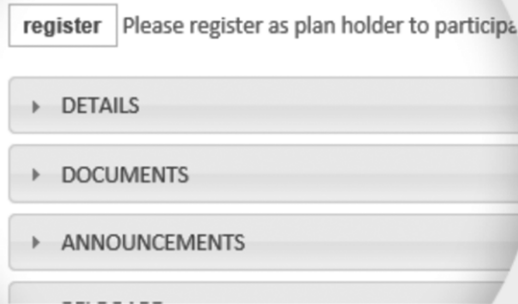
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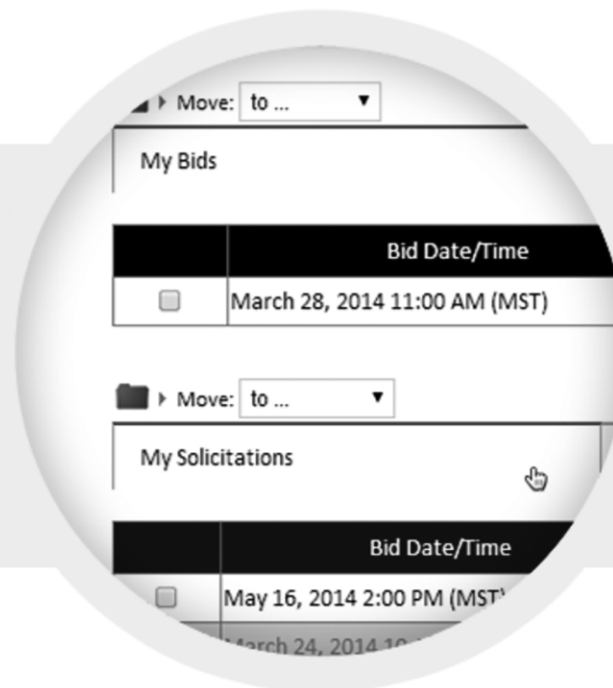


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ENERGY MODEL

CONTINUED FROM PAGE 17

sions are made much later in the design process. And, of course, they have their own permits to pull.

As project teams come to grips with decisions about what kind of HVAC and lighting systems to use and what kind of energy performance to expect, they often wish to take energy code calculations one step further. A life-cycle cost analysis can help make choices about specific energy systems the building might select.

Unlike a life-cycle assessment, which analyzes materials from cradle to grave, a life-cycle cost analysis is geared for rough order-of-magnitude projections. This tool allows project teams to arrive at the type of HVAC system (electric baseboard vs. heat pump) that best captures the needs of building occupants while meeting budget constraints.

A life-cycle cost analysis will look at an individual system and calculate the rate of return for investing in a more expensive system. This analysis will take into account financing and energy cost savings, but may not be able to fully capture the interactive effect that system will have with other systems.

For instance, a reduction in lighting power also reduces heat — increasing heating energy and reducing cooling energy. So while this calculation will tell you how much you will save on lighting, it will not tell you how much your heating energy will go up or how much your cooling will go down as a result.

This type of calculation is best with standalone systems. For instance, domestic hot water-system efficiency is a very simple calculation and has little impact on any other system.

This tool should not be con-

fused with an energy model. A life-cycle cost analysis can offer guidance with respect to the big decisions and general expectations, but it lacks any ability to refine results as the progress of design continues. It is useful in schematic design for rough order-of-magnitude decision making.

To truly understand all the energy uses in your building and how the systems interact, you either have to build the building or do a whole building energy simulation.

Whole building simulation

Energy models take things to a whole new level. With this three-dimensional computer model of the future building, you can simulate the interaction of nearly any combination of envelope, mechanical, electrical and renewable energy strategies that you wish to explore.

Energy models are slowly beginning to gain some traction in the industry. Like building-information models, they can be a very powerful tool for those project teams comfortable with the technology and the upfront investment in their development. Often used on projects seeking LEED certification, the requirement of the U.S. Green Building Council for buildings to optimize energy performance leads most project teams to develop an energy model.

A good energy model takes all of the energy code calculations from the envelope and uses the architect's CAD plans to create a 3-D model. HVAC systems are created, and the building is zoned according to the mechanical design.

Please note that energy models are developed in stages like construction documents. A schemat-

ic level of development is often called a shoe box model and bears as much resemblance to an energy model as schematic drawings do to construction documents.

Light fixtures, which have a significant impact on energy use, are also identified and can be paired with daylight controls and occupancy sensors to play a strong role in minimizing energy demand. Also added are appliances, elevators and miscellaneous equipment, etc.

The 2012 local energy codes have a very high bar for energy reduction and offer a revised energy model path to compliance (total building performance path). This allows buildings more flexibility in how they trade off energy-using features. The Seattle Energy Code also now requires onsite renewable energy systems for most commercial buildings, unless one of the exceptions is met.

An energy model pulls all of these building systems together into one dynamic model with local climate data and occupancy schedules. There are numerous reports that can tell building owners what impact various energy efficiency measures have. Energy models can also find the most effective combination of measures — that offer the best energy efficiency for the least cost.

A useful tool

Unfortunately, most owners don't get the biggest bang for the buck when they invest in an

energy model. There are lots of ways this can happen. Not all energy models are good ones. As with any computer-driven simulation, it's only as good as the information that went in.

Energy models are often created by individuals from mechanical engineering disciplines and tend to focus on that part of the model's parameters, rather than envelope or lighting considerations. The best models are provided by those who can do justice to all three primary systems.

