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A REPORT ADVOCATING FOR SOCIALLY
RESPONSIBLE SUSTAINABLE DEVELOPMENT

NATURAL DAYLIGHT IN BIG-BOX RETAIL STORES BOOSTS CONSUMER SALES

ENEREF INSTITUTE EXAMINES HOW RETAIL
LIGHTING CAN MITIGATE CLIMATE CHANGE AND
ALSO INCREASE IN-STORE SALES.

Big box retailers have the unique opportunity to increase in-store sales through better lighting design. Scientific evidence demonstrates that a 40% increase in retail sales can be achieved with precisely positioned skylights. According to the research,

natural interior daylight is effective because it creates a more hospitable shopping environment. More significantly, effective management of natural daylight can have a net-zero carbon footprint to motivate ecologically conscious customers.

RETAIL LIGHTING STRATEGY: HOW DAYLIGHTING INCREASES SALES

Retailers who incorporate natural light join a long line of success stories. In a mid-1980s study by the U.S. Department of Energy, Lockheed Martin discovered significant human-centric benefits by including natural light in their office space, in what was originally planned as an energy reduction project to reduce lighting costs. Lockheed was surprised to see an increase in productivity from their 2,700 engineers as a result of bringing natural light into the office. Furthermore, there was a 15% drop in employee absenteeism.

Today dimmable LEDs are vital to reduce global warming. However, far from replacing natural interior daylight as a primary light source, *the argument for natural daylight has, in fact, been strengthened by LED technology.* That's because modern LEDs are economically dimmable. Therefore, LEDs make it even easier to capture the energy benefits of daylight because daylight allows the energy load of LEDs to be reduced even further. Dimming a fluorescent fixture has always been an expensive technology. With the evolution of LEDs, dimmability is simple and practically free of cost.

What popularized skylights for large chain retailers was the extraordinary sales increase that Walmart achieved when they de-

signed their first energy-efficient model store in Lawrence, Kansas, in 1993. Specially designed skylights were installed on half of the store's rooftop. The SKUs located under the skylights sold better than those under fluorescent electric lighting. To validate the increased sales results of natural lighting, Walmart swapped merchandise from one side of the store to the other and noted the same sales increase for the merchandise moved to the daylit zone.

SKYLIGHTS CONCLUSIVELY LINKED TO HIGHER SALES

In a 1999 landmark study, PG&E commissioned Heschong Mahone Group (HMG, now part of TRC Companies) to investigate the effects of skylights on retail sales. Over an 18-month period, HMG analyzed the sales performance of a chain retailer's 108 outlet-stores, two thirds of which had skylights and one third of which had none.

The results establish a statistically compelling connection between skylighting and retail sales. In fact, apart from store hours, skylights were found to be the best predictor of sales. Based on the data and with 99% statistical certainty, the report found that the non-skylit stores would likely have seen 40% higher sales with

the addition of skylights, with a probable range of 31-49%.

In 2003, on behalf of the California Energy Commission and PG&E, HMG published a follow-up report in a different retail sector to determine whether the original findings would hold. The study observed 73 store locations in California over a two-year period. Twenty-four of the stores had a significant amount of illumination from skylights. Although to a lesser degree, the new findings demonstrated that daylight was strongly associated with increased sales, overshadowing the value of the energy savings. What is more, employees of daylit stores reported higher satisfaction than their counterparts working under electric lighting.

A TRIPLE PLAY FOR GROCERY STORES

By installing skylights, large retailers have a unique opportunity for a triple play: shrink energy costs, boost sales, and tackle climate change—all at the same time. Roughly 650,000 retail buildings consume about 20% of all energy used by commercial facilities in the US, representing more than \$20 billion per year in energy costs. That's why incorporating skylights is now common practice for big box retail

stores and warehouse distribution centers, 30% of which have installed skylights. Skylights are more efficient than windows in distributing daylight—it only takes 2-3% roof coverage to fully daylight the floor space beneath.

The pivotal opportunity lies in the supermarket sector. Everything from fresh fruit to soda bottles looks better under skylights because daylight accurately renders all wavelengths of light within the visible color spectrum. (Electric lights, especially fluorescent and HID, emit an irregular light color spectrum.) When merchandise is illuminated with the broad spectrum of sunlight, their true colors are reflected with an even intensity, making them more appealing to the human eye.

