

HOW TO RUN A GREEN DATA CENTER



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Why have a green data center?

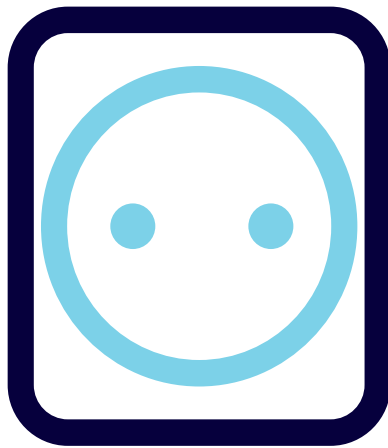
“Green” has been the color on every forward-thinking company’s mind for decades. Buzz words like “sustainability” and “environmentalism” are commonplace in the commercial arena, and corporations that present themselves as conscious of our planet’s limited resources are painted with a favorable brush in the public eye. But the movement isn’t grounded in simple PR power plays. While Mother Earth inarguably deserves our stewardship, at the heart of any business enterprise is that other type of green: the almighty ROI.

With services in existing building commissioning (EBCx) and Energy Star certification, sys-tek helps companies reduce their carbon footprint while simultaneously improving their bottom line. With 18 years’ experience in existing building commissioning, our commissioning agents are experts at identifying and diagnosing operational inefficiencies in data centers and other mission-critical facilities.



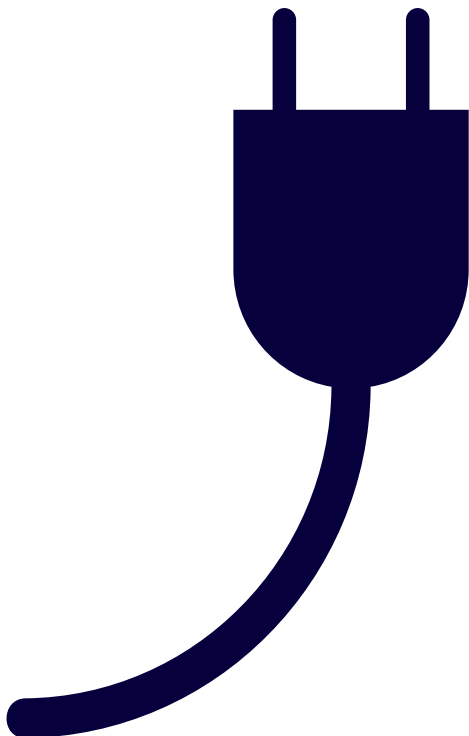
Having a green data center is another way of saying that you're using lean, mean, energy-efficient machines. Running such a data center lets your company be frugal and go further with less: the true exemplification of efficiency. Six percent off an energy bill here and another 4 percent there may not seem like much, but you might be surprised at how much you can slice off your energy bill with a few simple, economical fixes. Tech behemoths like Google, Facebook, Microsoft and Apple scrupulously keep their fingers on the pulse of their data centers for a reason, and are experiencing significant savings just by paying close attention and reacting responsibly.

As a decision-maker in your own business, it's important to realize that energy consumption isn't set at a static cost, but is a commodity fluctuating in value like any other market resource. When looked at comparatively, data centers are huge energy vacuums compared to standard office space, eating up as much as 40 times as much juice, according to a study by Lawrence Berkeley National Laboratories.



The best practices provided in this guide aren't intended as a be-all, end-all solution to eternally shrinking the overhead associated with your data center, but can provide you with a springboard for understanding (and diminishing) your energy bill.

For more information on cutting energy costs, contact **sys-tek**. Our existing building commissioning services can help reduce costs both directly and indirectly by cutting energy expenditure, eliminating wasted energy, extending equipment life, and reducing maintenance visits.





ways to run a greener data center

1. Get to know your data center

That which gets measured gets managed. It's impossible to know if you're appropriately spending (or verifiably decreasing) the amount of energy you're using without keeping close tabs on consumption rates.

On the most basic level, you should be reviewing your monthly electric bill. Read between the lines. What's it telling you? How much is it fluctuating month to month? Experiment with the layout and usage of your hardware and see how it affects your bill. Electrical equipment should also be regularly checked to make sure it isn't running wildly under or overcapacity. It's significantly easier to find and size servers that fit your needs than to consolidate servers that are already installed but being under-utilized.

To delve even deeper into your energy usage rates, have automated metering and reporting for electrical circuits on a smaller, more defined scale – per rack, application, or even individual unit if possible (check out the Kill A Watt, a plug-in device that painlessly gives you insight into just this). Such analysis gives more specific information than one lump, monthly bill and helps you segregate the big wasters from the lesser evils. And if you don't like the stats you're seeing, consider looking into upgrading to more efficient machines.

When shopping around, thoroughly assess the viability of your options before making a purchase. Sure, you'll be dropping a fair amount of money on new technology that doesn't necessarily make the old completely obsolete, but look at it as an investment. There will come a time, maybe even within the next year, that the fresh hardware will have paid for itself via carving out a chunk of your monthly bill.

Finally, measure consumption as frequently as you can for as long as you can. Google, for example, analyzes the effectiveness of each watt put into its servers on a second-by-second basis, and thus maintains some of the most efficient data centers of any Fortune 500 company. Avoid periodic snapshots of information – they can poorly represent the data and therefore be misleading.

One of the most fastidious ways to measure consumption over time is the Trailing Twelve Months (TTM) system, a design borrowed from the finance world. In it, reports are calculated based upon the last 12 months in full, rather than monthly or quarterly reports. This allows the information to avoid being skewed by seasonal blips or random fluctuations. TTM requires devout record-keeping and unrelenting vigilance to enforce, but the eye-opening data it provides about your energy trends and usage often makes it worth it.



