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Commercial Real Estate Industry

Critical Issues Series

Using the New ASTM BEPA Standard in Energy Auditing and ECM Performance Evaluation

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Introduction

Commercial buildings in the U.S. spend more than $100 billion per year on energy, according to EPA, or approximately $2-3 per square foot, representing approximately one-third of a building's controllable operating expenses. There are approximately 4.8 million commercial buildings in the U.S.[1], and more than 40% are greater than 30 years old.[2] These buildings represent a significant opportunity for energy efficiency upgrades, with the potential for individual buildings to achieve substantial savings.

Increasing building energy efficiency represents a rare everyone-wins opportunity. Government wins because it reduces the country's dependency on foreign oil and helps the country meet carbon emission reduction goals without the need for a carbon tax or cap and trade regulation. The environment wins because greenhouse gas emissions are reduced. The economy wins because jobs are created to support this emerging industry. The commercial real estate industry wins because building operating costs are reduced and valuations increased. Service providers to the commercial real estate industry, including consultants, engineers, lawyers, bankers and insurers, win because this represents an exciting new opportunity to grow their business.

At the heart of virtually every program to improve a building's energy efficiency is the energy audit. The building energy efficiency industry, through the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) energy audit guidelines, has defined multiple levels and components of energy audits. Fundamental to an energy audit is the collection of a building's energy use and cost data. The industry, through ASTM's Building Energy Performance Assessment (BEPA) standard E2797-11,[3] has standardized a methodology for the collection and analysis of such data. This paper is directed at the emerging industry best practice integrating the ASTM BEPA standard methodology with the ASHRAE Level I and II energy audit guidelines as applied to commercial and public buildings.

Background & Driving Forces for Energy Auditing

Regulatory Driving Forces

Regulations requiring the collection, disclosure and performance labeling of buildings began when the European Union Energy Performance of Buildings Directive 2002/91/EC was adopted by the European Parliament on December 16, 2002 and became effective January 4, 2003.[4] The Directive required Member States to develop building energy performance disclosure laws to become effective no later than 2009.

In the U.S., Michigan became one of the first states to require energy performance assessment and benchmarking when in 2005 the governor issued an Executive Order applicable to state buildings.[5] In January 2007, the governor of Ohio followed with a similar Executive Order[6] In October of that year, California passed the first law, AB 1103, requiring the collection of energy use data at commercial buildings in the state. California also added a benchmarking and disclosure requirement at the time of a real estate transaction whether it be a building's sale, lease or financing.[7] Benchmarking laws in one form or another have since been adopted in Denver, Colorado,[8] West Chester, Pennsylvania,[9] Washington, D.C.,[10] Washington,[11] Hawaii,[12] Austin, Texas,[13] New York City,[14] Seattle, Washington[15] and San Francisco, California.[16] States considering energy performance disclosure and labeling regulations include: Colorado, Connecticut, Illinois, Massachusetts, Maryland, Maine, Michigan, Minnesota, New Mexico, Ohio, Oregon, Tennessee and Vermont.

Most of the cities and states with building energy performance benchmarking and disclosure laws rely on EPA's Energy Star for benchmarking. Energy auditing comes into play when in the benchmarking process a building is shown to be a relatively poor energy performer and as a result the owner wants to evaluate ways to improve energy performance. This typically begins with an energy audit. When building energy performance disclosure by the owner to prospective purchasers, lessees and lenders is triggered by a pending commercial real estate transaction, there is added incentive for the owner of a poorly performing building to improve energy performance to maintain value. If an owner (the seller) does not take actions to improve the building's energy performance, then he or she runs the risk a prospective purchaser will adjust the purchase price relying on an energy audit to identify energy conservation measures (ECMs) and the associated investment.

Several of these building energy performance disclosure laws, such as San Francisco, New York City, Austin and Washington State, also include requirements specifically directed at energy auditing.

