

*Are You Throwing Money Away
By Following the "2-Year Payback" Rule?*

C

lose the Efficiency Gap: Use Profits to Drive the Capture of Value

John Bruce Wells
Chemonics International Inc.

John S. Hoffman
WorkSmart Energy Enterprises, Inc.

This article suggests that profitable energy efficiency measures are often foregone due to the internal structure of most American corporations, in which energy functions are managed by cost centers rather than profit centers. This limits access to capital and fosters use of financial decision rules such as the "2-year payback" criterion that lead to suboptimal investment. The authors propose that corporations restructure their operations so that energy functions are managed by profit centers that can implement energy efficiency measures in other business units, realize a profit, and return it to their parent company.

Years of work have documented that profitable measures can be undertaken in most businesses to improve energy efficiency. For example, Dr. Stephen DeCanio of the University of California, Santa Barbara, recently analyzed a data set provided by the U.S. Environmental Protection Agency of 3,673 individual lighting upgrades reported by participants in the voluntary Green Lights program.¹ The typical Green Lights upgrade is to replace magnetic ballasts and T-12 Lamps with

more efficient electronic ballasts and T-8 lamps. DeCanio found that the average internal rate of return (IRR) of Green Lights projects was 36.0 percent.

Coupling this high rate of return on a relatively risk-free investment with a history of utility-funded promotions and subsidies and aggressive federal programs, one would expect electronic ballasts and T-8 lamps to have driven magnetic ballasts and T-12 lamps from the market. In fact, this is not the case. In 1998, magnetic ballasts accounted for 62 percent of all fluorescent lamp ballast shipments.² Our vintage model of ballast sales, based on Census Bureau data, indicates that electronic ballasts serve only about one-third of commercial floor space in the U.S. In addition, within the past few years, the authors have visited numerous new commercial facilities lit by magnetic ballasts and T-12 lamps.

Despite a plethora of energy savings opportunities with low risk and proven financial returns, it is clear that profitable measures are often not undertaken.

COST-CENTERS ARE THE PRIMARY ORGANIZATIONAL BARRIER TO ENERGY EFFICIENCY

We believe that organizational structures create a fundamental barrier to corporate investment in energy efficiency. Private firms operate business units that have profit center authority and accounting systems. These profit centers have access to capital, earn profits, and can return funds to the corporation. A business unit that is successful grows, while one that does not earn money tends to shrink or be eliminated. When a business unit earns high rates of return it does not need to argue for money. The CFO (Chief Financial Officer) of the organization allocates it internally or raises it from capital markets. Growth of a business unit is rarely curtailed by lack of capital if the unit earns enough to justify raising additional capital.

Reducing energy within a business unit is almost always secondary to focusing on the core products and services that can grow a business unit's revenue. Careers are made on expanding markets and earning profits; usually not on reducing costs, except when cost reductions can be achieved without additional capital (e.g., "corporate downsizing").

Despite the fact that corporate real estate assets account for 30 percent to 40 percent of total corporate assets³, most companies do not manage their properties with the goal of maximizing economic value added. The absence of profit motives within organizational elements charged with decisionmaking reduces investment in profitable energy efficiency measures.

While corporations use a variety of management metrics for their revenue-generating activities, such as Economic Value Added, Total Business Return, Shareholder Value Added and Cash Flow Return on Investment, the most common performance metric in cost centers is simple payback, and the most common requirement is a two-year payback period, i.e., that the total cost of the project is recouped within two years through operating cost savings.

An example of a project with a two-year payback would be a lighting upgrade that costs \$ 10,000 to implement and saves \$5,000 per year in operating costs. As shown in Exhibit 1, such a two-year payback represents an IRR of approximately 50 percent.

Exhibit 1. Internal Rates of Return Consistent with Various Payback Periods and Project Lifetimes.

