

**STRATEGIC INDUSTRIAL ENERGY EFFICIENCY:  
Reduce Expenses, Build Revenues,  
and Control Risk**

**July 31, 2003**



**ALLIANCE TO  
SAVE ENERGY**

*Creating an Energy-Efficient World*

TITLE:	<b><i>STRATEGIC INDUSTRIAL ENERGY EFFICIENCY: Reduce Expenses, Build Revenues, and Control Risk</i></b>
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PURPOSE:	This report is intended for reference by industrial energy managers and the energy program and policy communities. It addresses the issue of improving business performance through applied energy efficiency. The discussion covers (1) the seldom-recognized benefits of industrial energy efficiency, and (2) the strategy for using business philosophy to encourage a variety of industry stakeholders to adopt efficient practices.



**ALLIANCE TO  
SAVE ENERGY**  
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The Alliance to Save Energy promotes energy efficiency worldwide to achieve a healthier economy, a cleaner environment and energy security. Founded in 1977, the Alliance to Save Energy is a non-profit coalition of business, government, environmental and consumer leaders. The Alliance to Save Energy supports energy efficiency as a cost-effective energy resource under existing market conditions and advocates energy-efficiency policies that minimize costs to society and individual consumers, and that lessen greenhouse gas emissions and their impact on the global climate. To carry out its mission, the Alliance to Save Energy undertakes research, educational programs, and policy advocacy, designs and implements energy-efficiency projects, promotes technology development and deployment, and builds public-private partnerships, in the U.S. and other countries.

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**TABLE OF CONTENTS**

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<b>EXECUTIVE SUMMARY</b> .....	<b>1</b>
<b>I. Overview</b> .....	<b>2</b>
Who should read this report?.....	2
<b>II. Energy Issues and Perceptions in Manufacturing</b> .....	<b>2</b>
Utility deregulation, volatility of fuel prices, power quality and continuity, and evolving emissions agendas are a few of industry’s “energy” concerns.	
<b>III. Energy Efficiency: What it Is, What it Provides</b> .....	<b>3</b>
Both energy management and capital projects add to business performance.....	3
Control of energy <i>prices</i> alone does not sufficiently control energy <i>costs</i> .....	4
Energy flow management provides access to lower prices for fuel contracts.....	5
Impacts of energy efficiency accrue beyond fuel bills.....	5
Energy flow data becomes a basis for activity-based cost accounting.....	6
Process speed, flexibility, and product quality can be improved through energy optimization.....	6
The energy-efficiency payoff may include new revenues in addition to savings.....	7
Many stakeholders, both inside and outside the firm, benefit from efficiency.....	7
Facility budgets should recognize the revenue and non-energy cost impacts of energy management.....	9
Energy efficiency supports the goals of core business investment.....	11
<b>IV. Delivering Business Philosophies</b> .....	<b>12</b>
Select target industries for energy efficiency outreach.....	12
Select target companies through appropriate background research.....	12
Corporate approval usually comes from decision-making teams.....	13
The energy efficiency messenger may be just as important as the message.....	13
Efficiency advocates should provide actionable follow-up materials.....	13
<b>V. Conclusions</b> .....	<b>14</b>
<b>REFERENCES</b> .....	<b>15</b>

## LIST OF TABLES AND FIGURES

---

<b>Table 1:</b>	Pros and Cons of Price-Focused Energy Cost Reduction Strategies.....	4
<b>Table 2:</b>	Corporate-Wide Industrial Energy Efficiency: Stakeholders & Benefits.....	8
<b>Figure 1:</b>	Budgetary Competition Among Typical Manufacturing Financial Line Items.....	10
<b>Table 3:</b>	Business Rationale for Capital Investment: Energy Efficiency’s Contribution to Fundamental Investment Goals.....	11

## EXECUTIVE SUMMARY

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This paper examines the promotion of industrial energy efficiency. It presents a business-oriented view of its benefits for manufacturers. It also presents communication strategies for developing industrial energy efficiency policies and programs. The intent is to improve industrial competitiveness through the greater acceptance of energy efficiency policies, products, and services.

**Manufacturers can reduce expenses, build revenues, and control risk through better management of their energy use.**

Industry competitiveness depends partly on smart resource use, including energy consumption. Energy optimization depends on energy flow monitoring, measurement, and verification. These are essentially management pursuits, distinct from making large capital investments for advanced technology. Energy flow data should foster greater communication and collaboration among production, utility, and finance personnel. Their coordination improves plant reliability, productivity, and scrap rates. Efficiency techniques contribute to desirable process attributes such as speed, flexibility, and product quality. These impacts are often more valuable than fuel bill reductions. The strategic application of industrial energy efficiency includes the following:

- **Reduce expenses.** Fuel bill savings are complemented by reduced material waste and avoided need for emissions control equipment. Emissions and safety penalties are avoided. Improved reliability allows reductions in overtime labor and hazard insurance premiums.
- **Build revenues.** Energy optimization can also generate new revenues. The extra production capacity provided by energy optimization will benefit manufacturers that need to expand their output to meet growing demand for their products.
- **Control risks.** Energy management offsets industry's exposure to risks posed by utility deregulation, volatile fuel prices, and power supply concerns.
- **Improve the bottom line.** Energy efficiency's financial pay-off can be expressed

in two parts: improved *profit margins* and increased *asset turnover* (a measure of increased productivity).

