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BETTER ENERGY MANAGEMENT IN SELF-STORAGE



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ABSTRACT

The demand for energy globally is rising. Lighting and climate control together are responsible for 45% of the consumption. At the same time, building and operating self-storage are associated with a significant carbon footprint. It is possible to reduce both the costs and the Co2 emissions through investments in better technology. LED light fixtures consume 80% less than traditional light fixtures while giving the same light output. Regular maintenance of HVAC systems can reduce running costs by 30%. Installing solar panels on the roof of the self-storage can make the facility almost 100% autonomous, depending on the climate and light hours. Through such investments, it is possible to cut the monthly energy consumption of self-storage by 50% and attract new consumers who value eco-friendly services.

BACKGROUND

Energy costs in self-storage are a significant expense. Many operators view them as a sunk cost. Building a storage facility with climate control can add 15% to the construction cost, with monthly maintenance and running costs on top. Changing business rules and investing in technology can help save 20–50% of energy expenditures for a business. This paper aims to explore different approaches to energy saving and how to implement them in self-storage. Rather than blindly experimenting and accruing sunk costs, it is better to follow established market best practices. In this whitepaper, we comprise our experience of operating self-storage facilities and being a service provider to other operators for 20 years. We have pooled the knowledge from the past 40 projects deploying energy management for self-storage. The information in this paper comes from results that we and our clients observed, to provide you with proven and tested best-practices.

Self-Storage is not the most energy-hungry industry; nevertheless, it has a high energy demand. It is not unheard of to receive electricity bills in the hundreds of dollars each month because the lights at many facilities stay on for 12 or more hours during the day. Heating and air conditioning can add another 30–35% to the total (Sonne and Walker 2018, 1–3). Not only is this a considerable financial burden in a

very competitive industry, but it is also a strain on the ecology and climate of the planet. Estimates based on a study conducted in the United States by the Washington State Department of Archaeology and Historic Preservation

“Changing business rules and investing in technology can help save 20–50% of energy expenditures”

concluded that merely building a 50,000 sq ft (4,600 sq m) self-storage facility consumes the equivalent of the energy used by 656 homes a year or 80 billion BTUs (PeerStorage 2020). That does not include the debris generated during construction nor the operating costs. In other words, the carbon footprint of self-storage is not negligible. However, already technology exists to compensate for this and ensure a greener future for self-storage and the planet. We will discuss those solutions in the following sections.



SOLUTION

Monitoring Energy Consumption

The first step to save on energy consumption is to understand it. Only after continuous monitoring and control of energy consumption can patterns emerge. At the end of the month, the electricity bill provides insufficient information to understand what causes spikes in demand or where energy wastage occurs at the facility.