MILLENNIAL AS TARGET CUSTOMER

To guard future revenue, retailers must attract millennials as a

transformational paradigm shift reshapes consumer behavior. Retailers who act aggressively to mitigate climate change can appeal to millennials, who strongly believe that climate change is upon us. Skylights offer retailers a net-zero energy resource, an attractive selling point to millennials.

Competition for millennials' wallets from online sales and delivery/pick-up services is threatening traditional grocery stores. Amazon, which already has a lock on millennials, plans to open 2,000 AmazonFresh stores in the United States by 2026. Trader Joe's, the leading supermarket chain in sales per square foot, particularly attracts millennials with their organic food offerings.

Traditional retail stores can adopt a millennial-friendly strategy by taking environmental action. Millennials now represent 28% of all US adults and 50% of the world's entire population. About

three quarters of the US population accepts the gravity of global warming, but the view is most commonly held among millennials, four fifths of whom consider climate change to be critical. By 2026, that number will grow to 91%, according to data collected by the University of Texas McCombs School of Business and Kay Bailey Hutchison Center for Energy, Law & Business.

Already, the majority of millennials support a carbon tax, according to the same study, and are also in favor of transitioning to 100% renewable energy. Touting net-zero success stories, like the use of natural daylight as the primary light source, is vital for retailers to bring millennials into their stores.

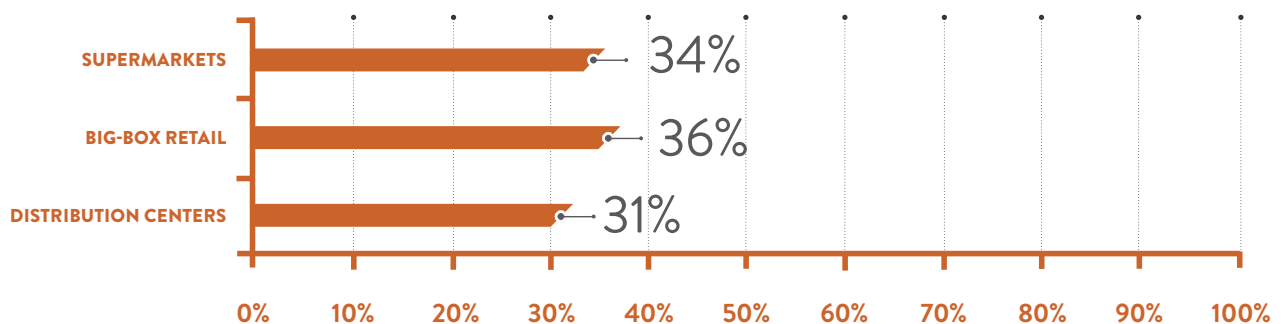
THE NECESSITY OF CARBON NEUTRALITY

The reason that millennials are so vigilant about mitigating climate change is that recent UN

MARKET PENETRATION OF SKYLIGHTS

RETAILERS OPPORTUNITY FOR ENERGY SAVINGS

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A SIMPLE 1% INCREASE IN PRODUCTIVITY CAN PAY 100% OF THE ANNUAL ENERGY EXPENSE OF A FACILITY.

STEPHEN SELKOWITZ | *Senior Advisor, Lawrence Berkeley*

reports have substantiated that the immediate consequences of climate change will be far more dire than previously thought. The Intergovernmental Panel on Climate Change (IPCC) found that to prevent the worst consequences of climate change from occurring as soon as 2040, carbon dioxide emissions must plunge to less than half of what they are today—within the next 10 years. That's why utilizing natural interior daylight is critical: unlike LED electric lighting, daylight uses no energy and produces no carbon emissions.

INCREASED PRODUCTIVITY CAN DWARF THE SAVINGS BENEFIT OF REDUCED ENERGY LOAD

Strategically placed natural interior daylight is a profit generator for employers. Salary is the single largest annual operating cost for most employers, and the cost of worker productivity is about 100 times larger than total energy costs in buildings on a per-square-foot basis, according to Stephen Selkowitz, Senior

Advisor for Building Science at Lawrence Berkeley National Laboratory. While numbers vary by region and business, the ratios are robust. For example, a typical \$4 per square foot cost of energy compares to rent at ~\$40.00 per square foot, and then to overhead salary costs of staff at ~\$400.00 per square foot. Therefore, if only a 1% increase in productivity is obtained in a well daylighted office space, the savings will be equivalent to 100% of the annual energy expense for the facility, explains Selkowitz.

