How to Choose An Energy Assessment for Municipal Buildings in Massachusetts

Municipalities often find themselves with a confusing array of choices when trying to identify projects to make their buildings more efficient. This document is intended to help educate municipalities and other local and regional public entities about how to get the energy assessment they want and need for the lowest cost. It is not intended to serve as a model document for public bidding processes.

To choose the correct type of energy assessment, you must first understand the goal(s) of the assessment. Common goals include:

- Save energy costs through immediate implementation of efficiency projects
- Identify all efficiency measures to create a comprehensive, long-range energy efficiency plan
- Assess whether savings from energy efficiency projects could fund needed maintenance
- Determine the best project(s) for use of a specific funding source such as a grant
- Obtain technical information necessary to move a complex project forward
- Determine the Mass Save™ incentives available for efficiency measures
- Identify operational efficiency opportunities for immediate implementation and energy savings

These goals can help guide a municipality towards the correct type of energy assessment. The following section describes three factors that can help create a successful energy assessment by matching the expectations of a municipality with the work performed by an energy auditor. Each of these factors are interrelated, but should be independently specified in any contract language:

- Scope
- Payback criteria
- Depth and accuracy of the assessment

Specifying Scope and Payback

The first two factors determining a successful energy assessment are the scope and the payback criteria. The scope refers to the building systems and attributes that will be assessed. Nearly all assessments will look at lighting because it is the “low-hanging fruit” – a measure with low cost and high energy savings. However, only some assessments will look at building envelope and insulation. This is particularly true in Massachusetts where the heating systems and building envelopes of oil- or propane-heated municipal buildings are not included in Mass Save™ energy assessments because they are ineligible for Mass Save™ incentives. A municipality may wish to specifically call out what systems should be included in any contractual language for an assessment using language such as “including, but not limited to…” For a whole-building assessment, these may include: interior and exterior lighting, heating, cooling, ventilation and air conditioning systems, the building envelope, and control/energy management systems. More detailed studies may focus on a single system or a combination of systems, taking the interrelation between systems into account. Additionally, for unique facilities such as fire stations, wastewater and water treatment facilities, and data centers for emergency/police/fire, municipalities may wish to call out the unique needs of those facilities (for example, truck bays and doors, aeration and mixing, pumping, and computer servers).Payback criteria refers to the measures a client will choose to implement based upon how long it takes to recover (pay back) an initial investment in a cost-saving measure. For example, a

lighting project costing $10,000 and saving $2,500 in energy savings per year has a payback of four years. At times, a municipality may have payback criteria that differ from those of other facility owners, thus making it important to specify the municipality's expectations in any contractual language for an assessment. For example, many businesses will not fund a measure with a payback of longer than two to three years. An auditor used to working with businesses may make an assumption that this criterion also applies to a municipality. The municipality, on the other hand, may want to consider funding all measures with a 20-year or less payback. If the municipality's expectations are not specified in the contract, there will be a mismatch of expectations and results.

ASHRAE Assessment Levels

The third factor determining a successful energy assessment is the level of detail of the assessment and the accuracy of the cost and energy savings information. Energy assessments are categorized into ASHRAE[1] levels 1-3 depending upon their level of complexity. The Figure below illustrates the pieces included in the ASHRAE Level 1-3 energy assessments. Note that the Preliminary Energy-Use Analysis is required for all levels of ASHRAE energy assessments. Municipalities and other local or regional public entities will be able to easily provide the one to two years of billing information, a kBtu/sf score and a comparison to other buildings if they are using MassEnergyInsight[2]

An ASHRAE Level 1 assessment determines how much energy a building uses and how that compares to other similar buildings, includes a short walk-through of the facility and identifies potential efficiency measures. The costs and savings of the measures are usually identified with low precision. An ASHRAE Level 1 assessment is often referred to as a scoping audit.

An ASHRAE Level 2 assessment expands on a Level 1 by identifying much more accurate costs and savings for the recommended efficiency measures. Note that these costs are still not bid-level construction costs but generally are within 15-20 percent of accuracy. Cost and energy savings from operational and behavioral measures are also quantified in an ASHRAE Level 2 assessment. For more complex facilities, an end-use breakdown of how a facility uses its energy (i.e., 30 percent of electricity use is for lighting, 60 percent for HVAC, and 10 percent for plug load) is typically included.

An ASHRAE Level 3 assessment is typically used for capital-intensive and/or complex efficiency projects. They include whole-building computer simulations to account for energy uses and to project energy and cost savings. Recommended measures cite bid-level construction costs.[3] An ASHRAE Level 3 assessment is sometimes referred to as an investment-grade energy audit (IGA). An Energy Savings Performance Contract (ESPC) uses this level of assessment to accurately identify the guaranteed savings associated with recommended measures. When implementing an ESPC project, the Energy Services Company performs the IGA and design work as an integral part of the ESPC process.[4]

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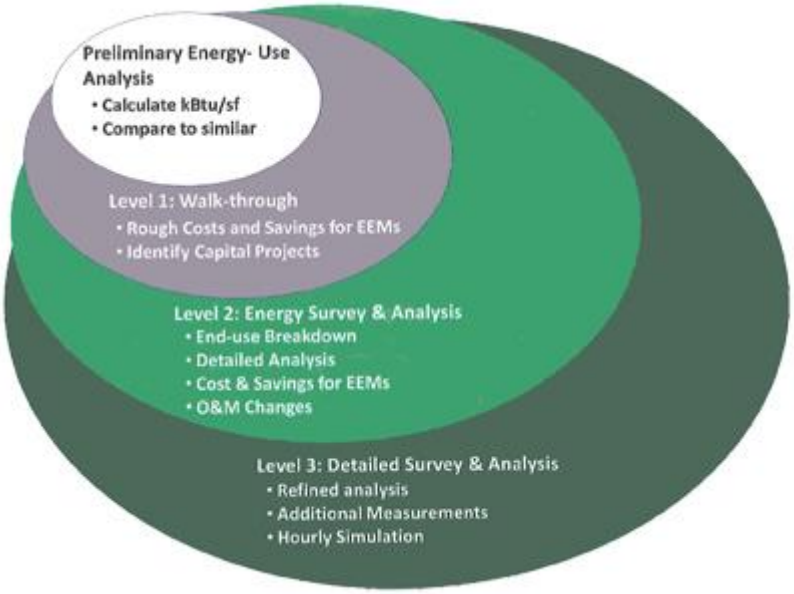
[1] American Society of Heating and Refrigerating and Air-Conditioning Engineers