Lifetime	2 year payback	3 year payback	4 year payback	5 year payback	6 year payback	7 year payback
7 years	47%	27%	16%	9%	6%	0%
10 years	49%	31%	21%	15%	11%	7%
15 years	50%	33%	24%	18%	14%	11%

The pervasiveness of the payback criterion is demonstrated by its use even in organizations charged with the mission of promoting energy efficiency. For example, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy recently prepared an analysis of motor system upgrades, restricting its analysis to "economic" measures, which it defined as those with "less than three-year payback":⁴

Use of the two-year payback criterion is completely at odds with modern financial theory. The average cost of debt in the U.S. is less

than seven percent (based on current bond rates) and the average cost of equity capital is less than 12 percent. A firm employing equal amounts of debt and equity financing has an average cost of capital of 8.5 percent. Such a firm, if acting rationally, would undertake all no-risk investments with an IRR greater than 8.5 percent. As shown in Exhibit 1, for projects with a ten-year lifetime, this criterion is consistent with a simple payback period of up to six years. Low-risk lighting upgrades meeting this criterion would include occupancy controls, dimmable ballasts, and fixture re-designs—a menu of options that is rarely chosen and technologies that are rarely seen outside “architectural” lighting designs.

The magnitude of market failure created by the two-year payback criterion is perhaps best given by what is often cited as a success story: the experience of Dow Chemical’s Louisiana Division. Dow organized an annual contest in 1981 to identify energy-saving projects with a one-year payback.⁵ Every year a large array of projects qualified and was funded. 575 audited projects were completed with an average return of 204 percent and aggregate annual savings of \$ 110 million.

While this effort saved Dow Chemical millions of dollars, the fact is that Dow Chemical’s cost of capital was closer to 8.5 percent, which represents a six- to seven-year payback. By only focusing on projects with a one-year or shorter payback, profitable projects were foregone whose aggregate value had to be far greater than the total amount saved.

Dow Chemical’s delays in undertaking energy-efficiency projects created an additional loss of profits. The fact that each year Dow Chemical was able to find additional projects needing a one-year payback means that it was losing profit by delaying its investments. Exhibit 2 shows a conceptual estimate of the losses involved for Dow Chemical or any other organization that fails to expedite all investments that exceed its cost of capital: for every one-year delay, total profits fall by about \$1.80 per square foot.

Rather than accelerate, expand and institutionalize this extraordinarily profitable program, Dow eliminated the contest coordinating committee in 1993 after the coordinator retired, and continuing efforts “cannot be tracked.”

Analysis of another Fortune 500 firm with a strong energy savings program shows that while it has reduced energy use by 20 percent in six years, it foregoes about \$50 million per year in additional savings (a loss

Exhibit 2. The Net Present Value of a Lighting Upgrade for a 1-million-square-foot Facility

Years to Implementation	Total NPV (\$Million) ⁶
1.5	12.2
2.0	11.3
2.5	10.4
3.0	9.5
3.5	8.6

of up to \$500 million in shareholder value) due to its use of a two-year payback criterion.⁷

Cost centers are usually poorly experienced in securing any type of external financing. In addition, the currently available financial products—loans, leases, and performance-based contracts—have attributes that reduce their desirability, particularly for activities that are viewed as not critical to the core business of a company.

Securing new loans is often hindered by existing loan covenants that require that certain financial ratios, such as debt-equity, be maintained. Organizations operating under this constraint are unlikely to allocate “borrowing power” to cost-center projects that do not grow the core business of the operating units. In addition, the equipment purchased for energy efficiency projects must be booked as a capital expense, which can reduce an organization’s return on equity.

Because it is difficult to obtain leases that qualify as true “operating leases” under the FASB (Financial Accounting Standards Board) guidelines commonly adopted by public corporations, most leases are booked as capital expenditures, and trigger the same concerns about loan covenants and deleterious effects on financial measures such as return on equity.

While performance contracts (in which an energy service company and a customer “share” the energy savings through various mechanisms) avoid concerns about loan covenants and financial ratios, they create extremely high transaction costs. Savings must be measured, monitored and verified. In particular, baseline conditions must be pre-defined so that increases in energy use due to altered operational con-

ditions (e.g., adding a second shift at a manufacturing plant) do not reduce payments to the energy services company. This creates a perceived potential for on-going operational interference. In addition, performance contracts that do not incorporate fixed payment schedules create uncertainty about future payments, which often proves unacceptable to customers.

