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You've set up a steering team to help drive your organization's energy-management efforts. Now it's time to look at the roadmap.

Part I of this two-part article discussed development of an organizational energy policy, endorsed by senior management. Concepts and systems for an energy steering team to begin administering energy management as a culture within an organization were also highlighted. In this concluding installment, the focus is on implementation and follow-up by the steering team. This team develops priorities, provides needed tools and techniques and develops incentives that encourage employees to make energy savings happen.

Momentum for energy management can begin by identifying 80% of the potential results that may result from only 20% of the potential actions. Even if the ratio is closer to 70:30, these actions will tend to have low risk and a high probability of success. The results can then be publicized and used to justify the future actions that may have a somewhat higher degree of difficulty and risk.

Energy conservation in existing facilities

Energy is often wasted when people are resistant to change. Every employee must be viewed as an energy manager when it comes to reducing energy uses in existing facilities. Employees at all levels must be encouraged via staff meetings or mass communication to:

- Suggest energy-saving measures
- Turn things off when not in use
- Operate equipment at the lowest possible power or thermal level
- Enable the use of controls which reduce energy use during unoccupied periods
- Report malfunctioning equipment

Training needs must be identified so people will have the know-how to reduce energy and utilities usage. Often, employees will identify their own training need if asked.

An Intranet Website is a valuable tool for providing information to employees on energy-conservation techniques, as well as for tracking the energy uses. Energy performance and ideas need to be periodically discussed at staff meetings, in conjunction with environmental issues such as recycling.

Organized energy assessments should be made periodically for every facility. New findings are most likely to result over time if energy assessments are performed using various methods, some of which include:

- Using an energy expert from outside the organization
- Cross-assessments, whereby a team from one facility in the same organization performs an assessment for another facility, and vice-versa
- Self-assessments, using a trained assessor from within the organization

The energy assessment should be performed according to a pre-developed protocol. The protocol should be designed to minimize site personnel time and disruption of facility operations.

Operation and maintenance

Planned or predictive maintenance techniques will best ensure energy-efficient operation of equipment. Reactive maintenance is likely to result in increased energy usage, as bearings wear to failure, motors run too hot, electrical distribution losses increase, components wear excessively, etc.

Standard, documented operation and maintenance (O&M) procedures should be developed to ensure energy efficiency and reliability for major energy-using equipment. O&M standard procedures should require various levels of approval from within the O&M organization, and should be updated on a regular basis.

The ideas of O&M personnel must be actively sought for energy improvements in existing facilities—*and during review of designs for new or modified facilities*. On the contrary, consider what happens when O&M people who probably know that an installed system will not perform as intended are NOT consulted: They'll no doubt make it operate as best they can, but often the end result will be unnecessarily high energy use.

REMEMBER**: Communication among O&M people across sites is helpful for energy-saving ideas, where an organization has more than one site.**

Energy-efficiency improvements frequently result in reduced maintenance requirements because things run cooler, rotating equipment spins more slowly and control is improved. These types of maintenance savings should be calculated and used to help justify energy-efficiency projects.

Best practices specific to the organization
Over time, the organization will identify best practices for energy savings in addition to aforementioned O&M procedures. Subjects for best practices include lighting systems, HVAC systems, compressed air systems, steam systems, process energy systems and any other energy-using systems. The energy champion or his/her delegate should document energy best practices, and the steering team should approve the documents. This documentation should be kept in as simple a format as possible, such as bullet points or checklists. The documents should be periodically updated and made readily available—*such as on an Intranet Website.*

Energy best practices can be obtained within the organization, and selected from outside sources such as the U.S. EPA/DOE Energy Star Website and trade organizations. O&M personnel should be encouraged to participate in development and review.

REMEMBER**: Best practices documents specific to the organization are a valuable checklist tool for energy assessments, as well as for the design of new or modified facilities.**

New and modified facilities
There is nothing more frustrating to an energy manager or steering team as first witnessing the progress of an existing facility becoming energy efficient, only to then see the opening (or commissioning) of a new addition that doesn't meet organizational energy objectives. The cost of energy-efficiency measures in a new facility is almost always lower than for retrofitting existing facilities.

As with the purchase of major energy-using equipment, energy decisions for a new facility design should be based on life-cycle cost (LCC). Basing decisions on LCC in the design process will take more time, effort and resources, but will pay dividends in the long run.

So, energy efficiency needs to be made part of the capital project management process for new or modified facilities. This process will usually consist of a number of phases, including business planning, facility planning, front-end engineering, project execution and operation and evaluation.

