Energy-Related Practices and Investment Criteria of Corporate Decision Makers

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ABSTRACT

This paper reports the results of our investigation into the energy-related investment practices, processes, and criteria of 26 corporate decision makers. Despite their pivotal role in the procurement process, decision makers have been largely neglected in previous published market research on energy efficiency. We targeted all major commercial building sectors (including office, retail, and health care); and both major corporations as well as real estate investment trusts. We found that most corporations have invested in some form of energy-efficiency improvements in their facilities, with the majority of them choosing "low-hanging fruit" investments with quick returns, such as improved lighting and HVAC equipment. While decisionmaking for energy-related investments occurs at a variety of levels, the majority of firms reported a bottom-up procedure, with final approval coming from a high-level financial authority, such as the building owner or the president. Most decision makers budget in advance for energy-efficiency investments, which are more often considered capital outlays than operating expenses. The basis upon which proposed investment decisions are made are first, technology track records, followed by financial performance estimates, perceived effects on tenant comfort and satisfaction, and finally, defined investment priorities.

Introduction

While abundant evidence exists that proves the profitability of energy-saving opportunities, the technologies embodying these opportunities have not spread universally throughout the building market; a phenomena sometimes called the "efficiency paradox" (DeCanio 1998), or the "efficiency gap" (Haddad & Howarth & Paton 1998). This paper presents results from survey research on the processes and criteria that corporate decision makers apply to the selection, design, management, and procurement of energy-efficiency measures and chilled water systems. It was conducted with support from the Pacific Gas and Electric Company (PG&E), and with the assistance of PG&E's Pacific Energy Center staff. The results of this research were intended primarily to define the direction and content of a CoolTools™ Decision Makers' Guide, a brief document designed to encourage informed decisions on selection and design of chilled water plants[1] among corporate decision makers in PG&E's program territory of Northern California. We feel that, despite the relatively small sample size of 26 decision makers, the findings are more broadly applicable to energy service

[1] Chilled water plants are central systems that provide chilled water for comfort and process cooling to one or more buildings.

providers, energy service companies[2], manufacturers of energy-efficient building products, utilities, and others interested in marketing energy-related technologies and services to the commercial building sector generally.

For the purposes of this study, a "decision maker" has been defined as any individual responsible for authorizing capital expenditures to improve the economic and energy-related performance of a facility. These individuals include owners or their financial representatives (such as chief financial officers, Directors, Facility/Department Managers, or Program Managers). Survey's have shown that these executives feel that they have little control over electrical energy costs in their facilities, and know little about energy cost management in general. However, Chief Financial Officers (CFOs) that had retrofitted their buildings reported a high level of satisfaction with the cost savings they had achieved (Komor & Katzev 1988, Market Research Bureau 1998).

Our research reveals that most firms employ a multi-stage, multi-actor process for the assessment and approval of energy-efficiency investments, including those that pertain to chilled water plants and HVAC systems. "Decision making" typically involves various parties within a firm; the most critical and information-intensive tasks of technical and financial assessment occur early in the process, while final approval tends to be relatively quick and perfunctory if a proposed investment meets key criteria. These criteria include financial performance estimates, of course, but also perceived effects on tenant comfort and satisfaction, technology track records, and technology reliability. We discuss these and other findings in detail in this paper.

Methodology

This study was conducted using an interview schedule, consisting of 15 fixed, open-ended questions. Interviews were conducted via phone by two IMT staffers in October and November of 1999. Questions focused on: 1) the extent to which major Northern California companies already invest in energy-efficient equipment and services in their facilities (both owned and leased), 2) the corporate decision making processes with regard to budgeting for energy-efficiency investments, 3) the types of technical information, performance indices, and other criteria that decision makers require when making energy-related investment decisions, and 4) the use of utility services in the restructured utility environment.

We initially identified 75 firms as targets for this survey, with the goal of obtaining 20 complete responses. Firms who own property in Northern California (PG&E's program territory) were chosen, and were purposefully selected to represent a range of building sectors (including office, retail, health care, government, and others) and corporate management types (including real estate investment trusts [REITs][3] and privately-held firms) (see Table 1). We placed emphasis on firms that own large or multiple properties, with commensurately large cooling loads, and therefore have the greatest potential for energy savings. For most targeted firms, the names, titles, and office phone numbers of individual

[2] Energy service companies (ESCOs) conduct energy auditing and consulting, design engineering and design built construction of energy projects to industrial, commercial, municipal, and institutional clients. They may also provide guaranteed savings programs, construction and project financing, and other types of performance contracts.

