What's in It for Me?
The Financial Dynamics of Corporate Energy Management

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ABSTRACT

Energy efficiency's promise of cost savings evokes little more than a yawn from industry's hard-nosed corporate leaders. For all its good work, the efficiency community usually offers a "one size fits all" message that is assumed to resonate evenly across all levels of an industrial organization. In reality, the manufacturing corporation is a loose confederation of functions—operations, marketing, engineering, finance, and so on—all of which are often in competition with each other for internal resources. These departments have very different accountabilities and expectations with respect to financial performance. While the organization as a whole "seeks profit," departmental goals can often frustrate that pursuit. Energy management clearly reveals this conundrum. Energy use transcends departmental boundaries, creating coordination challenges for an energy manager. This paper offers a financial justification for energy improvements that is nuanced for the segmented audience that is typical within a single corporate entity. The Strategic Profit Model will be used to show how corporate-wide financial outcomes are driven by departmental agendas. For the energy efficiency community, this exercise helps to coordinate key business managers and investors that would otherwise resist energy efficiency—by providing answers to the perennial question, "what's in it for me?"

Introduction

There are just over 200,000 industrial manufacturing sites in the U.S. As described here, "industry" refers to the factories, processing plants, and other facilities that convert raw materials into final products for global markets. In aggregate, these sites represent a full one-third of total U.S. energy consumption. The opportunities for industrial efficiency are large: up to 40 percent of U.S. industrial energy consumption is lost (U.S. DOE-ITP[1]), although much of that loss can be economically recovered by implementing energy-efficient technologies, procedures, and behaviors.

Should there be any doubt that industrial energy waste still exists, simply review the results of over 1,800 industrial energy assessments conducted by the U.S. Department of Energy's *Save Energy Now* program between 2005 and 2008. The average assessment identified about 70,000 MMBtu in annual natural gas savings (U.S. DOE-ITP[2]). Compare this to the 43 MMBtu of natural gas consumed by the average U.S. household in 2005 (U.S. DOE-EIA), and it indicates that the average industrial site presents a volume of potential natural gas savings equivalent to the combined consumption of well over 1,600 households. Simply put, one large industrial facility consumes a volume of energy equal to that of hundreds, if not thousands of homes. This suggests that a relatively small number of industry decision-makers can have a substantial impact on national energy markets.

National energy policy is one thing; the proprietary objectives of industrial organizations are quite separate. For a variety of reasons described below, industrial energy efficiency opportunities are not fully harvested. To date, the assessments compiled by the U.S. DOE's Save Energy Now program have yielded a mere 16 percent implementation rate (U.S. DOE-ITP[2]).

Industrial energy waste persists for many reasons, both human and technical. In today's era of global competitiveness and scarce resources, "energy" is simply another factor that competes with safety, product quality, human resource constraints, environmental liabilities, and other concerns to receive management attention. All of these issues demand time and impose overhead costs, all of which divert resources away from the core business of meeting production goals. Organizations find it impossible to optimize all these agendas at once. Safety and liability issues usually come first—if only because of the legal dimensions of non-compliance surrounding these issues. And while energy waste will inflate costs, at least it poses no legal penalties (aside from those related to fossil fuel emissions). Accordingly, the energy agenda is forced to wait.

Energy presents a unique management challenge. Most other business issues can be neatly delegated to one department, or even one person, who then pursues the issue while everyone else carries on business as usual. Energy costs, however, reflect decisions made by a virtually every employee in the facility. Choices-- made one minute ago, or a month ago, or even 20 years ago—all play a role in shaping the current utility bill. Who is accountable for energy expense? A procurement director may be tasked with managing the price at which energy is purchased, but price is only one side of the expense equation. Energy consumption is the other side—and everyone from the receptionist to the chief engineer to the apprentice machine operator determines consumption patterns. These people never see the facility's utility bill, while the accounts payable clerk has no idea where the purchased energy went. Most facilities lack the ability to trace energy consumption at a meaningful level of detail. With no measurement, there is no accountability. Regardless of the price at which it was purchased, energy is effectively "free" to all staff. There is no compelling reason to economize the use of a free commodity.