***REMEMBER*: The best opportunities in project development are in the facility-planning and front-end engineering phases. Far fewer opportunities exist in the project-execution phase wherein contracts are awarded, design details are finalized and equipment is purchased.**

Besides using best practices in the design (as noted above), there should be peer reviews of the design during the front-end engineering phase of projects. Peers ideally include technical experts who are not otherwise involved in the project design. The people who will be responsible for O&M should also review the design at this point.

Typical performance measurements for facility project teams involve:

1. Completion on time
2. Spending within the capital budget, and
3. Facility economically performing per business needs

Of these three performance measurements, the first two are by far the easiest to obtain, while energy efficiency falls into the third category. In reality, project team members are often rewarded for only items 1 and 2 above. Sometimes, energy-efficiency measures are even eliminated late in the project to keep it within the capital budget.

***REMEMBER*: Organizations wanting energy efficiency must reward project teams based on all three of the above objectives, even if more time and effort is needed to evaluate the third objective. Doing so will avoid the embarrassment of having to retrofit**

cost-saving energy improvements into a brand new facility, at much higher cost than if things were done correctly from the beginning.

Procurement of energy-intensive equipment or systems

The discussion of LCC leads to the procurement process. When it comes to major energy-using equipment and systems, simply seeking the lowest bid is inconsistent with energy-management objectives. After all, often more than 80 or 90% of the life-cycle cost of such equipment and systems is for energy input. The importance of the role of a procurement specialist is enhanced by incorporating LCC principles into the process.

A general approach for procurement according to lowest life-cycle cost is described here. Specifications must be developed by the unit initiating the purchase of energy-intensive equipment—*or its engineering service provider*—taking LCC objectives into consideration. Then, requests for proposal (RFPs) must be developed to ensure that suppliers understand the customer goal of minimum life-cycle cost. From the RFP, suppliers must understand the process to be used by their customer in calculating LCC so they can propose equipment and any maintenance agreements accordingly.

There are many ways to develop an RFP that ultimately awards the proposal to the supplier with the lowest life-cycle-cost, depending on the scope of what is to be purchased. The LCC calculation method should be approved by a financial specialist. As an example, the calculation process used to select the successful proposal can be based on the following items:

1. The capital cost
2. Annual energy-input expense costs based on:
    1. A system output profile of hours of anticipated equipment or system operation per year at various part loads
    2. The energy input needed at each part load condition (data provided by the supplier), which will be verified by pre-acceptance performance testing
    3. The unit cost of energy input to the equipment or system

4. Annual maintenance costs *and*
5. Determination of life-cycle costs by either:
    1. A present-worth factor, which converts annual costs (#2 and 3 above) to equivalent capital cost. Then, life-cycle cost is the sum of capital cost plus the present worth of annual costs, or
    2. A discounted cash-flow model that calculates life-cycle cost as "net present value"

In the procurement process, a penalty must be specified in the event that pre-acceptance testing (per 2.b. above) shows that energy efficiency is lower than stated in the supplier proposal. The penalty may be calculated based on the anticipated increased life-cycle energy cost due to the underperformance.

Equipment bulk-purchasing commitments, where feasible, can lead to other LCC savings. These could include lower prices for equipment, standardization of spare parts, a reduction in RFPs and, sometimes, even free engineering assistance from the supplier.

A procurement specialist is also a valuable leader or team member for the purchasing of the supplies of energy and utilities. Other energy-supply team members would be facility specialists, engineers and financial specialists. Together, they can identify competitive utility-supply alternatives, perform analyses of various available tariffs and seek the best combination of reliability versus cost. Some competitive supply alternatives may include deregulated electricity, transportation gas or cogeneration of electricity and thermal energy.

REMEMBER**: Best practices documents can be developed for procurement procedures for energy-intensive equipment, and for purchasing supplies of energy and utilities.**

Communication

Internal communication specialists are quite useful in making all employees aware of energy management. For example, they can assist with Website development, employee newsletters and press releases regarding the topic. The development of an Intranet site will enable communication of:

- The organization's energy policy
- Specific goals and progress
- Measurements
- Benchmarking
- Results of statistical analysis
- Energy-conservation techniques
- Case histories
- References (internal and external links)
- Best practices
- Awards and recognition

***REMEMBER*: Success needs to be celebrated! Awards or rewards are often highly effective motivators, especially if they are presented from senior management, with publicity. These can be as simple as trophies, plaques, free dinners, entertainment tickets, time off, etc. Monetary rewards can also be used.**

Review and adjustment
The energy steering team must periodically examine energy-savings results, compare results with goals and make adjustments for future efforts. Lessons learned must be identified and taken advantage of. This will ensure longevity of the energy-savings culture. **MT**

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