Leveraging “Big Data” to Control Costs and Improve Performance

GVRAHE Meeting
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Justin Del Vecchio, P.E.
“Big Data” Revolution in Healthcare

• 90% of the world’s digital data was collected in the last 2 years and doubles every 18 months.
• Standard EKG collects ~1,000 data points per second
• Leveraging healthcare data is improving outcomes and lowering costs:
  – $300,000,000,000 a year in new value can be created in healthcare by 2021 (McKinsey Global Institute)
  – Examples include better diabetes treatment, fraud detection, and adaptive pharmaceutical pricing and reimbursement
  – Overall objective is to find ways to put massive amounts of data to good use in a productive way … (without pushing CIO’s blood pressure to dangerous levels!)
  – Technology spending is outpacing facilities budgets due to better perceived value

What can “Big Data” do to reduce facilities OpEx?
What “Big Energy Data” is available?

- **Opportunity**: “Smart Meters” collect “Big Data” (electricity KW every 15 minutes = 35,000 pts per year) at medium to large bldgs
- **Challenge**: The data are difficult to manage and interpret graphically
- **Solution**: “Visualization” services support energy efficiency efforts by providing a fast, easy and inexpensive way to understand:
  - Operational patterns and deficiencies
  - ROI analysis of potential energy efficiency options
  - Opportunities for improvement
  - Benefits of submetering
  - Did my project deliver?
  - Importance of credibility across departments and up the leadership chain
What is KW interval data?

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Traditional energy use analysis (limited value)...

Monthly Total Energy Consumption (kWh)

Traditional Approach
For the SAME BUILDING, visualization of 3000X more data helps to quickly and more thoroughly understand a building’s operation.
Energy Use (kWh) vs. Similar Temperature Days

Two days with very different temperatures, yet identical energy use.

Two days with similar temperatures, yet very different energy use.

Expected curve for tightly controlled buildings using economization.
Daily Demand (kW) vs Similar Temperature Days

Step change from 750 – 1,000 kW indicates staging of equipment

Δ 585 kW

1,110 kW

475 kW

No dependence on Outside Air (OSA) Temperature and No consistency at all

Step change from 750 – 1,000 kW indicates staging of equipment
The ability to detect performance issues increases dramatically with smaller time intervals.
Energy Star and LEED awards do not equate to best performance and/or lowest cost operations.

Operational summary:
- Energy Star/LEED was achieved through use of very efficient (and expensive) equipment.
- However, the building could save considerably more energy.
“What If Analysis”: Visualization of low-cost savings opportunity at the same LEED/Energy Star School.

Potential Results of Improved Operations:
• 19-26% Annual Savings through no-cost improvements
Sample Report Deliverable

First Baptist Church Augusta

Summary Observations

† Electricity demand (kW) is shown for each 24 hour period from June 19, 2012 through June 17, 2013. The greatest demand occurred on Tuesday and lowest is in June. The building peaked at 770 kW on June 24, 2012 09:30 (Sunday).

† Seasonality is apparent with the facility reaching similar demand (kW) and energy (kWh) levels in the summer and winter. The start and stop times are not well defined during the cooling season. During the weekend, the facility runs from 7 am Saturday through to Sunday services.

† Meter 2 shows defined startups which begin between 8am and 8am throughout the year. Meter 1 (larger) starts between 4 and 5am throughout the year, except for Sundays where the startup begins Saturday morning.

† The facility load is highly volatile and peaky. Substantial variation in energy and demand is apparent across similar days and outside air conditions.

† In-depth analysis shows the potential for annual savings of approximately $30,000 through optimization of existing systems. Up to an approximate $58,000 could be gained through additional high efficiency and high performance adjustments and modifications. (Assumed cost of power 8.9 cents/kWh.)
Value of Submetering –
Example of Master-Metered Hospital (Florida)
Same hospital with 6 Submeters
Same hospital: Cooling Load Meters
Value of Measurement and Verification:
St Mary’s Hospital Project (Completed 8/2012)

POST-RETROFIT

PRE-RETROFIT

How is my project doing?
St Mary’s Hospital Load Density
Daily Load Profiles

Mondays

Tuesdays — Fridays

Saturdays

Sundays
Chiller Performance Before (Red) and After Construction (Blue)

PRE-RETROFIT

SUBMETER DATA NORMALIZED FOR DEGREE DAYS:
AUG’11 VS AUG’12

POST-RETROFIT

56% savings

Submetering Data Analysis (12 motor loads via EMS) – August 11 v 12
(Weather Corrected)
Interpret Energy Use Impacts Across Comparable Weather Days (Before and After)

PRE-RETROFIT: NOT GOOD: Faded dots = wide energy band between comparable “weather days” = marginal control

POST-RETROFIT: GOOD: Darker dots = tighter band between comparable “weather days” = better control & performance

Two days with similar temperatures, yet very different energy use.
What other “data visualization” could help healthcare facility managers?

- Natural gas usage (hourly data available from supplier can support retrofit sizing to save on project sizing and costs)
- Critical temperature/humidity performance (affect of other variables on T/RH control over 15 minute intervals)
- Impact of a different/negotiated electricity tariff

What if I don’t have an interval meter?

- If your electricity cost is over ~$40,000/year, consider adding a kW meter with data logging system and/or tieing into your EMS system
Grant Opportunity: NYSERDA PON 2689
Emerging Technologies & Accelerated Commercialization (ETAC)

‘Focused Demonstrations’ Targeted Categories

Building or energy system-focused technologies or approaches that offer energy data analytics and performance information; must produce actionable information for, and demonstrated responsiveness from, end-users in identifying and implementing energy savings opportunities.

Examples include:
- Remote energy audits
- Advanced energy information systems, for instance, building energy performance analytics software with dashboards

Applicants, if selected, are eligible to receive up to $150,000 from NYSERDA, as well as M&V services funded by NYSERDA.
Questions?

Justin Del Vecchio, Trane
(585) 370-3404
jdelvecchio@trane.com