Buying Down the Cost of Renewable Energy with Efficiency:

Making Money by Saving Energy and the Environment

Patrick C. Thompson
Vincent E. Yealdhall
EnergyWorks, Inc.

ABSTRACT

Energy efficiency can play a major role in the long-term viability of any building. The technology and practices are readily available to make a difference in both new and existing buildings. In most cases, the more resources one consumes, the greater the opportunity for savings. If savings are reinvested in new efficiency measures, the compounding effect over time can be dramatic. Further management practices can reduce operations and maintenance (O&M) costs, ensuring that efficiency gains are enhanced and maintained. Ultimately, the business becomes more competitive. "Buying Down the Cost of Renewable Energy" encourages a successful business plan that not only is good for the environment but makes sound financial sense. In fact, a practical and proven method is to start a revolving pool of funds with the savings from no-cost and low-cost energy conservation measures. This pool is reinvested every year in increasingly more sophisticated efficiency projects. Eventually, the revolving savings pool becomes big enough to be the source of equity investment; which facilitates the financing of larger projects such as combined heat and power (CHP) and alternative energy plants. Such money pool grows the same way a wisely managed investment portfolio does. The underlying discipline supports three key energy management elements: (a) fiscal responsibility and financial management, (b) organizational learning and (c) plant modernization or innovation.

Editorial note: While this case study reflects the case of a central utility plant, our experience has been the underlying strategy is one of the most successful energy management practices, which is widely applicable to all kinds of organizations, factories, farms, malls, schools, hospitals, etc.

Key Words: *Buying Down, savings reinvestment, revolving pool, CHP financing, renewable energy financing, energy investment portfolio.*

ENERGY CONSERVATION

A case study was conducted by EnergyWorks in 2008 for a central utility plant (CUP) that supports a 1.4 million square foot super regional shopping complex in Pennsylvania that began commercial operations in 1970. The CUP provides heating, ventilation and air conditioning (HVAC) for the complex. When EnergyWorks acquired the energy infrastructure in late 2003, it was found to be well maintained but lacking in major equipment upgrades and technology enabled operations. To achieve superb energy efficiency, the following approach was implemented from 2004 to 2008:

1. Selective equipment upgrades
2. Automation of best practices in O&M
3. Designing and installing an energy management system for real-time dynamic optimization.

The first year consisted of critical system and equipment reconditioning, a thorough audit of O&M practices and the compilation of a 5 year base-line average. Through the successive implementation of an information systems technology (IT) infrastructure, CUP modifications,

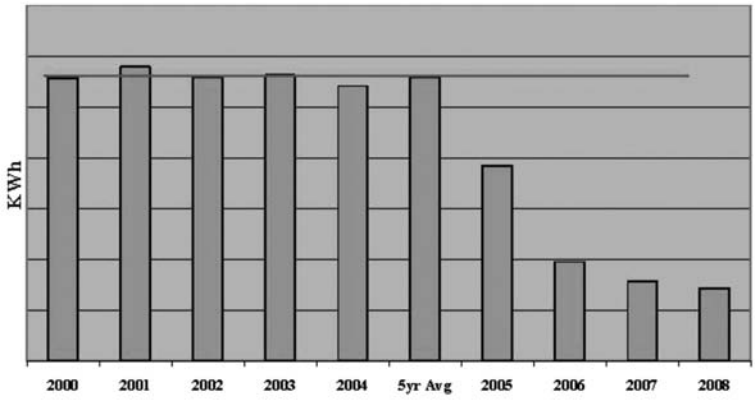

Figure 1. Total Annual CUP Electrical Consumption

and end-use upgrades, significant energy savings were achieved. As shown in Figure 1, the CUP realized a reduction in overall electrical consumption of approximately 75% during the implementation period.

The carbon dioxide (CO_2) reductions resulting from the energy efficiency improvements also display a consistent trend. In addition to providing substantial cost savings, the reduced consumption eliminates over 11 million pounds of greenhouse gas emissions per year compared to the 5-year baseline average. Figure 2 shows the reduced carbon footprint over the years, which is equivalent to driving a car around the world 10 times!