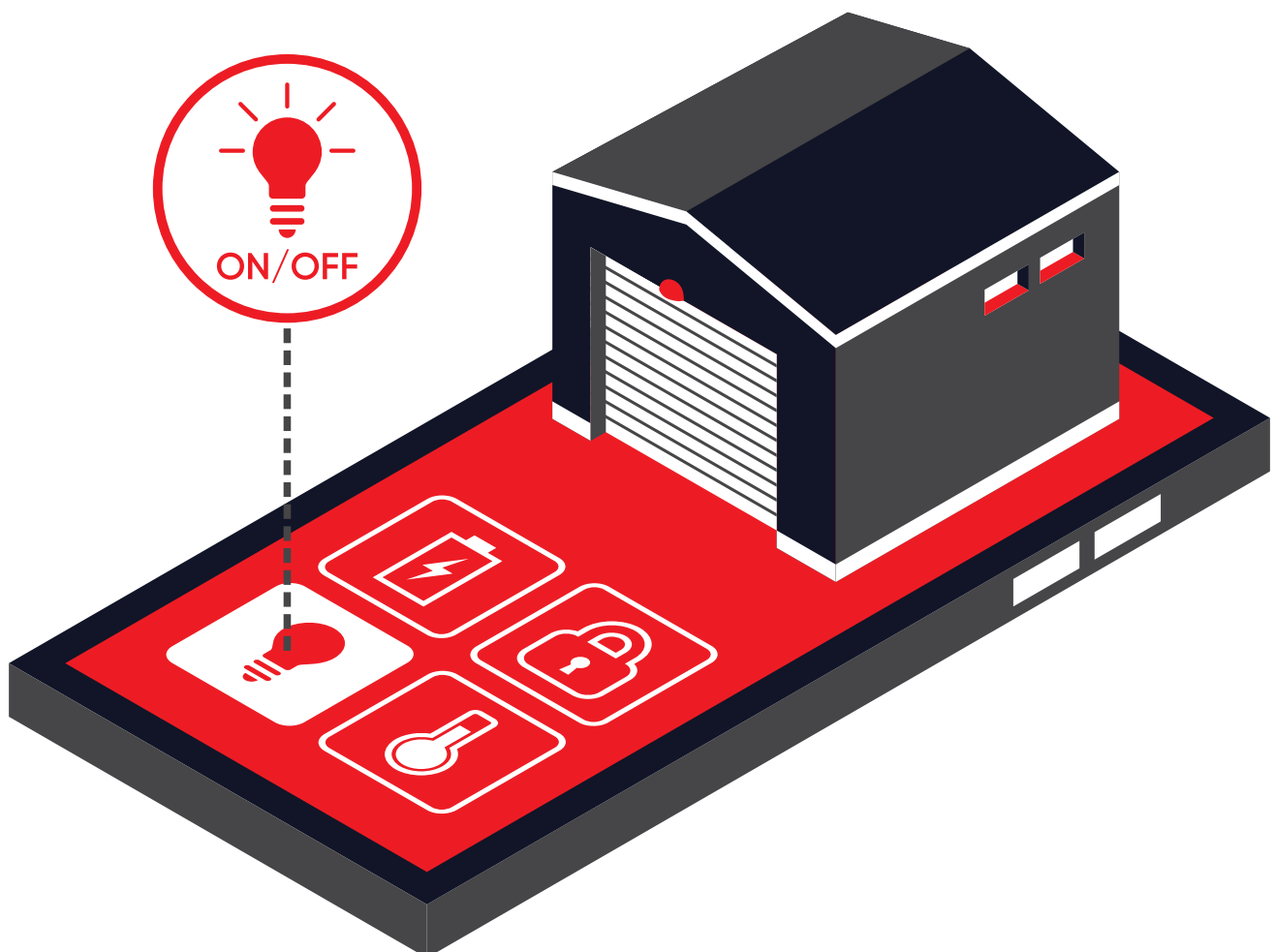
Even if rules are established to conserve energy, no one can say that they are observed or effective without monitoring. For example, many facilities have thermostats, but if employees or customers can easily change the settings, its purpose is defeated. People often forget to turn off lights when they leave. In many cases finding and eliminating energy wastage falls to the attention and diligence of the self-storage manager. The better solution is to leave it up to technology and eliminate human error as a factor. Self-storage automation is not only about automating billing or customer support. Automation of the facility can help identify energy leaks and implement better, more effective policies.

It is not only the human factor that plays a role. The energy needs of a self-storage

facility can vary a lot by location, so observing consumption patterns can give insights into the differences between different facilities. This helps managers to make more nuanced and pointed rules instead of a one-size-fits-all approach. A facility in Tokyo will have different energy consumption patterns than one in Sapporo or in Kagoshima. Installing an energy control system provides these insights. Modern solutions use AI to analyze weather reports, sensor inputs, and historical data to make climate control predictive rather than reactive. Instead of cooling down a room after it has heated up, this control system will prevent the room from heating up. A design like this can pay off in as little as 6 months and save a third of the energy bill (Vernon 2020). Monitoring devices can help to identify outliers, which are a symptom of underlying mechanical or operational issues. If you operate facilities of similar size, in similar climates - their consumption patterns should not differ by a lot. When one building costs significantly more per sqm to operate or has a much higher electricity consumption, it should be investigated.