Industrial organizations accept energy waste, and the financial impact of that waste, because no one recognizes or accepts the accountability to do otherwise. This waste is to the detriment of shareholders who trust business managers to maximize the financial returns coming from industrial operations. This situation begs for greater accountability, but how? Money is the common denominator for shareholders, managers, and employees. Industrial energy efficiency requires a tool that links facility decisions to shareholder returns. The purposes of this paper are to first recognize the disconnects between industry's energy choices and overall profitability, then to suggest how those connections can be made. The intended audience is that handful of industrial decision-makers who can have a dramatic impact on the nation's energy supply and security—as well as their own corporate objectives.

Background

Why is there a disconnect between the profit motive and daily industrial decision-making? Industrial organizations tend to be large and complex. Because many skills and resources are needed to serve a production process, division of labor is a practical necessity. This is evident in the creation of departmental functions. But in an environment of scarce resources, departmentalization can foster an internal, competitive dynamic that misallocates wealth.

Here's why: Budget development is as much about perception as it is the money itself. Budgets tend to be modeled on the previous year's actual experience. This puts the manager in a precarious position: under-spending this year could undermine the claim for next year's funding, while overspending may create the impression of waste or mismanagement. In effect, the department manager who economizes has just demonstrated the need for a smaller budget in the coming year. Managers tend to guard their budget dollars as a source of discretionary power. Over time, the annual cycles of budget development, defense, and execution yield a culture of hoarding.

Within the typical industrial organization, certain barriers to energy cost control are a consequence of departmental competition for budget dollars. Energy control activities and costs may be delegated to a "facilities" department, or wherever engineering and maintenance tasks are handled. An industrial facility manager ensures that buildings, manufacturing processes, and attending staff have the heat, power, ventilation, and other services needed to function effectively. These activities are often perceived as secondary in importance, relative to the core business of manufacturing products and meeting production goals. Accordingly, facility managers may be at a disadvantage when competing for internal budgetary and analytical resources. "Success" for a facilities manager means keeping emergency failures to a minimum. By definition, emergency issues are unpredictable in size and frequency. Given the choice between emergency preparedness and the efficiency of ongoing operations, many facility managers are hesitant to spend money on "fixing things that aren't broken." This allows energy waste to persist.

Everyone else carries on business as usual without regard to the energy expense implications of their actions. The facilities manager alone would be responsible for reversing the wasteful choices of others. This could be the job of a proverbial Sisyphus, never-ending and without reward. Unless everyone is accountable for energy use, an energy manager's effectiveness is severely limited. Under these circumstances, energy waste will prevail, directly reducing the financial return available to shareholders.

The Strategic Profit Model

Let's start with the obvious: an industrial enterprise exists to make money. Investors create the enterprise by providing capital equity to finance the assets that will produce goods for sale. If all goes well, the sale of these goods produces revenues in excess of the enterprise's capital investment and operating expenses. The financial efficiency of this process is captured in the "return on equity" concept. This concept is useful to investors that have many choices of where to invest their capital. Return on equity (ROE) is a *relative* measure that allows investors to compare the attractiveness of two or more investment alternatives.

ROE can be simply expressed as the ratio of new wealth created (variously described as *earnings* or *net income*) to the value of the investors' equity:

Equation 1:

$$\text{ROE} = \frac{\text{Net Operating Income}}{\text{Equity}}$$

The ROE equation yields a percentage based on a ratio of dollar figures taken directly from consolidated financial statements. "Net operating income" is an entry on an income statement, while "equity" is recorded on a balance sheet. An ROE of 20 percent, for example, is the result of $2 million in annual income being produced by assets that are capitalized by $10 million in equity.

The elegant simplicity of the ROE concept is not without its detractors. During the 1920s, financial analysts with Dupont Corporation noted that ROE was a static measure that failed to provide insight on the business dynamics behind its simple ratio. They wanted more than a financial snapshot; they wanted a meaningful measure of financial *productivity*.