[3] REITs are (usually public) corporations who buy, sell, develop, manage, and renovate real estate.

decision makers were identified in advance. An additional two firms were added to the list, based on the same original criteria, for a total of 77 targeted, and 26 completed surveys.

Table 1. Number of Respondents by Sector

Health	2
Residential	3
Diversified	4
Hotel	1
Office	11
Retail	3
Restaurant	1
Government	1
Total respondents:	26

Building sectors represented in the 26 surveys include income residential, diversified, hotel, office, retail, health care, restaurant, and government facilities. The number of facilities owned by surveyed firms ranges from four large buildings (city government) to 2,600 stores (national retail). Of the 10 companies that reported square footage, the average floor area represented is nearly 25 million square feet.

We confirmed that the respondents play a direct role in identifying energy-efficiency opportunities for buildings owned by the firm, assessing the merits of various options, and/or in approving proposed purchases. In several cases, interviews were conducted with multiple representatives of the target firm, such as cases where the CFO responded to relevant survey questions, and then referred us to the facilities manager to provide answers to the rest.

Findings

Level of Energy-Efficiency Investment

Nearly all of the surveyed firms had invested in some form of energy-efficiency improvements to their facilities. Projects reported range from replacement of lighting fixtures and meeting the California Building Standards Code, Title 24, to installation of advanced windows and retrofits of automation and control equipment. The Senior Vice President of Design and Operations at a large office REIT told us: "We do every retrofit we possibly can," and another decision maker told us that all of the buildings that his firm acquires are automatically analyzed for upgrade opportunities. The most frequently reported investment was lighting retrofits, followed by HVAC system replacement or retrofit, and other HVAC equipment. These findings are consistent with nationwide building energy consumption surveys from 1992 and 1995, where lighting was the greatest consumer of electricity in commercial buildings, followed by cooling (Davis & Swenson 1998, 4.127). Other improvements listed by our respondents were fan motor replacement, energy management systems, and time-of-day scheduling on lighting. Many decision makers said that they utilized utility rebates to reimburse or justify the cost of the investment. One of the respondents, a large office REIT, has conducted multiple energy-efficiency projects totaling

over $20 million, earning the U.S. Environmental Protection Agency's (EPA) ENERGY STAR™ Building Label[4] for 22 of its properties.

Only one respondent, the Vice President of Operations at a prominent retail REIT, said that his company had not made any energy-efficiency improvements to its facilities to date. This however, was primarily because the building tenants are responsible for the bulk of the utility expenses, with the REIT only paying for common area lighting such as in shopping center food courts and parking lots. Despite the fact that the company is only responsible for a small percentage of overall operating costs, the REIT had still decided to track their energy costs by seeking a contractor to measure their meter loads.

The extent to which corporate decision makers pursue energy-related investments is, we found, related to both who pays the electricity bills, as well as to the type of building sector (where retail or multifamily residential corporations will pay very little of the costs and others, such as office, may pay more). The overall level of energy-efficiency investment appears to be moderate, with decision makers most often choosing "low-hanging fruit" — quick-return retrofits such as lighting and HVAC equipment.

Decision-Making Process

Level of discretion. Across the range of respondents, investment decisions on building equipment and energy upgrades involve a complex process, which engages building-level staff and executives responsible for property management, as well as financial officers, investors, and their representatives. The process generally involves any or all of the following stages: tracking of problems and needs; investigation and technical assessment of equipment options; financial analysis; selection of a preferred option; approval; and procurement.

Most firms described a bottom-up decision making process, in which on-site property managers or chief engineers identify opportunities for investment, then seek further endorsement and analysis from regional managers or a consultant, and obtain final approval from a high-level financial authority. Almost universally, the most critical and information-intensive step is not the final approval and release of funds, but prior technical assessment and financial analysis. Such assessment and analysis is generally conducted by a combination of building managers and staff, consultants, or executives who oversee facilities and operations.

Some firms and agencies have managerial-level staff or consultants specifically responsible for energy management in buildings. In these cases, energy efficiency tends to be pursued in a systematic way. The smaller firms we surveyed tend to hire consultants to help them identify opportunities for energy-related improvements, then take bids on different systems. In other cases, companies will procure a consultant to conduct a detailed feasibility analysis after in-house staff has already identified energy-efficiency opportunities.

