



MORRISON HERSHFIELD

Energy Reduction Versus Data Center Performance: No Trade-off Necessary

By: Pete Ruys, AIA, ASID, Morrison Hershfield
Randy Walters, P.E., Morrison Hershfield

We all know that properly tuned automobiles obtain the best fuel economy and are better for the environment. Data centers are like cars. They are vehicles on the information highway, where poor maintenance, non-dynamic design, improper growth strategies and failed components can have them limping along with hazard lights flashing while others zoom by in the fast lane. Energy efficient data centers realize high-speed savings. Can your data center use some fuel economy improvement?

There are some very practical ways to increase efficiency and reduce energy waste in your data center. The benefits are two-fold: some extra green in the pocket, and a step in an environmentally friendly green direction. To obtain these benefits, you cannot continue to believe the following data center infrastructure myths. Re-commissioning is the single best method to disclose hidden problems, and monitoring and verification are essential for continued savings and reliability.

Myth #1: Reliability and performance will suffer if I take steps toward energy reduction.

The opposite is actually true. Properly maintained equipment operates more efficiently and is therefore more reliable. Power-frugal equipment produces less waste heat. Less stress on equipment means less breakdowns and longer life expectancy.

Myth #2: There is no significant return on investment to re-commissioning a data center.

Like driving a car for year with a bad oxygen sensor, adopting a set-it-and-forget-it mentality can cost a small fortune over time. The incremental losses in economy are cumulative. Water and air side balancing, infrared scanning, verification of design parameters and analysis of as-built or changed conditions will identify opportunities for improvement and show you where to take steps that will yield significant increases in efficiency.

Myth #3: Payback on investments should be three years or less.

Although three-year projections are appropriate for computers that rapidly become obsolete, the supporting infrastructure will garrison multiple generations of computing soldiers during its life. A 10-plus year look ahead requires a larger initial investment in superior quality equipment but yields decade-long savings and increased reliability. Such outreaching commitments add green to your profile as well as your bottom line.

Myth #4: Lowering the room temperature provides more time for orderly shut down.

This one is barely true, and the cost to benefit ratio is staggering. As an example, sub-cooling a 75 w/sf, 5,000-square-foot data center by 5 degrees Fahrenheit provides an extra 19.5 seconds for orderly shutdown. The yearly premium is roughly \$35,000! There are better insurance rates out there; money is better spent on performance upgrades.

Myth #5: Servers cannot see in the dark.

False: Servers have excellent night vision. You can safely turn out the lights. Doing so will save \$10,000 annually for the 5,000-square-foot example above. Upgrading the space with occupancy sensors to automatically turn lights off is the best way to secure these savings.

Myth #6: I can see immediate savings for improvements made.

Although most of today's equipment has built-in power monitors that allow you to see immediate results, the actual savings accrue over time. Interestingly, a watt of power reduction at the device can provide up to 2.5 watts of savings at the meter due to inefficiencies in power delivery and reductions in cooling load. Before and after comparisons should incorporate at least 12 months of data to eliminate factors such as seasonal variations.

Myth #7: DC power is for switches; AC power is for data centers.

Energy is wasted each time power is converted from AC to DC or vice versa. Reducing the number of conversions reduces energy consumption. Telecom equipment runs on DC power that is converted from the AC supply one time. Data center equipment, on the other hand, runs on power that has been converted twice, once at the UPS and then again at the server's power supply. Technically, there is not a full conversion at the UPS; however, the fact remains that each process wastes power. With advances in DC-to-DC conversion efficiencies, it appears that DC power for data centers may be next year's concept car.

Myth #8: A modular growth plan is most efficient.

The many qualifiers associated with this statement earn it the right to be called a myth. Modular, scalable solutions are effective when associated with a comprehensive growth plan, ongoing consultant involvement, monitoring and re-commissioning. As new technologies emerge, the day-one plan quickly becomes obsolete. A growth plan conceived five years ago is not valid today.

Myth #9: Air conditioning units (ACUs) adequately control humidity; no intervention is necessary.

ACUs do not know what their teammates are doing. When one ACU is humidifying, another can be dehumidifying, causing your building to drive with one foot on the gas and one on the brake. The loss is significant, at upwards of 23 kilowatts per ACU in electrical consumption alone. Widening the humidification deadband or synchronizing humidifiers within multiple ACUs is critical to eliminating this waste.

Myth #10: There's no such thing as a free lunch.

In addition to the practical techniques provided above, feel free to partake of the following low-hanging fruit.

1. Turn the thermostat up to 78 degrees Fahrenheit (assuming proper airflow and no hot spots exist).
2. Leave the hot aisles hot. Do not divert cold air where it was never intended to go.
3. Implement network optimization techniques.
4. Unplug any servers or other equipment that are no longer in use.
5. Install energy monitoring devices and threshold alarms.

With standard site monitoring, the check engine light may never come on. So unless your eyes are focused firmly on the dashboard, you can expect a breakdown. While there is no simple, single windfall solution, the cumulative effects of strategic changes can reduce your energy costs significantly. We sincerely hope that this has clarified all myth-understandings.

