Management Technology Inc.

Energy Conservation Group

Your Building

Our Approach

Audit

Design

Construction

Your New Building

Green Energy and Construction Considerations for Existing Buildings

Introduction

MTI is a dynamic, process-driven, and customer-oriented business with more than 24 years of solid experience in the commercial and federal sectors as a service provider. Formed in 1985, MTI has the experience, commitment, expertise, and professional integrity to deliver diversified, best-value services. These drivers enable us to operate at our highest level of performance and efficiency while providing a full range of service solutions.

We provide support services that include consulting, hardware, software and telecommunication support to a range of customers including the GSA, and others such as the Langley Air Force Base Air Combat Command, Network Operations and Security Center (NOSC); Commander of the Naval Air Force Atlantic Fleet (COMNAVAIRLANT); NMCI EDS; General Services Administration (GSA) Region 2 (Northeast/Caribbean Region); and the Portsmouth Navy School of Health. We provide superior value and performance in Support Services by matching a thorough understanding of our clients' needs with the experience and knowledge of our capable employees in a results-oriented and cost-conscious environment. Our employees' performance history of dedication and excellence is our greatest asset.

Technology exists today that can help reduce energy consumption in facilities by as much as 70%. Consider that this is equivalent to emptying all roads in the United States of Any vehicle that consumes petroleum products. MTI has assembled a technology agnostic approach to auditing energy consumption in buildings, auditing the Information Technology centers as appropriate, and in designing and implementing plans according to customer requirements. By remaining independent of any particular manufacturer, we believe that we can provide an unbiased view of your energy needs and can be more objective in recommending the areas most appropriate for remediation.

MTI's success is based on our strong tradition of partnering with our clients. We have a proven track record of performance excellence for GSA and will make every effort to maintain that level of support.

The MTI Energy Team is comprised of companies and individuals with the depth and breadth of experience to perform in each of the three areas as described in the remainder of this paper. The Green Energy Division is lead by Mr. Ray Brooks who is a certified Green consultant for Commercial buildings. His experience and knowledge combined with the experience of the other team members makes us uniquely qualified to help our customers achieve energy efficiencies that meet or exceed those as established by the U.S. Government.

In the past 3 years electricity rates have increased as much as 40 percent. Recent legislation at the Federal level, including cap-and-trade carbon credits, mandatory changes in alternative energy portfolios, and more-restrictive pollution regulations will soon result in further dramatic increases in electricity rates.

For many years, commercial and institutional facility managers considered utilities just another cost of doing business. A small part of overall operating costs, they did not justify the time required to manage them. Today, it is not unusual for utility costs to exceed monthly lease or mortgage costs, and they can no longer be ignored. Facility managers are turning more and more to professionals to maximize energy efficiency and minimize utility costs.

But until recently, computer center facilities were considered too critical to audit due to data security and system reliability concerns. However, as computer and communication equipment have become smaller, computer facilities are far more densely occupied, producing not only higher building electrical loads, but also significantly higher air-conditioning costs.

Central cooling systems, chillers, towers, and water pumps that years ago ran only on weekdays during the summer now operate 24/7. In fact, cooling systems have become mission critical, since a loss of cooling causes computer and network centers to automatically shut down in a matter of minutes, to avoid equipment damage, data loss, and collapse of operations.

Regardless of the level of technical detail and site work involved with completing an energy audit, there will be ***two different types of energy savings*** recommendations being addressed:

- **Operating and Maintenance Energy Savings.** Operating and maintenance energy savings are typically low-cost or no-cost changes to the way a facility is being operated. This can result in some utility savings. Building automation controlling the HVAC equipment on a time

schedule that does not match actual building occupancy schedules, or manual-mode operation running 24 hours per day are examples of large energy waste problems that are easy to correct once they have been identified.

Energy Cost-Saving Measures. Energy cost-saving measures are defined as those building renovations that will require the services of outside contractors to implement, and may require operating and maintenance budget adjustments to cover their higher costs. Although these projects may cost hundreds of thousands of dollars, the ability to pay them back through utility savings is usually found to be an excellent return on investment. These higher-cost energy reduction projects usually also provide better occupant comfort, improved lighting, and other indirect cost benefits. Examples of energy-saving renovations that provide both reduced utility costs and increased employee productivity and morale would include:

- replacing an aging HVAC system,
- upgrading lighting fixtures
- adding motion sensors,
- better ventilation control and reducing drafts
- adding skylights or light tubes
- increasing the number of individual temperature control systems.

