What is DOE announcing today?

The U.S. Department of Energy (DOE) is expanding the Better Buildings Challenge to include data centers and is challenging owners of data centers – both public and private—to make their existing infrastructure that houses network and other data processing equipment more efficient.

More specifically, data center partners commit to improving the energy efficiency of their data centers by 20% within 10 years and to showcase one specific project. Alternatively, a partner can commit a 100 kW or greater data center and commit to improve it by 25% within five years. Partners also commit to sharing results and the savings associated with the improvement of their data centers.

With this expansion, DOE is focused on improving efficiency of infrastructure (cooling, power supply losses) rather than installation of emerging IT systems or technologies. The opportunity for infrastructure savings is nearly 50% of the overall data center use. Said another way, for most data centers, the amount of energy used in the data processing, networking and storage equipment is as much as the energy to run the facility.

Why is the Energy Department's Better Buildings Challenge expanding to include data centers?

Data center energy use has grown rapidly in recent years and is expected to continue to grow. In 2013, U.S. data centers consumed about 100 billion kilowatt-hours of electricity, representing more than 2% of all U.S. electricity use[1].

The Better Buildings Challenge works to highlight innovative and replicable solutions from leading organizations and help further the wide-spread adoption of energy efficiency practices.

What is the savings opportunity for the nation?

If all U.S. data centers were 20% more efficient, we could save more than 20 billion kWh by 2020 as a nation. That translates to roughly $2 billion in cost savings[2].

Is 20% energy savings possible for a data center? Is it cost effective?

Data center energy consumption can be reduced 20%-40% by applying best management energy efficiency measures and strategies typically used with very attractive returns on investment and short payback periods.

Typical upgrades include aligning the servers into hot and cold aisles, managing cool air flow to the servers, supplying air to the servers within the ASHRAE recommended temperature range and optimizing cooling systems and controls. These upgrades reduce capital and operating expenses, and can pay back their investment cost within five years.

Data center partners, like other partners in the Better Buildings Challenge, commit to at least a 20% improvement across their portfolio of buildings. Given the array of (and difficulty in upgrading) small and medium data centers that are typically part of a portfolio, a 20% goal across data centers is laudable.

What is the role of Green Grid in the Better Buildings Challenge?

DOE currently has a Memorandum of Understanding with Green Grid. Green Grid is a non-profit, open industry consortium of end users, policy makers, technology providers, facility architects, and utility companies that works to improve the resource efficiency of information technology and data centers throughout the world. DOE has worked with Green Grid and other stakeholders to include data centers in the Better Buildings Challenge. DOE looks forward to working with Green Grid and other organizations interested in promoting and driving increased data center efficiency.

What is the Better Building Challenge and why is it important?

The Better Buildings Challenge is a voluntary leadership initiative led by the U.S. DOE that calls on CEOs of U.S. companies, and leaders of universities, school districts, multifamily residential organizations, and state and local governments to commit to a 20% energy savings goal in ten years across all the buildings in their portfolio. Organizations also agree to share their energy savings data and strategies as models for others to follow. In return, DOE highlights the work these leaders are doing and highlights their innovative solutions as replicable models for others to follow.

To date, more than 200 organizations, representing more than 3 billion square feet, 600 manufacturing facilities, and $2 billion worth of financial commitments have stepped up to the Better Buildings Challenge. Partners are on track to meet their energy savings goals, saving 2.5% annually for a total of $300 million since the program launched in 2011.

What kind of organizations can become data center partners in the Better Buildings Challenge?

Any organization with a portfolio of data centers or a single data center of at least 100 kW of IT load can join the Better Buildings Challenge. Both public sector and private organizations are encouraged to participate.

What does DOE offer Better Buildings Challenge Partners?

DOE will offer technical assistance and best practice implementation models to partners to encourage investment in energy efficiency. In addition, DOE will connect partners with financial, technology, and service allies that can provide best practice services for deep energy savings and guarantee transparency in results.

Who are the data center partners joining today?

Data center partners are leaders in their industry. There are 19 new partners pledging to improve the efficiency of data centers which altogether are currently consuming more than 90 megawatts of power. These partners include national laboratories, federal agencies such as EPA, DOD, SSA, and companies including CoreSite Realty Corporation, eBay, and Staples.

For a complete list of these partners, click here.

Will data center partners be installing new networks or systems to drive efficiencies beyond the building?

Data centers typically have IT refresh rates between three to five years. New IT equipment is generally more efficient than the older equipment that it replaces. DOE expects that the partners will be refreshing their IT equipment as they make improvements to the infrastructure.

