Role of Metering and Energy Management in Building Energy Efficiency

ECBC Regional Workshop, Ranchi
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# Why Energy Management?

## The Problem
- Organisation looking for an energy management solution
- Reduce energy cost
- Cost-effective solution

## The Solution
- Energy Management Solution
- On site or on cloud with controls capabilities
- Create a robust energy data framework

## The Benefits
- Helps reduce energy cost by 5-10%;
- Helps benchmark energy use across sites;
- Helps in sustainability reports, CDP or GRI reporting and inclusion in sustainability indices;
Basic Elements of an Enterprise Energy Management

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| Targets and Goals               | • Top management buy-in  
  • Someone is responsible for achieving the targets                      |
| Metering Infrastructure         | • Energy efficiency starts at the meters  
  • Decide on the level of sub-metering                                     |
| Invest in Energy Management System | • Take help of analytics  
  • Use a graduated and differentiated approach                             |
| Reap the Rewards                | • Data driven decisionmaking  
  • Energy, CO2, and Sustainability roadmap and reporting                    |
What is Enterprise Energy Management

It is an organisation’s ability to

- set aggressive energy efficiency targets and goals based on internal or external benchmarks
- optimise energy use at all levels through energy data collection
- institute appropriate process and procedures based on best practices to take informed decisions
- proactively deal with any climate change and sustainability policies and regulations
KPI Driven Energy Management: From ISO 50001 to Capex Investments

- Start a Culture of EM
- Take emotion and expertise out of decisions
- Data driven decisions & enterprise level reporting
- Action-oriented audits at a fraction of cost
- Capex/Opex based decision and Assured ROI with M&V
- ISO 50001
- Energy Management System
- Energy Assessment / Advisory
- Robust Energy Efficiency Project Execution
- M&V-based decision and Assured ROI
## Codes and Standards: Implications for KPI Driven Energy Management

### ECBC
- Advanced Metering Requirements
- Need to validate component and system perf.
- EPI Based Whole Building Compliance

### NBC Sustainability Chapter
- Ensuring Building Performance
- Load Segregation and Advanced Metering
- Better O&M Through EMS

### ISO 50001
- EnPI Model requires EMS
- Define and track KPIs for Target Setting

### Green Building Rating Systems
- Advanced Metering Reqs
- M&V reqd. for building performance validation
- Dynamic EPI reporting
## Journey to EPI (Pick the Right KPIs)

**Utility Meter**
- Get monthly or yearly energy consumption data
- Find out total built or carpet area and no. of employees
- Calculate EPI

**System Approach**
- Develop a sub-metering plan
- Monitor energy use at the system level
- Calculate LPD, EPD, KW/ton and roll it up to calculate EPI

**Component Approach**
- Develop a sub-metering plan
- Monitor energy use at component level
- Specify the most energy-efficient equipment/appliances
Benefits of Energy Management

**Monitor**
- Increased employee awareness (2%)
  - Installation of meters
  - Dashboards: Cost allocation Benchmarking Incentivizing
- Analytics and Improved awareness (3%)
- 2%

**Control**
- Improved awareness, identification of O&M improvements (10%)
  - Facility tune-up Elimination of waste
  - Operation Benchmarking, project improvements, continuous attention
- 15% to 30%

**Optimize**
- Continuous improvement Action plans

Case Study I: Hospital Energy Management
Approx. 1.1 million beds (0.9 bed per 1,000 in 2014); Approx. 50,000 beds in the next 5-6 years; Approx. 10% energy use of commercial buildings

Private sector’s share in hospitals and hospital beds is approx. 75% and 40%

Energy intensity benchmarks for Indian hospital:
200 – 300 kWh/m2 or 10,000-20,000/bed (Pvt hospitals: Multi-Speciality)
50 – 150 kWh/m2 or 15-15000/bed (Govt hospitals: Urban & Rural)

(Sources: Govt and industry publications)
Energy Costs in a typical private hospital

Annual Expense: 300 kWh/m² or 20,000 kWh/bed
Monthly Expense: ₹16/sq. ft. or ₹12,000/bed

Energy Costs for a BEE 5-Star rated hospital

Monthly Expense: ₹8/sq. ft. or ₹4,500/bed

More than 50% energy and cost saving potential
Benchmarks For Rating EE Hospitals

**ENERGY PERFORMANCE INDEX**
Energy Consumed normalised by built up area

**ENERGY PERFORMANCE PER BED**
Energy Consumed normalised by number of beds

**ENERGY MANAGEMENT OF HOSPITAL EQUIPMENT**
Procurement and O&M Guidelines for hospital medical equipment (approx 50% energy use)
ENERGY PERFORMANCE INDEX
Varies from 180-390 (large) and 170-285 (medium)

ENERGY PERFORMANCE PER BED
Varies from 21,000 to 30,000 (large) and 10,000 to 25,000 (medium)

ENERGY MANAGEMENT OF HOSPITAL EQUIPMENT
Procurement and O&M Guidelines almost non-existent for hospital medical equipment – Big Opportunity
Case Study I: Public Sector Building Energy Management
NITI Aayog has set itself a target to achieve a BEE 5 Star rating (from its current level of BEE 3 star rating)

Working closely with EESL and BEE, Schneider Electric has installed its energy management system SEO at Yojana Bhawan building in New Delhi.

SEO - a cloud based energy management system which
- Captures data from energy meters
- Helps track energy savings from ECMs
- Makes the data available online for energy analytics
- Helps track energy KPIs
- Provides ready-to-use framework for ISO 50001, LEED, GRIHA etc.
Building Energy Use Dashboard

Yojana Bhawan, Sansad Marg, New Delhi

Current BEE Star Rating

Building Area: 23116 m² | Employees: 700 | Operating hrs: 10:00 AM - 6:00 PM

Total energy consumption
704,755 kWh YTD and 160,255 kWh MTD

Total energy cost
Rs. 5,172,902 YTD and Rs. 1,176,272 MTD (at Rs. 7.34 per kWh)

Building Energy Consumption - YTD (Months)

Energy use comparison (week on week)
2,807 kWh (5% reduction)

Energy cost comparison (week on week)
Rs. 20,603 (5% reduction)

Energy Management System developed by Schneider Electric
Tracking Performance

Yojana Bhawan, New Delhi

Targeted BEE Star Rating

EPI

- 5 Star: 4
- 4 Star: 5
- 3 Star:
- 2 Star:
- 1 Star:

Energy consumption - YTD

Energy consumed is 55% of the monthly target

EPI - Estimated

- 87.62 kWh/m²

ECI - Estimated

- Rs. 643.15/m²

Energy Management System developed by Schneider Electric
Monitoring Hourly, Daily, Monthly Energy

Hourly energy use - working vs non-working hrs. (Last 6 days)

Daily energy use (Last 83 days)

Energy use comparison (year on year using utility meter)

Energy consumed is 55% of the monthly target

Energy used (2012 vs 2013) - reduced by 12% (295,800 kWh)

Energy Management System developed by Schneider Electric