Another area of consideration when it comes to measuring temperature and humidity inside your facility is the placement of the thermostat. Often during construction, the question will come up and there are different possible answers. All of them have advantages and disadvantages. In most cases the thermostat will be on one of the four walls. In practice this placement means that it cannot measure temperature and humidity with the highest possible accuracy. Air moves differently throughout a room at different heights. Obstructions from people or furniture also impact air movement, known as air stratification. This in return influences the measurement of the thermostat and the effectiveness of the AC unit in the room. Recently new technology is appearing on the market that uses a ceiling mounted unit - the hub - that uses infrared to measure air temperature and humidity in the room at a height of 3-4ft (0.9-1-2m). In essence this moves the measurement from the wall to the center of the space. Units like this come at a similar price point, as conventional thermostats. But field tests show that the energy consumption ratio between conventional, wall-mounted thermostats and the hub is 9:1. That is because the hub is more effective at detecting the current temperature and humidity and allows less fluctuations around the set-point. This solution is particularly attractive for new facilities, where a conventional thermostat is not yet in place. But the potential savings on energy cost make retrofitting existing facilities economically viable as well.

As energy needs for air conditioning are expected to rise sharply over the next three decades (Armstrong 2020), the demand for smarter and economic solutions will grow too. Investing in the right technology today will save businesses a lot of money and trouble later.



Lighting

15% of the global energy consumption goes towards illumination - the private, public, and commercial sectors combined. At the same time, an estimated 18% of the population has no access to electric light. It is safe to assume that demand and prices will increase in the future. Lighting energy consumption also accounts for an estimated 5% of global greenhouse gas emissions (Dreyfus and Gallinat 2015). Similarly, for a self-storage operator lighting needs and lighting costs are a significant part of the expenditures. But savings can be obtained easily by switching to Light Emitting Diodes (LEDs) instead of fluorescent light bulbs, making this a quick win. At 800 lumens, a modern 12W LED provides as much light as a 60W fluorescent bulb. They have a longer lifecycle and higher energy efficiency ratings, making an LED up to 80% more cost-saving (energy.org, n.d.). It is possible to use 10W or less 4-foot LED tubes in a typical layout and still provide enough light to make the facility look bright and welcoming. Changing to the newer generation will bring significant savings even for operators who have the older 20W LEDs.

Energy needs for lighting can be reduced even more by using sensors. Hallways, bathrooms, common areas, and the units themselves do not need to be illuminated 24/7. Most users are not in their units for a long time. Setting a timer to 15 minutes provides ample time to get in, pick up what they need, and leave. Motion sensors for lighting don't cost much, are money-saving, and a security feature. This makes them an attractive potential selling point to your customers. Even exterior lights that cannot be sensor-controlled and stay on all night, again for security reasons, can become cheaper to operate with modern light bulbs. To increase the ROI of such an investment, check with the municipality, utility vendors, and other sources for incentive programs or rebates to upgrade to more energy-efficient light fixtures.



“LEDs are up to 80% more cost-saving than a fluorescent light bulb”