IMPROVING SALES BY AIDING HUMAN BIOLOGY

While retailers need to engage millennials for long-term viability, their customers today are likely to be older and in need of better lighting. According to the Illuminating Engineering Society, people 55 and older require 2.3 times more light for the same visual acuity as 25-year-olds. Most interior spaces are electrically lighted to levels of 30-50 foot-candles. Well-managed daylight can raise the light levels much

higher without glare, bringing up to 200 foot-candles of full-spectrum light into a building—which would be costly to achieve with electric lighting. And rooftop skylights deliver plenty of daylight beyond the perimeter to the core of a space.

Daylight also directly affects our biology and our immediate decision-making. Every photon of light triggers a complex network of neural and endocrine system responses that send hormones coursing through our bloodstream to influence the brain, body and behavior. However, most artificial electric lighting doesn't match the wavelengths of natural sunlight. This is why recent biological discoveries should compel retailers to specify natural interior daylight as a primary light source: daylight elevates the likelihood that a shopper will make a purchase.

The key benefits of daylighting for retailers also include increased foot traffic because stores with natural illumination feel more inviting. Illuminating checkout counters with natural daylight makes customers feel more at ease. The same tactic can be used to encourage shoppers to interact with sales people, who seem more approachable under natural light. By creating a more pleasant shopping experience, retailers will attract more customers and raise sales.

ONE ARCHITECT'S SOLUTION

VELUX Dynamic Dome skylights "brought an abundance of visible sunlight into the space, even when the sun was low on the horizon."



ARCHITECTS' VIEWS

In an Eneref Institute survey on the benefits of natural daylight, architects reported specifying natural daylight for many reasons: improved aesthetics, more pleasant psychological feelings, enhanced quality of light, elevated visual comfort and better color balance.

Several architects interviewed for this report, who work with retail chains, expressed that today many high-quality commercial skylights available on the market bring in a large amount of daylight into the space.

One architect explained that she specified VELUX Dynamic Domes in a recent project for that reason: the dome geometry brought an abundance of visible sunlight into the space, even when the sun was low on the horizon. The architect

said she was also impressed by the system's impenetrable water barrier and fail-safe water protection.

SUSTAINABILITY

Many retail brands employ energy-reducing lighting practices, including the use of skylights. A typical Costco warehouse, for example, has about 200 skylights on the roof, evenly distributed over the sales floor. This is common for a number of big box retailers.

Today, many retail companies also counter climate change by incorporating LEDs. In 2017, Kroger made great progress by retrofitting LEDs in more than 1,500 stores. Walmart plans to reduce emissions by 18% by 2025 through more efficient lighting. Likewise, Target's energy efficiency programs are driven by

intelligent LED lighting systems, and Home Depot and Lowe's both plan to replace all lighting with LEDs.

NET-ZERO ENERGY

While LEDs are valuable to mitigate climate change, until our energy for electric lighting comes from 100% renewable resources, only skylights provide the net-zero energy necessary to halt global warming. Lighting buildings for net-zero energy with natural interior daylight can potentially provide a significant increase in retail sales and employee productivity. By using natural daylight, retailers can reduce electrical demand and carbon emissions—creating a solution that goes beyond energy efficiency to create future-proofed, productive and sustainable buildings on the path to net-zero energy.



LEAD BY EXAMPLE.

THE NATURAL INTERIOR DAYLIGHT INITIATIVE IS A CAMPAIGN TO PRESERVE OUR NATURAL RESOURCES, AND ENJOY NICER SPACES IN OUR HOMES AND BUILDINGS.

ENEREF INSTITUTE launched the Natural Interior Daylight Initiative to champion solutions in line with our mission that deliver sound ideas to significant market influencers. The initiative is designed to encourage responsible behavior within public and private organizations, municipalities and

corporations by offering common-sense solutions that achieve effective results. Our Virtual Campus is the repository for other Advocacy Reports and Web Forums.

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the opportunity to improve
our planet and society.*

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We launch initiatives designed to encourage the best that commerce has to offer—for people and for our planet. We promote the idea that being resource-efficient and socially responsible, is also profitable. Our Advocacy Reports demonstrate the benefits of successful solutions.

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