

Information and Motivational Incentives as a Stand-Alone Energy Conservation Measure

Claire A. Hobson and Kathy M. Baker, Bonneville Power Administration
James M. Scace, Energard Corporation

In the summer of 1990, Bonneville Power Administration contracted with Energard, Inc. to study motivational incentives as a stand-alone energy conservation measure. The goal of this effort was to show that by motivating individuals responsible for a facility's energy management significant energy savings can be realized. The study works with eleven buildings (six are part of a hotel chain and five are campus buildings at an university) and their building operators to initiate motivational incentive programs. This paper provides a detailed picture of the methodology used in the study and its outcome, and draws some conclusions about this type of approach to enhancing the performance of energy efficient equipment.

Introduction

One of the most pervasive problems the Bonneville Power Administration (Bonneville) has encountered is how best to maximize the measure lives of energy conservation measures (ECMs) installed through a variety of commercial sector programs. It is no secret that, in many cases, simply installing equipment does not guarantee energy savings. Unfortunately, most commercial equipment is not properly maintained nor effectively operated. Building followup into programs is part of the solution but that takes staffing and accountability to do it right.

Bonneville, in an effort to ensure that we are realizing returns on sizable ECM investments in the commercial sector and acknowledging the impact individual building operators have, contracted with a Northwest energy service company to reinforce the theory that the combination of information and motivational incentives for building operators not only enhances the performance of energy efficiency equipment, but is in itself a viable and long term conservation measure.

This paper summarizes the methodology used in this study, specifically looking at how incentive programs were set up at the two study group locations, provides a brief look at results, and provides some observations about using this approach in the commercial sector.

Methodology

Study Groups

Eleven buildings were selected to participate as subjects of this Study. They fall naturally into two groups: six are a

part of a hotel chain and the remaining five are campus buildings at a university.

The six hotels were selected for the Study because they all had Energy Accounting provided by the ESCO for a full year. In addition, they are all located within the same geographic area in Portland, OR (within 10 to 15 miles of each other at their greatest distance) so they are all exposed to virtually the same weather conditions. None of the hotels has been the subject of energy engineering analysis or retrofit work. Maintenance policy at the hotels is consistent, with requirements varying primarily with age of the hotels and each hotel's management priorities as would be expected in any multi-facility study.

Physically, five of the facilities are comparable in their wood frame and stucco construction ranging from two to three stories. One facility is a high-rise. Use of special purpose rooms (meeting rooms, pool areas, restaurants, etc.) compares well from hotel to hotel in that the demands of occupancy do not vary greatly.

Hotel senior management fully supports energy conservation efforts. However, savings are to be achieved with as little capital expense as possible. The initial and certainly most appropriate approach is to identify and capture the no-cost opportunities first.

The university buildings are located in even closer proximity (Seattle, WA) to each other. Two of the five buildings are dormitories with cafeterias. The remaining buildings are: an athletic center, a library and a multi-use facility (recreation center, health center, etc.). Square footages range from 95,000 square feet to 175,000 square feet.

Table 1. Description of Hotels

<u>Hotel</u>	<u>Square Footage</u>	<u>No. of Guest Rooms</u>	<u>Building Type</u>	<u>Extra Amenities</u>
Hotel 1	251,600	351	3 levels; 5 wings	2 restaurants; 2 lounges; pool; beauty salon; laundry; 15 meeting rooms; gift shop
Hotel 2	96,388	214	2 levels; 4 wings	1 lounge; 2 restaurants; pool; laundry; 6 meeting rooms
Hotel 3	302,988	320	4 levels; 4 wings	2 restaurants; 1 lounge; pool; children's pool; gift shop; laundry; 17 meeting rooms
Hotel 4	383,000	476	15 floors; 2 towers	3 restaurants; 3 lounges; pool; exercise room; gift shop; laundry; 15 meeting rooms
Hotel 5	133,000	237	3 levels	1 restaurant; 1 lounge; pool; gift shop; laundry; laundromat; 8 meeting rooms
Hotel 6	112,232	160	2 levels; U shaped	1 restaurant; 1 lounge; pool; gift shop; laundry; 13 meeting rooms

