



ENERGY STAR CASE STUDY

Energy Star Master Plan – for U.S. Department of Interior large Facility and Regional Data Center

When the U. S. Government makes major purchasing decisions about consolidating large facilities that contain data centers from several to few or one they rely on expertise of a knowledgeable and qualified Energy Management Consultant, such as StellCo Incorporated. Choosing the most efficient facility has significant impact on the agencies overall electricity consumption, manpower, services contracts and other recurring facility expenditures. The ENERGY STAR Master Plan Program was set up to unite energy expertise with facilities management IT support requirements to baseline and encourage the use of more energy-efficient buildings, equipment's, and operational protocols to reduce electricity consumption and reduce greenhouse gas emissions and multiple-redundant facility carbon footprints that contribute to so-called/highly debatable climate change.

About ENERGY STAR®

The international ENERGY STAR symbol is a simple way for consumers to identify products that are among the most energy-efficient on the market. Only manufacturers and retailers whose products meet the ENERGY STAR criteria can label their products with this symbol. In Canada, Natural Resources Canada's Office of Energy Efficiency administers and pro-motes the international ENERGY STAR symbol for a wide range of energy-using products.

Look for the ENERGY STAR symbol on product packaging, in product literature and advertising and on products themselves. Ask your local retailer to help you identify products that qualify for the ENERGY STAR symbol so you can begin saving energy and money.



Opportunities for Savings - The USGS site opened in the early 1970's as the largest mainframe computer in South Dakota. It currently houses one of the largest computer complexes in the Government. With approximately 600 employees and as the center expands its operations through consolidation from other sites the improved kilowatt consumption path is capacity and performance of the electrical, mechanical and IT systems. The primary constraint for expansion is the electrical system, followed by the mechanical system, and finally by

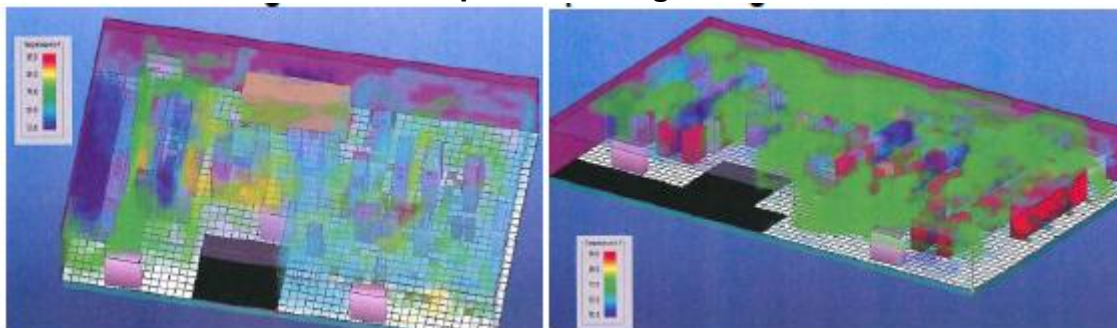


the space requirement of expanded IT systems. The electrical system consists of the generators, uninterruptable power sources (UPS), and power density. The mechanical systems are rated by cooling load, and the IT systems are rated by processing capability and storage capacity. The capacity of the center IT systems is roughly 400 servers, and storage systems capable of storing near 4 petabytes (PB), with most at 20%-60% utilization, due to the confines of the project structure.

StellCo Response, Government Goals with Significant Gains – Understanding customer goals and compliance objectives is our job as an Energy Management Services Consultancy. We understand how the government makes decisions which are critical to getting capital projects approved. An Environmental Protection Agency (EPA) study entitled Benefits of Energy Star Labelled Office Buildings was based on data from over 300 Energy Star Label completed projects. A summary of the study concluded that Energy Star-labelled office buildings are one-third more energy efficient than average US office buildings. With energy bills on average at least \$0.50 lower per year per square foot, or 35% lower than the average building. Moreover, by the sixth year these buildings were determined to be 20% more efficient than the first year labelled. Data suggests that buildings that focus on measuring their performance get even more efficient over time. In addition to operational and maintenance costs, other benefits includes greater personnel comfort, longer occupancy, higher property values and reduced exposure to volatile energy prices.

Performing ENERGY STAR MASTER PLAN Studies & Analyses - StellCo identified huge potential for electricity savings. Solutions include ENERGY STAR qualified products although they represent a small percentage of the recommended corrective actions. In order to achieve the Tier 2 data center goal, reliability was also addressed. The mechanical system and IT systems are sufficient for the Tier 2 rating, but the electrical systems needed to have several single point failures removed. The removal of the single point failures will be accomplished through the redesign of the electrical system and is outlined in the master plan. All federal facilities are directed to increase energy efficiency through application of national laws and executive orders. Efficiency also makes fiscal sense, and can help justify changes that need to be made to a facility and systems. Through use of our Computation Fluid Dynamics (CFD) software we were able to identify no/low cost efficiencies for the center’s computer room, mechanical and electrical systems reducing the need for additional infrastructure. Allowing the center to do more with less and allowing the center to operate with lower energy costs.

CFD Temperature “Fog” Models





Program Success and the Path Forward – StellCo results and facility construction estimates include a wide range of recommendation and assessments. Systems were determined to be using an average amount of power for operation, with a Power Usage Effectiveness (PUE) rating of 2.1. By following StellCo master plan recommendations, USGS will be able to reduce PUE rating by over 40%. The efficiency of the IT systems were evaluated and recommended to upgrade to Energy Star. The changes will reduce the energy usage of the data center by 45%-80%, over the life of the servers and data storage devices. The master plan and construction costs will help the USGS in the following ways:

- Understand and bench of existing kilowatt consumption and capabilities, future growth performance metrics, and future opportunities for life-cycle savings.
- Increased total capacity of servers and data storage by 246%; 157 racks to 387 racks (230 racks).
- Increase the center from a Tier 1 to Tier 2 reliability.
- Reduce total projected energy usage of the center by 63%, saving over \$480,000 annually,
 - ✓ Projected direct Electrical energy use drops 52%, saving over \$200,000 annually.
 - ✓ Projected Mechanical energy use drops 73%, saving over \$280,000 annually.
 - ✓ This would only occur if the data center was built out to the maximum racks at the current average kW/rack to accommodate site(s) consolidation to this site, cloud utilization and cyber security improvements.
 - ✓ Additional Cost Savings due to avoided purchases and optimized rack placement,
 - Mechanical - \$1.18M (Annualized over 20 years: \$59,000 annually)
 - Electrical – \$3.2M (Annualized over 20 years: \$160,000 annually)

Highly specialized physical LEED-AP and internal IT data center, electrical and mechanical auditing procedures were utilized. Projected savings are based on extrapolation of the current data. If the proposed expansion of computing capacity and personnel is increased as proposed with proper incorporation of recommendations provided the additional cost in energy to power and cooling of increased IT load and facility consumption would be over \$600,000 annually.

For future Energy Savings Performance Contracts (ESCO), StellCo Incorporated performs as a GSA Prime Contractor, as a subcontractor to major systems integrators (SI's), and with other teaming partners where our SME's are required.

Contact for StellCo Incorporated ENERGY STAR Program

Mr. Joe Whittington, B.S.I.E., P.E. University of Maryland, College Park, MD, Director Information Technology & Energy Management Services
1085 Willamette Falls Drive
West Linn, OR 97068
Tel.: (503) 655-0864
E-mail: joew@stellcoinc.com
Web site: www.stellcoinc.com
Case Study Release - DEC 2011