The analogy of *functional* productivity may help to explain the Dupont staff's vision for *financial* productivity. Let's say you own a very small, simple trucking business. You have one truck and one driver. You'd like to measure the functional productivity of the business. At the end of the day, you ask your driver what he accomplished. "I drove 70 miles per hour," he says. That's not enough, so you ask for more. "I drove for ten hours," he says. So now you have a little something: the driver covered 700 miles. But this doesn't describe what was accomplished. You find that he carried two tons of cargo. So now you have a basic productivity measure of *1,400 ton-miles*. This basic measure of productivity for this example is:

Equation 2:

$$\text{Productivity} = \text{Speed} \times \text{Duration} \times \text{Capacity}$$

In this example, *speed* provides an instantaneous measure of the velocity at which the task was undertaken. *Duration* describes the impact of speed over time, otherwise known as *distance*. But distance alone means nothing without a measure of *capacity* carried. Taken together, these variables indicate productivity. The separate variables allow a manager to isolate, evaluate, and address the individual factors that contribute to overall productivity.

The Dupont analysts anticipated a similar way to breakdown financial performance measures. Specifically, the question was: What drives the organization's overall profitability? The Dupont Formula, also referred to as the *Strategic Profit Model* (Higgins, 2009), traces the linkages between departments and profitability. The model developed from this beginning:

Equation 3:

$$\text{Return on Assets} = \frac{\text{Net Operating Income}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Average Assets}}$$

Return on assets (ROA) proves to be an intermediate result, the same way that *distance* was only a partial measure of productivity for the hypothetical trucking company. As an intermediate metric, ROA is relevant to the operational performance of assets currently in place. It may be most useful for comparing the management performance between two or more facilities owned by the same company. In other words, it describes how well one facility performs relative to all other facilities within a company when using assets to create wealth. But by definition, this statistic focuses on assets without distinguishing between the debt and equity that capitalize those assets. As such, it fails to describe shareholder returns, i.e., returns specific to equity by itself. That oversight is addressed by the basic Strategic Profit Model:

Equation 4:

$$\text{Return on Equity} = \frac{\text{Net Operating Income}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Average Assets}} \times \frac{\text{Average Assets}}{\text{Average Equity}}$$

…where:

- all values are from the same accounting period
- *net operating income* is the remainder of total revenues after operating expenses are deducted
- *revenues* are total sales receipts
- *average assets* is the total value of the organization's assets, expressed as the mean value of two consecutive end-of-year balances
- *average equity* is represents the value of all shareholder investment, expressed as the mean value of two consecutive end-of-year balances

A mathematically-inclined reader will notice that in Equation 4, the terms *revenue* and *average assets* would both cancel out, leaving *net operating income* divided by *average equity* as the result. But that would miss the point—the intention here is to isolate the separate contributions to business performance. The formula is simplified to isolate these contributions as follows:

Equation 5:

$$\text{Return on Equity} = \text{Operating Margin} \times \text{Asset Turnover} \times \text{Financial Leverage}$$

The formula's elements now focus on distinct business functions:

Operating Margin (Net Income Divided by Revenues)

This is a relative financial measure of the organization's efficiency in converting raw materials and other inputs (not including investor capital) into revenue. To the investor, an industrial facility is a money-making machine: one dollar's worth of inputs goes in one end, and some amount valued in excess of one dollar should come out the other end. An acceptable net operating margin reflects the minimization of costs as well as the appropriateness of the price at which the product is sold. There is a connection to energy in that production expenses vary directly with the reduction of energy waste. There's an indirect relationship in that energy optimization efforts usually have spill-over benefits in the form of increased productivity, reduced scrap rates, reduced emissions and safety liabilities, and the ability to bring new products to market that demonstrate a minimized environmental footprint.

Asset Turnover (Revenues Divided by Average Assets)

Again, this is a relative financial measure. If the industrial enterprise is a "pipeline" for generating wealth, then asset turnover is a measure of that pipeline's capacity. Simply put, this metric measures how much work is being produced. Asset turnover is particularly useful for comparing the productivity of different facilities that make similar products. For example, say that one facility employs $100 million in assets to generate an annual production worth $300 million (asset turnover = 3.0). This compares favorably to a facility with $150 million in assets with annual production worth $350 million (asset turnover = 2.3).