Larger firms tend to have a very prescribed approach to their decision-making process for energy-efficiency investments. For example, at a large office REIT, in-house engineering staff conduct yearly energy audits to identify and analyze opportunities for energy-related improvements. The Vice President of Engineering then evaluates proposed measures, followed by the Senior Vice President of Operations. After passing their respective criteria,

[4] A national program for eligible buildings which maintain an indoor environment consistent with industry standards.

the measure is entered in the budget and goes to the regional Senior Vice President. The CFO issues ultimate approval for the investment. At another firm, "regional property managers look at buildings with in-house engineers to decide which capital expenditures will have the best return on investment and come up with recommendations for projects with 'net operating income enhancing' potential. The management committee then approves or denies the investment." An exception to these systematic approaches was a decision maker at a large grocery that budgets for energy-efficiency investments on a strictly ad hoc basis. Any employee has the authority to make a recommendation for improvements, which is then brought before the Board of Directors to investigate and decide upon.

When asked who issues final approval for energy-efficiency investment, the greatest number of survey respondents said that upper management, the president, or the building owner bears this responsibility. High-level facilities or operations employees (such as the Senior Vice President/Regional Vice President of Operations or the Chief Operating Officer) were next most frequently cited. Two respondents said that a financial manager (the Chief Financial Officer of one and the Comptroller of the other firm) makes final decisions in their companies.

In three out of 26 companies, final approval for investment is made by group decision, such as the Board of Directors, or a combination of the facility owner, operation, and finance managers. Within one large real estate company, all final decisions regarding the budget are made by a seven-member financial resources committee consisting of the Chief Executive Officer, CFO and other business leaders, and are approved by a majority vote. In two cases, we found that sign-off for an energy-efficiency investment depended on the level of investment being sought. For one company, the Vice President issues approval for all investments over $25,000, while anything under that amount is decided by the Director of Facilities. Participants of a study of energy-investment related organizational behavior at two universities found that it was easier to raise $1 million than $50,000, because senior management makes the large capital decisions (Cebon 1992, 808).

Budgeting for energy efficiency. Twenty two out of 26 decision makers responded that they budget in advance for energy-efficiency investments. How far in advance, and how exactly they are planned, however, differs greatly among firms. While a decision maker told us that his company budgets in advance for energy-related investments only in *new* developments, the rest said that they account for energy-efficiency investments in their regular budget cycles, which range from one to five years. Budget plans under two years are very common, with seven firms reporting cycles of just one year. Of note is one firm that has an 18-month detailed budget and business plan, which is reevaluated yearly and updated quarterly.

Nine firms reported budget plans of over two years, with five decision makers reporting up to five-year capital plans. Three of the surveyed companies have five-year capital maintenance plans (for lighting and HVAC, for example), broken down by year. In a number of cases, the lead-time for budgeting depends on the capital cost of the investment, with higher outlays requiring longer advance planning. It appears that, overall, the further in advance the company budgets for energy-efficiency improvements, the more likely an investment will be implemented.

Energy-efficiency investments tend to be considered capital outlays as opposed to operating expenses among the majority of firms we surveyed, although to many of them this classification depends on the amount of capital and the type of investment in question. In

general, routine maintenance on equipment (for example, relamping or changing parts) is considered an operating expense, while investments with longer life spans, or higher cost items are budgeted as capital outlays. One respondent said that energy-efficiency investments were considered capital outlays only if they were over $1,000, and a second said that the investment would have to be over $10,000. The greater the size of the firm, the higher the threshold for a capital outlay tended to be. Two companies cited a $50,000 threshold, while a decision maker at another said that an investment would have to cost greater than $500,000 to be considered a capital cost rather than an operating expense.

More than half of those surveyed indicated that discretionary funds are available for energy-efficiency measures not specifically budgeted in advance, although such cases are rare. For most firms, unbudgeted outlays must be relatively inexpensive, and must have unusually attractive payback features. Seven decision makers reported that they do *not* make discretionary funds available for non-budgeted energy-efficiency measures. One respondent said that such investments have to be budgeted ahead of time or they will not be considered since energy efficiency is not a high priority for the firm.