**Energy efficiency policies and programs should complement industry's core business priorities.**

Efficiency advocates are encouraged to construct a *business philosophy* that clearly explains how an efficiency program will contribute to current business needs and challenges. Competitive challenges in manufacturing include product customization, rapid time-to-market, quality assurance, and the ability to manage business risk, which includes energy market volatility. Applied energy efficiency offsets these and other challenges to varying degrees. Efficiency plays a role in reducing exposure to the challenges of utility deregulation, fuel price volatility, power quality and continuity, and evolving emissions agendas. Considerations for outreach include the following:

- **Choose target industries.** The promotion of industrial energy efficiency requires more than a one-size-fits-all approach. Targeted outreach should conserve scarce energy program resources and also feature industry-specific messages that reflect unique circumstances.
- **Prepare to meet "decision teams."** The most effective dialog with companies will recognize their key personnel, including energy managers, plant managers, finance officers, and technical leaders. Such detail implies the need for sector-dedicated outreach specialists who are able to understand and communicate technical, financial, and managerial substance to a variety of plant and corporate personnel.
- **Provide actionable follow-up material.** The reference documents and diagnostic software provided by the U.S. Department of Energy's BestPractices program exemplify some of the most comprehensive no-cost assistance available today.

## I. OVERVIEW

Some manufacturing companies successfully boost their financial performance through optimized energy use. This leads not only to reduced energy consumption and associated environmental benefits, but also to capacity improvements that generate additional revenue. Other manufacturers dismiss energy efficiency as a distraction from their central mission of producing and selling products. Their disregard for energy efficiency results in the widespread forfeiture of opportunities to effectively compete in the global marketplace.

Efficiency advocates celebrate examples of successful industrial energy management in an attempt to encourage others to follow. That promotion has not always been effective. Advocates have historically promoted energy efficiency as its own good outcome. That message does not resonate with business leaders whose success is predicated on sales volume and revenue growth. Full adoption of energy efficiency will be resisted as long as this message gap endures.

To the extent that managers are unaware of the full range of energy-efficiency benefits, their budgeting process is skewed. Capital funding is almost always limited, and management biases tend to favor core processes over ancillary functions, including energy. Even if facility staffs are fully aware of energy improvement opportunities, they may lack sufficient time and appropriate labor to implement and maintain efficiency measures. Given incomplete knowledge of the benefits of energy efficiency, the easiest decision with respect to implementation is to “do nothing.”

Efficiency advocates will make greater progress if they offer the industrial sector meaningful solutions to their current business needs. Any outreach to industry should provide a *business philosophy* that clearly states a desired outcome for industry’s corporate leaders, such as improved bottom-line performance, enhanced productivity, or relief from business risks such as power supply discontinuities. Energy efficiency is then articulated as a contributor to

those needs. A well-crafted business philosophy should inspire corporate interest and shape the ensuing dialog with energy stakeholders. For industry, energy efficiency is not the goal, but the means by which larger goals are attained.

### Who should read this report?

- **Energy program and policy professionals** are the intended audience for this report in its entirety.
- **Corporate and plant managers in manufacturing** should refer to Section II, *Energy Issues and Perceptions in Manufacturing*, and Section III, *Energy Efficiency: What it is, What it Provides*.
- **Plant accountants** will appreciate much of Section III.
- **Vendors, consultants, and related solution providers** should also refer to Sections II and III.
- **Industry trade association professionals** may especially appreciate Section IV, *Delivering Business Philosophies*.

## II. ENERGY ISSUES AND PERCEPTIONS IN MANUFACTURING

For the majority of companies, energy is one of many inputs that enable the creation of products. Energy expenses generally represent less than five percent of total operating costs, although energy tends to be a much higher percentage of total *controllable* costs. Regardless of the percentage expenditure, a *breach* in fuel or power supplies can nonetheless stop production, which greatly impacts business performance through wasted raw material, idle resources, and lost revenue. While a company’s ability to control the availability and cost of energy may be limited, its ability to plan for and manage potential effects is much greater (Bennett & Wells, 2002).

Competitive pressures force many companies to focus on their core competencies of product and service creation. Still, the subject of energy itself may connote to corporate leaders a series of energy-related business risks that have

emerged over the past decade:

- *Purchasing fuel in a deregulated market.* With the privileges of an open commodity market for fuel come the burdens of searching for providers, negotiating contracts, and verifying service.
- *Volatility of tariffs and fuel prices.* Discontinuities in energy production impose a great deal of volatility on fuel prices. Subsequent volatility is apparent in corporate earnings.
- *Power quality and continuity.* Aside from deregulation, stress placed on an aging power transmission infrastructure has adverse implications for supply.
- *Evolving emissions agendas.* Large-facility asset management decisions regarding what technologies to select and when to commit to them are made difficult by the unpredictable evolution of emissions control regulations (Moore, 2003).
- *Controls, instrumentation, security of Internet and digital data.* Digital instrumentation, metering, and controls, which may be installed for their operational impacts, also often facilitate energy efficiency. The effectiveness of these systems, especially if Internet-based, is sometimes countered by imperfect data security.
- *Safety and certification of staff.* The regulatory obligations related to workplace safety have a direct impact on asset selection, maintenance, and staff certification (Moore, 2003).

