Can Energy Efficiency Risk Management Promote Sustainability?

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A 2015 Ecova survey of leading sustainability professionals identifies cost savings as a top driver of sustainability while a recent Verdantix study reports extended use of risk-based concepts as a "hot" 2015 trend in sustainability management. Can the intersection of these two trends potentially help achieve some of the more than $60 billion/year in overlooked, profitable energy efficiency savings? [1]

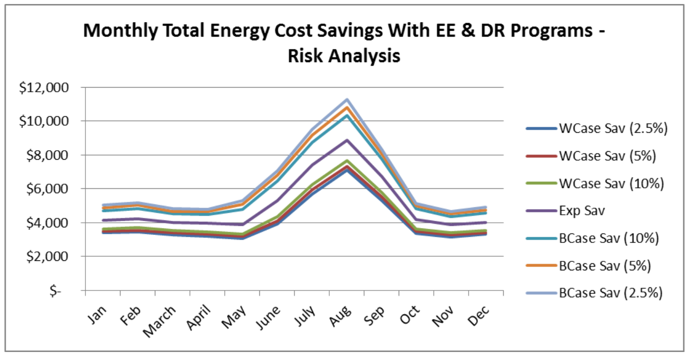
What would a risk-management approach to energy cost savings look like and how would it differ from traditional energy management practices? Traditional efficiency investment analysis is designed to avoid investment risk with inflated, "risk-adjusted" discount and hurdle rates, or more often, with short 2-3 year payback requirements as a final investment hurdle.

Rather than attempting to avoid risk with traditional approaches, risk management quantitatively determines investment returns and risk associated with each investment option allowing decision makers to identify profitable investments consistent with their risk tolerance. This approach identifies investments that would be overlooked, saving as much as 30% or more of energy spend even after deducting amortized investment costs.

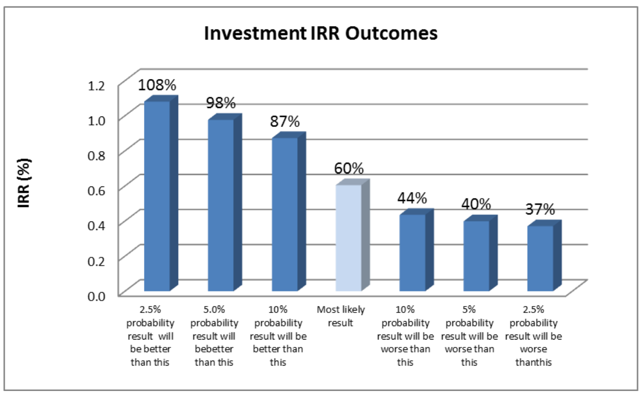
Risk management has been applied on Wall Street for decades to balance financial portfolio returns and risks. Value at risk (VaR) and marginal value at risk (CVaR) ,also called expected shortfall analysis, have been extended to address building energy efficiency investment risks in a new process called Energy Budgets at Risk (EBaR) ® [2]. The EBaR process applies low, high and expected values of all important variables that contribute to energy efficiency investment returns and uses a computational technique called Monte Carlo Analysis to calculate all possible outcomes and the probability that each outcome will occur. VaR and CVaR were extended to accommodate unique energy efficiency issues such as reflecting the impact of reductions in waste heat on AC, space heating and ventilation energy uses.

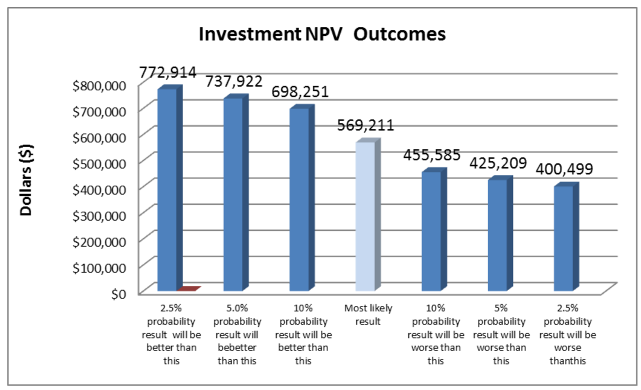
The great value of risk analysis is the ability to evaluate the probability of "bad" outcomes. A building engineer's "best" estimate of an internal rate of return of 90% is intriguing; however, knowledge that the "worst-case" outcome, likely to occur with only 2.5% probability, is still 70% is a compelling argument for the investment. If alternative outcomes provided for NPV, payback, monthly cash flow and other financial statistics are similar in terms of protecting against a bad outcome, the investment is likely to be approved even if the payback is greater than a traditional requirement of 2 to 3 years. This outcome can easily occur with an investment that provides benefits over an extended number of years.

An illustration of risk management insights is provided by an example analysis for a 100,000 square foot office building lighting and re-commissioning investment. This chart shows three “best case,” an expected outcome and three “worst case” results reflecting potential variations in weather, program performance, energy price increases, program capital and O&M costs, and historical monthly random energy spend variations. Best and worst case outcomes include outcomes that occur no more than 2.5%, 5% and 10% of the time.

