



A
B
C
D
E
F
G

ENERGY EFFICIENCY— A Programmatic Approach



Chances are your institution has made some form of greenhouse gas reduction commitment and you're facing down interim greenhouse gas reduction goals embedded in that commitment. Maybe you've got students clamoring for fossil fuel divestment. These are just some of the pressures beyond the normal pressures to reduce operating costs that necessitate a smart and strategic approach to reducing campus energy use.

Every college and university has undertaken some energy efficiency work in recent years, whether as one-off projects or well-orchestrated programs. However, few institutions have taken optimal advantage of the opportunity to invest in their own campuses.

Most schools require that their energy efficiency projects provide quick paybacks, implying returns in the high teens (or better), yet they have no mechanism for accounting for ancillary benefits when evaluating projects. Compare this to endowment investments that typically provide single-digit, long-term returns; for example, endowment performance from 2005 to 2014 averaged under 7 percent annual return.¹ There is a disconnect and an opportunity here. But taking optimal advantage of the opportunities to invest in our campuses requires a significant shift in perspective, an intentional effort to capture those opportunities, and some good strategic thinking about how to get there.





BENEFITS

You can reap significant benefits by taking on these challenges and designing an effective, comprehensive energy efficiency program.

ADDRESSING DEFERRED MAINTENANCE

For starters, energy efficiency programs provide opportunities to take a bite out of growing deferred maintenance backlogs. Following are several approaches to leveraging energy efficiency programs to address deferred maintenance:

- *Life-Cycle Cost Evaluation*—Although there is much talk about considering life-cycle costs in project selection, most institutions do not do this in a systematic fashion. True life-cycle costing considers not only capital cost and energy savings but the remaining life of equipment, maintenance costs, and the inevitable cost of replacement. It also considers benefits (and costs) over the life of the installation in contrast to the more common approach of considering only capital cost and annual energy savings in a simple payback analysis.
- *Hybrid Deferred Maintenance/Energy Efficiency Programs*—Blending deferred maintenance projects with quicker payback energy projects can be an effective way to gain approval. This approach leverages quick payback projects to help pay for longer-payback deferred maintenance projects. Consider a \$200,000 chiller replacement project that reduces energy costs by \$10,000 annually (a 20-year simple payback)—not terribly attractive as an energy project. But if that chiller is at the back end of its useful life and requires increasing attention and cost to maintain, there may be good reason to replace it. Marry that chiller project with, say, a \$100,000 lighting project with \$50,000 in annual savings and you have a \$300,000, five-year payback package that should be easier to get approved.
- *Diverting Energy Savings into a Renewal Fund*—Rather than recycle energy savings into a revolving loan fund, Brown University first used their energy savings to pay off the “debt” (principal and interest) and then diverted remaining savings into a renewal fund.² In addition to providing a good use for the savings, this approach helped broaden the coalition of supporters on campus (facilities management personnel who were not responsible for energy budgets became more enthusiastic about the program) and has helped move the program forward. You can apply the same principle, diverting savings to whatever priority makes sense for your campus.

IMPROVING THE USER EXPERIENCE

Energy efficiency projects often improve the user experience of the building as well. Light-emitting diode (LED) lighting upgrades can save energy and enhance the visual environment. HVAC control system improvements and existing building commissioning (sometimes referred to as “retrocommissioning”) often lead to improved temperature control, enhancing occupant

comfort. A laboratory ventilation project with a localized hazard assessment can improve lab safety while significantly reducing energy use.

CAMPUS AS A LIVING LABORATORY

Energy efficiency programs can include opportunities to engage the campus community in energy conservation efforts. They also provide opportunities for real-world connections to a variety of academic disciplines, from science and engineering via the technical analysis of energy projects or the measurement of project performance, to economics via analysis of the program’s financial performance, to marketing and communications, among others. For example, Hampshire College recently generated three courses focused on the design and construction of their Kern Center, which is soon to be certified by the Living Building Challenge (<http://living-future.org/lbc>)³.