CORPORATE RESTRUCTURING: A POTENTIAL SOLUTION

A variety of methods have been employed to circumvent the organizational and institutional barriers that hinder energy efficiency in commercial buildings. For example, the EPA Green Lights 2nd Energy Star Buildings programs have succeeded in reducing the cost of selling and securing top—level corporate commitments for energy upgrades. Few programs, however, have eliminated market inefficiencies or attacked their root causes. To eliminate the institutional and organizational barriers will require market transformation efforts that alter market conditions in a more fundamental manner.

Our key recommendation is that corporations restructure their operations to form business units—profit centers—to capture the profits from energy-efficiency investments.

A new profit-oriented business unit could take the form of a separate accounting division, subsidiary, or independent corporation, or could rely on various forms of outsourcing.

The new business unit would essentially “own the current bills” of the other business units in the company. Those business units would be committed to paying historical costs (or some pre-determined schedule of costs) for energy services to the new business unit. The new business would then identify, fund, implement and capture the profits from energy-efficiency investments.

The energy saving profit center would have its own balance sheet, with assets and liabilities; would have its own income statement—with profits (or losses); and would be eligible to compete for corporate capital and raise capital on its own. By creating value above its cost of capital, the new business unit would contribute to the firm’s overall prosperity.

Exhibit 3 is a conceptual diagram of how a new business unit would earn profits by improving energy efficiency within other units.

Exhibit 3. Conceptual Diagram of How a New Energy Services Profit Center Might Operate

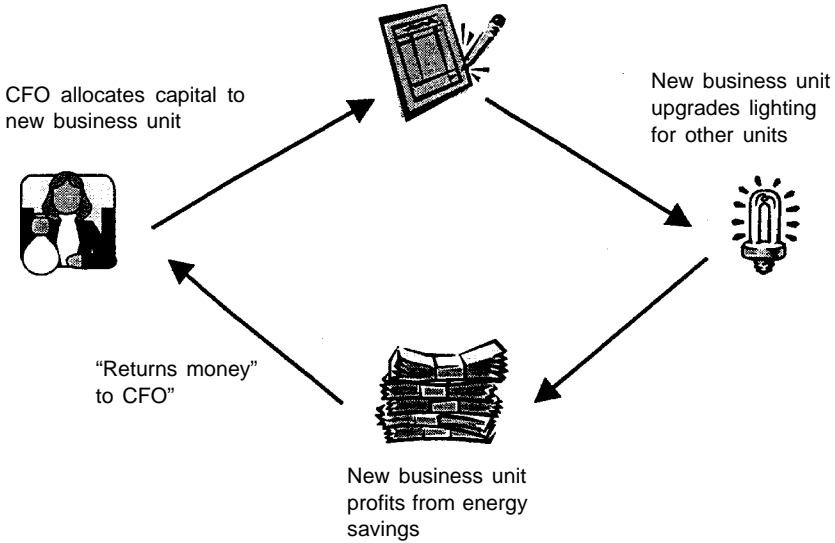


Exhibit 4 shows the operational schematic for one implementation of a new profit center.

