Wipro EcoEnergy

USING BIG DATA FOR OPERATIONS & ENERGY MANAGEMENT IN HOSPITALITY

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Abstract

The hospitality industry is increasingly focusing on better energy management as it looks to improve guest comfort levels while optimizing energy consumption. The effort is to reduce carbon footprint, bring in more energy efficiency by use of data-driven approaches and keep operational costs under check.

The industry, amid its diversity, faces certain common concerns about areas in which energy is wasted. Its diversity lies in the different kind of establishments it supports – be it large convention hotels, restaurants, guest houses, inns or motels. The varied nature of the physical facilities and the activities that they host can make energy management especially challenging.

This paper talks about the data analytics-based approach to determine Operational Effectiveness and Energy Management (OE&EM) for the hospitality industry.

Need for Operational & Energy Efficiency

Unlike other commercial buildings, hotels have unique energy requirements because of the variety of facilities available, functions provided and operational schedules. A hotel usually operates 24X7, round the year, although some sections such as the ballroom or a restaurant may be closed during specific periods in a day. Guest occupancy levels in hotels vary significantly across the year. In many hotels, even when a guestroom is not occupied, the air conditioning is kept switched on to prevent odor or guest discomfort. These factors contribute to the rising need for a specialized focus on Energy Management and Operational Effectiveness in the hospitality industry.

Advancements in IT, data convergence, and data analytics have found increased relevance in the way facility operations and management services are being delivered in the industry. Key Performance Indicators (KPIs) such as guest comfort, complaints, internal thermal and schedule policy compliance, energy consumption, benchmarking, etc. are being examined by hotel operators closely to understand and answer the "whats" and "whys," resulting in better insights into energy consumption and operations.

Breaking the Silos

The hospitality industry has Facility Management Systems and Energy Management Systems such as Building Management System (BMS), guest room controls system, metering/sub-metering and Property Management Systems working in silos. The recent Innovations in Information Communication Technology and high performance machines saw advent of concepts such as cloud connectivity, high speed data transfer, distributed databases, open standards for building controls such as LONWorks, BACnet, OPC, etc.

These allow the hospitality sector to integrate various energy management systems and use the data for informed decision making in day-to-day operations that can help improve:

- Guest comfort
- Overall hotel energy efficiency
- Lifecycle operating cost of hotel assets

Building controls systems are an offspring of industrial automation and controls systems. These systems are proprietary in nature and were conceived for use in standalone mode, with limited operational and consumption data sharing capabilities which can be leveraged for analytical purposes.

The end of 20th century saw standards like TCP/IP, XML and standard databases being acknowledged as the need for enhancing the scope of data sharing for remote monitoring, centralized aggregation, analytics etc. These technologies form the foundation for development of enterprise data analysis systems by collecting data from multiple sources such as Building Management System or Control Systems, Energy Monitoring System, Guest Room Management System and Property Management System (see Figure 1). They provide insights we wouldn't otherwise have.

BMS companies are lagging in adoption of the required IT standards. There is a major challenge in integrating with analytical engine for operational improvement and energy cost reduction.

Building Management System: Control system controlling and Connecting common area assets such AHUs, Pumps, Chillers

Property Management System: System used as Guest database for booking, special instructions (VIP room, etc.), also sometimes provided integration with guest complains

Guest Room Controls: Smart thermostats controlling the lighting, HVAC equipment in hotel rooms. Some hotels still have old thermostats which do not have commutating capabilities

