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Energy Savings Insurance and the New ASTM BEPA Standard

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Introduction

The commercial real estate industry is becoming increasingly concerned about how building energy efficiency trends may impact the value of property, given the nexus of energy consumption, net operating income and asset valuation. Moreover, the advent and growing popularity of building energy benchmarking and disclosure regulations in cities and states around the country[(1)] is fast becoming a "game changer," with new negotiating power being placed in the hands of tenants and buyers. This means sub-par building energy performance may well reduce the prospective tenant pool for any building with a poor energy use 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, studies are beginning to show that a building deemed to have relatively poor energy performance will have higher operating costs and be less valuable.[(2)] 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.[(3)]

The result has been a growing number of energy retrofit projects designed to increase building energy efficiency. The good news about such energy efficiency retrofits is the excellent project return on investment (ROI) that results from lower energy bills. Moreover, with certain types of financing structures, it is even possible to have an immediate and predictable positive cash flow. Since commercial building owners put a high premium on cash flow, an ability to make energy efficiency improvements on their property with only a minimum, if any, upfront cost, can be especially attractive.

Unfortunately, energy-efficiency investments are often constrained by the uncertainty associated with projected energy savings. The perceived risk of underperformance can pose various barriers to energy efficiency retrofits. From a building owner's perspective, the prospect of disputes over actual versus projected savings with sophisticated energy service companies (ESCOs) is often viewed as a losing proposition, and contributes to reluctance to initiate retrofits. One means to reduce the underperformance risk is through energy savings insurance (ESI).

Energy Savings Insurance (ESI) Policies

ESI policies can provide a backstop for energy savings guarantees given by ESCOs. Policies are typically between the insurer (the insurance company) and the insured (the ESCO). In exchange for a premium, the insurer agrees to pay any shortfall in energy savings below a pre-agreed baseline, less a deductible, over the term of the policy, typically in the 5-10 year range.

Pricing is usually expressed as a percentage of energy savings over the term of the contract. A percentage premium in the 2% - 6% range, with a 10% deductible is paid once in the first year of operation. However, depending on the project's financing structure, the up-front ESI premium may be rolled into the financing to enable payment over time.

The risk of the policy is reduced by specific contractual agreements and technical requirements. Contractual agreements include the use of deductibles and policy exclusions. Typical policy exclusions, for example, might include:

(1) Failure to perform required maintenance on energy conservation measure (ECM) systems;

(2) Physical damage to ECM systems;

(3) New end uses that increase building energy consumption (e.g., addition of a data center);

(4) Changes in energy prices;

(5) Failure or malfunction of data acquisition systems.

Technical requirements under the contract typically include review by the insurer of the engineering and design specifications, review of the energy monitoring plan and commissioning protocol, including acceptance testing and efficiency verification, construction inspections, on-going performance measurement and tracking, and on-going annual inspections.

As far back as the 1990's a select group of insurance companies offered some form of ESI, including AIG, Chubb and Zurich America. But with the building energy efficiency market only just beginning to emerge at that time and because the risk associated with underwriting ESI policies was not well-defined (due principally to lack of experience data), the market was unable to sustain insurance company interest.

However, today there exists a much larger, more experienced energy efficiency industry that is rapidly changing this picture. In fact, several insurance companies are now revisiting the ESI concept and market opportunity. One company, Hannover Re, a leading international reinsurance company working with Energi Insurance Services (Peabody, MA) recently launched an ESI product for ESCOs known as the "Energy Savings Warranty." It is expected that other insurers will follow as the market expands and emerging long-term energy retrofit financing programs take root, such as commercial property assessed clean energy (PACE) loan programs.

Benefits of Energy Savings Insurance

There are a number of benefits associated with ESI. These include:

(1) ESI transfers performance risk from the balance sheet of the entity (ESCO) implementing the energy savings project.

(2) ESI reduces barriers to market entry of smaller ESCOs who do not typically have sufficiently strong balance sheets to self-insure the savings.

(3) ESI forces the criteria for defining baseline energy use levels and savings to be transparent and explicit.

(4) ESI results in higher project confidence among building owners desiring to make significant energy efficiency improvements and lenders financing these improvements.

(5) The insurer provides third-party review of engineering and design and third-party involvement in ongoing measurement and verification, thereby increasing the building owner's confidence level to invest.

In sum, ESI mitigates the two principal barriers to energy efficiency project investments:

(1) the risk of underperformance; and

(2) aversion to disputes over energy savings.