Action Plan

The first step in managing utility costs and identifying potential future system problems in your facility is to conduct an energy audit. When managing multiple campus-style facilities, it is helpful to determine utility costs for each building on a dollar per square foot basis and begin with the highest energy users first. Like financial auditing, energy audits can take several forms, but usually involve ***three basic levels*** of detail.

Walk-Through Energy Audit. Much more than a simple tour of a facility, a walk-through energy audit involves a detailed site visit by experienced and certified energy auditorsand data center technicians. A review of as-built electrical and mechanical construction drawings, discussions with facility maintenance staff and IT staff, a review of data center plans and major computer systems, a review of utility billing history, and a assessment of all electrical, lighting, and HVAC systems will be performed.

A written summary report as shown in **Exhibit nnn** identifies all easy-to-correct operating and maintenance problems that can reduce utility costs when implemented. This report also includes recommendations for higher-cost system renovations and replacements that can produce significant energy savings. However, at this first level of the energy audit, detailed cost estimates and energy saving calculations are not normally provided due to the time constraint. Following the Walk-Through Energy Audit recommendations, one can typically achieve overall utility cost reductions in the area of 10 percent.

Technical Energy Audit. This second level of energy audit goes beyond the walk-through audit to examine all energy-using equipment: facility lighting, ventilation and exhaust air systems, heating and cooling systems, data center systems and all air handling units. Central plant equipment such as chillers, boilers, heating and cooling pumps, and cooling towers are reviewed and any problems noted. Computer centers include the added review of all packaged terminal-cooling units, UPS systems, battery storage systems, and backup generators, which may involve working under a higher level of security and limited accessibility. A recent study by Lawrence Berkeley National Lab, Self-benchmarking Guide for Data Center Energy Performance, revealed that in a typical data center installation, an average of 33 percent of total power goes to IT equipment. The rest is consumed by cooling (50%), the power system (9%), and lighting (8%). The most efficient data centers can achieve 80% power utilization for IT equipment. This measurement, however, does not take into account the efficiency of the computer systems at doing the desired work; only the ratio of power to computers vs. power to support equipment. The real goal is to do the same or more work using less power. Many data centers have expanded to the point where there just isn't enough power or cooling to allow new projects. Expanding data center power and cooling infrastructure can be very costly, and will only result in increased annual costs. Spending the money to make the center more efficient solves the same problem and reduces expenses while setting the data center on the GreenIT path.

Audit personnel will be experienced in completing such field investigations in restricted government and military facilities, and be familiar with security procedures and access limitations.

A written report is provided that includes, estimated data center efficiency, estimated costs to implement each energy-saving measure, the associated savings and return on investment to result. Recommendations are summarized and ranked on a simple cost-payback analysis that also indicates the most logical order of implementation. Noted in this report are the estimated remaining useful life of all HVAC and electrical equipment, to help the budget process for future replacement.

The higher-cost energy saving projects identified in the Technical Energy Audit provides annual utility savings of 15 to 25 percent and cost payback periods of 3 to 5 years. Renovations at this level produces significant improvements in employee comfort and major reductions in facility carbon footprint by implementing green building technologies.

Building Energy Modeling. The most accurate method for facility energy analysis is computer modeling. Since this procedure requires extensive data input to describe your facility, this methodology is normally reserved for large facilities and for use in analyzing those energy saving measures that have a very high implementation cost. After all field data has been collected and analyzed, as-built drawings of the facility are used to develop a base-building data base that will include all exterior surfaces, roofs, walls, windows, floors, and their insulation factors. Added to this data base will be an itemized list of every energy using device including all, lighting, office equipment, HVAC fans, pumps, chillers, boilers, air conditioners, refrigeration, cooling towers, pumps, fans, and the estimated hours of run time for each. A historical weather data file is then selected that is closest to your facilities location which contains average weather data for each hour of an entire a year. Using this data, the computer model is run multiple times, while making small adjustments in the data base until the computer-generated energy usage matches the actual month-to-month utility bills for the facility.

Once this "base" building model is operational, we then modify the data base to reflect each proposed energy saving measure and document the resulting increase or decrease in the utility usage. All energy streams are considered, as there will be interaction. For example, converting all light fixtures in a large office building from older style incandescent is an easy way to drastically reduce electrical usage. However, the loss of waste heat that was given off by the

older lights being replaced will increase heating energy costs. Each proposed energy saving measure must take this interaction into account when calculating the cost savings and pay-back of each measure. Each energy saving measure must be modeled in a logical order, and data input must take into account the energy saving reductions from the prior measure to provide a new energy usage totals before starting the next analysis. If this procedure is not followed, it is possible for the energy savings from all separately analyzed energy saving measures to total far more than a facility actual consumes.

