

TECHNICAL BRIEF

Driving to Green Energy

Challenge

Inefficient energy practices are impacting data center budgetary spending.

At Stake

Energy-efficient methods can save data centers money while providing a road map for incorporating renewable energy into their environment.

Solution

By making a concerted effort to set up an energy conservation strategy, you can help your data center save money as well as the planet.

There's a big difference between renewable and efficient energy. When people talk about renewable energy, they mean resources such as solar or wind power that help lower the world's carbon footprint. Efficient energy is about conservation, which helps save money and the planet.

The best energy scenario involves wise planning for both. "Today, it can be expensive to use renewable energy. But if you combine that with operating your facilities as efficiently as possible, then it makes for a good policy," said Bill Gast, Director of Global Data Center Energy Efficiency at CenturyLink.

Any plan for updating your energy policies must begin with reducing your current energy usage. Data center power conservation can start with a few simple steps, such as swapping incandescent bulbs for LED bulbs that last longer and use less energy. Exploring these types of best practices first will give data center managers a true sense of current power usage effectiveness (PUE) before building a road map toward the future.

The following topics outline areas within the data center to explore when making decisions about energy efficiency.

Water Conservation

You would think that using less water in a data center would be more energy efficient. While that is true sometimes, it is not true all of the time. Using less water for cooling in many instances consumes more energy. For example, nuclear, coal, and natural gas power plants that supply energy require a lot of water for cooling. They also generate a lot of transmission inefficiencies when generating power. As a result, reducing water at the

data center level actually can cause the power plant to work harder. Not all local, country, state, or federal regulations take into account the physical consequences of water conservation downstream. The truth is there's a trade-off. The challenge is finding the middle ground that uses the least amount of water overall, saving you money while minimizing the amount of energy used.

AC DC

Data centers use multiple large uninterruptible power supply (UPS) battery sources. "Because of our redundancy requirements, we have to use a lot of them," said Gast. "And if they are not fully loaded, they tend to be less efficient." To optimize these power sources requires maximizing their loads. But that's only part of the story.

Traditional data center designs use alternating current (AC) UPS technology that gets converted to direct current (DC) UPS technology to charge the UPS battery and remove power anomalies. The current then gets converted back to AC power. "Each conversion tends to cost data centers a lot of money," points out Gast. Depending on how your data center is set up, you could convert your facility from AC to DC, eliminating these

inefficiencies. When designing a data center, this is an important fact to consider. When converting a data center, there's a large upfront cost but potential savings in the long run.

Another option to consider is operating your UPS in "eco mode" to bypass the AC to DC back and forth conversions. With the proper analysis and coordination, eco mode offers the potential for reducing losses in the UPS system by two to four percent. Factors to look for when choosing an eco mode include ensuring the UPS will not be exposed to substandard power quality or have a negative impact on transfer time and reliability. If chosen wisely, eco mode can be a useful tool within an environment that functions without any loss of performance.

Density

Using newer, powerful, energy efficient hardware capable of packing more computing power within a smaller space combined with packing the gear as dense as possible within the data center racks allows for the most efficient cooling. This approach complements the move toward server virtualization, which raises the utilization of the physical hardware. Virtualization

offers scalability, simplicity, and cost savings. The cost savings comes from investing in less hardware and creating higher density within each server and rack. Such optimization helps the temperature differential and reduces cooling needs. "Improving the efficiency of the IT side of the equation has a cascading effect on the entire data center," said Gast.

Build or Upgrade?

With cloud services in high demand these days, service providers are constantly looking for more capacity. The challenge is choosing the right option to address that need. Sometimes

building a new data center is the wisest decision. Other times, upgrading what you have is the best fit. "When you build, you obviously get to take advantage of the newer equipment that's

more efficient,” said Gast. “But a lot of times, companies only look at cost. If you are going to do that, you need to do your due diligence by investigating life cycle cost.”

Life cycle cost can mean many things. For example, if you run a colocation data center, you may need to accommodate different compliance standards, such as HIPAA for the healthcare industry and Sarbanes-Oxley corporate governance for financial

institutions. Accommodating these regulations can mean spending a lot more time and budget than originally expected. Building a data center targeted to specific industries could lower your life cycle cost because you can plan from the outset to include the latest energy efficiency strategies into your design. If industry compliance isn't as relevant an issue to your data center, it might be easier to focus on increasing density and lowering the PUE of your current facility.