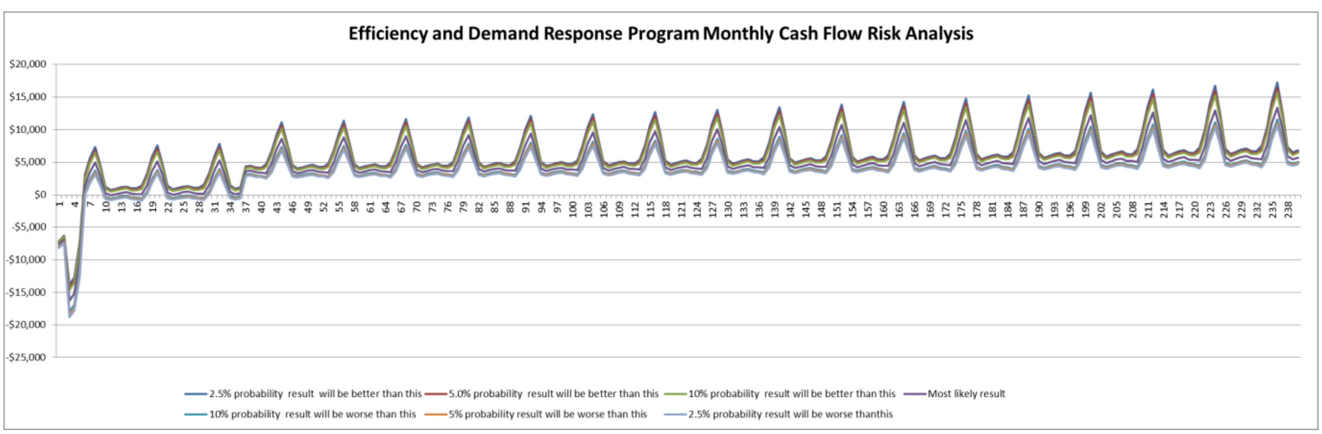


Internal rate of return and net present value outcomes range from 37% (worst case) to 108% (best case) and $400,499 (worst case) to $772,914 (best case).

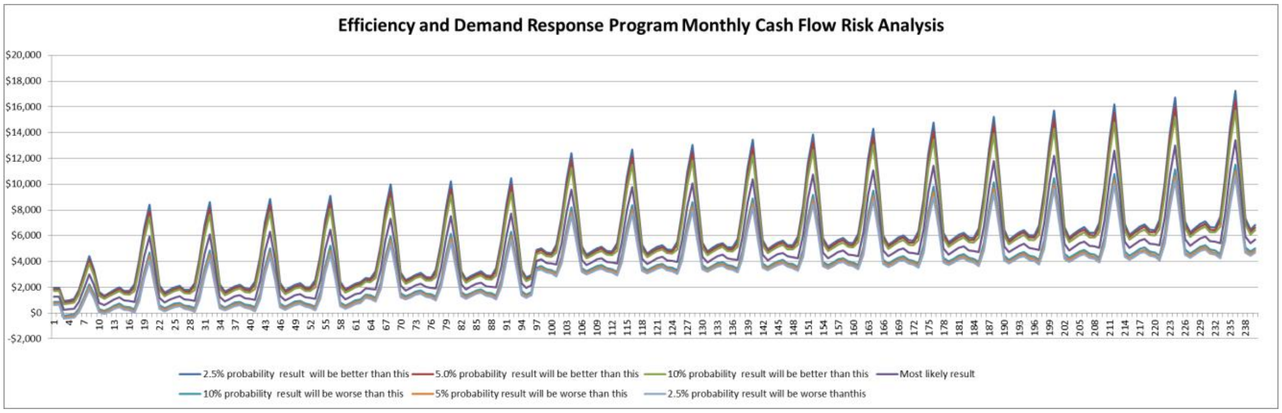




Monthly cash flow results show energy spend savings minus investment costs which in this case reflect the lighting program upgrade financed for three years and the labor costs of the lighting and re-commissioning funded internally.



The negative cash flow in early months can be nearly avoided if instead of paying the expected $30,000 in labor installation/Implementation costs of the two programs out of current operating expenses, these costs are financed along with capital costs and if financing terms are extended to 8 years for lighting and 5 years for re-commissioning. Resulting monthly cash flow is shown in the chart below. Under this alternative financing strategy, there is a only a 2.5% probability of experiencing a negative cash flow in the first year greater than $1,200 and a 10% probability of a greater than $477 negative first year cash flow. NPV outcomes in this case range from $396,406 to $751,586.



In these examples the payback for this investment is 3.1 years which would have been rejected by many corporate managers; however, this risk management analysis shows that even in a worst case outcome the IRR is 37% with a net present value of about $400,000, a very attractive investment.

The intuitive appeal of evaluating investment results with charts and tables that show the probability of various outcomes is obvious, providing the same easy-to-apply and quick evaluation process that has made traditional payback and other methods popular.

Footnotes

[1]Estimates of this "efficiency gap" losses vary; however, this figure of $60 billion/per year, which reflects about 30% of current commercial, institutional, government and industrial energy spend is consistent with most sources.

[2] Energy Budgets at Risk (EBaR): A Risk Management Approach to Energy Efficiency and Purchase Choice, Jerry Jackson, John Wiley and Sons, 2008, also www.energybudgetsatrisk.com . The book describes EBaR analysis in detail for those who would like to apply the process. Charts and tables in this paper have been generated with EBaR software.

About the Author. Dr. Jerry Jackson is president of the consulting firm Jackson Associates and Leader and Research Director of the Smart Grid Research Consortium. He was previously a professor at Texas A&M University, Chief of the Applied Research Division at the Georgia Tech Research Institute and an economist at the Federal Reserve Bank of Chicago. He is on the editorial board of the Journal of Sustainable Real Estate. He has a Ph.D. in economics from the University of Florida.