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Three Dimensions of Energy Opportunities

Hugh Lindsay and Terrence Tobin



Figure 1. Enterprise energy management offers a broad range of direct economic benefits to property owners and managers.

Boost Profits and Asset Value



Figure 2. Automated sub-metering and sub-billing improves billing accuracy while reducing or eliminating the labor involved in reading

Home

meters and generating bills.

Property owners, management firms, and brokerages regularly face challenges in maintaining or increasing profits and maximizing valuation. Energy is a significant operating expense that, when managed effectively, can help property firms survive tough times in the short term while reducing financial risk and strengthening competitive positioning into the future.

Studies by the U.S. Department of Energy show utility costs can be reduced 25% or more if properly managed. With energy representing on average as much as 30% of operational expenses, commercial real estate enterprises are in a unique and enviable position as compared with other industries in terms of the potential to lower costs and improve net operating income (NOI). For example, for a 500,000 square foot (ft²) building with average energy costs of \$1.80/ft², cutting costs by 25% will produce \$250,000 in enhanced NOI. At a 10% capitalization rate this could amount to a \$2.5 million increase in property value.

Ancillary benefits include increased tenant satisfaction and retention, decreased environmental impact, and the potential for achieving “green building” certifications. Energy performance can also reflect well on the skill of the management team and, in turn, on valuation. The Energy-Star organization notes that “[Investment] firms totaling more than \$4 billion in assets under management are looking at companies' EnergyStar performance for signs of superior overall management quality.

For the maximum level of benefits to be enjoyed all three dimensions of energy costs should be considered: fixed, variable, and exceptional. Specific information and functionality is required to turn each into an opportunity. Enterprise energy management (EEM) systems affordably deliver the intelligence and automation needed to uncover opportunities, make effective decisions and dynamically respond with appropriate measures.

Fixed Cost Opportunities

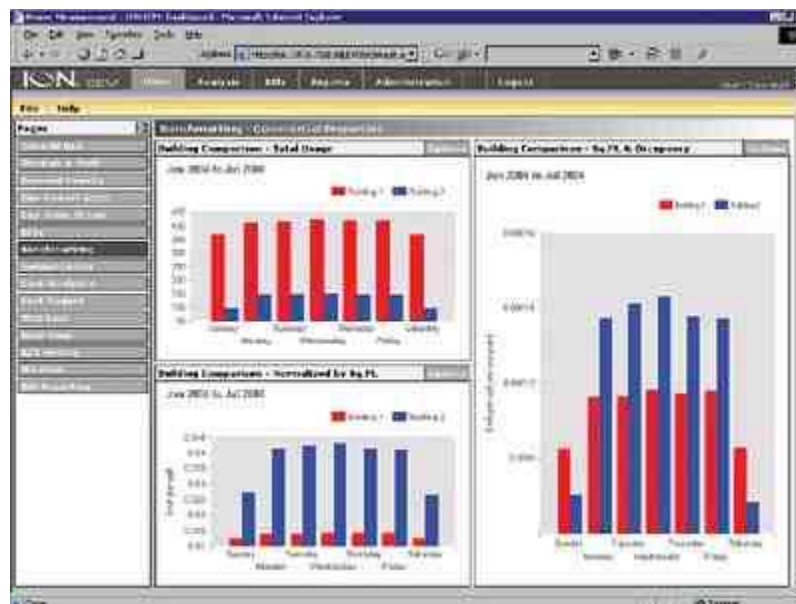


Figure 3. EEM key performance indicators, benchmarking and normalization tools help analyze and compare building performance and reveal opportunities to reduce costs.

Fixed energy costs include a facility's typical base load of energy consumption as well as the resources required for administration, operations, and maintenance; all of which represent savings potential.

Energy costs are often allocated to tenants based on a square footage formula, which can be highly inaccurate. Tenants are increasingly asking to be more accurately billed; in some areas leases now include accurate sub-metering as a standard clause. If sub-meters exist, manual labor is often used to read them, process the data, and create bills, with human error affecting costs and tenant satisfaction. Typically, only monthly energy totals are available, not interval measurements (e.g. readings every 15 minutes) that are needed to sub-bill for coincident energy demand or other utility charges applied on top of base load. Higher resolution data are also not available that could offer insight into opportunities to better manage costs.

EEM systems provide a complete sub-metering and sub-billing solution that supports all forms of utilities (e.g. electricity, gas, water) and leverages existing meters while allowing new ones to be added where required (figure 2). Meter data are automatically uploaded on a frequent basis to the EEM software over corporate networks, the Internet, or wireless communications, realizing a low total cost of ownership while enabling reach across entire property portfolios. Equipped with an integrated rate engine and data quality tools, tenant bills are calculated based on simple or complex rates with assured accuracy. High labor rates associated with data collection and processing are avoided while tenant satisfaction is increased.