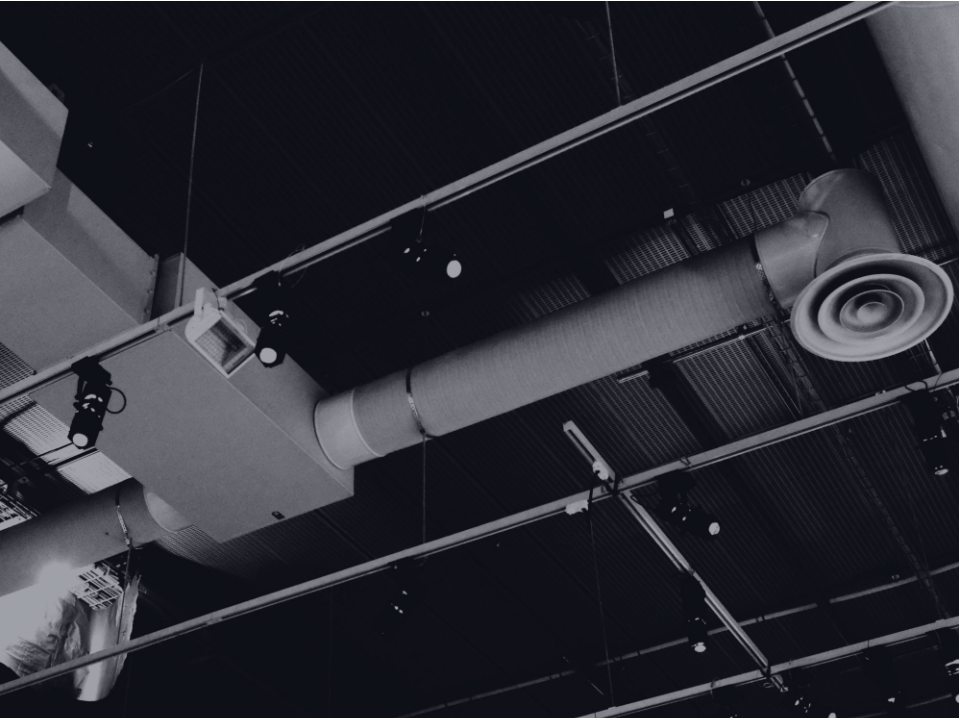
HVAC and Climate Control

As outlined earlier, self-storage per unit's monthly energy bill can increase by 30–35% if the build has unit is climate-controlled units. Globally, AC makes up 37% of energy consumption and is a driver of both the boom in energy demand and growing carbon emissions. By contrast, the previously discussed lighting only amounts to 7% of worldwide energy demand. (Armstrong 2020). Therefore, is it out of the question that you should find ways to make your climate control more energy efficient and less hungry in your self-storage, not only to save money but also to save the planet.

Just like with lighting, modern technology solutions make it possible to reduce the energy demand of your climate control system. Storage facilities, unlike office space, typically don't hold anything that generates heat. Keeping the temperature at 28 degrees while the humidity is between 40–60 inside the unit is a good rule of thumb for most renters.

Again, having a good Building Energy & Management System (BEMS) can make the difference between effective and ineffective rules. At the facility typical climate control