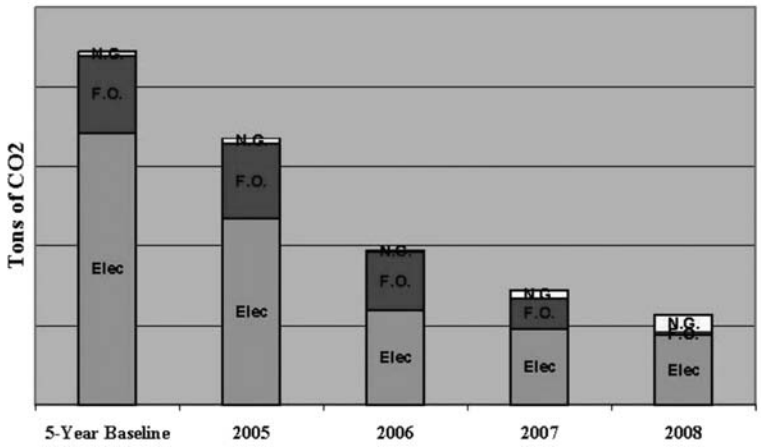

Figure 2. Annual CUP CO_2 Footprint

OPPORTUNITIES

The CUP buys down the cost of renewable with the following:

1. Through greater energy efficiency, the business consumes less energy commodities without sacrificing the level of service.
2. Energy savings pay for the original capital upgrades and are successively reinvested in new upgrades, further reducing the carbon footprint.
3. Because less of the savings are needed for further efficiency improvements, they are reallocated for the purchasing of renewable energy credits to eventually achieve a carbon-neutral business.

4. Increased purchasing power enables serious consideration of renewable on-site generation, where monies available can significantly lower pay back period. Photovoltaic (solar), wind generation and biomass are examples; however, tax credits and government grants can also make these on-site generation options viable through lower financial commitment.
5. Lower energy consumption also hedges against the future volatility of the energy commodity markets. Principally, less consumption brings more stability and predictability to the operating costs of the business.

Significant savings were achieved through higher energy efficiency. Figure 3 shows how the savings were able to quickly pay for the capital investments that enabled the energy efficiency gains.

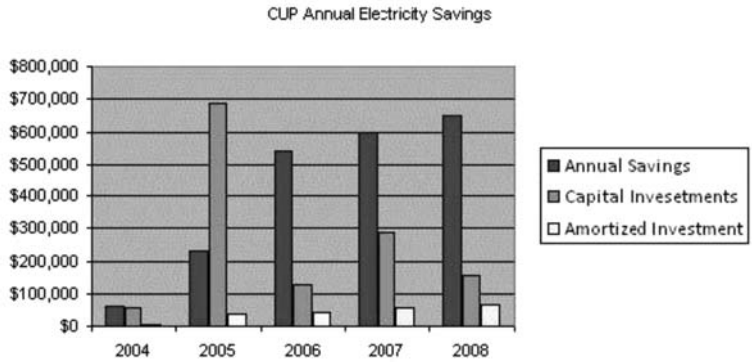

Figure 3. CUP Annual Electricity Savings

Renewable energy credits (RECs) are available from multiple sources. A REC is "a collection of all environmental and social attributes internalized in a unit of renewable power, usually 1 MWh[1]." For the purpose of this study, we could obtain voluntary RECs to offset the carbon footprint of the CUP. The price of a voluntary REC currently ranges from $1.00 to $32.00/REC on Evolution Markets[2]. Chicago Climate Exchange[3] also contains voluntary credits traded on a futures market.

Recent trading has been between $1.00 and $2.00/REC. All of the RECs that were researched are Green-e[4] certified. At the end of 2008, the CUP electrical use was 2,860 MWh (Figure 1). Assuming the

same consumption in 2009, the price of carbon offset through RECs can be calculated. To participate in the voluntary offset of 100% of the CUP electrical energy consumption, an investment of between $2,860 and $91,520 would be required. Because the median market price is around $2.00 per REC, the investment is likely to be under $10,000. As seen from the savings shown in Figure 3, this can easily be paid for by energy efficiency savings.