Buildings include a variety of high-demand loads, including HVAC components like rooftop units, chillers, and fans. Building automation systems (BAS) are often tweaked to assure comfort, with maintenance typically based on estimates of equipment operation and on predefined service schedules. Though often considered a building's energy management system, energy-related information from BAS is typically limited in both amount and accuracy. This can mean opportunities are missed to improve energy efficiency or reduce risk associated with potential equipment misoperation or failure.

In contrast, EEM systems automatically collect and report detailed power and energy information from all energy assets, including HVAC, BAS, electrical distribution systems, and onsite generators. An EEM system continuously tracks conditions and alerts operations staff to any potential problems before they occur. The source can then be quickly isolated using graphical facility overviews of real-time electrical and equipment status, historical information, and "drill-down" analysis. These tools help drive proactive maintenance, extend equipment life, avoid capital costs, and reduce labor.

EEM systems also deliver the information corporate and facility managers need to deal with energy in financial terms. Browser-based "dashboards" listing key performance indicators (KPIs) help track and verify enterprise-wide conditions and costs on a dynamic basis. Trending tools report on the complex relationships between energy drivers over a week, month, season, year, or any other range. Energy consumption for buildings and other cost centers can be aggregated and normalized to remove independent variables such as temperature or square footage from the profile. This allows for accurate direct comparison, helping identify inefficiencies and opportunities to reduce usage. For example, start-up procedures can be optimized to avoid demand peaks and HVAC settings can be adjusted to reflect occupancy and weather patterns.

The EEM system will also provide an accurate energy baseline prior to any

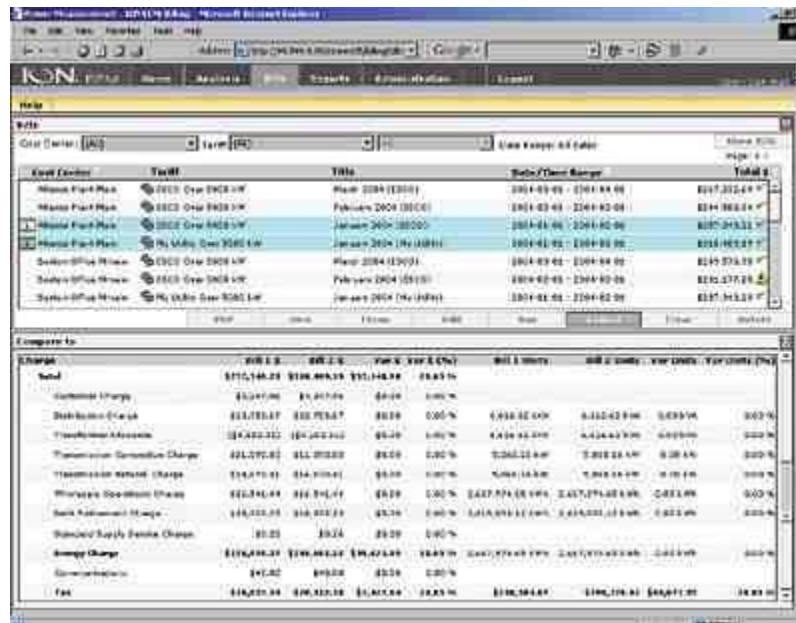
retrofit or initiative, helping verify effectiveness afterward. Ultimately, building performance can be benchmarked (figure 3) and the information used to support certification with nationally recognized rating systems such as those developed by the EnergyStar or ASHRAE organizations, or the U.S. Green Building Council's LEED program.

Utility billing errors due to meter malfunctions, meter reader errors, wrong tariffs, or incorrect billing intervals can also offer an opportunity to recoup costs. Errors that seem in the building's favor can still be a problem. Many contracts allow the utility to recover missing charges long after the fact, making it impossible to pass them on to a tenant that may have moved on.

To help avoid these situations, EEM software can be used to internally calculate accurate monthly "shadow" bills, matching the utility's rate structures, and compares each billing period to the utility's bill to identify any inconsistencies. The EEM system draws its data either from revenue-class meters installed in parallel with the utility's billing meters or, where allowed, by importing energy pulses from the existing billing meter.

The electrical systems and other energy distribution systems for new facilities are often over-designed, and additional capacity in existing buildings goes undiscovered. An EEM system delivers detailed load profiles for each building and major circuit. This can help safely maximize the use of existing capacity, avoid unnecessary upgrades, and help planners right-size the infrastructure for new buildings to minimize costs.