ESI introduces another powerful tool to help the commercial real estate market unlock the full-potential of their building's energy savings and monetization opportunity. The combination of ESI with long-term energy retrofit financing can fill the commercial real estate market void that has been limiting large-scale market adoption of significant energy retrofit investments.

ESI's Target Market

The target market for ESI is principally the small to medium-sized ESCOs that lack a strong enough balance sheet to back energy performance guarantees. Large ESCOs with strong balance sheets may not need ESI as they often self-insure, although they may want to use ESI to remove a potential liability from their balance sheet or in cases where the building owner requires the guarantee to be collateralized. Also, ESI will most likely be targeted to the so-called "deep energy retrofits" that require significant capital investment and have longer-term payback periods. The low cost energy conservation measures with short 2-3 year payback terms are generally paid out of the owner's operating budget and generally constitute the current focus of the market in the current economic climate.

The Role of Energy Auditing and the Use of ASTM BEPA Standard Methodology for Data Collection and Analysis

The first and foundational step for an ESCO working for a building owner to evaluate their energy savings and monetization opportunity is to conduct an energy audit to establish baseline conditions. Energy savings are then evaluated against this baseline. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (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. Such measures can typically be implemented within the building's operating budget and cause little to no disruption to building operations. The Level I audit 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 and can be a valuable tool for ESCOs to screen potential opportunities with clients.

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. A Level II audit 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. ECMs often involve relatively significant capital and need to be budgeted for as capital expenditures. Installation of ECMs can often cause disruption to building operations and therefore involve careful planning.

ASHRAE Level III Energy Audit

ASHRAE also provides guidelines for 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. ASHRAE Level III audits are relatively expensive and can involve considerable time.

ASHRAE Level II or Level III energy audits are commonly used by ESCOs to establish the baseline for determining energy savings.

ASTM BEPA Standard Methodology Integral to Energy Audits

The first critical step in any 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 also can remove the bias of independent variables such as historic weather, occupancy and operating hours.[4] As such, the ASTM BEPA methodology is able to fill shortcomings that currently exist in the energy auditing process.

Shortcomings in the Energy Auditing Process

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 occupancy should be considered in the analysis. These and other related issues had generated considerable marketplace confusion and resulted in the commercial real estate industry approaching ASTM in 2009 to develop a standardized methodology.

ASTM BEPA Resolves Shortcomings in Energy Audits

In view of this need to resolve the shortcomings in energy auditing and 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).[5] 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.

What the BEPA Standard Does

The ASTM BEPA establishes a standardized methodology for the collection, compilation and analysis of building energy use and energy cost data. As such, use of the methodology fills many of the holes in existing energy audit guidelines. It also complements existing building rating systems and can facilitates better benchmarking and building performance labeling initiatives by introducing standardization to the data collection and analysis process, thereby enabling a more "apples-to-apples" comparison of building energy use data.

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

- *the time frame over which data needs to be collected* [three years or back to the last "major renovation" if completed in less than three years, with a minimum one year if reliability criteria are met]
- *the criteria that must be met for collecting reliable building energy use data* [see Table 1]
- *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 that 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 that is developed]
- *how the building energy use equation is determined* [using ordinary least squares regression of monthly energy use data against the associated monthly values of the independent variables that impact building energy use such as heating and cooling degree days, occupancy, building operating hours, etc.]
- *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 energy cost* [the BEPA standard defines these as the pro forma building energy use and pro forma building energy cost]

Market Confusion over "Energy Savings"

"Energy savings" is probably one of the more commonly misused and misunderstood terms thrown about in the energy efficiency market. A number of fundamental questions need to be answered. Is it energy use savings or energy cost savings? If it is energy use savings, is it actual energy use savings or adjusted energy use savings? Similarly, if it is energy cost savings, is it actual energy cost savings or adjusted energy cost savings? And if it is adjusted energy use or energy cost savings, how is it adjusted? If a guarantee is made on energy savings, does it apply to both energy use and energy cost? These are just some of the questions that all parties in an energy retrofit project, including the ESCO, the building owner, the lender and the insurer, need to have answered in an explicit and fully transparent manner.

To an ESCO, energy use savings usually means adjusted savings over a baseline. Common adjustments, for example, might account for changes in:

(1) square footage;

(2) operating hours;

(3) weather conditions;

(4) occupancy;

(5) facility energy equipment other than that associated with the energy efficiency improvements;

(6) electricity/fuel pricing;

(7) unanticipated actions taken that may alter building energy use.

