Wireless Sensor Networks, January 2012

# FINDINGS

## Wireless Sensors Help Increase Control, Decrease Consumption

Today's data centers consume roughly two percent of all the energy used in the United States, with a significant portion of that energy going to non-IT loads, such as cooling and power conditioning. A Green Proving Ground (GPG) technology assessment suggested that wireless sensor networks could provide a cost-effective and facilities-friendly way of helping data center operators visualize and implement system changes that reduce overall energy consumption. Recently, we put that assessment to the test at the USDA's data center in Saint Louis, Missouri.

## What We Found

**50% REDUCTION IN COOLING LOAD.** Efficiency measures reduced the data center's cooling load by 50 percent, reducing total power usage by 17 percent. This represented an annual savings of 657 MWh. There was also a corresponding reduction in the data center's Power Usage Effectiveness (PUE), from 1.85 to 1.54. Its carbon footprint was reduced by 542 metric tons annually. GSA's research partner, Lawrence Berkeley National Laboratory (LBNL), projects that if this technology were adopted by tenant agencies and applied to data centers across the entire GSA portfolio, it would yield an annual decrease of 545,000 metric tons of $CO_2$.

**$62 MILLION IN ANNUAL SAVINGS.** Data center energy cost savings were calculated at $30,000 per year, based on current local utility rates. Simple payback was calculated at 3.4 years. Adoption of this technology by tenant agencies throughout the GSA portfolio would yield an estimated $62 million in taxpayer savings annually.

**AN EFFICIENT AND EFFECTIVE TOOL.** Deployment of the wireless sensor network enabled retro-commissioning and provided a tool for ongoing monitoring, benchmarking, assessing, implementing efficiency measures, and evaluating the results.

**A TEST KIT THAT DELIVERS.** Deployment of the data center's wireless sensor network required multiple interruptions of facility power, increasing both time and expense. To improve this process, LBNL, in association with the technology vendor, Synapsense, developed a wireless sensor test kit, which provides most of the full network's benefits while reducing deployment time and power interruptions. GSA will help tenant agencies acquire the test kit, providing them with an opportunity to achieve similar energy savings with non-intrusive/non-interruptive equipment.

*"By most standards, this data center is an efficient facility. The fact that a wireless sensor network helped it significantly reduce its energy profile speaks volumes for the technology."*

RON JONES
Facility Manager
Office of the Chief Information Officer
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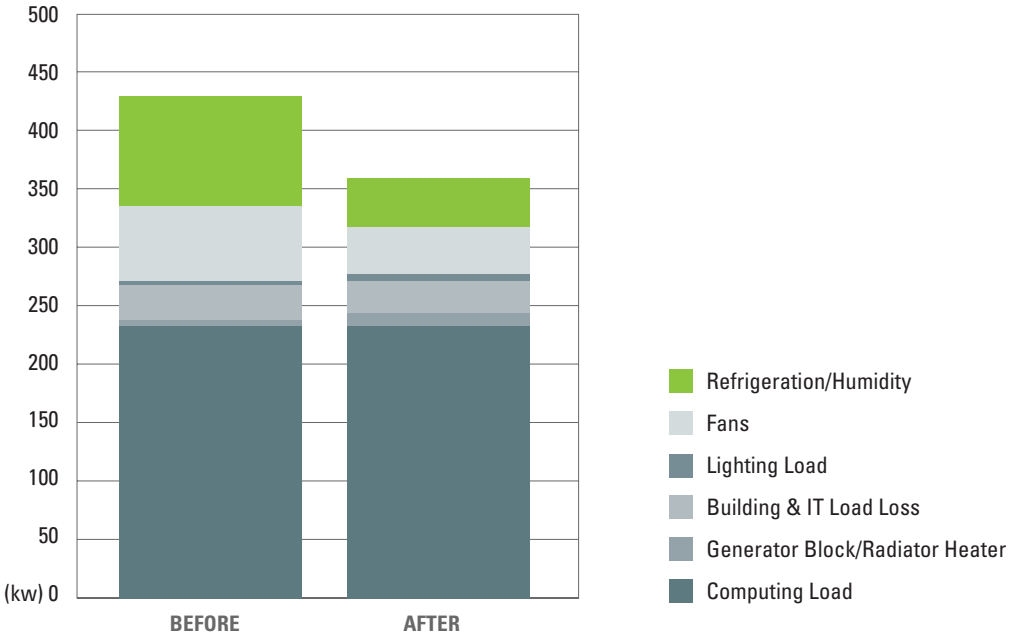
GPG
Green Proving Ground Program

**The Green Proving Ground program leverages GSA's real estate portfolio to evaluate innovative sustainable building technologies. The program aims to drive innovation in environmental performance in federal buildings and help lead market transformation through deployment of new technologies.**

## DATA CENTER POWER USAGE DISTRIBUTION

**50% Cooling Load Reduction, 17% Overall Data Center Energy Reduction**




## What We Did

GSA's Green Proving Ground program commissioned LBNL to deploy a self-configuring network of wireless sensors in a demonstration facility at the USDA's state-of-the-art data center in St. Louis, Missouri. During the baseline testing period, in June of 2010, the network gauged recirculation and by-pass air mixing, cooling system efficiency, and adherence to IT equipment thermal-operational ranges recommended by ASHRAE. The assessment also established the center's baseline energy utilization and identified energy efficiency measures and their potential energy savings benefit. Subsequently, LBNL implemented air-flow-management and cooling-efficiency changes based on their analysis of the wireless sensor network data.

## What You Can Do

To address the federal share of data center energy usage, OMB is requiring agencies to consolidate data centers and in some cases move to cloud-based solutions. Remaining facilities must achieve significant energy savings through best practices. By comprehensively understanding the real-time performance of data centers, through technology such as the wireless test kit developed as part of this Green Proving Ground project, federal agencies can meet mandated efficiency targets. For more information, contact Chris Cockrill (chris.cockrill@gsa.gov), GSA Energy Program Manager, Sustainability Branch.

*"Wireless Sensor Network for GSA Data Centers Monitoring," the full LBNL report on which these Findings are based, is available from the Green Proving Ground program website, www.gsa.gov/gpg.*