Variable Cost Opportunities



The screenshot shows a software interface with a table of utility bills and a comparison table below it.

Bill Number	Start Date	End Date	Amount	Rate Class	Usage (kWh)	Usage (kWh)	Usage (kWh)	Usage (kWh)
1000000000	1/1/2004	1/31/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	2/1/2004	2/28/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	3/1/2004	3/31/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	4/1/2004	4/30/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	5/1/2004	5/31/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	6/1/2004	6/30/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	7/1/2004	7/31/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	8/1/2004	8/31/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	9/1/2004	9/30/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	10/1/2004	10/31/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	11/1/2004	11/30/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000
1000000000	12/1/2004	12/31/2004	\$11,148.33	1000000000	1000000000	1000000000	1000000000	1000000000

Charge	Bill 1 (\$)	Bill 2 (\$)	Var %	Var (\$)	Bill 1 Units	Bill 2 Units	Var Units	Var Units (%)
Total	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Energy Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Distribution Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Transmission Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Transmission Service Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Transmission Demand Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Wholesale Acquisition Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Bank Payment Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Standard Supply Service Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Energy Charge	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Commodities	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%
Tax	\$11,148.33	\$11,148.33	0.00%	\$0.00	1000000000	1000000000	0	0.00%

Figure 4. EEM software helps model energy requirements and perform rate comparisons based on actual usage data and utility tariffs.

How energy is purchased, how it is used by the building, and how it used by tenants are all dynamic processes that offer opportunities to reduce cost. Each depends on having the right information to support timely strategic and tactical decisions.

Property firms can procure energy more efficiently and for better rates if they are in a strong negotiating position, which often depends on the depth and

quality of information available. EEM systems will aggregate energy consumption information from across all properties, across wide geographies, to help negotiate bulk energy pricing with a single supplier. Using accurate forecasting and “what if” scenarios, energy managers can compare different rates, tariffs, suppliers, or whether it is more profitable to shift loads or pay more when prices are high (figure 4).

Weather, occupancy, retrofit opportunities, and other variables can be incorporated into future models. For example, predictions can be made regarding how an energy bill might increase if the average summer temperature increased by a degree, helping financial managers set an appropriate risk level and bounds.

Buying off real-time spot markets or taking advantage of utility rebates associated with load curtailment or demand response programs can sometimes reduce energy costs. Some suppliers offer discounts if the customer can simply demonstrate an energy management system is in place that can support such programs. EEM systems provide the communications capability to receive real-time pricing or curtailment signals and provide the analytic capability to help managers evaluate the opportunities against current or projected building usage and needs.

Alarms can be used to give advance notification before costs or consumption levels peak, giving the time needed to decide whether to temporarily reduce consumption. Selected non-critical equipment can then be manually or automatically switched off; on-site generators can be started up in a coordinated fashion. Ideally, such programs will include the participation of tenants to maximize load shedding potential.

Tenants can represent one of the largest opportunities to reduce costs. With gross leases, energy conserved directly benefits the property firm, and fixed-base leases, tenants benefit by cutting energy costs above those covered by the lease while further reductions pass savings to the property firm. Each situation may be incentive for the landlord to invest in efficiency measures.

For a triple net lease, it may appear as if any energy reductions will benefit only the tenant; however, the property firm can potentially achieve full benefits by “rebalancing the pie”. Lower operating costs can be leveraged by increasing rental rates while keeping the effective cost to the tenant the same (figure 5). Alternatively, energy cost savings can be used to lower the lease to improve a building's price competitiveness.

EEM systems convert raw energy data and complex utility tariffs into dollar values that the landlord and tenants can understand and act upon. Automatically generated reports can be distributed in paper, email, or HTML format, providing tenants a view of their consumption and costs and, in turn, driving behavior. Helping tenants reduce energy use in this way helps increase profits as well as competitive advantage. As an additional benefit, as efficiency increases so too does a building's asset value.

Exceptional Cost Opportunities

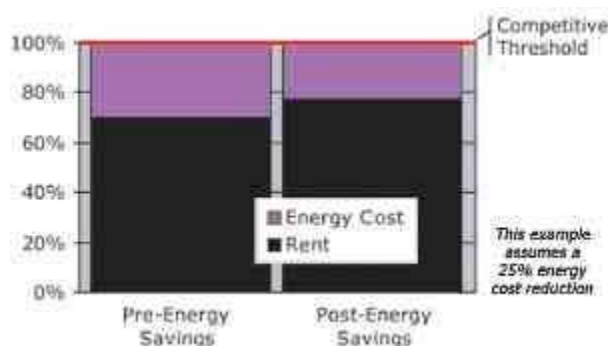


Figure 5. Lowering energy costs provides an opportunity to rebalance the components of a tenant lease, benefiting the property firm, tenant or both.

