Book Energy Budgets at Risk (EBaR)

A Risk Management Approach to Energy Purchase and Efficiency Choices (Wiley Finance)

Jerry Jackson
Wiley, 2008
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Recommendation

Since the first oil embargo in 1973, energy prices have increased and become more volatile, creating the corporate need for better financial tools to evaluate energy costs. Enter energy economist Jerry Jackson, developer of the "Energy Budgets at Risk" (EBaR) analysis that technically oriented managers can use to make sharper decisions about how and when to upgrade systems to achieve energy efficiency. EBaR is a trademarked cost and risk analysis tool, and Jackson explains it (and, in truth, promotes it) clearly. Although his book is a bit repetitive and loosely organized, it contains all the formulas, graphs and rationales needed to explain EBaR's statistical approach. *BooksInShort* recommends this to math-minded managers who seek new ways to assess and control their organizations' energy costs – and to help the planet along the way.

Take-Aways

- Businesses face greater risks due to more volatile, expensive energy costs.
- You can use the "Energy Budgets at Risk" (EBaR) analysis to make better investment decisions about how, when and whether you should upgrade to more energy-efficient systems.
- EBaR techniques can help companies reduce their annual energy costs 20% to 30%.
- Consider the risk management significance of improved energy-efficiency.
- EBaR is a quantitative method for analyzing energy investments and purchases.
- Health care and energy are the biggest cost problems facing businesses.
- Use value at risk, net present value and capital value budgeting to analyze the costs and benefits of energy-efficiency investments.
- Several factors determine the merits of an energy investment.
- They include: technology costs, energy use, price, rate structure, weather and performance.
- Returns from energy-efficient investment can create a new revenue stream for your firm.

Summary

More Volts for the Buck

Managers who use Energy Budgets at Risk (EBaR) analysis techniques can cut their facility's annual energy costs from 20% to 30%, thus increasing their cash flow. EBaR helps managers quantify the risk of investing in upgraded, modified or redesigned energy-efficient systems. It is an innovative structure for assessing and enumerating the risk inherent in energy costs. Organizations can use it to lower their power costs, to evaluate the purchase of new energy-efficient technology or to weigh the decision to redesign or improve existing energy-use systems.

> "This...introduces a new framework to evaluate and quantify energy cost risks, energy-efficient investments and energy purchase decisions based on risk management tools refined over the last decade in the financial industry."

Energy expenses are one of the two most significant costs businesses face (the other is health care). EBaR is meaningful as a comprehensive quantitative way to analyze energy investments and purchases in the same kind of detail that you exercise in evaluating other investments. It uses risk management tools developed and polished in the financial-services sector. Properly applied, this approach can reduce costs, increase cash flow, meet your company's risk tolerance needs and boost your bottom line.

> "Energy Budgets at Risk (EBaR) analysis explicitly recognizes [the] risk tolerance of individual organizations and risks associated with specific investment decisions."

EBaR is especially critical as rising costs, green energy initiatives and the quest to develop new revenue put fresh emphasis on the need to manage corporate energy use. As of mid-2007, natural gas expenses at U.S. commercial establishments were 100% more than their 1999 levels and oil prices were up 250%. Electricity price

hikes vary by state, but prices rose 36% in California and 54% in Florida. Such immense increases escalate corporate operating costs, and cut companies' reserves, profits and earnings.

"Organizations are desperately in need of a new approach to evaluate energy-efficient investments in today's costly and uncertain energy markets."

When most analysts consider energy-efficient investments, they generally conclude that a 15-month payback period is reasonable. But managers should not focus only on the earn-back aspect of energy-efficient investments; they must also analyze the risk involved. EBaR helps manage both facets of the decision about upgraded energy-efficient systems.

"High, erratic energy prices have created financial crises for many businesses, institutions and government agencies."

An EBaR analysis follows several steps. First, it lists the variables that affect your energy budget and identifies your potential return if you invest in more energy-efficient systems. It identifies the variables that affect your costs, and calculates the risk probabilities for each variable. It analyzes your energy costs and determines if an investment in more energy-efficient technology is worthwhile, in terms of your risk and your budget. Analysts who conduct an EBaR process generally wrap up by presenting an executive summary and an engineering summary of their findings. Another EBaR risk-management tool allows analysts to determine when the data available is so insufficient that they should recommend that managers postpone an equipment-upgrade decision until they can obtain more information.