Effectively, these adjustments reflect those parameters over which an ESCO has no control that can impact the energy performance of the building.

Energy cost savings on the other hand are also difficult to get a handle on and may be actual or adjusted, depending upon whether they are based on actual or adjusted energy use. The use of actual energy cost savings determined by comparing actual energy use in the year after the ECMs were installed multiplied by the actual cost of energy in that time, to the actual energy use in the year prior to the ECMs being installed multiplied by the actual cost of energy in that time, can lead to very misleading conclusions. Some of the reasons for this might include:

(1) weather conditions might have been different, e.g., an unusually warm winter or unusually cool summer;

(2) building occupancy conditions might have been different, e.g., a tenant turnover resulting in a temporary high vacancy rate;

(3) building operating conditions might have been different, e.g., a tenant requiring a second shift and increasing building operating hours;

(4) the building might have undergone a major renovation; or

(5) a new tenant, with a more intensive energy requirement, might have moved in, e.g., adding a large data center.

It is for these reasons, among others, that it is more appropriate to use adjusted (or normalized) energy use.

Use of the ASTM BEPA Methodology for ECM Performance Evaluation

The adjusted energy use effectively removes the biases that can impact building energy use. This is where the ASTM BEPA Standard's methodology is most helpful. First of all, it enables the definition of a technically sound, consistent and fully-transparent baseline calculation. The BEPA Standard defines (for the first time in the industry) what constitutes a "major renovation" and specifies that energy use data to establish the baseline (prior to ECM installation) needs to go back three years, or back to the last "major renovation" if it was completed in less than three years, with a necessity to have a minimum of one year's worth of data. Once this information is collected, the ASTM BEPA methodology includes developing a building energy use equation (by ordinary least squares regression using monthly data over the three year period). This equation relates building energy use (or building energy use intensity, EUI) to the independent variables that can impact building energy use (such as heating degree days, cooling degree days, occupancy, building operating hours, etc.). The independent variables are each evaluated statistically over the 36 months being used to establish the baseline.

Consistent with the International Performance Measurement and Verification Protocol (IPMVP),[6] the baseline building energy use equation established using ASTM BEPA methodology is then used to project building energy use in the post ECM installation reporting period, e.g., one year, had the ECMs not been installed. Values for the variables in the building energy use equation are then the actual monthly performance values in the post ECM installation reporting period. The energy savings would then be the difference between the projected building energy use had the ECMs not been installed and the actual building energy use in the reporting time period (refer to Figure 1).

A step-by-step procedure to determine energy savings using the ASTM BEPA methodology is summarized below.

(1) Collect three years of energy use data at the building (prior to ECM installation) following ASTM BEPA methodology, collect building characteristics such as vacancy rate, building operating hours, etc., and collect local weather data (HDD and CDD).

(2) Use ordinary least squares regression analysis to determine the building energy use equation relating monthly energy use to the independent variables such as HDD, CDD, vacancy rate, building operating hours, etc. following ASTM BEPA methodology.

(3) For each month post-ECM installation, collect actual energy use data, local weather data and building characteristics data. (Calendarize the data following ASTM BEPA methodology.)

(4) For each month post-ECM installation, estimate building energy use had the ECMs not been installed using the equation developed in step 2 with the monthly values for the independent variables as collected in step 3 and the minimum 10 year historical HDD and CDD weather data from the nearest weather station with historical data available. . (Note: Error analysis can be conducted on the results of the building energy use equation developed pre-ECMs and used to determine a confidence band (e.g., 95% confidence level) around the projected energy use had ECMs not been installed.)

(5) The difference between the projected monthly building energy use had the ECMs not been installed (determined in step 4) and the actual monthly energy use post-ECM installation (collected in step 3) represents the energy use savings. Summing these savings over a full year represents the energy savings (kBtu/yr) realized by the building owner that year.

To get the energy cost savings, the energy use savings determined in Step 5 above is multiplied by either the post-ECM retrofit building energy cost multiplier (in $/kBtu) as defined following ASTM BEPA methodology or the pre-ECM retrofit building energy cost multiplier (refer to Table 2). The building energy cost multiplier represents the actual energy cost ($) in the reporting period divided by the actual building energy use (kBtu/yr) in that same period. Whether or not the price of energy will be fixed, e.g., fixed at the pre-ECM level, specifically depends on the contractual agreement. If the price of energy is not fixed and the price increases in the reporting period, it is possible that an ESCO can meet its energy cost savings guarantee without necessarily meeting its energy use savings guarantee.