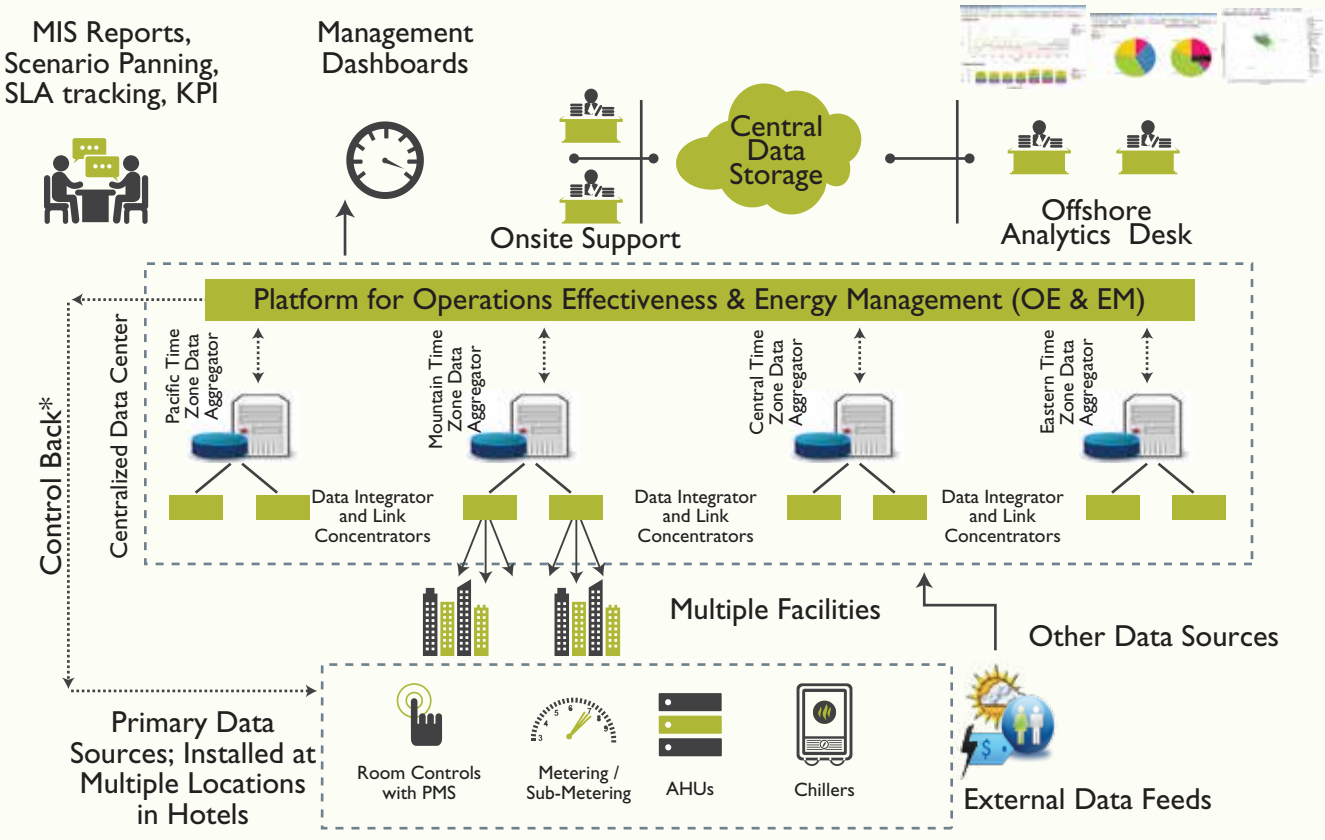
Energy Monitoring System: Hospitality industry has many meters (mostly standalone but having commutating capabilities) installed

Energy Operations Management Systems and Uses

Power of Big Data Analytics

The hospitality industry can effectively reduce energy use by leveraging on the **OE&EM Platform** as this helps improve bottom line and brings down operating costs. Understanding energy and operations components (such as energy and operations spend and it's break-up, its correlation with business needs, guest comfort, weather, availability, etc.) in the sector is the first step towards this.

Energy and operations management can be achieved by ensuring major systems are run as per best optimized schedule and set points, detecting break down, identifying inefficiency of systems, and reducing energy leaks. This is done by integrating BMS, utility meters and sub-meters, guest room controls, Property Management System and other business systems (such as financial components related to breakdown cost, Annual Maintenance Contract, retrofit costs, service costs, work orders, etc.) to collect site data on a central energy platform. The **OE&EM Platform** has the capability to run algorithms. Data analysts and scientists use it to identify opportunities for operational improvements and energy cost reductions.



An OE&EM Platform

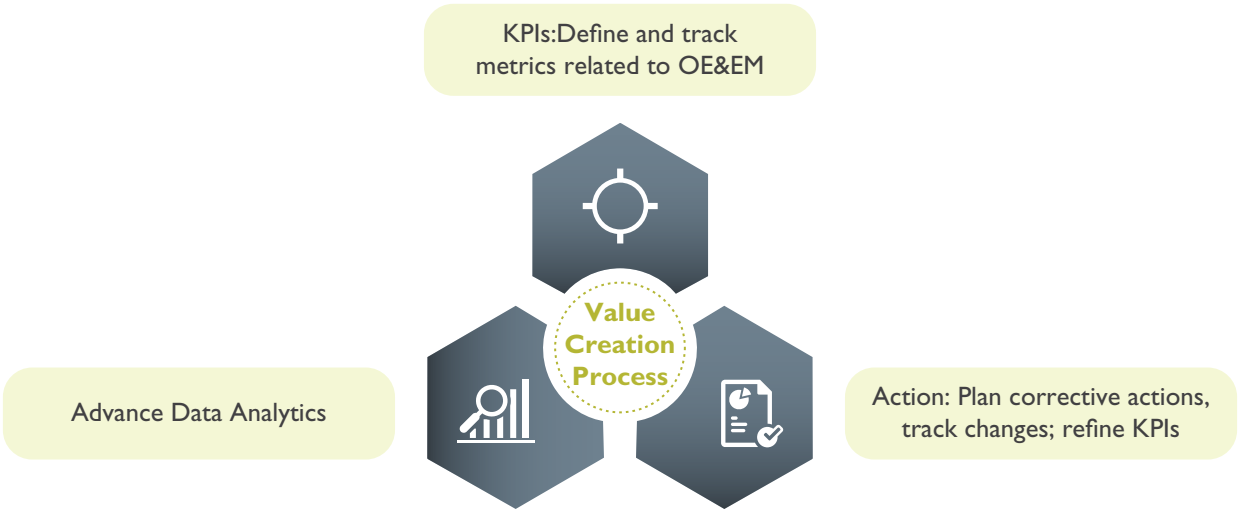
Contemporary Building Management Systems (also called as Energy Management System) provide capabilities for collecting millions of data points, deviation detection, data trends, schedule management and consumption monitoring. However, there is an abundance of data and an absence of analysis, making it a "data rich but information poor" situation.