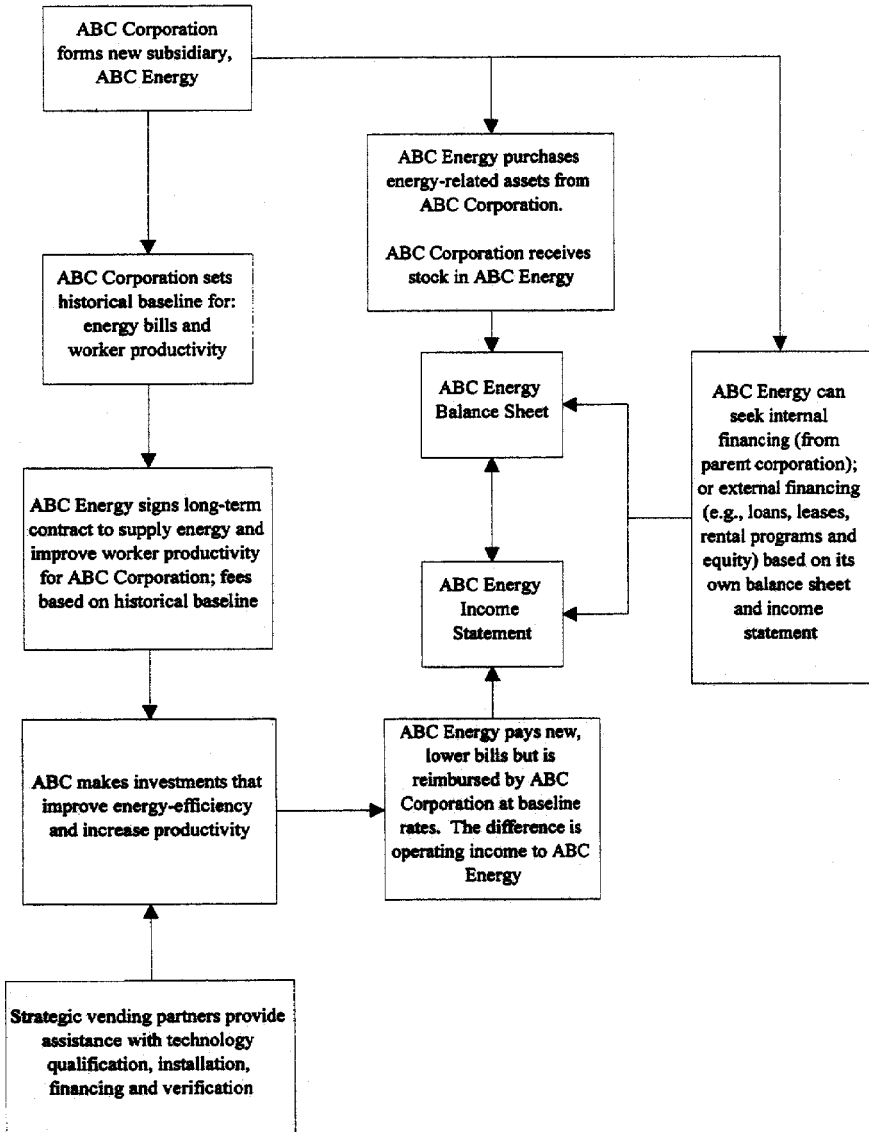
New Institutional Frameworks are Needed

Establishing proper accounting systems will greatly assist in the effective operation of new energy-efficiency profit centers. Charts of accounts will need to be modified so that changes in energy use and costs can be measured and verified.

Particular attention must be given to measuring and accounting for productivity gains (e.g., fewer product defects, lower absenteeism) generated by upgrade projects. Intra-company agreements will need to be established that handle the flow of data and transactions. Such frameworks will need to establish principles and mechanisms for dispute resolution.

Fortunately, establishment of better accounting systems for establishing baseline energy use and worker productivity will have value in managing the processes, not just in creating more paperwork. Because energy systems frequently fall out of alignment with design goals, the monitoring systems installed to assure fair payouts will have the beneficial side-effect of improving the operations of the energy systems,

Exhibit 4. Schematic Diagram for the Structure of a New Energy Services Profit Center



thereby inevitably increasing the total savings (and earnings of the new business unit).

New purchase agreements, service agreements, and other legal steps may also be required to assure that property rights of financing entities can be protected so that investment can be securely made by third parties in an efficiency market.

An Outline of the Profit-Center Campaign

A concerted effort is needed to launch this campaign. Public and non-profit entities working to improve the energy efficiency of the economy might work through existing channels to reach senior-level executives. For example, articles and op-ed pieces could be placed in publications such as the *Harvard Business Review*, *CFO Magazine*, *Directors & Boards* and the *Wall Street Journal*. We employed a similar strategy for the launch of the Green Lights program.

Institutional investors should also be induced to support efforts to create new energy efficiency profit centers. That institutional investors can be influenced to take action is not debatable. The California State Pension Fund (CalPERS), for example, owns \$141 billion in total assets, has been active in the "corporate governance" movement, and been a major leader in pressure on boards to improve profitability. It recently adopted a variation of TEVA (total economic value added) as its central measure of corporate success. Groups like CalPERS need help in understanding that energy efficiency investments can yield significant improvements in TEVA. A campaign should be launched to persuade such institutional investors to exert influence on firms to maximize profitability through creation of energy efficiency profit centers.

Working with the financial community will be critical to the success of the new spin-offs. Fostering new service businesses to serve these new profit centers can create a virtuous circle of growth and profit.