Financial Leverage (Average Assets Divided by Average Equity)

This metric describes the degree to which an organization uses borrowed wealth (or *debt*) to supplement the equity supplied by its investors. In other words, it's a measure of how much the business entity relies on other people's money to underwrite its assets. This concern usually rests with a chief financial officer and has no immediate bearing on day-to-day operating decisions. But financial leverage is relevant to energy optimization to the extent that debt financing may be used to pay for energy waste remediation or to finance the start-up of product lines that will be promoted for their environmentally-friendly attributes, derived in part from the energy-efficient way in which they were manufactured.

The basic Strategic Profit Model (Equation 4) addresses *pre-tax* return on equity. A more advanced model provides a post-tax measure by incorporating tax and debt consequences. By pulling line items from consolidated financial statements for a specific accounting period, it looks like this:

Equation 6:

$$\text{Return on Equity}_{\text{post-tax}} = \frac{\text{NOPAT}}{\text{Pre-Tax Profit}} \times \frac{\text{Pre-Tax Profit}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Average Assets}} \times \frac{\text{Average Assets}}{\text{Average Equity}}$$

…where the variables are as defined above with Equation 4 PLUS:

- *EBIT* is "earnings before interest and taxes," and is synonymous with "net operating income" as used in Equation 4
- *Pre-tax profit* is the result of extracting interest costs from EBIT
- *NOPAT* is "net operating profit after taxes," or the remainder after subtracting taxes from pre-tax profit

In its full articulation (Equation 6), the Strategic Profit Model describes returns to investors after taxes. Equation 6 is also helpful in capturing the consequences of any tax benefits that accrue to the corporation. More to the point, the collection of any energy-related tax benefits can be neatly connected to shareholder results by using this formula. For example, investment in a renewable energy application may result in a tax credit. That credit directly reduces the difference between pre- and post-tax profit measures. Mathematically, the impact is apparent in Equation 6: an increased value for the ratio NOPAT to pre-tax profit is a proportional increase to post-tax return on equity.

Puttng the Pieces Together

Let's restate Equation 6 by replacing the component ratios with their equivalent concepts:

Equation 7:

$$\text{Return on Equity}_{post\text{-}tax} = \text{Tax Burden} \times \text{Interest Burden} \times \text{Operating Margin} \times \text{Asset Turnover} \times \text{Financial Leverage}$$

Stated this way, the Strategic Profit Model is a tool for industrial organizations to "connect the dots" between staff accountabilities and returns to shareholders. The connections may be described as follows (line numbers indicate only a reference and not ranking):

Minimize Tax Burden	
Chief engineers and Finance officers	1. Pursue investments in energy-related assets that yield tax benefits.
Minimize Expenses to Increase Operating Margin	
Machine operators *Office staff* *Facilities manager*	2. Shut down machinery when not in use 3. Shut down computers and other office equipment in use 4. Make facility-wide use of motion detectors, screen savers, timers and other controls to reduce energy waste
Maintenance staff	5. Repair leaks in steam, compressed air, water, and other in-house utilities. 6. Optimize fuel-air mixtures for combustion 7. Maintain adequate insulation 8. Minimize friction in motors and motor drives 9. Match motor horsepower to loads 10. Ensure proper start-up sequencing to avoid peak demand spikes
Production schedulers and operation managers	11. Schedule workloads to take advantage of time-of-use electricity tariffs 12. Coordinate production calendars with scheduled maintenance calendars
Procurement managers	13. Develop an energy procurement strategy that minimizes purchase price for a given level of risk aversion 14. Implement life-cycle cost criteria for procurement of energy-related hardware
Chief engineers	15. Facilitate the utilization of energy consumption data that tracks usage to points of accountability throughout the facility
General managers	16. Ensure that the costs and benefits of energy improvements are shared across departmental lines. For example, avoid situations where Dept. A pays for an improvement, but all the benefits accrue to Dept. B.