Furthermore, “energy” may also be perceived as a larger set of environmental or sustainable business concerns. Traditionally, the environmental agenda was dismissed as fluff by many corporate leaders, who when asked about the subject would direct inquiries to their managers of public affairs (Wulfinghoff, 2003). But in light of increasing public awareness of the long term environmental impacts of energy use, industry is increasingly taking the matter more seriously. In 2001, almost half of the 250 largest global companies published “corporate

responsibility” reports, up from 35 percent in 1998 (Weisul, 2002). Increasingly, “customers, shareholders, and capital markets will reward companies who treat their environmental mitigation costs and responsibilities as investments” (Letwin, 2003).

### **III. ENERGY EFFICIENCY: WHAT IT IS, WHAT IT PROVIDES**

This section describes the practice of applied energy efficiency. The discussion covers facts, misconceptions, and the linkage between efficiency practices and financial impacts. A key point to be made is that energy efficiency can facilitate capacity expansion and revenue growth in addition to simply reducing fuel bills.

“Energy efficiency” is often described as the volume of energy consumed per unit (or per dollar value) of production. When recorded periodically, this metric allows plant managers to diagnose one plant’s performance over time, or to compare the performance of two or more facilities. Industrial energy efficiency affects more than fuel bills, and the benefits accrue to others in the company in addition to the plant manager.

**Both energy management and capital projects add to business performance.** A manufacturing facility can improve its energy efficiency in one (or both) of two ways: by making capital investments in new, more efficient equipment, or through better monitoring, maintenance, and verification of energy flows in existing equipment. The capital improvement approach implies that a piece of machinery will improve efficiency. In contrast, the management of energy flows is an ongoing, behavioral pursuit that provides as much insight on plant productivity as it does on energy consumption.

It is true that certain capital projects contribute to energy efficiency. But a tremendous volume of energy savings can be derived from *operating practices* applied to common, every-day technologies that are already in place. These include steam systems, compressed air, and

motor drives. Forty-five percent of industry fuel purchases go directly to on-site powerhouses that generate steam and electricity to support core process activities (Arthur D. Little, 2000). For the most part, powerhouse technologies are neither new nor exotic. This may partially explain why powerhouse optimization is so frequently overlooked (Moore, 2003).

**Control of energy *prices* alone does not sufficiently control energy *costs*.** To many corporate observers, *energy efficiency* is confused with *energy price*. Under this interpretation, “efficiency” is attained by securing energy at lower commodity prices. This thinking loses sight of the fact that energy expenditures are a function of price *and* quantity purchased. That this perception endures in industrial practice may be explained (but certainly not justified) by the following (see Table 1):

Table 1: PROS AND CONS OF PRICE-FOCUSED ENERGY COST REDUCTION STRATEGIES
<p style="text-align: center;"><b>PROs:</b></p> <ul style="list-style-type: none"> <li>• Easy to initiate: benefits accrue without the energy consumer having to adjust practices or procedures.</li> <li>• Easy to sustain: the price impact is more easily sustainable: once the price is set, it requires no more thought or action.</li> <li>• No coordination needed: price improvements accrue to all facility stakeholders without need to coordinate operational concerns.</li> </ul>
<p style="text-align: center;"><b>CONs:</b></p> <ul style="list-style-type: none"> <li>• Lost consumption improvements: price improvements reduce the incentive to manage energy consumption.</li> <li>• Lost non-energy benefits: the price-only focus reduces the opportunity to address related issues such as raw material waste, idle-resource costs, safety, plant reliability, and productivity.</li> <li>• Increased vulnerability: low energy prices may encourage unnecessary energy consumption, or at least fail to improve current consumption patterns. This puts the manufacturer in a vulnerable position should fuel prices spike upward.</li> </ul>

SOURCE: Alliance to Save Energy

A corporate energy strategy that focuses only on *prices* will fail to capture the full range of productivity benefits that come from managing *consumption*. At worst, consumption and related inefficiencies may actually increase.

The actions that provide energy efficiency are staff training, proper technology selection, disciplined monitoring of system-wide energy flows, and adequate maintenance. A well-used

adage in engineering is that “you can’t manage what you don’t measure.” Data provides a window on system performance, and the effort that goes into managing energy flows also improves safety, emissions output, productivity, and financial performance. As an operational pursuit, energy efficiency is the outcome of *management by variance*, achieved when diligent managers detect and remediate failures of plant integrity that are evident in data anomalies.

**Energy flow management provides access to lower prices for fuel contracts.** Obviously, efficiency can reduce total expenditures as fuel consumption per unit of production is decreased. There is an additional dimension to fuel savings, related to the contract purchase of fuel. The disciplined monitoring, measurement, and verification of energy flows help to avoid downtime. In turn, production schedules become more predictable. This gives the manager added leverage when negotiating with fuel marketers. Fuel is cheaper when purchased in fixed-priced contracts, so predictable consumption allows a greater proportion of fuel to be acquired in this manner. This avoids the bother and expense of purchasing fuel in spot markets, which may happen when plants put on extra, unscheduled shifts to compensate for downtime. The net impact of energy efficiency is a reduction in the average price of fuel consumed. Securing fuel supplies via fixed contract has the added benefit of protecting against price spikes, which are becoming all too common in today’s energy markets.

One immediate benefit of energy flow management is the verification of fuel bills. Utilities can and do make errors in billing. Some plant managers never see the fuel bills for their facilities. Effective energy management puts information in the hands of such plant managers who can then compare their internal energy statistics with those metered by the utility. Response to erroneous utility charges can add savings over and above any efficiency initiative.

