White Paper

Leveraging Rapid Energy Model-Enabled Energy Audits and Benchmarking in identifying and quantifying energy savings opportunities in Building Maintenance and Operations

Prepared for U.S. General Services Administration Federal Acquisition Service (FAS) Potential Federal Strategic Sourcing Initiative (FSSI) Building Maintenance and Operations (BMO)

Energy efficiency represents a massive economic and environmental opportunity across GSA's portfolio, but identifying and evaluating specific savings measures has traditionally been a slow, costly process. New advances in analytics and rapid energy modeling, however, are dramatically lowering the time and expense of energy audits, which the GSA acknowledges it must do to comply with requirements and meet its energy savings initiatives.

The initial list of suggested Building Maintenance and Operations (BMO) Best Practices provided in the Request for Information is diverse, yet represents a sampling of the possible energy savings in the broad BMO field. Based on the large variations in building use-type, occupancy patterns, and climate zones, a comprehensive list that would include all possible energy savings possibilities would not be cost effective to prescribe or maintain. The key to identifying best practices specific to a building, a campus, or a region is the ability to swiftly perform complex analyses utilizing only the most essential, readily-available data elements; for example fuel types, building use types, occupancy and operational hours, hyper-location-specific climate data, and high level information on end-use systems. Traditional approaches to such analysis are more costly because they involve numerous

Best Practices Menu	Description of Best Practice
Rapid Energy Model-Enabled Energy Audits and Benchmarking	• Cost effective alternative to fulfill the audit component of Comprehensive Energy and Water Evaluations required for EISA 2007 compliance at 50-80% less cost than traditional methods • Transparent, consistent, and comprehensive building evaluation using physics-based energy modeling typically reserved only for large projects • Streamlined audits and benchmarking with as little as 15 data points dependent on building needs • Dynamic energy model of the building that serves as an asset for future evaluations

hours of on-site assessment and documentation of every asset in a building by energy engineers.

Rapid energy model-enabled energy audit and benchmarking software leverages the skills and knowledge of the energy engineer to identify the appropriate inputs for each building, and then analyzes building data with a physics-based energy model that can evaluate thousands of potential Energy Conservation Measures (ECMs) in minutes. With this approach, each building can be analyzed quickly, yielding easy to interpret energy and water benchmarking and performance indices, along with a list of ECMs and savings potential. On-site or remotely, the energy engineer can refine the inferences with additional known asset data, creating an ever more sophisticated model of each building and ever more precise measure recommendations. For example, the most cost effective measures can be refined as additional equipment is gathered. At the click of a button comprehensive, standardized reports which meet ASHRAE Level 1, 2, or 3 standards can be created which outline customized criteria such as simple payback, life cycle cost, energy and water intensity costs, CO2 emissions, LEED points, incentives and rebates, or ENERGY STAR score.

All of the current listed best practices pertaining to energy use would result in savings if implemented and tracked properly, but all present hurdles during both the implementation and persistence stages and may or may not be the best opportunities for all buildings. Advanced power strips, for example, have shown varying levels of energy savings based on technology used, areas served, and occupant acceptance. Similarly, the best practices involving seasonal building temperature controls and boiler settings would require investigation into the optimal settings based on system type, building occupancy, and schedule, and should provide a means to monitor manual overrides and set point changes, which can reduce the realization of actual energy savings from what is projected. Optimal hot water set points are dependent on original system design conditions and equipment efficiency, and implementing a rigid, single temperature requirement for all facilities in a portfolio may not result in the expected energy savings or system performance. By utilizing rapid energy model-enabled energy audit and benchmarking software, buildings can be identified, or ruled out, as potential candidates for these and thousands of additional measures to ensure that the additional time and cost associated with investigation, implementation, and follow up is best applied. By leveraging software, the energy engineer spends less time in each building, focusing on only the most critical aspects of that building. The result is the best measure recommendations for each building manager at a lower cost. Users of this software have repeatedly reported time and cost savings of up to 80%. This could translate into tens of thousands of dollars per building audited.

Rapid energy model-enabled energy audits and benchmarking utilizes an iterative and efficient process of refinement and tuning with advanced energy modeling techniques and sound building science to combine collected building asset data inputs with detailed statistically-derived inferences to quickly develop an 8,760 hourly thermodynamic energy model of the building that can be calibrated to actual building energy use. The use of a software-enhanced solution allows users to capitalize on a database of tens of thousands of previously-audited buildings. This robust database helps the software to make accurate deductions about the energy-using equipment, systems, and subsystems of the building when such

information is not readily available or when a higher level assessment is desired for cost considerations. These inferences are completely transparent to the user and can be modified as more of the building's asset data and actual energy and water consumption data, along with corresponding hyper-local weather data, are incorporated.

Section 432 of the Energy Independence and Security Act of 2007 (EISA 2007) requires federal agencies to conduct comprehensive energy and water evaluations on covered facilities once every four years. Although the law was written before rapid energy model-enabled energy audits and benchmarking were commercially readily available, a software-enhanced assessment coupled with engineering know-how can accomplish all of the required components of the comprehensive audit, reducing the number of costly on-site hours required. The initial assessment output is used to help identify the best candidate measures for BMO staff to implement to meet the statutory energy performance requirement for federal agencies to reduce building energy intensity by 30 percent in 2015, relative to fiscal year 2003 (42 U.S.C. 8253 subsection (a); reduction goal).

The resultant reports from rapid energy model-enabled energy audits include detailed ECM information, including narrative descriptions, measure costs, savings, and simple payback. Building energy use baselines are established and can be continuously monitored with implemented ECMs identified in timelines, easily allowing the impact to be quantified and tracked. Information from this follow up will allow the user to determine the effectiveness of the implemented ECMs to identify the strongest ECM candidates for portfolio wide implementation.

Rapid energy model-enabled energy audits and benchmarking is a powerful initial screening tool for facility energy managers and maintenance staff to quickly visualize their building's performance, to prioritize the direction of limited maintenance resources to areas with the greatest savings potential, and to track post-implementation performance in an easy to use, standardized format, at a cost that is significantly reduced from traditional on-site audits. As a stand-alone best practice, the GSA could fully outline the level of inputs required, systems to be audited, and ECM package prioritization. These services would be suitable for a government-wide implementation with a consistent report and data presentation across criteria such as varying regions, building use types, building energy and water consumption, and square footage.

For more information contact:

Natalia Camblor, CEM, EBCP, CBCP, Senior Project Engineer: SCS Engineers

Kevin Splain, LEED AP, QCxP, Mechanical/ Controls Engineer: SCS Engineers

Allison Bially, Director, Sales: Retroficiency

www.scsengineers.com

www.retroficiency.com