Energy cost information. Electrical energy costs are seen by financial decision makers as the least controllable of several typical business costs (i.e. labor, rent, promotion/marketing) (Market Research Bureau 1998). A study of behavioral issues influencing energy use in small commercial buildings also found a strong belief among small-business people that energy use, and therefore, energy costs, cannot be controlled (Komor & Katzer 1998, 237). While nearly all of the decision makers in our study said that they do track energy costs in their buildings, how closely they were tracked varied from hourly in some companies, to monthly or even less frequently in others. The reasons reported for monitoring energy costs closely were fairly straightforward: "Energy is a major expense for our business," and, "We have to keep operating expenses at X to that we can charge Y for rent." One office REIT uses a database that tracks energy costs by month, by building, and plots facility energy use over the past three years. Another decision maker said that his company engineers conduct frequent energy audits with information on expenses and energy usage, and then make comparisons on a yearly and seasonal basis.

In sectors such as retail and in residential REITs, decision makers rarely keep track of their company's energy costs because they only pay the utilities for common-area costs, which are minimal. An office building owner also told us that energy costs do not get much of his attention because the costs are fairly stable. Those companies with the majority of properties outside California tended not to track costs very closely because of relatively low energy prices.

Decision-Making Criteria

Track record and reliability. The majority of decision makers interviewed stated that they most often rely on information about the track record of an energy-related technology for their investment decisions. One respondent said that, from his company's perspective, the track record for energy-efficient technologies is already established and is therefore unimportant. Another said that his firm already has a wealth of information about which technologies generate the best returns, because it owns numerous energy-efficient buildings that have earned the EPA ENERGY STAR™ Building Label. However, over half of the

decision makers surveyed agreed that information about the track record of a technology is critical because, as one put it, "it's hard to undo something once it's done."

Looking at the historical performance of a technology helps decision makers differentiate among the various products presented to them by vendors. One decision maker said that he likes to actually test out a technology (particularly a newer one) if the vendor will let the firm use it on a trial basis first. Another firm may try a technology on a few floors of a building, and if it is successful, undertake an entire building retrofit. One respondent also noted that vendors and service providers themselves need a strong track record of experience, reliability, and analytic accuracy. This firm also gathers information about vendors from other vendor competitors.

Financial performance. Our research found that, with the exception of one decision maker who said that he does not conduct a financial analysis at all unless the firm will have to borrow capital, financial performance indicators are universally critical factors in the investment decision. In most cases, decision makers use specific indices, such as payback period, benefit/cost ratio, present value, and rate of return when making energy-related investment decisions. By far the preferred index reported in our survey is simple payback time (11 decision makers). One frequently cited factor causing under-investment in energy-saving technologies is the alleged shortsightedness of management—usually manifested in very short payback periods required for investment (including energy). A 1991 EPA survey of 48 firms revealed that the median payback required for one class of energy investment was two years (DeCanio 1993, 908). Our survey concurred with these findings, with an average payback threshold for investment of two to three years (with a reported range among firms of less than one year, to six years). Possible reasons for this emphasis on short-run results are the prevalence of incentive, information, and organizational control problems in organizations (DeCanio 1993, 908-910).

Our findings revealed that firms that *are* willing to accept longer payback periods often base their stance on additional criteria, particularly performance reliability and expected measure lifetimes. Measures expected to stay in place for longer periods have longer acceptable payback times. One respondent's firm stipulates that air-conditioning measures must have a simple payback time of six to seven years; lighting, two years; and sensors, nine months. This firm considers the integrated effect of measures, and seeks an *overall* target payback time of about three years. Other firms specifically consider the amount of time expected to elapse before savings start to be achieved, with one reporting that if an energy-efficiency investment has a 50-year life, the firm does not worry about payback period at all. Our relatively small survey sample precludes generalizations about the affect of organization size on energy-efficiency investment criteria, analysis of the EPA Green Lights Program[5] indicates that larger organizations are more willing to accept longer paybacks for energy-efficient lighting investments than smaller organizations (DeCanio 1998, 451). With regard to building sector, the same analysis also found longer paybacks for warehouses and educational buildings than with retail and health care facilities, relative to office space (DeCanio 1998, 451).

The second most important index to decision makers in our study is rate of return (ROR) (10 respondents), with an average threshold of about 12 percent. The lowest reported

[5] A voluntary compliance program of the U.S. EPA that promotes energy efficiency in buildings through investment in energy-saving lighting.

rate of return was 8 percent, and the highest was 20 percent. Others said that the rate varies depending on the cost of capital at the time; required rates may be higher for new technologies because of the higher risk of investment, or, as with simple payback, more flexible for long-lived measures. Present value is used by three firms, with one reporting that it is a very popular index for projects over $10 million. One decision maker also cited the prospect of increased property asset value as another key financial parameter.