INVESTING VERSUS DIVESTING

Many schools have been under pressure from students to divest their endowments of fossil fuel holdings. Regardless of one’s opinion on divestment, a strong case can be made that investing in reducing your campus’ greenhouse gas emissions has more impact than divesting from fossil fuels. Williams College recently took this approach in announcing a new greenhouse gas reduction initiative. “We will invest, not divest,” said Williams College President Adam Falk in an announcement that indicated that the college would not pursue a formal divestment policy,⁴ but instead would invest \$50 million in greenhouse gas reduction initiatives.

FINANCIAL RETURN

Regardless of what you think of these various benefits, energy efficiency makes basic financial sense. With most energy efficiency programs providing double-digit returns to your campus, why wouldn’t you aggressively pursue these opportunities?



BARRIERS AND SOLUTIONS

There are plenty of reasons these opportunities don’t get pursued.

FUNDING

The traditional model for addressing energy efficiency involves competing with other annual budget priorities. There is never a shortage of urgent priorities laying claim to available funds, and—in a zero-sum game—energy efficiency programs are typically left with scraps from the table.

To move the needle on energy efficiency, we need to see it as an investment in our campuses that provides attractive financial returns and supports the educational mission. In that context it makes sense to take up funding of energy efficiency efforts out-

side of the normal budget process. Doing so will free up budget dollars in the medium to long term. But getting a significant program funded either inside or outside the normal budget process is challenging.

Green Revolving Funds—Revolving loan funds or green revolving funds (GRFs) have been touted as one possible solution. But GRFs still need to be funded. Although they can be (and are on many campuses) a great component of an effective energy efficiency program, they require significant seed funding to be impactful and thus don't solve the funding problem in and of themselves.

Fortunately, there are a number of funding/financing options available to most schools.

- *Endowment Funding*—Although endowment funds are generally not to be spent on campus operations, there are ways for endowments to invest in their associated campuses without running afoul of rules, regulations, and good practice. And there is precedent for this approach in both public institutions (such as Weber State University in Utah⁵) and private (such as the California Institute of Technology⁶ and North Central College⁷).
- *Debt*—Borrowing funds at low single-digit rates and using the proceeds from much higher-performing energy efficiency investments is a winning proposition for schools that have the debt capacity. This is the approach Brown University used to fund its \$20+ million program.
- *Carbon "Tax"*—A recent whitepaper out of Vassar College⁸ considers the prospect of a carbon charge at the college designed to approximate the "social cost of carbon." This is a great mechanism for schools to put their money where their mouths are. Is reducing global greenhouse gas emissions a priority? Is leading on this issue important to your institution's identity? Then considering the social cost of carbon only makes sense when evaluating projects that impact the institution's greenhouse gas emissions. Of course, considering the cost of carbon when evaluating projects is one thing, but implementing a mechanism to charge that cost through to departments

is a bit more challenging. The Vassar whitepaper makes a strong case for the benefits of tackling that challenge. Among those benefits is that it provides an elegant mechanism to fund an energy efficiency program or seed a GRF.

BANDWIDTH

Insufficient bandwidth is a huge, often unrecognized barrier to the success of a program. Many facilities directors believe they can achieve their ambitious energy efficiency goals within their

**Up to 99% thermal efficiency.
No glass lining failures.
15-year corrosion warranty.**

CONQUEST®
Condensing Water Heater



AquaPLEX®
ENGINEERED DUPLEX ALLOY

15-year tank and
heat exchanger
warranty

- Tank and heat exchanger are made from AquaPLEX® duplex stainless steel alloy. Fully passivated, AquaPLEX is immune to corrosion in potable water regardless of temperature and requires no lining or anodes of any type
- Up to 96% thermal efficiency at full-fire from 70°F to 140°F
- Seamless modulation improves efficiency to 99% during periods of low demand
- 199,000 to 800,000 Btu in 100 and 130 gallon tanks
- Electronic operator with digital temperature readouts and plain text for status, diagnostics and 15-event history. Includes Modbus for BAS connection
- ASME construction



Engineered Water Heating Solutions®

www.pvi.com

departments. And many do have the capabilities and could implement an effective program if that was their primary function. However, many programs fail to gain traction because they get buried under other priorities.

The simple reality is that facilities departments are not staffed to run significant energy efficiency programs. Without an honest assessment of internal capabilities and capacity and a solid plan for addressing the gaps, a grand energy program easily devolves to one-off projects done on an ad hoc basis.