This group of five buildings have been the subject of several thorough engineering studies and has been a client of the ESCO since the early 1980s. In addition, they have had several years of Energy Accounting provided by the ESCO and had lighting retrofit work performed under Bonneville's Purchase of Energy Savings Program. Under this program, the ESCO entered into a contract with the university, financed their retrofit project, provides remote electronic monitoring of all pertinent meters and is being compensated by Bonneville for saved energy. The retrofits

were successfully installed and the university maintained and controlled the new equipment without direct contractor involvement for two years.

This success could partially be attributed to a competent and highly motivated Director of Security and Facilities who supported and actively pursued energy efficiency and directed his building operators to do so as well. Following the retirement of the aforementioned director, both electrical and steam use began to increase. Given this

Table 2. Description of Campus Buildings

<u>Building</u>	<u>Square Footage</u>	<u>Building Type</u>	<u>Facilities</u>
Building 1	120,078	10 Stories	Dorm; kitchen; dining; student lounge
Building 2	176,976	12 Stories	Dorm; kitchen; dining; student canteen
Building 3	105,602	2 Stories	2 pools; 3 gyms; 5 handball courts; 2 squash courts; large locker rooms; classrooms; offices
Building 4	94,273	5 Stories	Meeting rooms; study rooms; offices; main circulation room
Building 5	44,726	4 Stories	Dorm; extended care nursing; 2-story chapel; recreation room; laundry, kitchen; dining

personnel change, internal politics at the university and a pervasive lack of motivation on the part of management and building operators, the university became a natural, albeit challenging, candidate, for this Study.

Information: A Key Ingredient

As previously mentioned, both study groups have contracts with the ESCO to provide low-cost but highly effective tools for substantially reducing energy costs. Information and its use has proven to be a key ingredient to successfully reducing energy costs and can provide an important foundation for motivational incentive programs.

The ESCO strongly believes that energy can only be successfully managed or controlled by the responsible use of information provided by perpetual monitoring. This is achieved in the following ways:

- Electronic Tracking - Real-time monitoring of energy sensors located throughout client's buildings that logs and displays remotely at the ESCO office hourly, monthly and annual use of all utilities and sub-systems.
- Energy Accounting - Monthly monitoring of utility usage and cost with written and verbal communication with plant engineers and all levels of management.

Setup of Incentive Program for Hotels

The ESCO's first step in initiating the motivational incentive program at the hotel chain was to set up a three-way dialogue between the chain's corporate engineering, the Directors of Engineering at the individual hotels and the ESCO intended to heighten awareness and set up a formal feedback process for information from Energy Accounting reports. Six distinct activities/results were realized as a result of this dialogue and served to lay an appropriate foundation for the implementation of motivational incentives:

- The individual hotel engineering departments were presented with initial Energy Accounting reports. Each hotel's performance was analyzed in comparison to other hotels in the ESCO's database, in comparison to published industry standards and in comparison to the hotel's past previous performance history. Initial Energy Accounting determined that many of the Energy Use Indexes were considerably higher than industry averages and that opportunities existed for substantial reductions.