Big Data analytics tools helps identify **"What" (pattern analysis)** as reference and later Subject Matter Experts use this pattern analysis to identify the **"Whys"** and action to correct the deviation. This methodology of using analytics to transform data into useful information is the added advantage of OE&EM Platform-based operations.

Journey In Advanced Analytics

Data Collection and Storage	Data Preparation	Data Analysis	Advanced Analytics
• For accurate data collection, we need to define (i) When and how often to collect data on energy, cost, weather etc. (ii) Units of measurement (iii) Managing data duplication	• Data Cleaning – is used to remove irrelevant data	• Standard reports – that help understand what deviations happened and why. It can be a monthly or quarterly report	• Regression Analysis- Quantifies relationship between the dependent, i.e, energy use, and independent variables such as weather, occupancy, etc
	• Data Integration – Extract, Transform and Load (ETL) processes can be used to collate data from outside sources, transform into operational needs, load it into end target	• Ad hoc/operational and energy performance deviation reports – that help understand how many deviations, how often, where, etc.	• Correlation Analysis – to know the relationship between two variables such as temperature and consumption
			• Cluster Analysis - to find homogenous groups across sites
		• Query drilldown/Root cause analysis – helps understand key issues such as major energy usage deviations, schedule and thermal policy violations, where exactly is the problem, or how can it be rectified	• Forecasting - helps pre-plan through series of variables related to seasonality and weather
			• Predictive Modeling – helps prepare contingency plans
• Specific guidelines on data storage devices, permissions to read/write the data, data structure algorithms, periodic maintenance, data warehousing, etc.	• Data Selection – data relevant for the analysis is extracted using algorithms and tools like SQL, Access, Excel, etc.	• Simple statistical tests like T Test, Z Test can be used in some cases	• Optimization – helps plan how to do things better

The goal of OE&EM is to generate Business Intelligence. Typical value creation process based on data analytics can be depicted



Value Creation Process Cycle

This framework will help make the Energy Management System of the hospitality industry a more data-centric one which will boost operational efficiencies with minimum capital investments. Being a continuous process, it also helps sustain the operational improvements and energy savings for a longer period. The centralized view enables organizations to compare their performances through benchmarking and by prioritizing action plans.

'Center' of Gravity

An analytics-based approach, backed by a energy and operations center, which is different from the traditional approach of retrofits and refurbishments, is the ideal way to move forward. Key elements of analytics-based Operational Effectiveness and Energy Management approach are:

- It is a **No/Low CAPEX** model for achieving energy savings that leverage existing infrastructure
- Empowers operations and management teams to proactively manage equipment performance and reduce downtime. It reduce man-hours spent on diagnosis and reporting

About the Authors

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About Wipro EcoEnergy

Wipro EcoEnergy is the energy services business division of Wipro Limited that provides intelligent, sustainable solutions for energy consumption and management. Utilizing leading edge analytical tools we deliver energy efficient solutions to our clients that reduce their carbon footprint, energy usage & recover avoidable energy losses.

Wipro EcoEnergy's Managed Energy Services offering, holistically addresses the entire spectrum of energy and sustainability services providing sustained energy savings. Wipro EcoEnergy has created a strong local ecosystem of partners in North America, Europe & APAC and has deployed its Energy Management Services solution for a number of clients around the world. These clients have seen substantial energy savings and cost reduction during the course of their engagement with Wipro EcoEnergy.

For more information please visit: www.wiproecoenergy.com Or reach us at ecoenergy.info@wipro.com

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