Tenant retention/satisfaction. Overall, decision makers claimed to pursue energy efficiency investments more aggressively under lease arrangements where the building owner pays the utility bills, than in situations where the tenant is responsible for paying the energy costs. However, variations were reported, such as when tenants have long-term leases (over 10 years) as was the case in three firms, or when the property owner wishes to increase the marketability of a site (two firms). Many respondents pointed out that their tenants effectively pay the utility costs anyway, whether explicitly in pass-though leases, or implicitly in the form of higher rents. One even noted that their incentive to invest in energy efficiency comes from their experience that "tenants like to locate in energy-efficient buildings and are willing to pay more for it."

Whether an energy-efficiency investment will help attract higher-rent tenants, or retain existing tenants, appears to be very important to many decision makers. Issues around building aesthetics were reported by numerous respondents to eclipse conventional energy-related payback considerations. With respect to energy efficiency, then, considerations regarding lighting fixtures which are visible, versus HVAC systems which are not, may affect a building owner or manager's decision about what kind of investment to make.

Similarly, tenant comfort was noted by decision makers to play a key role in their investment decisions about energy-related improvements. According to some, energy cost-saving measures might be passed over if they are perceived as posing an inconvenience to building tenants (or in the case of hotel REITs, to guests) such as lighting sensors or after-hours HVAC controls. One decision maker noted that energy-efficiency measures would never be pursued at the expense of tenant comfort; equipment upgrades and replacements have to be functional (i.e. meet current operating standards) and not negatively impact the tenant.

Even in cases where the company does not pay the utility costs, as with a prominent office REIT we interviewed, the decision maker stated that if their tenants express interest in energy-efficiency measures, they will pursue them even if such measures do not meet prescribed criteria for payback period or return on investment. Decision makers point out that even if a capital outlay appears to only benefit the tenant, cost-saving investments will ultimately reward the building owner as well. If the initial investment is at least partially paid back by the tenant, then reduced operating costs will be realized even more quickly.

Investment priorities. When asked where energy efficiency stands as a priority relative to other investments, four decision makers said that it is a high priority, while three reported that it is a very low priority for their companies. One REIT decision maker said that energy efficiency is a high priority because the company specializes in Class A office buildings, and actually uses their efficiency as a marketing tool in attracting potential investors and tenants. For many firms, energy constitutes one of their highest operating expenses (up to 30 percent

according to one respondent, and second only to taxes according to another), and energy efficiency is therefore a very significant factor in helping them raise net operating income.

About half of the surveyed firms indicated that energy-efficiency investment was a medium to low priority for their company. A respondent from a hotel REIT admitted that while energy efficiency is the lowest possible priority for his company (due to low energy costs incurred mostly at off-peak hours), it is slowly gaining importance with the services of a newly-acquired energy consultant. A telecommunications firm that we surveyed said that energy efficiency is last on the company's official scale of one to five, after "1) network, 2) baseline, 3) infrastructure support, and 4) cosmetic enhancements." Projects are typically dropped after the third category due to budget constraints.

Among our respondents, energy-efficiency investments compete with a wide gamut of other corporate priorities. Two of our respondents note that their firms make distinctions between "revenue-expanding investments" such as new building acquisitions or expansion of a store, and cost-saving measures such as energy-efficiency upgrades. Many decision makers cited competing priorities within the realm of building operations, such as safety, reliability of service (as with elevators), telecommunications upgrades, and cosmetic repairs. One residential REIT specifically noted the priority of enhancements, such as interior redecoration, that can be reflected in higher rents.

One representative of a large office REIT noted that ultimately, energy efficiency does not have to outcompete other potential investments, but rather is assessed in itself, based on its expected returns. A retail firm noted, similarly, that energy efficiency is "as important as store fixtures or new merchandise; all investments compete equally depending on their return on investment."