- The stated corporate goal with respect to energy efficiency emerged. The chain wanted to achieve as much savings as possible without capital expense.
- Corporate personnel requested a three-day meeting with the Operating Vice President, Corporate engineering staff and each hotel's Director of Engineering. Day One was devoted to Operations and Maintenance training. Days Two and Three were devoted to site visits to encourage "cross-pollination" of operational ideas and the informal establishment of friendly competition between hotels. Once corporate management's support and enthusiasm was made evident it clearly showed that a company-wide program was to be accomplished internally with the ESCO's help rather than a program that was being done "to" or "for" the director of engineers.
- Once early successes were documented via the Energy Accounting Report, the executive officers were notified and a presidential letter of support was prepared for the company information newsletter. The monthly Energy Accounting Report was made available to all hotels and is filled with current and long term comparisons (with rates of change as percent) for nearly all data presented. Operating personnel were able to gauge progress, or lack thereof, in terms of both energy and expense. Monthly updating of comparison information works something like a report card. It is also a continuing reminder that the individual hotel's results are being reviewed at all levels of management.
- Additional comparisons are made each month by means of the company-wide ranking of Indexes. This stimulated informal conversations between Directors of Engineering. Competition was encouraged and blossomed into side bets and friendly badgering. The competitive spirit began to run at a high pitch as soon as the dynamics of change became evident.
- Directors of Engineering soon discovered that their monthly Energy Accounting Report could be used as a vehicle for communicating with their General Managers: to enhance management's awareness of their problems and concerns, to call attention to their accomplishments and to quantify these accomplishments in terms of financial impact on their hotel. This improvement in communication in turn provided positive reinforcement for the Directors of Engineering and encouraged them to continue and increase their efforts.

Once the foundation had been laid for the motivational incentives program, a pre-planning phase was initiated to put into place at the hotel chain such a program. Incentives in the chain's case were cash awards made at the end of the year based on a percent progress toward achievement of pre-set under-utility budget goals. All funds for the incentive program are a portion of the hotel's under-budget savings. The pre-planning phase depended heavily on the Energy Accounting reports. Specifically, progress analysis, cost determination, ranking for worst case management and O&M cost reduction opportunities were of utmost importance.

In August and September a preliminary utility budget review is done for each hotel for the following year based on Energy Accounting trends in the current year. (The hotel is on a calendar year fiscal year.) The process was initiated early in the fall to accomplish the following:

- Determine, by fuel, possible reduction with O&M measures,
- Increase utility budget awareness at all levels,
- Improve budget management skills at the director of engineering level, and
- Increase priorities to conserve all utilities.

Budget acceptance is gained throughout October and November by management with a determination of potential reductions. Goals must be set for all metered utilities by January 1, based on the overall management goal for all properties. Properties with higher Energy Use Indexes are given greater goals and efficient properties lesser goals. These net to management goals. Once the goals have been approved and are published for each hotel, the program is in place for the year. The base year is January 1 with the issuance of the ESCO's Energy Accounting Report for January. Reports track progress based on utility use reduction and performance to budget. This process continues throughout the fiscal year with a high level of phone consultation between the ESCO, corporate engineering and each hotel.

Incentive bonus payments are based on achieving from 25% to 125% of the reduction goal. The directors of engineering have a potential of a year-end bonus of up to 15% of salary.

All program expenses are charged to utilities monthly. This burden includes the potential bonus. The result is a minimum risk that the net program will ever result in an over budget utility report. If a surplus does not exist, no bonuses are paid.

Setup of Incentive Program for the University

In comparison to the successful initiation of the motivational incentives program at the hotel, the university has been a great disappointment. Repeated attempts to establish a program have been largely ignored. At one point, things looked promising following a meeting during which upper management expressed support for the program. However, this "support" quickly vanished and nothing has been even remotely done to implement the plan. Repeated meetings with Plant Services and Student Affairs have been sincere in their discussions but lacking in rational direction or purpose. Neither Plant Services nor Student Affairs are empowered to initiate a process to encourage campus energy efficiency, primarily because it requires buy-in from the administration. (Fortunately, this is changing. In February 1992 the ESCO provided Plant Services with a software system the ESCO developed that provides diagnostic information about the university's energy use patterns. One individual is using it and making modest progress in reducing energy use.)

The fact that the current Director of Security and Facilities does not have an energy background does not help the situation. His background is in criminology and hence, this is where his primary emphasis lies. Further complicating the situation is a personality conflict between this Director and the head of Plant Services (who is also new to the university). The head of Plant Services is pro-conservation however, has had a difficult time coming up to speed and in the meantime, has lost the respect of Plant Services employees. The Director of Security and Facilities has chosen to side with Plant Services employees rather than the head of Plant Services. Given this tenuous relationship, conservation is unlikely to become a priority. A lack of manpower has compounded the problem. Employees are not well-trained and in effect, spend most of their time "putting out fires".