Lowering PUE

PUE is a ratio of total energy consumption (IT load, cooling, lighting, and so on) divided by energy consumed by the IT equipment. Service providers are always looking to lower their facility's PUE. To do so requires initially getting an accurate reading of your environment. “Every one of our data center managers knows what their PUE is,” said Gast. “We work at getting that feedback on a more real time basis rather than just a monthly basis to get a more accurate reading.”

There are several different ways to measure PUE, but having it rated through the Department of Energy's energy star rating ensures certification by a professional engineer.

To lower your PUE, you should apply basic conservation measures, such as using LED lighting. If you run a colocation data center, you should also work with your customers to

help them either increase the density of their current racks or purchase high-efficiency servers. If you run your own data center, it is much easier to follow such a strategy because you don't have to rely on someone following your instructions.

After basic conservation practices comes the planning stage. This requires understanding the logistics of how and where your building was originally designed and how you want it designed. Poor logistics or planning can result in weight and size limitations that impact your options.

Because data centers can never go down, managers have to perform updates while the facility remains in operation. To ensure that nothing goes wrong during energy efficiency upgrades, managers should always plan for different contingencies.

Energy Sources

Data centers often support mission-critical business applications. As a result, they need to be up and running 24/7. To deliver such high availability requires using reliable power sources on the grid, such as fossil fuels and nuclear power. Each source has notable environmental concerns, but from a business perspective offers relatively low-cost production.

If you want to buy renewables off of the grid, you can go to your utility and pay extra to mix those resources in with your regular ones. This is a great way to lower your carbon footprint. In most instances, however, you cannot go completely off the

grid. In order to maintain tier certification for industries such as healthcare and financial, data centers must have certain redundancies and robustness in place. This necessitates service providers always having a presence on the grid.

When considering renewable energy sources, remember that there are no perfect options. Renewable energies such as wind and solar can provide intermittent production sources, but they require energy storage or pairing with an alternate source to deliver continuous power. Hydroelectric power produces no emissions but brings other concerns such as water shortages in

drought conditions and environmental impacts on fish spawning and water chemistry above and below the dam. Distributed energy generation options, such as fuel cells from Bloom Energy, help mitigate risks from power grid distribution interruptions as well as reduce carbon output. But they are not stand-alone solutions. Until we find a better solution, data centers will likely use a mix of sources for the foreseeable future.

There are also certain scenarios where a utility might reward you for using renewable energy sources. For example, you could utilize solar panels and store that energy in big banks of batteries. When summer comes and the utilities fear over-capacity issues, you would be able to use your stored solar panel to ensure you don't raise your energy demands. The utility would reward you with incentives for taking such action.

Conclusion

Every light switch, wall outlet, and piece of hardware equipment in your data center requires using energy. While you cannot control this reality, you can work on conservation practices. Using energy-efficient methods can have a minimal effect on your infrastructure but a noticeable impact on your energy bill. You can either pocket the savings or transfer them toward mixing renewable energy in with your grid sources. While renewable energy sources may currently be expensive and somewhat unreliable, advances in production technology will in time lower their cost and make them just as reliable as what is now on the grid. By planning today, you could reap even greater savings tomorrow for you and our planet.

- Investigate whether water conservation in your facility uses or saves more energy.
- Explore ways to eliminate energy conversion steps that waste energy.
- Look into virtualization and other methods for increasing the density of your facility.
- Replace your lighting with LED bulbs.
- Learn what renewable energy sources are in your area and available as possible alternative sources.

About CenturyLink Colocation Data Centers

CenturyLink Colocation gives you access to more than 60 state-of-the-art global data centers and 2 million square feet of raised floor space across North America, Europe, and Asia. Our Data Center Colocation Services enable you to easily federate your applications into other infrastructure services, including cloud and managed hosting, providing you with the platform choices, security, and availability you need to run your business.

About CenturyLink Business

CenturyLink, Inc. is the third largest telecommunications company in the United States. Headquartered in Monroe, LA, CenturyLink is an S&P 500 company and is included among the Fortune 500 list of America's largest corporations. CenturyLink Business delivers innovative private and public networking and managed services for global businesses on virtual, dedicated and colocation platforms. It is a global leader in data and voice networks, cloud infrastructure and hosted IT solutions for enterprise business customers.

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