San Francisco, for example, requires[16] the owner of any nonresidential building with a gross floor area of 5,000 square feet and less than 50,000 square feet to receive a walk-through energy audit which meets or exceeds an ASHRAE Level I audit once every 5 years. Implementation is scheduled to begin April 1, 2014. Buildings 50,000 square feet or greater are required to conduct a comprehensive energy audit which meets or exceeds an ASHRAE Level II audit once every 5 years. Implementation is scheduled to be phased in over a three year period beginning April 1, 2012. It is estimated that approximately 2,700 buildings in San Francisco could be impacted by this regulation.[17]

A "Confirmation of Energy Efficiency Audit" must also be prepared including: the date the audit was performed, along with affirmation by the energy professional and building owner that the audit complies with applicable standards; a list of all retro-commissioning and retrofit measures available to the owner with a simple payback of 3 years or less; and the estimated costs and energy savings associated with these measures and which measures have been implemented by the building owner. The building owner is required to file the "Confirmation of Energy Efficiency Audit" with the Department of the Environment. It will be publicly accessible and updated annually. Energy audit due dates are to be established by the Department of the Environment and staggered over a five year rolling deadline.

Compliance with the energy efficiency audit regulation is not required for new construction (less than 5 years old), or if the building has received an Energy Star label from EPA for at least 3 of the preceding 5 years, or if the building is LEED for Existing Buildings: Operation and Maintenance (LEED-EB:OM) certified. Also, buildings in financial distress can apply for an extension of not more than one year.

San Francisco has also established energy auditor qualifications that include one of the following:

(1) Licensed Professional Engineer with at least 2 years of relevant experience; or ASHRAE Commissioning Process Management Professional Certification; or similar qualifications; or

(2) Association of Energy Engineers Certified Energy Manager (CEM) or Certified Energy Auditor (CEA); or

(3) At least 10 years experience as a building operating engineer, or at least 5 years experience as a chief operating engineer and either (a) BOC International Building Operator Certification; or (b) International Union of Operating Engineers Certified Energy Specialist; or

(4) Equivalent professional qualifications to manage, maintain, or evaluate systems, as well as specialized training in energy efficiency audits and system maintenance.

New York City requires[14] property owners with buildings larger than 50,000 square feet to have an ASHRAE Level II energy audit conducted every 10 years and to file an "Energy Efficiency Report" with the City Department of Buildings. Following the energy audit, the building owner is required to correct deficiencies through retro-commissioning. Retro-commissioning includes basic maintenance and repair measures such as cleaning HVAC ducts and vents; adjusting and calibrating equipment sensors and controls; tuning boilers; making sure that motors, fans and pumps are in good operating condition; and keeping permits, maintenance records, and other documentation updated and organized. The retro-commissioning process, which typically will pay for itself in less than 2 years and often less than a year, does not include major capital improvement projects. The "Energy Efficiency Report" includes the findings of the energy audit and documentation that the corrective retro-commissioning measures identified in the audit have been implemented. It is estimated that as many as 26,000 buildings in New York City could be impacted by this regulation.[17] Compliance is phased in (according to the last digit of a building's block number) over 10 years beginning on December 31, 2013 with buildings having block numbers ending in 3. Energy audits can be completed up to four years before the "Energy Efficiency Report" filing due date.

Compliance with the energy efficiency audit regulation is not required if the building has received an Energy Star label from EPA for 2 of the preceding 3 years; or if the building received LEED-EB:OM certification within the four prior years; or, if there is no Energy Star program for the building type, a registered design professional certifies that for 2 of the past 3 years the building's performance has been 25+ points better than an average building of its type under the LEED 2009 ratings for existing buildings; or if a building complies with energy efficiency standards in six of the following seven areas: individual heating controls, common area and exterior lighting, low flow faucets and shower heads, pipe insulation, domestic hot water insulation, front-loading washing machines, and cool roofing.

