Scientific Conservation™

Written Testimony of
Scientific Conservation

Before the High Performance Building Council,
National Institute of Building Sciences

Re: Data Needs to Achieve High Performance Buildings

Building Sector: Software, Vendors and Manufacturers

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Background on Scientific Conservation

Scientific Conservation (SCI) provides predictive diagnostics, fault detection and analytics for the commercial building space, driving next-generation energy management and predictive maintenance solutions to public sector, commercial and retail buildings. SCI drives energy efficiency by addressing the source of persistent problems – the complex, expensive energy systems in commercial buildings.

SCI's pioneering software-as-a-service platform, SCIwatch, manages every key facet of a building's operations and energy usage by enabling facility managers and engineers to prioritize needs, and act accordingly based on streaming diagnostics. Rather than facility managers manually searching for usual breakdowns after a problem occurs, SCIwatch instantly informs key stakeholders when and where potential failures could occur. This is done by automatically, continuously predicting and identifying anomalies and potential faults for all assets. Stakeholders are always aware of the performance and maintenance status of their building systems. With action items prioritized by cost savings and/or risk to operations, our customers then proactively clear detected faults to optimize systems and reduce spend.

Current State of Green Buildings

Current political, economic, regulatory and investment climates have created a perfect storm of opportunities for the development and advancement of new green buildings now and well into the future. Energy efficiency and environmental sustainability movements are taking hold worldwide. This includes bi-partisan support within the U.S. Government over the last few years. The Energy Independence Security Act of 2007 calls for the complete transformation of the commercial buildings sector to Net-Zero by 2050. In February 2011, President Barack Obama announced Better Buildings, a green building initiative aimed at improving energy efficiency in commercial buildings and persuading private businesses to invest in retrofitting existing facilities by offering tax incentives for efficiency programs.

Building codes and standards are being re-written and/or developed all over the world, driven by rating systems, such as:

Leadership in Energy and Environmental Design (LEED®) developed by the U.S. Green Building Council (USGBC). This standard is rapidly expanding internationally
Building Research Establishment Environmental Assessment Method (BREEAM) in the United Kingdom
National Australian Built Environment Rating System (NABERS)
Comprehensive Assessment System for Built Environment Efficiency (CASBEE) in Japan

Government legislation now mandates public disclosure of energy consumption for commercial buildings in the United Kingdom, Australia, Japan and the U.S. cities of San Francisco and New York. Combined with a growing number of incentives, funding sources, financing vehicles and general interest and demand for more sustainable work environments, investments in energy efficiency and green buildings are increasing. With this, there is an ever increasing demand for greater visibility and transparency into buildings' energy usage, providing granular and actionable data for stakeholders.

SCI's Data Needs and Data Output

One of the fastest growing energy-smart technologies today actually stems from a data solution that is decades old: Building Automation Systems (BAS; interchangeable with Building Management Systems or BMS). With the advent of what Pike Research describes as "Building Energy Management Solutions," all buildings – from older buildings with pneumatic or low-voltage controls to buildings with newer BAS products – are becoming capable of providing increasing amounts of digital data that can become the cornerstone of intelligent, advanced energy management and maintenance strategies. These include:

Automated fault detection diagnostics
Integrated, whole-building optimization
Transformation of portfolio-wide maintenance, repair and operations
Smart grid and intelligent demand response programs
Informed capital planning based on real data

For buildings that have a BAS, new technologies enable advanced data aggregation, automated continuous analytics and reliable cost management aligned with the goals, policies, objectives and resources of building owners. Today, building owners can derive far more value from a BAS than they ever could before.

With the ability to meaningfully interpret data from a BAS, SCI delivers data beyond meters to the equipment / asset level of a building. SCI uses existing building data more effectively through our flagship product SCIwatch. SCIwatch is a scalable energy and maintenance management solution that interfaces remotely with building systems and assets through the BAS. On a daily basis, operational problems causing energy waste, risk to equipment life and issues with occupant comfort are identified through automated analyses of utility meter and sub-meter interval data, BAS trend logs (time-series data) using heuristic engineering calculations and machine learning algorithms. The resulting faults can be viewed using a Web browser and managed through a built-in work order ticketing system. Faults are monetized according to their excess energy cost and prioritized for resolution by maintenance staff or third-party service providers.

Details necessary to configure SCIwatch are collected through on-line collaboration, and utility meter and sub-meter data, weather data and trend logs (time-series data) are collected automatically on a continuous basis.

Specifically, the following data elements are collected from customer sites to enable SCIwatch:

- General building information, including description, type, square footage, year of construction and utility rate schedules.
- 24 months of utility billing history (automated link to Energy Star Portfolio Manager) and hourly weather data (automated link to the National Oceanographic and Atmospheric Administration or NOAA).
- Utility meter interval data (and sub-meter data) in 5, 15, 30 and/or 60-minute intervals.
- Normalizing factors, such as space condition requirements (temperature and humidity), weekly hours of operation, full-time employees (FTEs), personal computers (PCs), design lighting standards and seasonal variations.
- Make, model and features of the existing BAS, method of connectivity, other systems that collect trend logs, and a full points list.
- All available technical documentation, including as-built drawings, sequences of operation, test and balance reports, commissioning reports, previous energy audits, and preventive maintenance plan to develop a complete and detailed asset inventory.

This data is collected directly from the customer and by on-site employees or contractors. As such, SCI is both a collector and a provider of granular building energy data.

The data and the ensuing analytics are valuable for key service providers in the building industry – from financial transactions (leases/sales), utilities (rebate programs), project finance, insurance, certifications (e.g. LEED, ASHRAE), to engineers and architects looking to take the best approaches to future building systems.

Due to the volume of trend logs collected and historical recording of faults with SCIwatch, energy engineers and commissioning agents have unprecedented access to raw data needed to conduct measurement and verification (M&V) analyses of energy savings and/or fulfill reporting requirements for utility incentive programs. This rich data set can also be used for streamlining maintenance operations, providing greater precision and confidence in capital planning and overall reliability of building performance.

Recommendation

SCI recommends creating an aggregated database of not only whole building energy data, but also end-use and asset level energy data. Today, we can use CBECS data to segment the commercial building market we target, but it's not granular enough to provide actionable information. CoStar, providing commercial real estate information, is more relevant as it details specific properties, including levels of LEED certification and Energy Star Ratings. However, CoStar does not specifically focus on energy information. As such, SCI would like to see a database that marries CoStar level building information with granular asset level energy consumption data.

Such a database can be aggregated and supported from a variety of sources:

- Cities such as San Francisco and New York that are requiring more rigorous building data transparency (aggregated on websites such as buildingratings.org)
- CBECS 2003

LEED's Building Performance Partnership data
Technology companies, such as SCI, that gather asset level performance information
Industry organizations, such as BOMA, that are compiling information on whole building energy usage
Survey methods can be deployed to fill in data gaps – which can be done in stages on a region by region basis

Given the high demand for such a database, users of this data can pay a subscription to access the information. And organizations that help supply data can be compensated for the use of their data. Privacy and anonymity will play an important factor and will require careful consideration.

In the initial stages of structuring such a database, SCI urges NIBS to go beyond the meter or submeter level of information and create the infrastructure to support end-use and asset level building information in such a database.