[2] MassEnergyInsight is a no-cost, online energy-tracking tool provided by DOER and available to Massachusetts public entities (www.MassEnergyInsight.net).

[3] M.G.L. c.7, §§38A½-O contains procedures for selecting designers.

[4] For more information on ESPC, go to DOER's Energy Management Services web page at http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/ems.html

Relationship of ASHRAE Energy Audit Levels 1, 2, and 3[5]



Time-of-Use and Streamlined Building Modeling Assessments

Assessments using alternate methods to the ASHRAE standards described above are beginning to be offered. These methods incorporate new data sources, such as energy consumption data associated with time-of-use (TOU) meters, and/or new analytic tools, including streamlined building energy modeling protocols, that have not yet been integrated into the standard ASHRAE approach.

The main advantage to these newer evaluation methods is a much quicker and less expensive energy assessment. DOER is currently conducting a comparison of four types of energy assessments, including an ASHRAE evaluation, streamlined building modeling only, streamlined building modeling with time-of-use analysis, or time-of-use analysis only. While DOER's comparison is not yet complete, it suggests that these emerging analysis tools can provide results comparable to a traditional ASHRAE approach, while requiring much less time and money. However, while some new assessment platforms promise high-quality results without a site visit, DOER finds that on-the-ground validation of building assumptions are necessary for quality assessments. Additionally, where assessment methods rely heavily on billing data, it is worth noting that their results will be lacking if accurate and comprehensive reporting of billing data are not provided.

Assessments that use time-of-use meter data are limited to facilities with time-of-use electric meters (also called interval meters). In municipalities, usually only the high schools or largest facilities will have these types of meters installed. The analysis of time-of-use data is a powerful tool that permits analysts to examine a building's electrical use through review of 12 months of the property's historic electric load at 5- or 15-minute intervals. Reviewing these data provides insight into a building's operations that a traditional analysis, which relies on monthly consumption reports, would often miss, such as whether a building's electric demand remains high overnight when it would commonly decrease.

[5] Source: https://www.ashrae.org/resources--publications/bookstore/procedures-for-commercial-building-energy-audits

Energy Assessment Recommendations

To summarize, there are several important factors to make an energy assessment as successful as possible:

- Specify the scope and payback criteria.
- Require a site visit by the energy auditor.
- Require the energy auditor to identify the anticipated amount of all utility incentives for measures with a payback of 10 years or less.
- Suggest that the energy auditor include all measures for all facilities in a single table that includes facility, measure, annual cost savings, project cost, utility incentives, net project cost and measure life.
- Be prepared with accurate and complete energy usage and cost data.
- Have a plan for funding and implementing the recommended energy conservation measures.

Auditor	Mass Save	Mass Save	Private Vendor	Private Vendor	Private Vendor	Energy Services Company (ESCO)	Private Vendor
Type of Assessment	**Municipal Program Assessment**	**Technical Assessment**	**Scoping Audit**	**Energy Assessment**	**Technical or Modeling**	**Investment Grade Audit**	**Time-of-Use and/or Streamlined Modeling**
ASHRAE Level	1-2	3	1	2	3	3	N/A
Cost	None	None	Low	Medium	High	High	Low
Purpose	To identify ECMs that are eligible for incentives	To study specific ECMs	To determine whether a building is worth investing time and money for a more thorough audit	To identify ECMs	To model complex building systems or study specific ECMs	To identify ECMs that may be used to fund additional capital measures (roofs, windows, etc.)	To rapidly identify ECMs
Pros	Identify incentives May be implemented directly with vendor	Identify incentives May be implemented directly with vendor	Gives overview of potential ECMs	Will identify incentives if in scope	Costs are bid-quality Will id incentives if in scope	Costs are bid-quality Provides a means to fund ECMs with a range of payback periods and other capital measures	Fastest method to identify ECMs Low and no-cost operational measures identified
Cons	No oil/propane heated measures Limited to measures <7 year payback May require further study	No oil/propane heated measures Limited to measures <7 year payback	Little or no cost and energy savings information Unlikely to identify incentives Lack of coordination with utility	Costs are an estimate May limit measures based upon payback or scope if not specified Lack of coordination with utility	High cost Lack of coordination with utility	If used solely for auditing, very high cost Lengthy procurement and contract process for implementation Lack of coordination with utility	May or may not identify incentives Lack of coordination with utility
Best for Goals	A, D, F	A, D, E, F		A, B, D, maybe F	A, B, D, E, maybe F	A, B, C, D, maybe F	A, G

ECM = Energy Conservation Measure

Goals:

A. Save energy costs through immediate implementation of efficiency projects
B. Identify all efficiency measures to create a comprehensive, long-range energy efficiency plan
C. Assess whether energy efficiency projects could fund other projects needing capital
D. Determine the best project(s) for use of a specific funding source
E. Obtain technical information necessary to move a complex project forward
F. Determine the Mass Save incentives available for efficiency measures
G. Identify operational efficiency opportunities for immediate implementation and energy savings