**Impacts of energy efficiency accrue beyond fuel bills.** The same measurement, verification,

and maintenance activities generate non-energy benefits as well. Improved plant integrity means that assets are more reliable, and by avoiding downtime, the plant generates more product. Efficiency also adds to productive capacity. Steam systems, for example, may devote the first 10 to 25 percent of their send-out to leaks, radiant heat losses, and combustion inefficiencies. Improved monitoring and maintenance can recapture those resources so that they may be applied to extended or new production, effectively creating new revenues for the plant.

A summary of 77 case studies gives some indication of the value of non-energy benefits attributable to energy efficiency in a manufacturing setting (Finman & Laitner, 2002). These cases considered such “non-energy” benefits as reduced raw material waste, reduced water consumption, reduced maintenance and repair, improved process cycle times, and other equipment performance enhancements. Of the total number of cases, 52 included a monetized estimate of both energy and non-energy savings. Based on energy savings alone, project paybacks in aggregate were 4.2 years. With non-energy benefits included, the aggregate payback was 1.9 years. It is also interesting to note that 41 of the 77 cases involved “state-of-the-art” technology installations, while 35 involved every-day (conventional) technologies. As a subset, the conventional technology case studies displayed a 2.3 year payback on energy savings alone, while the inclusion of non-energy benefits dropped the payback to only 1.4 years.

Workplace safety is a by-product of improved plant integrity. Improvements in monitoring and maintenance catch more operating anomalies before they threaten life or property. A clean facility log book is leverage for a lower insurance premium, while the avoided legal fees and settlement costs in the wake of an accident are incalculable.

Stability of operating parameters reduces waste, as reflected in lower raw materials expenditure. For some processes, insufficient heat transfer can spoil works in progress, rendering a greater waste of raw material. For example, improved

insulation of steam distribution lines and the reduction of scale build-up in pipes both ensure that heat transfer is achieved at or near system design specifications.

A properly designed industrial energy data system does more than monitor energy flow. It will also reflect a facility's volume and pace of production, including:

- plant output per period of time,
- material inputs per unit of product, and
- the contribution of energy to per-unit costs.

By integrating energy data with production information, a higher level of communication among plant managers and financial staff is achieved. The data becomes a "pulse" for overall plant integrity and effectiveness. All plant stakeholders will benefit by avoiding the costs and revenue losses associated with downtime.

The emissions control agenda provides a two-part opportunity for some manufacturers. Emissions output from manufacturing plants are in direct proportion to fuel consumed. Fuel efficiency is an effective way to avoid emissions penalties and the need for emissions abatement hardware. The other benefit is the marketing potential that comes from providing "green" or environmentally-friendly products. The triple impact of energy efficiency for many companies includes decreased fuel use, reduced emissions output, and reduced raw materials waste. These impacts will demonstrate environmental stewardship, which for some companies becomes the basis of their marketing and public relations efforts. A leading example is the forest products company Weyerhaeuser ([www.weyerhaeuser.com](http://www.weyerhaeuser.com)).

**Energy flow data becomes a basis for activity-based cost accounting.** Energy efficiency's monitoring, measurement, and verification activities facilitate the accounting of overhead costs.<sup>1</sup> Activity-based costing (ABC) is

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<sup>1</sup> *Overhead* refers to general manufacturing costs that cannot be directly attributed to units of production. Whereas raw materials, production labor, and fuel are

important for facilities that make more than one product. If done properly, ABC ensures that costs and profits are appropriately assigned to each product line. Improper cost accounting may distort financial decisions such as product pricing, income declarations, production mix, and capital investment allocations. Activity-based costing is equal parts formula and judgment. There is no absolute best ABC practice, but there are different ways to minimize the distortion that is inherent in its application.

Traditional accounting methods apply overhead costs per corresponding labor hour or square foot of plant space. The labor hour approach lacks precision because (1) not all labor is billed at the same rate, and (2) not all billed hours are equally productive. The square-foot approach is equally deceptive, because the magnitude of value-added from any stage of production usually has little to do with the volume of space in which the activity occurs.

Energy flow data collected in the pursuit of energy efficiency may serve as a basis for activity-based costing. This is especially true for processes that experience high energy costs as a proportion of total expenses. Since energy utilization is mostly synchronized with production, the flow of energy to production stages and product lines becomes a basis for the pro-rata allocation of overhead costs.

**Process speed, flexibility, and product quality can be improved through energy optimization.** The role of energy efficiency should be put in the context of industrial *business performance*. The primary determinants of excellence in product fabrication are speed, flexibility, and quality. These are the keys to lowering costs and capturing revenue.

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examples of costs that vary directly with production, plants incur general costs that accrue regardless of output. These general costs, or *overhead*, typically include management salaries, real estate costs, employee benefits, advertising, etc. *Overhead cost allocation* assigns general costs in some predetermined, formulaic manner.

But instead of competing with these objectives, energy efficiency facilitates them.

Faster process set-up and order turn-around are components of a competitive edge. The unimpeded transfer of heat (an ingredient of virtually every manufactured good) contributes to speed. Some of the energy-efficiency activities that contribute to unimpeded heat transfer are the optimization of combustion firing rates, installing insulation that retains thermal resources in the intended distribution system, the use of digital controls that coordinate motor drive speeds, and the operation of traps that separate dry steam from condensate.