New York City also requires that the energy audit be performed by a qualified energy auditor as approved by the Department of Buildings. Qualified energy auditors currently include:

(1) A NYSERDA-approved Flex Tech contractor; or

(2) A Certified Energy Manager (CEM) or Certified Energy Auditor (CEA) by the Association of Energy Engineers; or

(3) A High Performance Building Design Professional (HPBD) certified by ASHRAE.

The Austin, Texas Energy Conservation Audit and Disclosure (ECAD) ordinance[10] requires, among other things, that multifamily properties and commercial buildings undergo energy audits, and even requires mandatory upgrades for those multifamily properties that exceed 150% of the average energy use. Approximately 2,800 buildings in Austin could be impacted by this ordinance.[17]

Washington State requires leased public buildings (exceeding 10,000 square feet) to have an Energy Star rating score of 75 or better, unless a building owner agrees to undertake an energy audit and implement cost-effective upgrades. Energy audits are also required for government-owned facilities with an Energy Star rating score below 50.

It is evident from this growing body of legislative and regulatory activity at the local, state, national and international levels that building energy performance assessment, often involving building energy audits directly or indirectly, is in the process of rapidly becoming an important new element in the management, acquisition and operation of commercial and public real estate.

Business Driving Forces

In addition to growing regulatory pressure, the commercial real estate industry is becoming increasingly concerned about how these building energy efficiency trends may impact the value of real estate portfolios, given the nexus of energy consumption, net operating income and asset valuation. For example, it is likely that less energy efficient buildings will become less competitive in the marketplace and probably require some form of rent discounting to attract and retain tenants, particularly since tenants are responsible for energy costs under triple-net leases. While prospective tenants in the past had no access to building energy use and cost data, they typically entered triple-net leases (where they generally paid an allocated share of utility costs based on the amount of floor space they occupied) under the incorrect assumption such costs were essentially similar from building to building.

Disclosure and benchmarking significantly change the game with new negotiating power being placed in the hands of the tenant. This means poor building energy performance may well reduce the prospective tenant pool for any building with a poor rating. With tenants now looking for the "fully-loaded" occupancy cost that combines the base rent with operating expenses, of which energy cost is a major component, it can reasonably be expected that a building deemed to have relatively poor energy performance will be less valuable. This is one of the principal reasons why property owners, prospective purchasers of commercial real estate, and lenders who provide financing are becoming more concerned about a building's energy performance in their due diligence, and consequently are looking to quantify energy performance.

Energy Efficiency Lending

A relatively new business opportunity identified by banks and specialty energy efficiency financing firms involves offering loans to clients for building improvements that will increase energy efficiency. By offering loans with extended amortization periods, for example to 10 years, energy savings driven by improvements with relatively short payback periods (less than 3 years) can be used to pay back the loan. In this way, there is minimum out of pocket expense to the building owner to improve their building's energy performance. Such lending programs begin with an energy audit to identify potential energy conservation measures, related savings and payback periods. If the building owner proceeds to implement the recommendations made in the energy audit and that are to be financed by the lender, the cost of the audit can also be packaged in the total loan. In addition, specialty energy efficiency financing firms are emerging that will finance 100% of building energy improvements.

ISO 50001

ISO 50001, Energy Management System Standard, was published on June 15, 2011 and provides organizations with an internationally recognized framework to plan, manage, measure and continually improve energy performance. Conformance to the standard provides proof that a facility has implemented sustainable energy management systems, completed a baseline of its energy use, and committed to continual improvement in energy performance. An energy audit is integral to providing baseline energy use and identifying energy savings opportunities.

LEED-EB:OM® Certification

The LEED-EB:OM Rating System is a set of voluntary performance standards for the sustainable ongoing operation of buildings not undergoing major renovations. It provides sustainable guidelines for building operations, periodic upgrades of building systems, minor space-use changes, and building processes. Certification status has as one of its goals establishing and optimizing the building's energy performance and efficiency. For planning and opportunity assessment, an ASHRAE Level I energy audit is required to be conducted. To develop a more comprehensive understanding of the operation of the building's major energy-using systems and plan to achieve energy savings, an ASHRAE Level II energy audit is often conducted.