Several leading management-consulting firms have adopted variations of the total economic value added approach as their central theme. They charge as much as \$60,000 a month per consultant to help Fortune 500 firms implement TEVA-type frameworks for managing their core business. Perhaps these firms represent a means to make energy efficiency a freestanding business within corporations. At present, while TEVA-related measures are increasingly being incorporated into large corporations, in many cases they are being used primarily in revenue-generating units and have not been adopted for business activities

viewed as “support functions,” which unfortunately often encompasses real estate and energy management activities.

To Start: Just Do It

The most effective strategy to further broad development of new energy efficiency profit centers is for a market information program to work with one or more companies, under real conditions, to create new profit centers.

Working under real world conditions would facilitate the identification of the myriad organizational and institutional issues that accompany the creation of the new units, and allow solutions to be developed, tested and refined. The lessons learned are likely to prove transferable in a broader context.

In addition, publicizing the profits that these initial business units generate for their parent companies will create a strong inducement for other companies to follow. When *Forbes* and *Fortune* run the picture of decisionmakers who have made their companies or investment funds billions of dollars by creating profit centers to reduce energy use, the rest will follow—CEOs and investment managers are competitive if nothing else.

CONCLUSION

The magnitude of the opportunity is truly large. While progress is being made through efforts to promote energy efficiency, what is missing and needed is a program that directly assaults the organizational impediments and institutional deficiencies that have severely reduced the rich harvest of energy gains now possible throughout the world in buildings, industry and residences. What is needed is to prove that a business model based on profit will work as well here as it does everywhere else.

ABOUT THE AUTHORS

John Bruce Wells is a senior analyst with Chemonics International Inc., a management consulting firm. He can be reached at 1133 20th Street, NW, Washington, DC 20036; 202-955-3467 (voice); 202-955-7530 (fax); jwells@chemonics.com. Prior to joining Chemonics he founded and managed the Bruce Company, which served as EPA's lead subcon-

tractor for the Energy Star and Green Lights program.

John S. Hoffman is president of WorkSmart Energy Enterprises, Inc., a technology development and commercialization firm. He can be reached at 2948 Macomb Street, NW, Washington, DC 20008; 202-237-1491 (voice); 202-237-1493 (fax); hoffman@worksmartenterprises.com. As director of the Atmospheric Pollution Prevention Division, Hoffman was the progenitor of EPA's voluntary programs, including Energy Star, Green lights and Golden Carrot.

Endnotes

- ¹Stephen J. DeCanio, "The Energy Paradox: Bureaucratic and Organizational Barriers to Profitable Energy-Savings Investments," Working Paper in Economics # 19-95, University of California, Santa Barbara, 1995.
- ²"Fluorescent Lamp Ballasts, Summary 1998, MQ36C(98)-5," Current Industrial Reports, Bureau of the Census, Economics and Statistics Administration, U.S. Department of Commerce, June 25, 1999.
- ³R.K. Brown, A.L. Arnold, et al., *Managing Corporate Real Estate*, New York: John Wiley & Sons, Inc., 1993, p. 44.
- ⁴Scheihing, P.E., M. Rosenberg, et al., February 1998. "United States Industrial Motor-Driven Systems Market Assessment Charting a Roadmap to Energy Savings for Industry," International Workshop on Industrial Energy Efficiency Policies: Understanding Success and Failure; June 10-12, 1998; Utrecht, The Netherlands. Emphasis added.
- ⁵Ernst von Weizsäcker, Lovins, A. and Lovins, H. 1997. *Factor Four: Doubling Wealth, Halving Resource Use*. Earthscan Publications, Ltd.
- ⁶NPV is calculated for a hypothetical 1 million square feet facility that can achieve a net savings of 20 cents per square foot per year, which is the average for Green Lights participants. Savings are measured over a 10-year period and discounted at 9 percent.
- ⁷Confidential conversations among a co-author, energy manager and real estate executives of a Fortune 500 company, April 1998.
- ⁸A FASB operating lease must meet all of the following criteria; 1) the lease cannot transfer ownership to the lessee at the end of the term; 2) the lease cannot contain a "bargain purchase option"; 3) the lease term must be equal to less than 75% of the estimated economic life of the property, and 4) the present value of the minimum lease payments must equal less than 90% of the fair market value of the property.