Market share in some industries is predicated on product customization. Since energy efficiency requires intensified monitoring, maintenance, and verification of energy flows, plant staffs are provided with an accurate and ongoing assessment of capacity utilization. Accordingly, they can more quickly and confidently determine their ability to accommodate the new and varied process loads that come with custom orders.

Any manufacturer of pharmaceuticals, plywood, corrugated paper, or a host of other products will indicate that thermal energy should be applied in precise proportion to material inputs. Failure to do so will result in inputs that are wasted due to improper adhesion, distillation, sterilization, humidification, de-humidification, or other heat-intensive processes. The common facilitator to these processes is reliable heat transfer. Manufacturers obtain control of heat transfer through the same activities that minimize heat loss.

**The energy-efficiency payoff may include new revenues in addition to savings.** Why is revenue enhancement preferred over expense reduction? For a profitable firm, a one percent improvement in revenue yields more net income than a one percent improvement in expenses. This fact embodies the investment spirit of many

corporate leaders, who sign-off first on *revenue enhancing* opportunities before considering *expense saving* initiatives.

Energy efficiency can save money *and* build revenue, as evidenced in the two-part calculation of return on investment (ROI), as shown (Garrison, 1991):

$$\text{Operating Margin} \times \text{Asset Turnover} = \text{ROI}$$

Energy efficiency increases operating margin (the ratio of operating income to revenues) for reasons that include reduced energy consumption, a lower average fuel cost through greater use of fixed contract prices, avoided emissions penalties and overtime, and reduced insurance expense (see Table 2, below). The second element of ROI accrues through asset turnover (the ratio of revenue to the value of assets in place). The additional plant capacity recaptured through efficiency, plus reinvestment of the incremental operating margin back into production, enables the plant to generate more revenue through expanded production. The impact from asset turnover is especially valuable to a firm that serves a growing product market, and seeks to keep up with demand through increased asset utilization (Russell, May 2003).

Corporate officers who incorporate energy efficiency into their manufacturing processes demonstrate a higher return on investment. They are better positioned to attract equity capital. Equally as important, the manufacturing operation survives another round in the continuing battle with global competition.

**Many stakeholders, both inside and outside the firm, benefit from efficiency.** The impacts of energy efficiency accrue to a range of stakeholders, from the chief executive and financial officers to pipe-fitters on the plant floor. Table 2 summarizes the potential benefits and beneficiaries of energy efficiency.

**Table 2:  
CORPORATE-WIDE INDUSTRIAL ENERGY EFFICIENCY:  
Stakeholders & Benefits**

**1. Chief Executive Officer (CEO)**

Dollars saved are dollars earned. Efficiency initiatives save money that adds to net income and shareholder wealth. Also, plant capacity recaptured through efficiency improvements can support new product lines, in turn providing greater market share and penetration for the manufacturer—thus *generating new revenues*.

**2. Chief Financial Officer (CFO)**

Plant assets may break down, but they never stop accruing interest or other carrying costs. Steps taken to ensure system integrity will decrease downtime and translate into higher return on investment. ROI is realized in two steps: (1) profit margin improvement as costs per unit are reduced, and (2) increased asset turnover as savings are reinvested into production, thus generating additional revenues. Improved ROI is well received by Wall Street analysts.

**3. Plant Manager**

Disciplined monitoring, maintenance, and utilization of energy flow data produce benchmarks for normal operations. Deviations from data trends may indicate lapses in plant integrity. The plant manager uses this “early warning system” to ensure reliability and minimize disruptions that lead to idle resources and lost revenue.

**4. Product Managers**

An increasing number of firms position their products as “green” or environmentally-friendly, and energy efficiency facilitates this claim. Note that combustion emissions are proportional to fuel consumed—reducing one reduces the other. “Green” consumer products usually command a premium price in the marketplace, so the company wins twice with energy efficiency: production cost savings and higher revenues per unit.

**5. Procurement Director**

Plant downtime can force the manager to run extra night or weekend shifts to catch up, necessitating increased fuel purchases in high-priced spot markets (and incurring overtime labor). In contrast, optimized and well-maintained plant systems are less prone to breakdown, which means fuel and other inputs can be more accurately projected and obtained through lower cost fixed-volume contracts. Also, a safer plant has leverage in negotiating a lower hazard insurance premium.

**6. The Public Affairs Director and Surrounding Communities**

Industrial emissions are directly proportional to fossil fuel consumption. Efficiency limits the production of SO<sub>2</sub> (a component of acid rain), NO<sub>x</sub> (a catalyst for ozone depletion), CO<sub>2</sub> (a catalyst for global climate change), and particulates (which create smog and a variety of adverse health impacts). The quality of life for plant workers and surrounding communities is enhanced when energy efficiency mitigates noxious pollutants.

*(continued next page)*

**Table 2:  
CORPORATE-WIDE INDUSTRIAL ENERGY EFFICIENCY:  
Stakeholders & Benefits**

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**7. Plant Floor Staff**

The increased emphasis on monitoring and maintenance requires a greater level of staff training and involvement. Training opportunities and professional society membership contribute to the development of a more highly educated workforce. Pay-for-performance begets loyal staff as well as better-run operations. It also helps for staff to understand that efficiency contributes to the company’s competitive position—as well as job retention.