PACE Programs

Property Assessed Clean Energy (PACE) laws, enacted at the state level and implemented by local government, allows owners of commercial and industrial real estate to borrow money for 15 to 20 years at low rates to fund energy efficiency improvements, installation of renewable energy systems and water saving measures. As of June 2011, twenty-four states have passed enabling legislation enacting PACE programs. PACE uses the tax lien structure to allow clean energy improvements to be paid off via long-term property tax assessments. The very low risk of property tax default lowers the cost of PACE capital. Moreover, under triple net leases, property taxes are a pass-through (to tenants), thereby establishing a process in which tenants will both benefit from energy cost savings and participate in paying for the energy savings measures, with the former hopefully offsetting the latter.

To implement a PACE program the local government entity, operating under state enabling legislation, must first establish a special "clean energy finance district" capable of issuing bonds which would be needed to finance projects. The program specifies the types of properties that can participate and the terms under which a project would qualify. Depending on the program, liens under PACE programs may include access to the government bonding authority or rely on property owners negotiating loan terms directly with approved third party PACE finance providers including their local bank or through pooled lending structures. An energy audit is required for participation in all PACE programs.

179D Tax Incentives

Section 1331 of the Energy Policy Act of 2005 (EPAct 2005) enacted § 179D of the Code which provides a tax deduction (through December 31, 2013) for the cost of qualifying energy efficiency improvements in commercial buildings. A tax deduction of up to $1.80 per square foot is available for buildings that save at least 50% of the heating and cooling energy of a building that meets ASHRAE Standard 90.1-2001. Partial deductions (for buildings achieving less than the 50% reduction in energy use) of up to $0.60 per square foot can be taken for measures affecting: the building envelope, lighting, or heating and cooling systems. The tax deduction also applies retroactively to qualified measures placed in service after December 31, 2005. Energy auditing is an integral component to document and certify that a building is qualified to receive the EPAct tax deduction.

Energy Auditing

An energy audit is a survey of building systems and operations to identify energy consumption and determine steps that might be taken to reduce energy use. The prime targets for energy audits and installation of energy conservation measure (ECM) retrofits are commercial buildings greater than 50,000 square feet. With more than 255,000 buildings in the U.S. in this size category,[2] the potential market for energy audits alone is well over a billion dollars. Hence, the energy audit market represents a significant business development opportunity for energy consulting, engineering and services firms.

The four major objectives of an energy audit include:

1. Establishing baseline building energy use;
2. Quantifying energy use according to major function (disaggregation);

3. Benchmarking against peer buildings; and
4. Identifying energy cost reduction opportunities.

The essential driving mechanism behind these objectives begins with collection and analysis of a building's utility bills.

ASHRAE has developed multi-level guidelines to conduct energy audits. While overlap between levels is common, each level can generally be described as follows:

ASHRAE Level I Energy Audit

An ASHRAE Level I energy audit consists of a walk-through analysis to assess a building's energy cost and efficiency by analyzing energy bills and conducting a brief on-site survey of the building. Operational metrics of building equipment is typically limited to data collection of nameplates but can be more detailed if that data is readily available. Level I energy analysis will typically identify and provide a savings and cost analysis of low-cost/no-cost measures (see Table 1). It will also provide a listing of potential capital improvements that merit further consideration, with an initial estimate of investment and potential cost savings. Level I audits are particularly useful to prioritize energy savings projects.

A Level I audit for a commercial building typically costs between $2,000 - $5,000, depending on specific property type and size. Energy conservation measures (ECMs) typically can be implemented within the building's operating budget. For commercial buildings, the audit often involves a one day visit to the site for the walk-through and is usually submitted to a client within 1-2 weeks. Recommended ECMs typically cause little to no disruption to building operations.