Non-energy issues. Regarding chillers specifically, sixteen of the decision makers surveyed reported that the mandated phase-out of CFCs (ozone-depleting compounds) has had at least some impact on their decisions regarding cooling equipment. In some cases the higher cost of CFC has been *the* major criterion for their new equipment decisions, causing them to choose only HCFC or HFC (alternative refrigerant) systems. Some respondents said that the phase-out has sped up their equipment replacement plans, while others said that CFC chillers are only replaced when they reach the end of their useful life, or when it becomes more cost-effective to upgrade them.

Of the ten respondents that reported little impact on their choices about cooling equipment from the phase out of CFCs, the predominant response was that "There's still time—no crunch yet to get rid of current equipment." Another interviewee said of the phase-out: "It's just another variable" in his decisions about chiller equipment. While all of the firms surveyed have felt the increase in refrigerant prices (both CFC and its non-restricted alternatives), it is simply understood that all new equipment purchased must be non-CFC.

We discovered that indoor air quality issues are a very important consideration, relative to other factors, in decision makers' evaluation of HVAC systems and equipment. Many in fact said that it is their top priority. Reasons for such focused attention to indoor air quality issues range from tenant retention (especially in the office sector), to lawsuit avoidance relating to "sick building syndrome" (particularly in companies that own health care facilities), to a commitment to comply with voluntary air-quality-related ASHRAE and OSHA standards in order to gain "green building" recognition. Only two respondents said that indoor air quality was "barely an issue" to their HVAC equipment decisions.

Occupant comfort issues were of high importance for over half of those surveyed, with decision makers in the office and retail sectors voicing the most concern. One office–REIT said that occupant comfort issues are "always a top priority." An interviewee at another office REIT specializing in Class A office buildings told us that HVAC is the biggest complaint among tenants and is therefore an area with little room for compromise. In other words, for this company at least, issues of comfort will outweigh energy efficiency or other cost-saving measures. Eleven decision makers reported, however, that occupant comfort issues were not very important: "We deal with it only if people complain."

Energy-related services from utilities and other providers. Our findings revealed that the availability of utility rebates greatly increased the likelihood that certain energy-related improvements will be funded. Thirteen of the 26 companies we surveyed reported that rebates were the energy-related service they used most, both prior to and since utility deregulation. Lighting and HVAC retrofits were the most commonly rebated activities. One decision maker at an office REIT told us that rebates had allowed them to justify financially retrofits that would not otherwise have been approved. Rebates are seen as "free money," and are especially important to REITs whose shareholder accountability forces them to be very concerned with savings opportunities that affect the bottom line. Other utility-offered services used by decision makers in our survey include rate and trend analysis, energy-use information, and updates on newly available technologies.

Survey participants were much less certain about their use of utility services after deregulation. One respondent told us that in the absence of rebates, his firm has looked as far as it is going to at post-deregulation services, and is waiting to see what happens after competition transition charges drop off. In general, respondents seemed to feel that, since deregulation, few opportunities are currently available to companies from utilities. One said that "most utilities haven't been able to offer us much," while another reported that it has actually been more difficult to get information from utilities since deregulation due to the competitive environment. Four decision makers said that they have either not been affected by, or not noticed a difference in, services offered by utilities.

When decision makers require consultation regarding the selection and management of HVAC systems and equipment, they reported that they would most likely turn to the following sources:

- Consultant (14 respondents)
- In-house staff (11 respondents)
- Utility company (i.e. regulated utility) (8 respondents)
- Equipment vendors (7 respondents)
- Energy service company (3 respondents)

Those that said they would primarily choose a consultant to help guide their decisions regarding chiller selection and management, indicated further that the firm would have to be large, well-known, trusted, and/or one with which they already have an established relationship. Some saw third-party consultants as being less biased than vendors and utilities. One respondent actually reported that "utilities would be last on the list" of whom he would contact for such services. Another said, furthermore, that his firm has yet to find a consultant or a utility with the operational skills that they profess to have: "They don't seem to have a good sense of how things actually work in buildings."

Discussion

While our research does reveal some trends and common tendencies, the survey findings also shows marked diversity among corporate decision makers in the energy-related investment practices, processes, and criteria that they apply to energy-related decisions. As a result, they defy characterization as a unified market to be approached by broadly-designed ESCO or other marketing efforts. The relatively small size and targeted nature of the sample may also limit the ability to widely generalize the findings discussed here. We feel, however, that this survey may serve as a model and a starting point for ESCOs marketers and energy-efficiency program managers among utilities and public agencies, and that a number of important implications can be drawn with regard to the following factors: targeting products and services to the appropriate audience, uncertainty and risk aversion among corporate decision makers, awareness of the specific financial considerations decision makers employ, and decision makers' concern with tenant retention and satisfaction.