Once each energy saving measure has been modeled, including all inter-actions between different measures and different energy streams, the cost to implement each measure is estimated and a cash flow analysis is completed. If an energy saving measure will require monthly or yearly maintenance or replacement parts, these costs can also be included in the analysis to better reflect real world operating costs and the time value of money. After all energy saving measures have been analyzed, they will be arranged in order of those having the most energy savings for the lowest cost. When operating and maintenance funds are limited, you will find our ranking of these potential energy saving projects, combined with our estimated remaining useful life for the equipment and systems that would be replaced, will be very valuable when developing your multi-year maintenance and equipment replacement budgets.

Report Findings and Develop Client Requirements

After studies and surveys are completed and energy modeling is performed and a clear picture of the facility's energy usage is made then the Client's requirements are addressed. In the Green process of facility and building modernization many, often competing considerations come to the fore. At this juncture, MTI recommends meeting with our Clients to discuss the range of energy issues that were uncovered and the possible actions that could be taken together with financial and other consequences that might arise. The process begins by helping Clients identify their actual requirements for building or facility energy modifications. This process involves the mediation of competing interests and desires among facility users. The results are correlated with budgets and finances in order for the project to continue. At the conclusion of this process, a document is prepared stating the Client's requirements for Green modifications of the facility. The next step is development of conceptual designs.

Conceptual Design

The design phases of projects follow these categories:

Pre-Design: Development of the program or brief for the project, which includes development of project requirements and objectives, including green design.

Conceptual Design: development of schematic designs is proposed for client consideration. All green proposed considerations are included in the appropriate plans, sections and elevations are appropriate and should include

Schematic Design: Proposed solutions are examined and evaluated for technical and budgetary viability as the proof of concept

Design Development: Schematic designs are validated, systems are optimized, machinery and equipment are selected and with development of details, specifications are initiated.

Construction Documents: Construction drawings and specifications are developed that reflect the aspirations for the project. These documents become part of the construction contract.

MTI's primary focus will be the Pre-Design and Conceptual Design categories prior to the actual engagement of a firm for creation of a detailed construction design. Based on the various energy audits and analyses, our understanding of the possible avenues that may be taken toward Green improvements and the Client's requirements MTI develops a change matrix with budgetary/financial implications for the Client's consideration. Once the Client gives approval to the changes deemed necessary, MTI begins creating conceptual designs.

Once an energy audit has been completed, management and budget decisions must be made to decide which projects to implement and in what order. Higher-cost energy-saving renovations usually require the help of a management team to create the bid documents for the design and construction of the more complex projects indicated by the audits. It is also important that the initial energy auditing team stay involved during this project implementation phase to ensure the scope of work has been clearly identified, and that system designers and specifiers fully understand why the work is being carried out.

At this point MTI makes a detailed examination of as-built and existing conditions of the facility or building, taking into account architectural and structural features, the various systems, including HVAC, plumbing, fire protection and alarms, electrical and data, IT, lighting, elevators and potential remediation areas such as asbestos and begin the preparation of proposed solutions for Client consideration. The conceptual designs offered as proposed solutions will include all Green considerations that are appropriate for the situation and consistent with the Client's specific requirements. When the Client finalizes its approval of proposed solutions, MTI will prepare a Cost Estimate and Schedule for implementing the approved solutions taking into account current market conditions, competitors and availability of materials. This affords the Client a reasonable forecast of when the solutions may be implemented and at what cost.

Owner's Agent Services

MTI's interest in the project does not end with the conceptual design phase. Although we are not a design firm and do not offer those services, we are highly experienced in assisting owners in the process of translating contracts for construction and renovation into completed work. This often translates into acting as the "Owner's Agent" during construction. We have the staff of experienced engineers, estimators, schedulers and inspectors to properly oversee the implementation of the Client's desired Green changes to its facility or building. Through oversight and construction management practices, we continuously monitor the activities of the general contractor and its subcontractors on behalf of the Client to maintain a continuing avenue of communication and to assure that the construction work is being done in accordance with the terms of the contract. We also provide an interface with the general contractor for the resolution of issues as they develop in the course of construction. In our experience, this form of construction management provides an excellent relationship between the general contractor and owner and offers outstanding assurance that the completed project will be compliant with the contract and satisfactory to the Client.

Closing

MTI is a firm that is dedicated to environmental resource management and stability. We understand that to achieve this stability, Eco-friendly processes, materials and people need to be involved. MTI recognizes the changes that need to be made in order to become more energy efficient. Our focus is to deliver to our customers those changes, and solutions that create a cleaner an more energy efficient environment for the future.