ASHRAE Level II Energy Audit

An ASHRAE Level II energy audit includes a more detailed building survey and energy analysis than in a Level I audit, and more detailed financial analysis. In addition to nameplate data collection, empirical data acquired through various field measurements using handheld devices are common. Diagnostic reports such as recent Test, Adjust, Balance (TAB) results can also be included. It will typically identify and provide the investment and cost savings analysis of all practical ECMs that meet the owner's constraints and economic criteria, along with a discussion of any changes to operation and maintenance procedures. Sufficient detail is generally provided to justify project implementation.

A Level II audit for a commercial building typically costs between $7,500 - $20,000, depending on specific property type and size. ECMs often involve relatively significant capital and need to be budgeted for as capital expenditures. As such, more detailed financial analysis is performed including ROI and payback period determination. For commercial buildings, the audit generally involves a one or two day visit at the property but in certain cases can require up to one week, with a final report including recommendations submitted to a client within 2-4 weeks. Recommended ECMs typically can cause some disruption to building operations and therefore must be planned for.

ASHRAE also has a Level III energy audit (often referred to as an "investment grade audit") generally applicable to projects identified in the Level II audit that are very capital intensive and demand more detailed field data gathering as well as more rigorous engineering analysis. The Level III energy audit provides even more comprehensive project investment and cost savings calculations to bring a higher level of confidence that may be required for major capital investment decisions. Data collection will most certainly involve field measurements acquired through data loggers and/or an existing Energy Management System (EMS). For most commercial buildings, however, a Level II energy audit should be more than adequate.

The Data Collection Problem

Unfortunately, until recently no consistent standardized methodology existed in energy auditing for the collection of building energy use and cost data to establish a baseline. While it may seem relatively straightforward to simply collect utility data, the devil is in the details. For example, prior to the adoption of the ASTM BEPA Standard, there was no standard time period over which building energy use data had to be collected. Energy professionals have commonly used anywhere from one to three years. Also, there was no standard on how partial month data collected from a utility was "calendarized" or converted to a calendar month basis. Some energy professionals simply used daily averaging while others utilized complicated weighing factors such as weighing by heating or cooling degree days. If a building had undergone a major renovation, there was no standard on how this should be taken into consideration, if at all. There was not even a standard definition as to what constitutes a major renovation. There were no standards on how weather conditions should be analyzed and taken into consideration, how building operating hours should be factored in the analysis, or how building vacancy should be considered in the analysis. These and other issues had generated considerable marketplace confusion and resulted in the commercial real estate industry approaching ASTM to develop a standardized methodology.

The Solution

In view of this growing need to standardize the methodology for building energy use and cost data collection and analysis, ASTM in February 2011 published its standard E2797-11 for Building Energy Performance Assessment (BEPA).[3] The Standard was developed over two years through the ASTM consensus process by a dedicated Task Group of more than 220 professionals, including engineers, architects, attorneys, real estate investors, owners, managers, bankers, energy equipment manufacturers, software providers, educators, government officials and professional associations. With so much at stake for the commercial real estate industry, the Task Group was determined to develop a practical methodology for data collection and analysis to be conducted in a technically sound, consistent, transparent, practical and reasonable manner. It also provides a standardized data collection and analysis methodology for use in energy auditing.

What the BEPA Standard Does

The ASTM BEPA standard establishes a methodology for the collection, compilation and analysis of building energy use and cost data. As such, use of the methodology also complements existing building rating systems and facilitates better benchmarking and building performance labeling initiatives.

The BEPA methodology standardized a number of major variables associated with data collection such as:

- the time frame over which data needs to be collected [three years or back to the last "major renovation," with a minimum of one year]
- the criteria that must be met for collecting reliable building energy use data [see Table 2]
- what constitutes a major renovation [building renovation that either involves expansion (or reduction) of the building's gross floor area by 10% or more or impacts total building energy use by more than 10%]
- how partial month data is calendarized [by determining average daily usage during each partial month covered, and summing the daily average usage over the number of days in the calendar month]
- what building energy metrics are to be used [energy use in kBtu/yr and kBtu/SF- yr; energy cost in $/yr and $/SF-yr]
- how building energy use is normalized [by gross floor area in square feet and by using the mean value of the statistically evaluated independent variables that impact energy use such as heating degree days, cooling degree days, vacancy rate, building operating hours, etc. in the building energy use equation]
- how the building energy use equation is determined [using weighted ordinary least squares regression of monthly energy use data against the associated monthly values of the independent variables that impact building energy use]
- what weather data needs to be collected, over what time period and how it is to be statistically analyzed [heating degree days and cooling degree days are collected for a minimum 10 year period, from the weather station nearest to the building with historical data available, and statistically analyzed to calculate the 25th percentile, mean and 75th percentile values]
- what constitutes an appropriate range for building energy use [upper and lower limit scenarios are determined based upon 25th percentile and 75th percentile values for the independent variables used in the building energy use equation]
- what the most representative (unbiased) values are for building energy use and cost [the BEPA standard defines these as the pro forma building energy use and pro forma building energy cost]

The ASTM BEPA standard also includes an appendix that identifies for the major commercial real estate property types those building characteristics that may have a significant impact on a building's energy use.

ASTM BEPA Complements Energy Auditing and ECM Performance Evaluation

The first critical step in an energy audit includes the collection and analysis of building energy use and cost data to establish baseline conditions that are truly representative of the building's performance. The ASTM BEPA standard has been uniquely designed to meet this foundational need in a technically sound, consistent and fully-transparent manner that removes the bias of independent variables such as historic weather, occupancy and operating hours. The output from the ASTM BEPA standard includes:

(1) Pro forma building energy use and cost based upon mean values for the independent variables used in developing the building energy use equation. For example, heating and cooling degree days are based upon statistical analysis of at least ten years worth of historical weather data collected from the nearest weather-reporting station to the building. Vacancy rate is set at the mean monthly level over the last three years. The same is true for building operating hours and any other independent variable(s) established as meaningful by the energy professional.

(2) Range of building energy use and cost established by using the 25th and 75th percentiles for the independent variables used in developing the building energy use equation.

(3) Actual annual building energy use and cost for each of the prior three years as determined by reviewing historical utility data.

Pro forma building energy use is considered the representative energy use (kBtu/sq. ft.-yr) for the existing building normalized to the mean values of the independent variables that can impact the building's energy use. Therefore, biases are removed. The range of building energy use represents the most probable range of existing building energy use under actual conditions, e.g., weather and occupancy variability, etc.

The ASTM BEPA methodology includes five components:

(1) Site visit – to observe the building during the walk-through, conduct interviews and collect any records (utility data, etc.) not previously provided;

(2) Interviews – with the present owner, operator, and/or key site manager;

(3) Records collection – collect and compile the necessary records related to building energy use and cost;

(4) Records review and analysis – to determine pro forma building energy use and pro forma building energy cost, and the range of building energy use and cost;

(5) Report – on the findings.

An ASTM BEPA "Plus" combines an energy audit with the ASTM BEPA methodology. A cost comparison based upon combining the ASTM BEPA with a Level I or a Level II energy audit is presented in Table 3. These data are for typical commercial or public buildings and do not apply to industrial property given the significant variability associated with industrial/manufacturing facilities.

In order to determine the performance of energy conservation measures (ECMs) implemented at the recommendation of the energy auditor, the methodology in the ASTM BEPA standard can again be used. For example, one year after all the ECMs have been implemented, another building energy use equation would be developed (for the prior twelve months only) in accordance with the standard. Again, to ensure a truly representative, apples-to-apples comparison, the mean values of the independent variables would be inserted and new pro forma building energy use and cost values determined. These pro forma energy use and cost values would then be compared with the baseline (pre-ECM retrofits) pro forma building energy use and cost values to measure and verify (M&V) the performance of the implemented ECMs. Energy service companies (ESCOs) have also begun to incorporate this industry best practice methodology into their guaranteed performance contracting M&V scope of work to ensure a high degree of accuracy in their post-retrofit performance to pre-retrofit pro forma baseline comparison analysis.