**8. Local Economic Development**

Given the realities of global competition, a plant that gains an efficiency edge is more likely to stay in business. Also, when corporations must consider plant retention and expansion, they are more likely to favor their most efficient sites. Manufacturing activities have a multiplicative effect on local economies through related service industries.

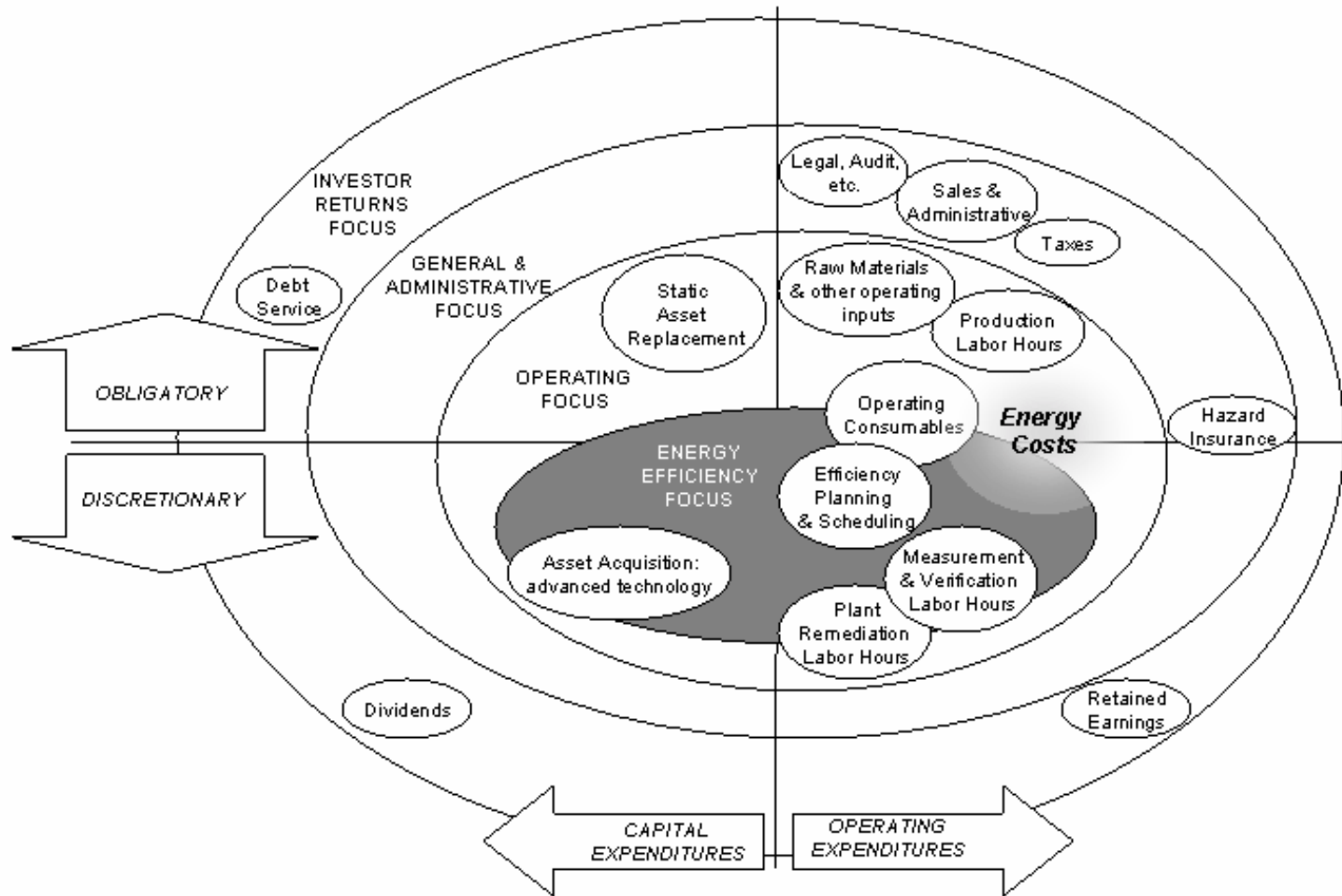
SOURCE: Russell, March 2003.

**Facility budgets should recognize the revenue and non-energy cost impacts of energy management.** Traditional budget thinking considers energy-efficiency initiatives to be in competition with “regular” uses of both capital and operational funds. Whereas most expenses are obligatory, the costs that enable energy efficiency are considered to be discretionary. Comprehensive expense analysis would reveal expense reductions in fuel costs, overtime labor, insurance, avoided safety and emissions penalties, and avoided raw material waste as a result of increased energy efficiency. Yet another budget impact is the additional revenue that energy efficiency may provide through improved capacity utilization and reinvestment of savings into production (Pye, 1998).

Company budgets are often assembled by individuals who have no knowledge of the interrelation of plant activities and their implications for expenses. The tendency is to budget for the coming year by simply trending each line item up by an inflation factor from the previous year. Thus, budget requests for more labor hours for energy flow monitoring and verification are often rejected because the offsetting impact on fuel expenditure and productivity is unanticipated.