Under the Better Buildings Challenge, DOE will work with data center owners on improving efficiency of infrastructure to complement the work they are doing on the installation of emerging IT systems or technologies. Half of the energy supplied to a typical data center is used in the cooling and power infrastructure.

Why now?

Data center electricity use continues to grow rapidly while overall U.S. electricity use has remained stable over the last few years. The opportunity to make energy efficiency improvements is large because the majority of owners and operator have focused on the availability and reliability of the data centers. Owners of the largest data centers providing cloud services practice energy management, but the vast majority of owners do not. Sharing and implementing existing best practices can reduce costs while increasing reliability. Typical investments in infrastructure improvements have payback periods of less than five years.

When will we see results?

Within the first year of joining, partners will share their energy performance data, and develop an energy metering plan, a showcase project and implementation model. All of these solutions will be made available on the Better Buildings Challenge website.

How are federal agencies stepping up to improve their data centers?
The federal government is leading by example. Today, seven federal agencies are committing fourteen data centers and eight of the data centers are located within DOE's national laboratories.

Current estimates are that 10 percent[3] of the federal government's electricity use goes to data centers. Federal data center partners will pilot new solutions and focus on how to reduce energy used by these data centers.

Is DOE regulating data center energy use?
No, the Better Buildings Challenge is a voluntary partnership program. Data center owners and operators that commit are doing so because it is something they want to do.

Data Center Background

What is a data center?
A data center is a repository (closet, room, floor or building) for the storage, management, and dissemination of data and information. Data centers house computer systems and associated components, such as telecommunications and storage systems.

Data centers can be small, medium, and large and set up in closets or take up an entire floor of building space. Large data centers are typically stand-alone buildings.

Who owns U.S. data centers?
The vast majority of data centers are small server rooms and closets found in a variety of buildings owned by small and medium businesses and organizations, or are located in multi-tenant data centers. Multi-tenant data centers have expanded rapidly over the last few years. The larger data centers owned by the major cloud providers and national super computer centers comprise about 8% of the server market. Some of the players in the multi-tenant data center market include household names such as Dell, HP, and IBM. Federal agencies also own data centers. These data centers represent 5 to 10%[4] of all data centers in the U.S.

How many data centers are there in the U.S.?
There are about 3 million data centers - that's 1 data center for every 100 people – located all across the country and each requires a lot of energy[5].

What are the highest priority improvements a data center owner can make?
Improving the utilization of servers, consolidating data center operations to take advantage of the efficiencies of scale, adopting integrated organizational models to increase accountability, deploying data center infrastructure management strategies to enable greater reporting and efficiency, and adopting best practices for cooling and powering data centers can all lead to significant savings.

In a typical data center, every kW saved with IT equipment can potentially result in nearly 2 kW saved in the infrastructure. Additional savings can be obtained by applying best practices such as hot and cold aisle isolation, managing airflow, and raising the temperature within the ASHRAE recommended range.

How is the efficiency of a data center measured?
The industry standard metric for data center efficiency is the Power Usage Effectiveness or PUE™. Most simply, PUE™ equals the total energy consumption of the data center divided by the energy consumption of the IT equipment.

What is PUE?
PUE™ is a measure of the effectiveness of the infrastructure, including cooling and power systems, serving the IT systems. Data centers with smaller PUEs are considered more efficient because they need less cooling.

End Notes

[1] This figure is a DOE estimate based on the 2000-2010 historical compound annual growth rate of 10.5% from the 2007 EPA report to Congress and the 2011 Koomey Report. The projection starts from the midpoint of the 2010 range of data center electricity use provided by the 2011 Koomey report. Jonathan Koomey. 2011. Growth in Data center electricity use 2005 to 2010. Oakland, CA: Analytics Press. August Report to Congress on Server and Data Center Energy Efficiency, Public Law 109-431, August 2, 2007.

[2] These figures are DOE estimates based on the 2000-2010 historical compound annual growth rate of 10.5% from the 2007 EPA Report to Congress and the 2011 Koomey Report, as well as an LBNL survey of data centers that found that on average as much electricity was used for the cooling and power as was used for the IT equipment in a data center. The 20 billion KWh represents savings in the cooling and power infrastructure due to energy efficiency improvements. The $2 billion is a conservative approximation based upon a constant cost of 10 cents per kilowatt-hour.

[3] This figure is a DOE estimate based upon an approximation contained in the 2007 EPA Report to Congress, and actual electricity data in FY 13 from the Federal agencies.

[4] 2007 EPA Report to Congress

[5] 2014 NRDC Issue Paper

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