The bottom line for a building owner is that the definitions of "energy use savings" and "energy cost savings" must be consistent, accurate and transparent in an ESI policy, along with how any "adjustments" are to be made. The same is true for an energy performance contract with an ESCO.

Conclusion

The use of ESI is expected to expand significantly as regulatory, business and a number of other emerging driving forces accelerate the need for energy efficient buildings. The energy audit is integral to energy efficiency improvements and the ASTM E2797-11 BEPA Standard's methodology is an integral part of the energy auditing process, filling many of the shortcomings and tying many of the loose ends in existing guidelines. ASTM BEPA methodology establishes a technically sound, consistent and fully-transparent baseline (pre-ECM retrofit) and enables transparent post-ECM retrofit performance measurement.

With building energy efficiency fast emerging as another important and fundamental component in the management, acquisition and ongoing operation of commercial and public real estate, energy savings insurance is expected to re-emerge as a valuable tool to reduce perceived risk, leverage long-term energy retrofit lending programs and help unlock the full-potential of energy savings and monetization opportunities in real estate portfolios. The ASTM BEPA Standard methodology will undoubtedly be an important part of the insurance and financing underwriting process.

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Table 1. 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.

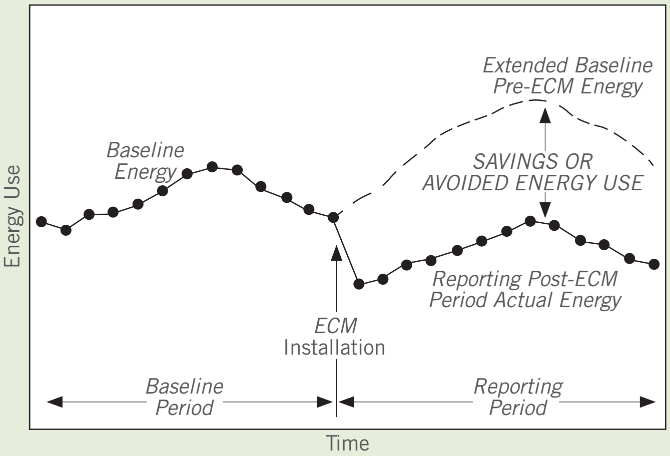
(6) Partial month energy data should be "calendarized" by determining average daily usage during each partial month covered and summing the daily average usage over the number of days in the calendar month.

(7) Confirmation of building data and characteristics by a qualified professional.

Table 2. "Energy Cost Savings" Options

Type	Description
Actual	Energy cost savings based upon actual energy cost in the year before the ECMs were installed compared to the actual energy cost in the year after the ECMs were installed.
Adjusted	Energy cost savings based upon projected energy use (as determined from the ASTM BEPA methodology) that would have existed in the year after the ECMs were installed (or for whatever the reporting time period is) minus the actual energy use in the year after the ECMs were installed times a building energy cost multiplier. The building energy cost multiplier (determined following ASTM BEPA methodology) can be based on either: (1) *Fixed energy price option:* the total energy cost in the period, e.g., 12 months, prior to the ECMs being installed divided by the associated actual energy use in that same period, $/kBtu (2) *Actual energy price option:* the total energy cost in the period, e.g., 12 months, after the ECMs were installed divided by the associated actual energy use in that same period, $/kBtu

Figure 1. Determination of Energy Savings After Installation of ECMs.



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.

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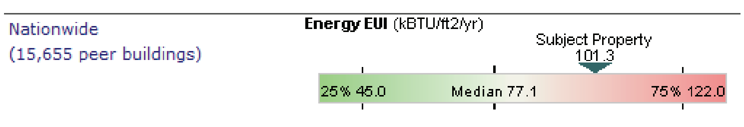

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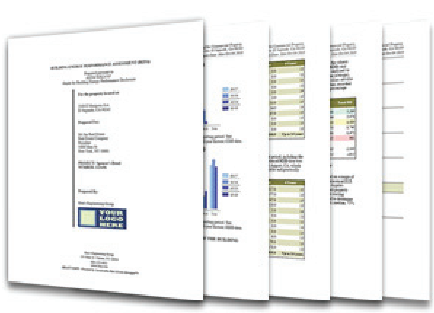

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