Figure 1 (next page) schematically illustrates the place of energy efficiency relative to other budget priorities. This diagram establishes a distinction between capital expenditures (left side) from operating expenditures (right side). It also separates obligatory expenses (top half) from discretionary expenses (bottom). Finally, the diagram depicts levels of corporate focus as a series of concentric rings: energy efficiency is a subset of operations, while general and administrative and investor returns functions are added as outer layers of activity. Typical budget line items are then positioned among the three dimensions accordingly. Note that energy costs are depicted with an indefinite border to underscore the potential of energy management. The efficiency impact of energy monitoring, measurement, and verification activities will not only reduce the magnitude of fuel expenses, but also move some of that expense from “obligatory” to “discretionary.”

**Figure 1:**  
**BUDGETARY COMPETITION AMONG TYPICAL MANUFACTURING FINANCIAL LINE ITEMS**  
 Energy Efficiency vs. Other Uses of Funds



**Energy efficiency supports the goals of core business investment.** It is useful to review the for-profit business reasons for capital investment. The intent here is to show how energy efficiency does not compete with, but in fact supports, each of these fundamental business goals (see Table 3).

<p><b>Table 3:</b>  <b>BUSINESS RATIONALE FOR CAPITAL INVESTMENT:</b>  <b>Energy Efficiency’s Contribution to Fundamental Investment Goals</b></p>
<p><b>1. Open new markets and revenue sources</b>  When energy efficiency is applied to major plant utilities such as steam and compressed air, the plant recaptures much of the capacity that was formerly forfeited to efficiency losses. This capacity can be applied to new or expanded production lines.</p>
<p><b>2. Grow market share</b>  As described above, energy efficiency returns a greater proportion of capacity to productive use. The additional production can facilitate a manufacturer’s quest for additional market share.</p>
<p><b>3. Attain a price premium</b>  Plant emissions decline with fuel consumption. A clean process can boast environmentally-friendly or “green” products. Energy efficiency is usually the quickest and most cost-effective way to contribute to “green” or sustainable business agendas. “Green” consumer products tend to command a price premium in the marketplace.</p>

<p><b>4. Reduce expenditures</b>  The discipline of applied energy efficiency:</p> <ul style="list-style-type: none"> <li>• reduces fuel bills through decreased consumption,</li> <li>• lowers average fuel prices derived through greater fixed-price contract purchasing,</li> <li>• reduces the waste of direct materials input,</li> <li>• lessens the need for purchases of environmental remediation and control equipment, and</li> <li>• reduces hazard insurance premiums.</li> </ul>
<p><b>5. Reduce operating risk</b>  Applied energy efficiency will:</p> <ul style="list-style-type: none"> <li>• hedge against fuel price volatility,</li> <li>• avoid costs associated with equipment downtime (which includes lost revenue as well as idle resource costs),</li> <li>• avoid penalties related to safety and emissions violations,</li> <li>• avoid legal and settlement costs related to lapses in safety, and</li> <li>• provide proof of environmental stewardship.</li> </ul>
<p><b>6. Reduce competitive risk</b>  The price of avoiding new technologies and process improvements is to endure the failure of aging assets and loss of business to competitors who gain advantages through innovation. Energy efficiency will contribute to speed, flexibility, and product quality.</p>

SOURCE: Alliance to Save Energy

Instead of striving to create interest in energy efficiency in and of itself, industrial energy programs may make better progress by positioning energy efficiency as a solution to existing business challenges and interests.

#### IV. DELIVERING BUSINESS PHILOSOPHIES

This section discusses the considerations in promoting an effective, business-oriented, energy-efficiency message. Such a message will:

- clearly articulate an outcome with meaningful business value,
- coincide with specific business needs,
- have meaning for a variety of key plant personnel,
- be delivered by a respected entity, and
- include direction for actionable follow-up.

Business needs, energy-based solutions, and corporate decision-making styles are all highly varied. In sum, a one-size-fits-all approach to advancing energy efficiency will be of limited use. At the very least, efficiency advocates should be prepared to differentiate their message for each target industry. Company-specific messages are preferable, if resources permit individualized attention. And even within a company, efficiency advocates will encounter decision-making teams made up of different stakeholders from within the corporation (see “Decision-making teams,” below in this section).

**Select target industries for energy efficiency outreach.** Limited resources will certainly be a factor for the energy program community. In lieu of pursuing all industry incumbents, a practical approach will target a few industries that are most likely to be receptive. This focus will also leverage the assistance of industry trade groups and generate success stories of interest to industry peers. Chances for program success are enhanced by pursuing a quality, in-depth dialog with a limited number of industries. (Cooper, et. al., 1999). In addition, targeted industries could be those that:

- have a history of government-business collaboration,
- enjoy pre-competitive collaboration among peers, especially in terms of performance benchmarking,
- feature energy as a high proportion of

operating expenses, and

- experience a growing product market (See in Section III, “The energy-efficiency payoff”).

Efficiency advocates should prepare their overture by developing a baseline understanding of the target industries through a review of economic statistics, annual corporate reports, and consultation with trade associations or constituents who are familiar with the industries’ most critical issues.

**Select target companies through appropriate background research.** Once target industries are selected, attention turns to choosing the specific companies to approach. The ideal company is one that:

- is solvent and reasonably well-run,
- has a set of facilities, products, or processes that are narrowly defined,
- is the subject of a recent merger, acquisition, or change in management,
- will soon embark on a significant capacity upgrade, and
- makes risk or quality management a priority (e.g. is an ISO 14000 or Six Sigma participant).