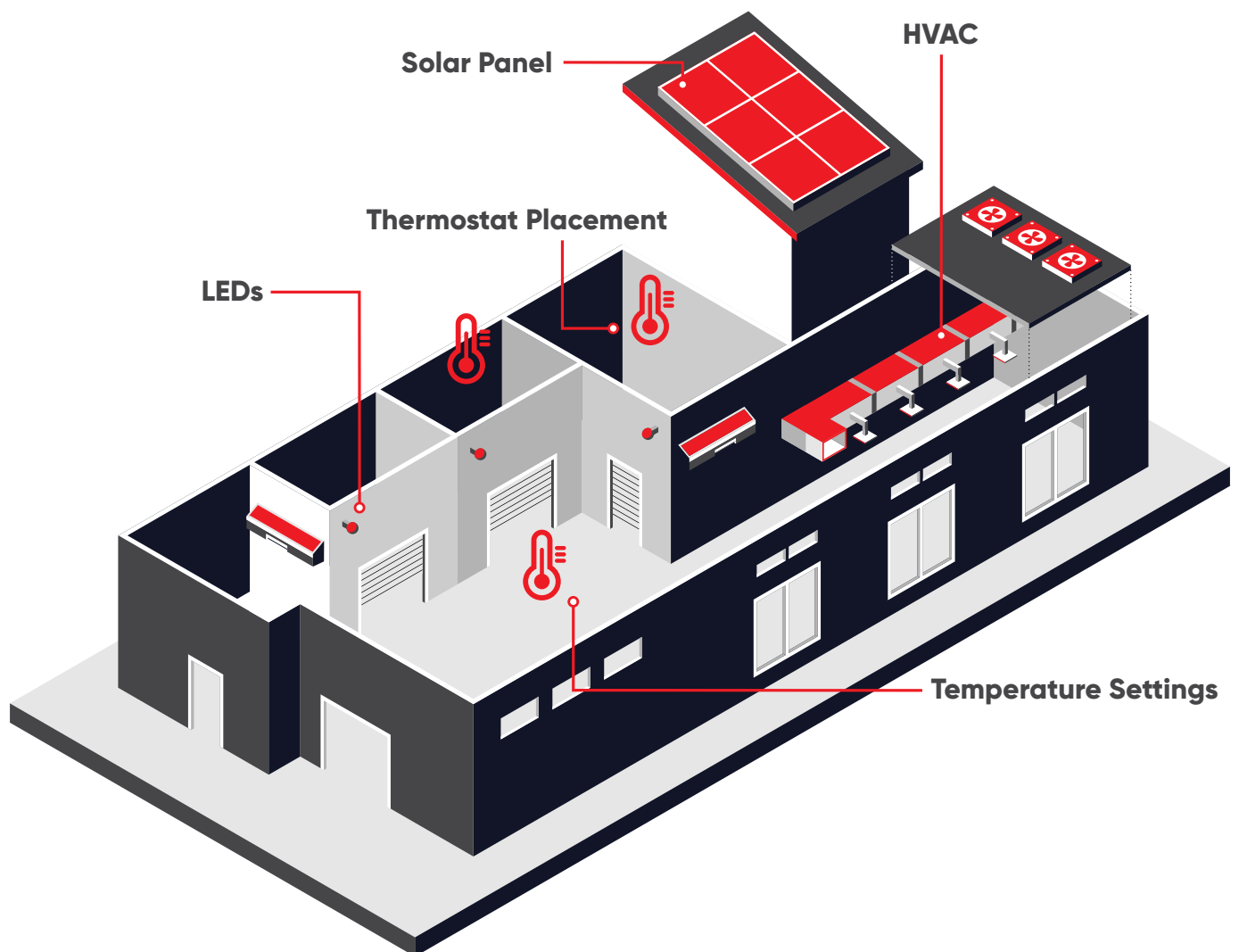
installations include air conditioning, circulating fans, exhaust fans, and dehumidification systems in high humidity areas. The combined pull at the energy grid of these systems can be substantial. Monitoring the use of the systems is essential to establish rules and policies about their use. The efficacy of savings measures depends highly on the environment and climate outside, the quality of insulation, and the usage patterns of the facility. Knowing your consumption patterns makes it possible to avoid or reduce peak demand charges, which will translate into a sizable saving on your monthly electricity bill. A high-performance HVAC system paired with an energy-efficient building design can reduce annual energy costs by 30% and pay off in three to five years. The recommendation is to have fiberglass insulation on the roof and walls of the storage and sealed and insulated heating and cooling ducts to improve efficiency by 20% or more (Gerathy, 2016). Even without a power management system, savings on energy costs for climate control and HVAC can be achieved by implementing the following measures.



"an energy-efficient building design can reduce annual energy costs by 30% and pay off in three to five years."

Desiccant Wheel Dehumidification Systems are a leading technology to keep humidity levels acceptable for storing personal belongings, such as documents, furniture, electronics, clothes, and others. Reducing the humidity also lowers the perceived temperature. If a unit does not have to be climate controlled, merely lowering the humidity to around 50% can positively impact the renter's stored items and comfort level. Changing the fans to run 10 minutes every hour, instead of 24/7 (if local regulations allow), will save a lot of energy, as they have powerful and hungry motors. It is unlikely that clients will be in the facility all the time, so CO2 concentration should not become a problem. Similarly, it is possible to achieve savings by running only 50% of your AC units at any given time.