Target Audience

As discussed above, decision-making processes regarding investments in energy efficiency generally involve multiple stages, including identification of needs, enumeration of options, technical and engineering assessment, financial analysis, and various necessary approvals. Each of these stages involves its own participants; technical staff or consultants responsible for building construction and operations handle most of the technical and financial assessment, while any of various senior managers or owner representatives issue final approval, especially for large investments.

A study of energy investment behavior among small-business owners and managers at a shopping center divided target behaviors into two useful types; energy-using equipment selection, and utilization. They found that equipment selection decisions are made by contractors rather than by small-business managers. "Therefore, programs to encourage efficient equipment choice should be targeted not at small-business people but at equipment contractors. Equipment utilization decisions are made by small-business people, and, therefore, programs to encourage efficient use of existing equipment should be targeted at small-business people" (Komor & Katzev 1988, 240). Our survey also found that CFOs, and other top executives of firms (including owners and shareholders) may be involved with approval of a company's investments, particularly when such investments are relatively large; often, however, CFOs, owners, and other executives are not involved at all in energy-related investment decisions. In these cases, at least in our interview sample in Northern California, the ultimate responsibility for such decisions lies with various possible officeholders, including regional managers and vice presidents of facilities or operations. It appears critical, therefore, to target energy-related products and services to the appropriate decision maker in a company.

Uncertainty, Risk, and Reliability

PG&E research points to the following observation about risk: "Many engineers are reluctant to use 'advanced' designs rather than their 'standard' designs due to perceived risks with unfamiliar approaches. . . . " (PG&E 1998, 2-15). One key finding from this study

sample is that corporate decision makers — not just engineers or other technical specialists — also strongly resist new technologies for their lack of a proven track record of success and reliability. Proposed investments may promise high levels of financial performance, with substantial supporting design documentation and claims from the vendor or consultant. However, if the proposed systems are viewed as unreliable for lack of prior documented implementation successes, even rigorous documentation and appealing cost criteria may not win approval of a potential investment. It appears, then, that decision makers must trust the technology in question — ideally, on the basis of a track record or pilot testing, and also on the basis of relationships with trusted vendors and service providers. This resistance indicates an important need to directly address how planning and analysis can reduce uncertainty and risk associated with advanced systems.

Financial Considerations

From the perspective of manufactures/vendors of energy-related equipment, our survey findings indicate that it may be especially useful to pay attention to how the expected long operating life of some equipment can trigger financial criteria that differ from those applied to other, shorter-lived energy-efficiency investments. This point would be consistent with approaches already employed by a number of our respondents, under which firms' customary criteria for simple payback time and rate of return may be stretched if the expected measure lifetime is long, as with many chilled water systems. Overall, however, our findings support other research that organizational and institutional factors are as important determinants of firms' investment behavior and outcomes as the role of pure economic considerations (DeCanio 1998).

Tenant Retention and Satisfaction

Perhaps our most striking finding is the extent to which tenant retention and attraction are important to building owners that lease their properties, and can sometimes be, as one respondent noted, "the number one key" when making investment decisions. It should therefore be kept in mind that energy-efficiency upgrades can be viewed with favor as much for their ability to please tenants, as for their ability to reduce the firm's own operating costs. Furthermore, other firms claimed that they will stretch their customary financial criteria to invest in low-performing measures, if they are requested by tenants. Conversely, reduced energy use is interpreted by many firms as requiring a corresponding reduction in comfort (Komor & Katzev 1988), and many decision makers in our study pointedly indicated that they will avoid energy-efficiency investments that could inconvenience tenants or compromise their health and comfort.

Our survey also revealed that some decision makers perceive that tenants are willing to pay more to locate in energy-efficient buildings; therefore even in buildings with net or pass-through leases, owners see that they can reap financial gains from accrued energy savings. Therefore, those who target energy-related products and services to corporate decision makers (as indicated by our sample of 26 respondents in Northern California) could leverage this emphasis on tenant retention and attraction by focusing their marketing efforts on indoor air quality and other non-energy benefits, in addition to the usual financial criteria and risk mitigation. Recognizing such non-financial benefits of conservation has been found

to increase the probability of the energy-conserving actions being taken (Komer & Katzev 1988).

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