

## How to Evaluate Individual Buildings



An on-site energy performance study, known as an energy audit, should be used to identify specific energy and cost-saving measures that could be implemented in individual buildings. These on-site evaluations can also confirm any cost estimates that may have been developed earlier. This document discusses the value of an energy audit and provides guidelines for selecting energy audit and review teams. It also offers pointers on identifying potential energy-efficiency measures, and offers suggestions for prioritizing the implementation of measures in your plan.

### Understanding the Energy Audit

While an initial analysis of building stock is wide in scope and low in level of detail, energy audits of individual buildings should be narrowly focused and highly detailed. The energy audits will lead to the identification of specific energy- and cost-saving measures, which may include operations and maintenance activities.

An energy audit should typically produce a report that contains the following elements:

- A comprehensive analysis of energy costs
- Specific recommendations on energy- and cost-saving renovations
- Recommendations to reduce electrical (or other fuel) demand costs
- Estimated costs of energy efficiency measures
- Projected annual energy and cost savings
- Available financial or other support from the utility (or others) for specific measures
- Recommendations on further analysis needed

Your state energy office and local utilities are likely to be valuable sources of information on the procedures used for energy audits in your area. Keep in mind that your efforts should proceed as quickly as possible from the identification of specific measures to actual installation of the retrofits. You will find that the information in the energy audit goes out of date quickly.

### Assembling Your Energy Audit and Review Teams

Personnel skilled at conducting energy audits of buildings are an important resource for determining the specific renovations to be planned for individual buildings. When choosing the energy audit analyst or team, previous experience should be considered. The following are some important factors for consideration:

- Knowledge of costs for energy renovations. Although initial estimates of costs for energy renovations may have been prepared during initial planning, confirmation of estimated costs is critical during the individual building studies, particularly as capital budget allocations will have to be made based on these cost estimates.
- Skill at evaluating the type of building. Different types of buildings may require different skills and approaches. For example, energy retrofits are sometimes performed in stages, with lighting retrofits performed first and other retrofits later. If you are doing lighting first, find auditors with skill and experience in lighting retrofits. Building size can also introduce variations: small buildings may require more creativity in developing renovations that match building function, while large buildings may be more “generic” in their requirements for some basic energy-saving measures (such as lighting).
- Skill at performing energy surveys. Knowledge of the energy systems being considered for renovation and knowledge of system interactions are important. Experience with this type of work should be carefully considered.
- Experience with evaluation of benefits. The

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energy audit team should be able to assess both energy and cost benefits. The latter requires familiarity with local utility rate schedules.

- Knowledge of life-cycle costing methods. If your organization wishes specific life-cycle costing methods to be used in the evaluation of economic benefits, the audit team should be capable of producing results that satisfy your requirements.

In addition to the team selected to perform the actual energy audits, serious consideration must be given to selecting a review team. This team is composed of independent energy audit experts and members of your organization to help guide the energy audits and perform the following functions:

- Develop a useful energy audit reporting format.
- Provide initial assessment of the caliber of audits being performed.
- Perform basic quality control checks on methods used for the audits.
- Perform quality control checks on audit results.

A major quality control issue concerns the specific assumptions to be used in handling utility rate schedules and in estimating the utility cost reductions (or increases) due to energy-efficiency measures. Also, if the audits are performed by more than one audit team, the review team should be responsible for assuring the consistency of results and methods among audit teams. Initially, the review team should provide significant support, but as the energy audits proceed, its role should be reduced to that of maintaining quality control.

Using the most qualified energy audit consultants and reviewers can enhance the quality of your energy audits. As mentioned above, the more experienced members of your organization should serve on the review team along with hired audit experts. Qualified experts and energy audit team(s) can be found through your local utilities, government energy

agencies, architect/engineering firms, and local business directories. As always, using local or regional consultants whenever possible will contribute to a stronger economy in your community.

### **Identifying Potential Energy-Efficiency Measures**

Once the key energy problems of a building have been identified through the energy audit, the next task is to select the most cost-effective measure or combination of measures to correct those problems. Certain energy-efficiency measures tend to be implemented more frequently than others since they offer substantial energy savings, rapid paybacks, low costs, and easy implementation. Energy savings opportunities can be found in numerous areas of any building. The areas that will be reviewed as part of the energy audit include the building shell or envelope, lighting, mechanical systems, district heating and cooling (if applicable), and operation and maintenance measures.

### **Planning and Prioritizing Measures**

A variety of factors should be considered in planning or prioritizing the installation of energy-saving measures. Some situations may serve as “triggers” to expedite installation, while others may support deferred action (e.g., timing of equipment upgrades to coincide with scheduled renovations in the same area of a building). Several of these situations are discussed below along with the associated opportunities.

### **Funding Availability**

Many public and private organizations regularly fund some or all of their energy-efficiency improvements from current operating revenues or through direct debt financing. In general, funding through such internal sources provides two clear benefits: it returns all savings to the organization, and it is usually the simplest and quickest option administratively. However, even if internal funds are constrained, the lack of investment capital should not be cited as a major obstacle to the implementation of sound energy-efficiency improvements to buildings and facilities. Capital for energy-efficiency

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improvements is easily available from third parties through a wide range of flexible financing instruments. Three common means for obtaining such outside financing are lease or lease-purchase agreements, energy savings performance contracts, and incentives available through utility demand-side management programs.

### **New Construction/Major Rehabilitation**

New construction and building rehabilitation are particularly opportune times to incorporate energy-efficiency improvements. Making efficiency improvements during construction or rehabilitation can significantly reduce the cost of improvements (as compared to the cost of later retrofits). As a result, improvements that may not be possible or cost effective in a retrofit situation may become viable. It is generally not possible, for example, to perform a major upgrade of energy efficiency, such as the addition of insulation to a wall, to an occupied commercial building. As part of a planned rehabilitation effort, however, the measure can be easy to install and therefore becomes a very cost-effective option.

### **System Failure**

Impending system failure is an excellent time to look at energy efficiency. This is because expenditures are going to be required anyway -- unless the system is no longer needed. The decision becomes whether to use these expenditures to repair an antiquated, worn, or inefficient system or apply them toward the purchase of a new, more energy-efficient system. The new system will offer sizeable annual energy savings, reduced maintenance costs, and longer life. If the annual fuel use and efficiency of a system is known, the energy savings resulting from the installation of new, higher-efficiency equipment can often be easily estimated. These annual energy savings can often tip the economic scales toward the purchase of a new system.

Depending on the failure mode, system replacement may be the only option. The additional cost of the more energy-efficient equipment should be looked at closely in this case. Often, the additional first cost of the higher-efficiency equipment can be repaid rapidly by the resulting energy savings.

*For more information contact the Rebuild America Clearinghouse at 252-459-4664 or visit [www.rebuild.gov](http://www.rebuild.gov)*