Conclusion

The building energy audit market is in the process of expanding significantly as regulatory, business and a number of other emerging driving forces accelerate its growth in the commercial and public real estate industry. At the same time, it is expected that the energy data collection and analysis methodology provided in the ASTM E2797-11 BEPA standard will be an integral part of the energy auditing process and the accepted methodology to determine the technically sound, consistent and fully-transparent baseline performance as well as the post-retrofit performance measurement of the ECMs that are implemented. There can be no question now that building energy performance assessment is fast emerging as another important and fundamental component in the management, acquisition and ongoing operation of commercial and public real estate.

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Table 1. Common No-Cost/Low-Cost Energy Saving Measures for Commercial Buildings[3]

No-Cost Measures

- Measure and track energy performance
- Educate tenants and employees about how their behaviors affect energy use (for example, turning off computers, and unplugging chargers and other accessories, coffee-makers, and so forth when not in use)
- Turn off lights when not in use or when natural daylight can be used (instruct night and weekend security staff to turn off lights as well)
- Set back the thermostat in the evenings and at other times when the building is unoccupied
- Lock thermostats in publicly accessible areas to prevent unauthorized adjustments
- Make sure thermostats are properly placed (when space is reconfigured during tenant improvements)
- Calibrate thermostats periodically to ensure they are measuring the true temperature
- Temperature set points on thermostats should be set cooler in winter (for example, 68 to 70°F [20 to 21.1°C]) and warmer in summer (for example, 74 to 76°F [23.3 to 24.4 °C])
- Revise janitorial practices to reduce the hours that lights are turned on each day (for example, the janitorial staff can "team clean" so they only use lights in one area at a time)
- Maintain HVAC equipment per manufacturer recommendations (for example, boiler tune-ups, regular cleaning of filters and coils, making sure dampers are working properly)
- Add a purchase specification to buy energy efficient products

Low-Cost Measures

- Install energy efficient lights—replace incandescent lights with Energy Star-qualified compact fluorescent lamps (CFLs), cold-cathode CFLs, or light-emitting diodes (LEDs); replace T12 lamps with T8 or T5 fluorescents; replace magnetic ballasts with more efficient electronic ballasts for all fluorescent lamp fittings
- Install photocells in areas with windows or skylights to decrease lighting during daylight hours
- Install and use programmable thermostats
- Install occupancy (motion) sensors in offices, conference rooms, restrooms, closets, maintenance areas, and elevators, and dimmable lights on motion sensors in stairwells
- Seal leaks in air supply and return ducts
- Insulate heating and cooling ducts, hot water lines, water heater, and storage tank

Table 2. ASTM E2797-11 QA/QC Criteria Applicable to Building Energy Use Data Collection and Analysis

1. No "major renovation" (defined as involving expansion (or reduction) of the building's gross floor area by 10% or more, or as impacting total building energy use by more than 10%) should have occurred in the 12 month period over which the data was collected.
2. Proper calculation of building gross floor area.
3. Weather normalization based upon at least 10 years of heating degree day and cooling degree day data from the nearest weather station to the building having this historical data.
4. All non-weather independent variables (such as vacancy rate and building operating hours) collected each month in the 12 month period should be within 15% of the average monthly value determined by statistical analysis of three year's worth of data, assuming the data is available.
5. Space where a tenant has left but continues to pay the rent in accordance with the lease should be viewed as vacant space.
6. Partial month energy data should be "calendarized" by determining average daily usage during each partial month covered and summing the daily average usage over the number of days in the calendar month.
7. Confirmation of building data and characteristics by a qualified professional.

Table 3. ASTM BEPA Plus An Energy Audit: Cost Comparison for Commercial (Non-industrial) Property

Parameter	**BEPA+ASHRAE Level I Audit**	**BEPA+ASHRAE Level II Audit**
Time on-site	1 Day	up to 1 Week
Energy Savings Calculations	Preliminary	Detailed
Cost of ECMs	Low-cost/No-cost	Significant
Disruption of Building Operation for ECM Installation	No	Yes
Report Submittal	1-2 Weeks	2-4 Weeks
Typical Report Cost Range	$2,000-5,000	$7,500-20,000

BIOGRAPHIES

Anthony J. Buonicore, P.E.