Corporate annual reports will reveal insight about specific companies, including:

- data on the industry in which the company operates: its structure, suppliers, customers, product substitutes and complements, competitive dynamics, and general future direction.
- the company itself: its capital structure, mission statement, goals, product mix, financial performance, competitors, and trade allies.
- its corporate officers, including fields of expertise, prior positions held, academic accomplishments and affiliations, and any civic memberships. Company-specific research of this nature may or may not reveal opportunities for energy-based solutions, but it will certainly give the efficiency advocate a meaningful foundation for an ensuing dialog with corporate representatives.

Add to this investigation an understanding of the “corporate DNA” of the company itself, meaning the position of the chief executive officer relative to other officers. Corporate structures have very different implications for how the CEO will make decisions (Gillen, 2003):

- Case 1: The CEO responds to a Board of Directors. Certain business values are imposed on the CEO, as well as targets for performance. The challenge in this case is to articulate energy-efficiency programs to facilitate the CEO’s performance requirements.
- Case 2: The CEO co-leads with a president. The CEO is probably focused on matters external to the firm, while the president is ultimately responsible for all internal issues.
- Case 3: The top person is both president and CEO. Power is concentrated, but so are the details, so this leader may have a greater propensity to delegate.
- Case 4: The CEO is also the sole or dominant owner. Time horizons could be longer (favorable to investment), but differences in individual personalities makes the proposal strategy difficult to predict.

**Corporate approval usually comes from decision-making teams.** In almost all cases, a manufacturer’s decisions about energy-efficiency initiatives will be rendered by a team of individuals. The team will include stakeholders from within the company whose interests will in some way be impacted by energy projects. An efficiency advocate will need not only to identify these decision team members, but to gain an understanding of the interests that each brings to the table. Typically, any member of a decision team can say “no” to an initiative, but only one can say “yes” (Peoples, 1993).

Plant managers will be concerned primarily with impacts on process reliability and the ability to meet production targets. Financial staff should be apprised of the full range of economic

benefits. A representative of line workers will need to know the impacts on labor requirements. Finally, a “dominant influencer,” or someone in whom the CEO or primary decision-maker confides, is likely to be present. It is crucial for the efficiency advocate to articulate the benefits of energy efficiency to each member of the decision team (see Section III, Table 2).

**The energy efficiency messenger may be just as important as the message.** The preceding text emphasizes the value of focusing energy-efficiency promotion at least on target industries, and if possible, on specific companies and even individual stakeholders. This implies a highly personalized delivery mechanism. Trade associations are ideal for their industry-specific focus, while individual industry specialists may perform liaison functions. A cadre of staff may be affiliated with a state or regional energy office, a trade association, or a select group of consultants. Perhaps the best approach is to draw from all these potential sources.

Whatever the arrangement, the task of energy-efficiency advocacy may be best handled by one or more people who are prepared to discuss both business and technical issues with equal cogency. Their communication skills are the key to articulating a business philosophy that will motivate industry to adopt energy efficiency not as an end in itself, but for its impacts on current business needs.

**Efficiency advocates should provide actionable follow-up materials.** Efficiency advocates should be prepared to share with industry the resources that facilitate project proposal and implementation. This will include self-led diagnostic and technical reference material, contacts for plant energy assessments and technical support, and financial assistance.

The U.S. Department of Energy’s BestPractices program generates technical reference material pertaining to common plant utilities, including steam, motors, fans, pumps, compressed air, and process heating. Materials include reference documents as well as diagnostic software. Users have the choice of either applying these materials to their own self-led energy

improvement activities, or using them as benchmarks for evaluating the claims made by any engineering consultant they choose to enlist. All BestPractices materials are free of charge and are available through a toll-free clearinghouse at (800) 862-2086, or from their web site: [www.oit.doe.gov/bestpractices](http://www.oit.doe.gov/bestpractices).

The National Inventory of Manufacturing Assistance Programs is a compendium of over 160 state, regional, and utility energy assistance programs. The types and depth of assistance programs vary widely, but include technical assistance, plant assessments, financing and rebates, and analytical tools. At the time of this writing, NIMAP is due to be released as an online database. For more information, contact the Alliance to Save Energy at (202) 857-0666.

## V. CONCLUSIONS

Efficiency advocates have historically promoted energy efficiency to industrial audiences that, for the most part, neither seek it nor fully understand its significance. Accordingly, the full potential of industrial energy efficiency has yet to be realized. Efforts to promote industrial energy efficiency will certainly be more successful if the outreach presents meaningful solutions to current business priorities.

Energy-efficiency impacts only begin with fuel bills. Applied energy efficiency is a by-product of energy flow monitoring, measurement, and verification. Flow data reveals anomalies that may be a detriment to operating costs as well as plant safety, reliability, and productivity. An underappreciated fact is the same efficiency efforts assist in growing revenues by recapturing plant capacity that otherwise would be forfeited to lapses in operating integrity.

The promotion and adoption of energy efficiency may involve *communication* more than technology. The technical means already exist and are well-documented, as exemplified by the U.S. Department of Energy's BestPractices program. Efficiency advocates must be ready to formulate a series of overtures that are at least industry-specific. Messages tailored for individual companies and even key stakeholders within companies are preferable. The industry audience will include chief executive officers, finance professionals, plant managers, and perhaps other staff. Each will bring to the dialog unique perspectives that must be anticipated. This implies the need for energy-efficiency outreach to be carried out by a series of industry sector specialists. Each specialist needs to understand industry needs and convincingly address these with energy-based solutions.

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