The situation is made even more interesting given that the university pays for electricity at a rate of \$.025 per kWh. If they use an extra 10,000 kWh, it increases their bill by only \$250.00. The university is simply not willing to spend man hours trying to find the cause of an increase. The ESCO has suggested that the greatest incentive for non-profits would be a rate structure that directly rewards use reduction which equals budget surplus for other use. An even stronger incentive would be rate penalties for increased use. The Conclusions section provides some additional observations about why the university's performance in the motivational incentives arena has been less than stellar.

Results

The hotel's Motivational Incentive Program has been successful. For a eleven-month period data shows a net reduction of 1.7 million kWh at a program expense of \$17,700. Hotel labor expenses were minimal and incentive payments have been added specifically to control utility costs. For the subject hotels, the overall results for the eleven-month period are encouraging. Electricity savings from September 1990 through August 1991 were:

Hotel #1	-	385,941 kWh
Hotel #2	-	77,252 kWh
Hotel #3	-	479,776 kWh
Hotel #4	-	88,296 kWh
Hotel #5	-	*(241,234)kWh
Hotel #6	-	77,965 kWh

Maintenance personnel at Hotel #5 were new. However, during the four months following August 1991 losses were turned around as new personnel came up to speed. As of 12/31/91 electrical use had dropped 1.1% in the rooms as well as 0.9% on the main power.

Cost effectiveness numbers are impressive. As mentioned, at a direct cost of \$17,700, 1.5 million kWh were saved over a seven-month period. That equates to 1.2 mills or \$0.12 per kWh saved. This cost assumes savings that are strictly electrical when, in fact, the program has also generated substantial savings in natural gas and water.

Conclusions

As noted in the previous section, the two study groups responded in vastly different ways to this Study. Given this dichotomy, it may be appropriate to prioritize which commercial entities would benefit most from this approach based on the following observations:

1. Institutional/governmental facilities are not commercial entities. They have no profit motives and are therefore, less inclined to react to outside influences if they are currently meeting budgets for utilities.
2. In general, personnel at institutional/governmental facilities that have the greatest impact on utility use are under a union contract that does not lend itself to cash awards to individuals. (This does not mean motivational incentive programs cannot work. Programs that provide recognition and appeal to personnel's professionalism have proven successful in institutional settings. See Peter Cebon's paper in the proceedings.)

3. Conservation is equated with reduced services to faculty/students/employees at institutional/governmental facilities and is perceived as a detriment to the work/academic environment. If there is a complaint, the operations personnel will generally react by changing the operating parameters drastically without an in-depth analysis of the complaint. This reaction is also intimately tied to Observation #1 above. If budgets for utilities are being met, there is no reason NOT to make a change.
4. As can be the case in any commercial building, there are often increased energy loads unrelated to installed ECMs that can mask savings. Here again, if utility budgets are being met, there is no reason to isolate and quantify the new load or even understand where the new load is coming from.
5. The budgeting process at institutional/governmental entities can also be a strong deterrent to a motivational incentives approach to saving energy given that budgets are often unofficially "use-or-lose" in their format.

In short, this approach is not for every commercial building. Profit or the need to increase profitability is not as important in the institutional/governmental sector. The private sector is no different than the institutional/governmental sector when it comes to equating efficiency with reduced services (see Observation #3 above). Their principal business is to provide goods and services to a range of customers. Companies view the need for efficiency as considerably less important than the need to maintain strong customer relationships. However, they are responsive to actions that increase the cost competitiveness of their products or profitability.

By convincing commercial building management that there is a significant cost/benefit ratio of offering building operators a monetary portion of energy savings realized or a trip based on a percentage of savings realized, utilities not only stand to realize substantial energy savings, but will safeguard and protect significant investments made in commercial sector buildings. An intimate knowledge of the client's operation and maintenance style is essential, plus proven measurement techniques that the participants trust to be equitable. This approach could easily be incorporated into several followup/aftercare program services (operation and maintenance contracts, building commissioning, etc.) being offered by utilities around the country.