The comparison of becoming carbon-neutral by purchasing RECs in combination with energy efficiency upgrades versus only purchasing RECs can be seen in Figures 4 and 5. Both examples illustrate accepted methods to become carbon-neutral. The energy efficiency upgrades pay for themselves and finance the purchase of RECs.

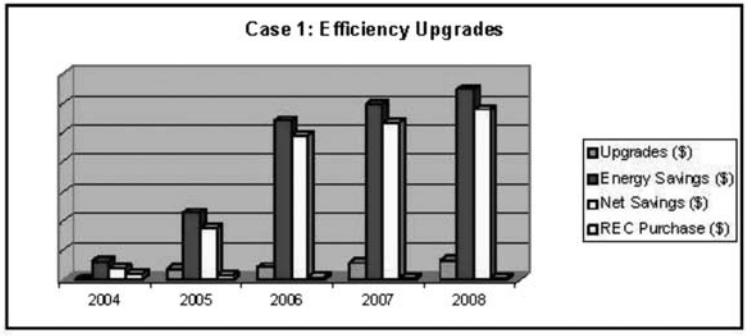

Figure 4. Case 1: Efficiency Upgrades

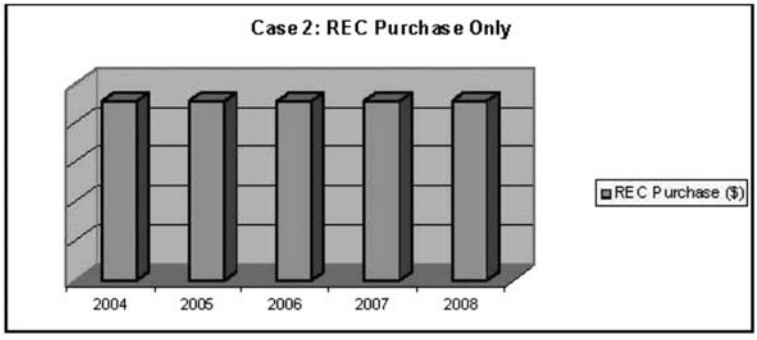

Figure 5. Case 2: REC Purchase Only

CONCLUSION

Through its high level of energy efficiency, the business described here will be far less vulnerable to future volatility in the price of energy commodities. This reduced vulnerability and lower operating costs contribute to the economic sustainability of the business – be it a for profit or non for profit organization. Furthermore, the marked reduction in green house gases from conservation, coupled with a transition to consuming renewable energy (whether self-generated or through purchased credits) constitutes a certain pathway to environmental sustainability.

This case study demonstrates the possibility for reconditioning and revitalizing older facilities to meet future needs. In the long run, a well planned and well executed strategy toward sustainability can be largely self-financing. Public policies can encourage development of technologies and markets to accelerate broad adoption of such strategies.

While this case study reflects the case of a central utility plant, our experience has been the underlying strategy is one of the most successful energy management practices, which is widely applicable to all kinds of organizations, factories, farms, malls, schools, hospitals, etc. The underlying discipline supports three key energy management elements: (a) fiscal responsibility and financial management, (b) organizational learning and (c) plant modernization or innovation.

References

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2. Evolution Markets—environmental broker http://new.evomarkets.com/index.php?page=Renewable_Energy-Green-e_Certified_Credits
3. Chicago Climate Exchange – operates cap and trade system for green house gases http://www.chicagoclimatex.com/content.jsf?id=821
4. Green-e – consumer protection for renewable energy and greenhouse gas reduction http://www.green-e.org/

ABOUT THE AUTHORS

Mr. Patrick Thompson is President and Chief Executive Officer of the EnergyWorks group of companies. Mr. Thompson has over 30 years experience in the energy industry. He holds a Bachelor of Science degree in engineering from the United States Naval Academy, a Master of Science in engineering from the University of Michigan, and a MBA from the University of California. For more information, see www.energyworks.com.

Mr. Vincent Yealdhall is a senior engineer with EnergyWorks, Inc.