AC and HVAC maintenance is another, sometimes overlooked area of potential savings. It is recommended to buy an HVAC system with a higher Seasonal Energy Efficiency rating. Such a system will be more effective and result in savings of up to 40%, as a recommendation of the US Department of Energy states. Regularly changing filters and preventive maintenance of the HVAC system can add another 10-40% of savings depending on the measures (Kerr, 2019).



Even the temperature settings of the thermostat can have a positive impact on your monthly bill. If the aim is to keep the facility at around 28 degrees Celsius, it makes sense to turn on the AC when it reaches 29 degrees Celsius and let it drop to 26 degrees Celsius. It will take a few hours for the temperature to rise slowly. The longer the AC can stay off, the more energy will be conserved.

It is also worth considering whether all units within the storage need to be climate controlled. In an area with a mild and overall stable climate, rooms can stay at room temperature, which is suitable for most types of stored items, without the need for too much interference and control. At such facilities, it is possible to have only a fraction of fully climate-controlled units and offer them at a premium, while temperature and humidity are left to fluctuate in the remaining units.

Solar Energy

The flat roofs of self-storage create an ideal opportunity to put solar panels. While the efficacy depends on the geographic location and sunlight hours, it is still possible to become fully or partially self-sufficient with solar power. The excess energy generated usually is stored in batteries. When those are full, it is possible to sell back to the grid, making the venture even more money-saving.

Solar power is particularly attractive for businesses in the expansion phase. Installing solar panels on a brand-new facility is easier than retrofitting an existing one. Nevertheless, the investment pays off on average within a decade in developed

countries, making it an attractive addition. Modern units generate power during cloudy days or rainy days as well. With climates across the world changing, many places experience more sunny days in a year, further increasing the power output of solar panels. Solar panels not only help cut down your monthly electricity bill but contribute to reducing the carbon emissions of self-storage. A contribution to a greener planet, which brings us to the next topic, how to improve the ROI of your investment even more.



Monetizing modernizations

The first step to further increase the returns on such investments is to make use of government incentives and tax breaks. My countries offer attractive incentives for investments in ecology-friendly technology. In 2020 the Japanese government announced plans for such funds and allocated a budget of 1 trillion JPY (Sakaguchi and Tsuji 2020). Your tax accountant should be able to advise.

But this is not the only means. Research suggests that increasingly customers are making conscious decisions towards greener consumption behavior. Recent surveys suggest that almost 40% of consumers are willing to pay a price premium of up to 5% for

eco-friendly alternatives (TOLUNA November, 1). In other words, a great way to improve the ROI of investments in better lighting, more effective HVAC or solar panels is to advertise it and monetize it. Self-storage is a very competitive industry, and differentiation is not easy - in the end, all operators compete on price and location. Adding in a greener service to the equation might tip the scale in favor of your business. Even if you decide against charging a price premium, advertising environmentally friendly facility features will open the door to a previously untapped consumer group, increasing the client base.

"Almost 40% of consumers are willing to pay a price premium of up to 5% for eco-friendly alternatives"

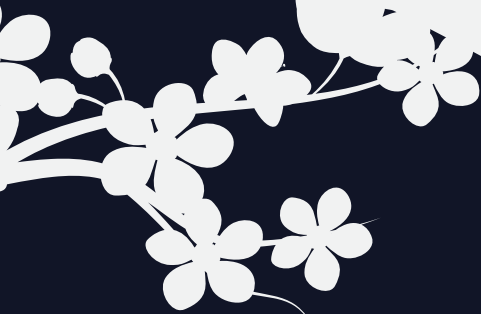


CONCLUSION :

To conclude, while energy consumption, driven mainly by the HVAC system and the lighting, can be a strain to the budget and finances, there are ways to reduce them. Installing energy monitor technology, investing in LED lamps, and regular maintenance of the HVAC system will cut costs considerably. An investment in solar panels rounds up the eco-friendly self-storage facility.

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