Increase Revenues to Improve Operating Margin and Asset Turnover	
Product developers and marketers	17. Develop products and/or services that can be marketed as environmentally-friendly, thanks to the company's demonstrated reduction in energy waste 18. Join supply chains organized exclusively for bringing environmentally-friendly products to market3
Chief finance officers	19. Sell carbon credits associated with the reduction of fossil fuel emissions
Chief engineers	20. Where markets permit, sell surplus electricity generated from onsite power plants
Increase Asset Values to Improve Financial Leverage	
Chief financial officers	21. Optimize depreciation values. Cost segregation is a hybrid engineering/accounting effort that enables this result. The purpose is to improve cash flow by reclassifying energy-related assets for tax purposes from a 39-year depreciation category to a 15- or 7-year category. By the way, cost segregation is a very compelling reason for getting an energy audit.
Chief engineers, Chief finance officers	22. If you believe that an industrial facility's value is increased by its efficiency, invest in energy metering, monitoring, and verification (MM&V) systems that empower staff to make real-time energy optimization decisions. Overall plant value should increase as MM&V capabilities help to prevent waste and to offset safety and emissions liabilities.

Addressing Apparent Contradictions in the Model

Depreciation vs. Cash Flow

If an asset has already been placed in service, then with all else being equal, it is advantageous to accelerate its depreciation. This effectively increases near- to medium-term cash flows to the business. Annual cash flows are improved by an amount equal to income taxes that are avoided. But here lies the one contradiction: if depreciation is accelerated, then annual expenses are increased. This is a good thing in that it reduces tax liabilities (and improves cash flow). However, this is bad from the Strategic Profit Model's perspective. Increased depreciation means increased operating expenses, which reduces net operating income. In other words, this decreases the model's *operating margin* term. To counter this, a solid corporate energy plan would (1) seek a cost segregation analysis that identifies opportunities for accelerated depreciation; (2) use the cash flow derived from this depreciation exercise to invest in energy-related assets that provide tax credits or deductions, and (3) reap the operating expense savings that the new energy investments provide. This clearly requires some asset management collaboration among the organization's finance and engineering leadership.

Asset Turnover vs. Debt Burden

The issue here is using debt to improve returns on shareholder equity (ROE). On one hand, borrowing increases financial leverage, which is good for ROE. But if that debt is used to capitalize additional assets, this decreases asset turnover (a bad outcome, from the shareholders' perspective). However, investors are made whole again if sufficient new revenues are generated by the new assets, therefore offsetting the decrement in asset turnover. The business strategy here can be to generate new revenues through the production of "green" and environmentally-friendly product lines. A green product is made possible in part by an energy-efficient manufacturing process. Strategic planning would allow increased borrowing specifically to finance the capacity for producing "green" product lines. Meanwhile, the revenues from that production improve the operating margin while boosting asset turnover.

Implications and Conculsions

Truly efficient use of industrial energy requires a coordination of priorities within facilities and across layers of management. This feat is made difficult when decision-makers throughout the organization fail to see the connection between energy choices and bottom-line business performance. The antidote to this dilemma may be to refocus on *money*, and in particular, shareholder equity. The Strategic Profit Model, presented here, has been used for years by Wall Street for analyzing the performance of publicly-traded companies. It can and should be adopted to promote energy efficiency to business leaders.

The Strategic Profit Model will coordinate engineering, operations, and finance decisions needed to maximize energy-efficiency investments. Not only that, the model is a blueprint for connecting those decisions to the primary business purpose of maximizing returns on shareholder equity. In effect, this framework counters the skeptics of energy efficiency by answering the question "What's in it for me?"

For a variety of reasons, manufacturing organizations fail to maximize return on equity. This is especially evident when competition among departments leads to the failure to spend a dime that would actually cause a whole dollar to be saved. The Strategic Profit Model helps to reconnect decision-makers with the true determinants of business performance. It does this by breaking down the return on shareholder equity into components that can be linked directly to discrete functions within the manufacturing organization.

Industrial energy efficiency can be harnessed to shareholders' benefit if the true "money" impacts are made clear to all stakeholders. The Strategic Profit Model is a framework for fostering the internal collaboration that industrial organizations need to ensure that energy improvements contribute to business performance.

References

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