The cost of poor power reliability has been well documented in recent years. One study showed that power outages interrupted operations at 72% of U.S. businesses in a recent year, while another study revealed 46% of companies surveyed said each hour of downtime costs them up to \$50,000, while 8% said it costs more than \$1 million per hour.

The source of reliability problems can sometimes be on the utility side of a facility's service entrance, for example power disturbances caused by lightning strikes or downed power lines. To guard against these, companies will often install filtering devices and UPS or generator backup systems. These are effective only if equipment is continuously tested and optimized.

EEM systems help facility engineers evaluate how the overall quality of power affects equipment and uptime. Permanently installed intelligent meters monitor key distribution points and upload real-time data and historical logs to software that helps personnel analyze conditions, isolate the source of disturbances or failures, predict future occurrences, and validate the operation of mitigation equipment (figure 6).

The system can help baseline a facility's minimum power quality requirements. It can also compare conditions to international standards and determine if the energy received from the utility meets contractual requirements. Like a "black box" flight recorder, an EEM system will capture evidence that is often the key to receiving thousands or even millions of dollars of compensation from an energy provider.

Computers and data processing equipment, motors, power switching or protection devices, and even equipment designed to mitigate some power problems can all add unwanted harmonic frequencies and high-voltage transients onto a facility's electrical distribution network. These, in turn, can cause data loss and malfunctions in computers, building automation systems, or process equipment. Worse, transformers and conductors can overheat and fail or power breakers can trip needlessly, any of which can cause a complete facility outage.

Using pager, phone, or workstation, an EEM system will alert personnel to imminent problems, help them isolate and analyze high-risk conditions, and perform the necessary control functions to avoid downtime and the associated lost revenues. Capital replacement costs can be avoided or deferred and workload for maintenance staff reduced. Being able to guarantee higher reliability can also help keep existing tenants satisfied and attract businesses that are especially sensitive to power quality glitches.

As with any sound business strategy, achieving real and sustainable results depends on having accurate and actionable information. Enterprise energy management technology exposes fixed, variable and exceptional costs in financial terms and provides the tools property firms need to respond to opportunities, verify savings, drive best practices, and extract the maximum financial and competitive advantages from energy.

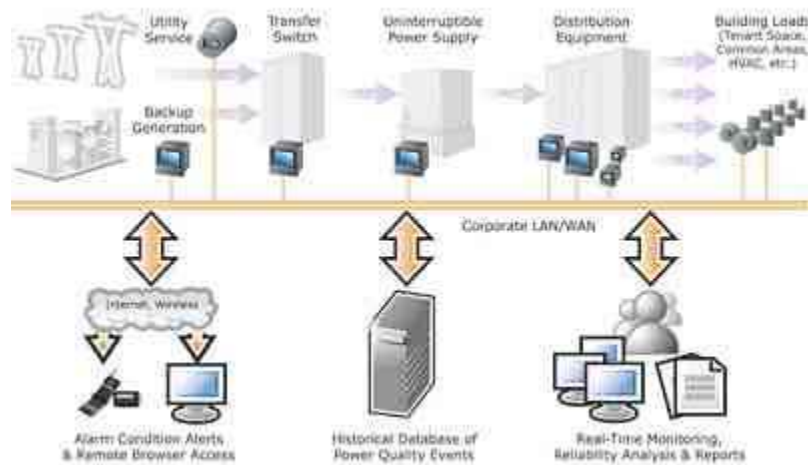


Figure 6. EEM systems help keep the power on by alerting operations staff to critical conditions, helping isolate sources, verifying backup system performance, and documenting importance evidence if an outage occurs.

Lower Fixed Costs

- Cost recovery through tenant sub-billing
- Reducing the cost of operations
- Shadow metering to catch billing errors
- Expansion planning

Control Variable Costs

- Better energy procurement
- Dynamic control of loads and generation
- Tenant energy management

Avoid Exceptional Costs

- Protection from outside disturbances
- Power quality improvement

Hugh Lindsay is a marketing manager with Power Measurement, and has worked with clients throughout world to help them understand and leverage the benefits of energy information for modifying behaviors and driving change.

Terrence Tobin is the corporate communications manager for Power Measurement and has worked extensively in the high technology sector in the fields of research, development and communications.

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