2. Assess and direct air currents

The predominant way of maintaining a functional, safe temperature for a data center is by managing the passage of hot and cold air. When hot air is created by servers, it needs to be methodically siphoned away to allow cooled air to take its place. In addition, care needs to be taken to make sure the hot air doesn't unduly mix with the cold, nullifying the circulation process.

Heat mapping is the most accurate way of studying exactly if and where this is happening. This three-dimensional rendering lets you visualize exactly how air is flowing in, through and around the machines and clearly illustrates where problems subsist by color-coding space within the room. Fixing air breaches can be extremely inexpensive – the task could be as easy as installing some curtains or sheet metal to better guide the channels of air.

3. Allow higher temps in the server room

Data centers are naturally sources of thermal energy. From electrical currents to lasers to the very cooling fans themselves, almost everything associated with the machines generates some amount of heat.

Since data centers usually aren't segregated into their own standalone complexes, we have a natural tendency to want to cool them uniformly with the standard office work area they adjoin. However, allowing the station to run at a slightly higher temperature – say 80 degrees instead of the socially sanctioned office protocol of 72 – saves greatly on cooling costs. Just be aware at what temperature the room can top out at before being a hazard to the hardware, though this cautionary cutoff point is usually surprisingly warm.

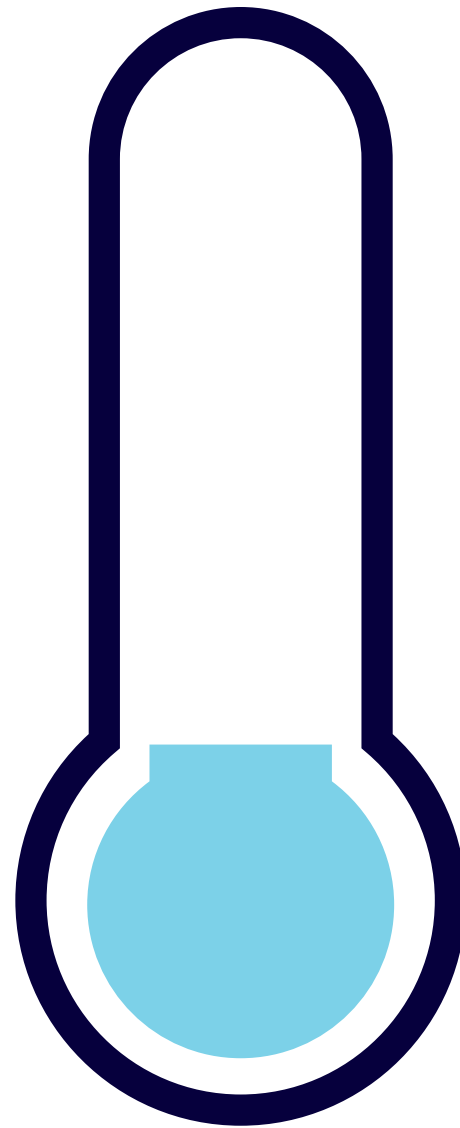
4. Utilize avenues of free cooling

Look to the outdoor environment for a natural solution to overheating. Rather than air-conditioning indoor air, consider using the colder ambient air from outdoors to let Mother Nature do the job. Evaporative coolers, also known as desert coolers or wet air coolers, are another extremely cost-effective option.

Time for a quick chemistry lesson. The evaporation of water is an endothermic reaction, meaning it requires energy to transition from liquid to gas. The energy used in this process is thermal, meaning the evaporation causes the temperature around the water vapor to drop. This premise is also why we sweat. Water droplets on our warm skin quickly evaporate, helping our body to drop in temperature when we exercise.

Evaporative coolers are basically reaping the benefits of sweating all over the data centers they function in. Water can be accumulated from any nearby water source, such as rainwater, a river or a standing body of water.

Evaporative coolers also have an extra component to them that makes them especially “green.” For every one gallon of water used for evaporative cooling, two gallons of water can be saved on the energy production side. Depending on the size and level of cooling needed at your data center, this could equate to thousands of gallons of fresh water saved every year.



5. Avoid superfluous server capacity

Given the tendency of IT departments to err on the side of caution and have too much hardware rather than too little, an excess of devices in the data center unfortunately becomes the norm. It's recommended to scale the operational size of your data center in deliberate, pre-planned steps.

Have a multitude of expansion plans in place in order to accommodate growth as it happens, and have contingency plans for both rapid and slow growth rates. While a surplus of buzzing machines may help your financial forecasters sleep better at night, it directly elevates your day-to-day costs and unnecessarily balloons the energy bill.



6. Optimize the routes of power distribution

The typical data center operates by connecting disjointed stations that aren't necessarily configured to seamlessly transfer power between one another. For example, a data center might receive an initial AC charge, then transfer it to DC to pass through a battery terminal. From here, it inverts it back to AC, then sends the signal to the server, where it is finally inverted to DC yet again for regular use. That's a whopping three conversions just for normal, day-to-day function. Instead, the battery could be brought directly on-board the server itself, negating the need for so many inversions. Such a simplification slims the process down to just a single switch between current types.

The take-home message here is that the data center needs to be picked through with a fine-tooth comb for ways to innovate. Start with a holistic understanding of your goal and work backwards. There are literally infinite ways in which routes of power distribution can be hampered, misdirected or overloaded, and it's up to you and your team to sniff and sift them out.

Contact sys-tek today for a free data center assessment and learn how to make your facility greener through existing building commissioning.

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