Anthony Buonicore is a past president and Fellow Member of the Air & Waste Management Association, a Diplomat in the American Academy of Environmental Engineers, a Qualified Environmental Professional and a licensed professional engineer. He is a member of the ASTM Property Environmental Due Diligence committee, former chairman of its ASTM Phase I Task Group, and currently chairs the ASTM Task Group that developed the U.S. standard for vapor intrusion screening for properties involved in real estate transactions. In addition, Mr. Buonicore is chairman of the ASTM Task Group responsible for developing the new Building Energy Performance Assessment and Disclosure Standard.

Mr. Buonicore has been a leader in the energy-environmental industry since the early 1970s, serving as General Chairman of the American Institute of Chemical Engineers' First National Conference on Energy and the Environment in 1973 and as founder and first chairman of the Air Pollution Control Association's Energy-Environmental Interactions Technical Committee in 1974. He pioneered the use of refuse-derived fuel pellets (a bio-fuel) mixed with coal in stoker-fired boilers and has written extensively on energy and environmental issues.

As a Managing Director of Buonicore Partners, LLC, Mr. Buonicore is responsible for management of the firm's commercial real estate holdings and all due diligence activities associated with property acquisition. He holds both a bachelor's and a master's degree in chemical engineering.

Robert Watson, P.E.,C.E.M.

Robert Watson is a principal at NOI Engineering, PLC, with responsibility for overseeing the firm's involvement in energy-related projects in the commercial real estate sector. He is a licensed Professional Engineer with a Bachelor of Science in Mechanical Engineering and is a Certified Energy Manager and Certified Energy Auditor.

Mr. Watson currently serves as Chairman of the Technical Subcommittee for the ASTM Building Energy Performance Assessment Standard (E 2797-11) and is a member of the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), Association of Energy Engineers (AEE), and North Texas Association of Energy Engineers (NTAEE).

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SRS delivers Sustainable Real Estate Manager® an Internet-based, software-as-a-service workflow platform enabling building owners, operators, investors, lenders, tenants and consultants assess, benchmark and optimize the energy and sustainability performance of their properties.

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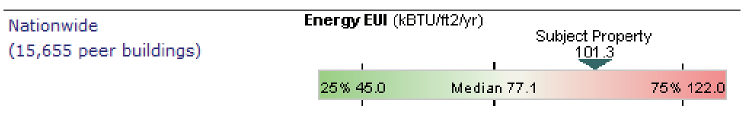
Sustainable Real Estate Manager® (SRM) seamlessly integrates leading industry standards, benchmark and rating system protocols with proprietary data and workflow automation enabling the capture of your energy and sustainability-related opportunities.

The SRM guided workflow solution has reinvented industry best practice methodology for building energy efficiency benchmarking with its Peer Building Benchmarking™ database, encompassing 120,000 buildings across 15 property types, 3.3 billion square feet, over $7.8 billion in annual energy costs and $635 million in annual water/sewer costs.



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Advanced Energy Innovations (AEI) is a National Energy Consulting firm and a third party Energy Advocate, always adopting the client's goals as our own. With nationally recognized expertise in the Energy Policy Act of 2005 (EPAct), as well as tracking energy incentives and utility rebates nationwide. AEI offers a creative and unique approach to comprehensive environmental solutions. With a diverse national network of partners, including contractors, engineers, architects and others, AEI is able to provide environmental solutions that cover every facet of energy and water conservation. AEI provides full service engineering and design services and turnkey project management with the full-time and constant goal of saving energy, expense and the environment. AEI also has developed proprietary online audit tools and software that are currently in use by several utility companies and third party programs, including the (LACBPP) Los Angeles Commercial Building Performance Partnership.