Key EBaR Components

The EBaR system relies on several metrics to evaluate a company's possible return on energy-efficiency investments, including:

- **"Internal rate of return"** (IRR) – This indicates the effective yield on an investment in energy-efficient equipment. Calculate the IRR on an energy project by comparing your initial investment to your possible annual savings using baseline data (such as a year's worth of electricity and natural gas bills, for example). The higher the IRR, the more profitable the investment. Use the IRR to compare various efficiency programs.
- **"Net present value"** (NPV) – Managers use NPV to analyze an investment's income streams, costs and benefits, based on the "time value of money."
- **"Capital budgeting analysis"** – This analysis covers long-term investments. It centers on payback (investment costs divided by annual savings), but analysts using this tool often downplay risk and energy costs. Energy risk management, which has the same goal as financial investment risk management, should be part of capital budgeting analysis.
- **Values at Risk (VaR)** – This metric generally applies to liquid investments, while EBaR is based on measuring tangible, illiquid, fixed investments. However, VaR uses probability distributions to measure a portfolio's risks, thus allowing investors to calculate their anticipated best- and worst-case scenarios over time, based on probability or confidence levels. EBaR uses a similar approach to calculate your energy cost risk, or your expected net energy and cost savings after an upgrade or design.

EBaR in Action

EBaR analyzes price volatility to mitigate energy expenses and to help companies find the best way to invest in new or upgraded energy-efficient equipment. For example, if managers want to estimate how much money and energy they might save by replacing fluorescent light fixtures with energy-efficient lights, they can use EBaR to assess the proposed project. Several unknowns or variables may shape the results. Predicting electricity costs over the new bulbs' lifetime is difficult, as is determining how many hours a day the lights will be on, so calculating the project's energy efficiency and savings isn't a black and white matter. When a company analyzes an energy investment that has unknown factors, like a building's projected energy use, the best predictive framework is to use probability distributions that reflect different possible outcomes.

"Organizations are eager to reduce energy costs, but lack the ability to make sound financial decisions with respect to energy-efficiency investments."

The EBaR formula relies on calculating risk and uncertainty across various scenarios. Uncertainty describes a situation where you can't get data about a potential outcome. Risk is the likelihood of negative results, and your risk tolerance is the maximum probability of a negative outcome you can accept. These distinctions matter since managers must deal with many variables and risk levels when calculating energy savings. For example, when you assess a new air conditioner's heat-loss or electricity use, variables like humidity and weather will affect your calculations.

Managing Risks

Managers use EBaR analysis to identify and analyze budget variables in the decision to upgrade to more energy-efficient systems (or not to), and to set parameters for energy use and costs.

"Common sense says that managing risks is a more profitable strategy than avoiding risks."

Using EBaR to evaluate the risk involved in replacing or redesigning an old energy-inefficient system generates two sets of statistics: One measures the cost exposure of your current energy-use technology (including the difference between budgeted and actual costs) and the other measures the potential costs of investing in a specific new system. The data in an EBaR energy investment analysis also may include the cost of new efficient technology, potential reductions in monthly and hourly energy use, and the operating traits of various mechanical systems. Some of the information necessary is available through energy efficiency testing.

"The feeling of not knowing enough to know what to ask makes the information development process seem more complicated than it really is."

The customary budget analysis framework uses "Monte Carlo" evaluations that take information from various sources, like energy bills, electric and natural gas prices, and summer and winter weather variables. Analysts use this data to generate a picture of probable energy expenses at various seasons and energy price levels. The more sources of information analysts have to evaluate, the more stable their results will be.

"Greater uncertainty leads to more risk-averse choices."

EBaR compares each energy system's investment risks and savings. Its final analysis should show electric, natural gas and total energy costs to demonstrate how variations in weather and energy prices may affect expenses under different scenarios. Such an analysis should provide the best possible estimate of an energy budget and should report on related budget contingencies. EBaR enables intelligent comparisons of various energy-use and saving systems against certain variables. For instance, changing a factory's lighting system might raise or lower its heat levels, which could affect its heating, ventilation and air conditioning costs and technology choices.