Even with a great energy model, many owners don't know how to take the best advantage of this complex and powerful tool. And, of course, they have to rely on a knowledgeable energy modeler to employ it.

Energy models have several primary uses. They can be used to evaluate energy reduction and cost benefit during design or to obtain building permits. They can assist with LEED certification. They can also be used for measurement and verification.

The biggest benefit of an energy model is that once built you can use it over and over again. For discerning owners that pursue measurement and verification strategies, the energy model is an invaluable tool.

Design-level energy models are built on assumptions. But once the building is constructed and occupied, those assumptions can be replaced with real data.

Using utility bills and actual weather conditions, an energy model can be calibrated to represent actual energy usage

on an annual basis. With this tool, operational issues such as equipment malfunctions and leaks can be identified. Power demand can be shifted from peak times. Equipment performance can be monitored.

When the time comes to consider capital improvements, owners will again be faced with choices about energy systems and cost benefit. This time their energy model stands ready to replicate a whole new set of assumptions.

Energy reduction is everyone's concern in the construction industry. The cost of energy is volatile. It's a significant percentage of construction and operating costs for the building.

Supply and demand issues for energy are also uncertain over the long term. A building design oriented toward reducing energy demand, and constant vigilance with respect to maintenance and operation is essential to optimizing energy use and controlling costs.

The use of energy also contributes to global warming and climate change, so energy reduction will continue to be a regulatory priority for the foreseeable future. Buildings that can offer efficient energy use will have a competitive advantage in the marketplace.

A good energy model can be a useful tool before, during and after construction.

Michelle Rosenberger and Nancy Henderson are partners in ArchEcology, a sustainable design consulting firm in Seattle.

WALL

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energy, water and waste. Why not create a green building rating system that just deals with these key performance indicators for sustainable construction and operations? Let's walk before we try to run.

● Leverage technology to create benefit: Let's put all of the key performance indicators on cloud-based data platforms so that designers, building owners and facility managers would see green building ratings as a valuable management and reporting tool, instead of a costly "add-on" to their normal mode of operations.

If you want a Green Globes certification, for example, you'll have all the information available, and the assessment of your operations can be done in an afternoon, using any tablet,

computer or smartphone.

Green building certification will grow market share only if it is understandable and cost-effective. What we don't need to do is pursue "dead ends" in sustainability such as "zero waste" or "net-zero water" for an elite group of buildings, but instead bring "the other 99 percent" of buildings to the table and to improve their operations. The math is simple: saving 5 percent in 50 percent of buildings trumps saving 50 percent in 0.5 percent, by a factor of 10.

Green building for "the other 99 percent" is within our reach. Why not just do it?

Jerry Yudelson joined the Green Building Initiative as president in 2014.

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MAKE A CASE

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The right people

Smart leaders know that people are an asset that can appreciate over time. The right people will help a company create stakeholder engagement around sustainability issues and develop strategies to capture value throughout the development process.

Sustainability is also a rapidly evolving field and companies can benefit by investing in team members with the ability to stay ahead of changes in the industry. Project teams composed of people skilled in understanding economic imperatives, collecting the right data and developing value analysis around sustainability are the teams that can communicate effectively with investors.

The key is to seek out team members who are actively engaged in industry conversations around sustainability and direct their skills and connections toward strengthening business.

Political process

Engaging in local real estate policy discussions can be a powerful route to positively impacting the often fragmented political decision-making process. By participating in the political process with a coordinated commitment to action, the real estate community can collaborate with policymakers to reshape markets and systems to reward sustainability and

enable businesses to lead the way in tackling these challenges.

Looking ahead

In 2013, 76 percent of CEOs who participated in the U.N. Global Compact-Accenture CEO Study on Sustainability said that embedding sustainability into core business practices will drive revenue growth and new opportunities.

Real estate investors seeking these new opportunities want investment decisions that are grounded in a strong business case. There is no doubt that an intelligent approach to sustainable development makes sense, but investors must have a clear understanding of sustainable business practices and the value they can generate in the bottom line.

Business leaders willing to focus on communication, invest in the right people, and engage in policy discussions are better poised to capitalize on the opportunities sustainability will continue to create.

Stuart Hand is an architect with MulvaneyG2 Architecture, where he specializes in project management, architectural design, and sustainable building design and construction. Hand serves as the co-chair of the NAIOP Washington Sustainable Development Committee.

FEDERAL CENTER SOUTH

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loops through several of the piles before the concrete was added, which generated 40 tons of heating and cooling.

It was a cost-effective addition because the piles were already going in with a very high upside: an endless supply of energy to help heat and cool the building.

Using the best ideas

The final element was the collaboration and trust among the project team that allowed the best ideas to surface and be carried out successfully.

For example, the design-builders selected a cutting-edge smart lighting system that adjusts lighting based on occupancy and, when occupied, on existing light. The system delivers exactly the amount of light necessary, where and when it is needed. Actual light usage is communicated back to the central system, where it's tracked and measured.

But cutting edge isn't always user friendly. In this case, the electricians weren't

familiar with the product and, as it turned out, it had some bugs as well. Because trust existed across the project team, installing the system became a group endeavor. Electricians, experts and inspectors worked together to understand the system and troubleshoot it for a successful installation.

Steve Nicholas is a senior project manager with Heery International and was construction manager on Federal Center South Building 1202. Heery provided construction management assistance and was responsible for energy modeling and analysis, LEED support and full commissioning services.



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