External Factors Affecting EBaR

While EBaR is a powerful analytical tool, it does not operate in a vacuum. Key cost variables vary greatly by individual organization, which EBaR takes into account. Other variables depend on energy regulations, competition, seasonal pricing and environmental issues. Texas and New York now have competitive electricity and natural gas markets. Customers in such markets have more pricing options, and that affects savings and costs. Competitive energy providers use different pricing programs, like linking electricity prices to natural gas prices, using options strategies to limit price volatility and setting up hedging strategies to lock in energy prices.

> "Traditional analysis taught in business schools recommends incorporating future risk factors in discount rates used to assess the present value of future income streams."

The greatest pricing flexibility is in electricity markets. Electricity prices vary according to the time of day and the season when electricity is produced. Prices are quoted based on kilowatt use, and include demand charges payable to the local distributor and the transmission company. This means retail providers must analyze their energy use to identify the best energy purchases. Retail electricity providers make their profit from the spread between their purchase and delivery costs and their sales revenues. The purchase and delivery price spread depends on when customers use their electricity. To gauge this demand, retail electricity providers must estimate the cost of service based on each customer's load profile.

> "Since energy prices impact efficiency investment returns and efficiency investments impact competitive price quotes, efficiency investments and purchasing decisions should be considered simultaneously."

Yet, most customers who seek energy efficiency have a few choices when purchasing electricity. One option, if possible, is to finalize a price and then implement energy-efficiency programs which link lower prices to kilowatt and kilowatt-hour targets.

Customers can also use hedging to lock in their electricity costs. But while hedges offer price protection, they are costly. Contrast the cost of hedging or not hedging by comparing the electricity market price (in cents per kilowatt hour) against the odds of a lower market price and against the annual cost savings at the market price. In this analysis, customers gain more pricing flexibility by getting a fixed price with an option to renegotiate if the market price falls below a certain target. Businesses can use the spot price, along with an option, to convert to a fixed price if prices rise above a benchmark. EBaR analysis remains effective in these pricing scenarios.

Creating Effective Reports

Many executives do not look at energy efficiency programs from financial and risk management perspectives, which they consider too technical. Instead, they tend to make decisions based on a simple IRR or payback formula. This creates tension about energy programs between the financial and engineering staffs. EBaR allows the financial staff to consider energy projects from a financial risk and reward framework. Managers who use EBaR can create clear reports to present their case for energy efficiency to senior management.

> "Individual organizations are losing tens of thousands, hundreds of thousands and, in some cases, millions of dollars per year in unnecessary energy costs."

Such an executive summary should contain many of the same analyses used in investment proposals, including present and expected energy costs, the current energy budget, recommended energy-efficiency options, costs and expected savings, investment analysis, investment risk, impact on budget risk, contributions to CO_2 reductions and other green costs, opportunity costs and loss in facility capital value. Use charts and graphs where appropriate.

> "The evidence is overwhelming that nearly every business, institution and government agency can reduce energy bills with cost-effective energy-efficiency investments."

Professionals also can estimate potential energy savings by comparing tables in the Market Analysis and Information System (MAISY) database, which has information on more than one million commercial, institutional and government facilities. It details their energy use, equipment, building structures, operating characteristics, and hourly energy loads over the span of a year. Energy equipment manufacturers, utilities, fuel cell storage companies, wind energy companies and national research laboratories use this database. Analysts turn to it to determine energy use (on a square-foot basis) by business categories, building types or weekly operating hours, among other information subsets.

> "EBaR investments provide the same financial bottom line impact as an increase in revenues."

Energy-efficient upgrades often yield attractive investment returns for buildings with energy use characteristics in the MAISY database's 30th percentile. More than half of the cost savings should be net savings, or savings after paying for the investments in new systems. In effect, these investment returns are a new revenue stream for the company as a result of its energy program.

About the Author

Jerry Jackson is an energy economist, consultant and Texas A&M professor with 30 years of experience in developing and applying practical solutions to difficult energy industry problems. He has worked with more than 20 *Fortune* 500 companies, as well as start-ups, utilities, state agencies, research labs and the U.S. Department of Energy.