Whether it is an individual from your staff or an outside resource, having someone whose primary focus is the advancement and success of your energy program is critical to the success of any significant program. Without a capable and focused driver at the wheel, it will be difficult to keep the program on course.

EXPERTISE

There are a few areas of expertise that become important in executing an effective energy efficiency program.

- *Energy-engineering expertise.* Energy engineers look at building systems differently from design engineers. They focus on squeezing efficiencies out of existing systems.
- *Utility program expertise.* The best approach to maximizing utility incentives is to collaborate closely with a firm or individual who works with the utility programs on a regular basis. This marriage of your institution's client relationship with the utility and the program expert is the most effective combination for maximizing utility incentives.
- *Project management.* Many energy projects take place in functioning buildings. Managing projects in operating buildings is different from managing new construction or major renovations. Coordinating with building users and stakeholders and scheduling construction activities and access become much more complicated. It is best to include those with expertise in this type of work on your project management team.

LONG-TERM RESULTS

If your institution is going to invest in an energy efficiency program based on expectations of attractive returns, you need a plan to ensure that those returns persist over time. Modification of control sequences, hidden failures of small components, and drift from calibration of key sensors can all be detrimental to

WISDOM AND ADVICE

- Taking optimal advantage of the opportunities to invest in our campuses requires a significant shift in perspective.
- "We will invest, not divest."—*Adam Falk, Williams College president*
- With most energy efficiency programs providing double-digit returns while offering a smart way to invest in your campus, why wouldn't you aggressively pursue these opportunities?
- To move the needle on energy efficiency, we need to see it as an investment in our campuses.
- "There are no magic bullets. It really requires a systematic and robust energy efficiency program to go after hundreds if not thousands of energy efficiency improvements to achieve significant reductions."—*Christopher Powell, Brown University*

energy savings over time and are difficult to detect with conventional means.

Thankfully, software analytics have advanced significantly in the last decade, making it possible to monitor building systems more thoroughly. A well-designed performance optimization system can catch a variety of these insidious hidden problems. This is done by monitoring key building automation system data points and running sophisticated diagnostics to detect anomalies and alert building operators. With an effective savings watchdog in place, you can proceed with confidence that the intended energy savings will persist year after year.

PROCESS

Perhaps the most frequent mistake made in implementing energy programs is to conduct them like all other business, without much consideration for how well "business-as-usual" operating procedures support the program objectives. An effective

energy program will be complex, as indicated by Christopher Powell, Brown University's associate vice president for sustainable energy and environmental initiatives. "There are no magic bullets," says Powell. "It really requires a systematic and robust energy efficiency program to go after hundreds if not thousands of energy efficiency improvements to achieve significant reductions."

To start such a program, you need to scope out the opportunity and answer a number of key questions: How much money are we going to spend and when? What are our interim metrics and milestones? How thoroughly do we need to quantify the campus-wide opportunity before proceeding? What steps of the process are sequential versus parallel? And how will the program performance be measured and judged? Without addressing these types of questions, work will stall at every step along the way as the team pauses to figure out what comes next.

Conversely, clearly defining a process up front will enable smoother transitions between phases and components of the work. A well-thought-out process will save time by identifying work that can be done in parallel, and will facilitate smoother execution by defining decision-making authority and processes ahead of time, thus avoiding delays from sorting those issues out. Defining the criteria for project approval will accelerate work by providing the project team a clear target to shoot for—thus avoiding the need to go back to the drawing board on projects that miss the mark—and enable quick approval decisions when those criteria are met.

CONCLUSION

The benefits of an effective energy efficiency program are manifold. However, so are the barriers. A successful strategy for navigating those barriers requires shifting how we think about energy efficiency investments. Getting the program funded is a key and difficult hurdle, but it is by no means the last.

A successful program requires an honest assessment of internal capabilities and capacity for the variety of work comprising the program. Finding the right partners and clearly delineating their roles will help. With the right resources in place and a well-considered process for execution, you will be well on your way to a successful energy program that will generate dividends for your institutions for many years to come. ☺

ENDNOTES

1. National Association of College and University Business Offices, "Average and Median Annual Investment Rates of Return for U.S. College and University Endowments and Affiliated Foundations: Fiscal Years Ending June 30, 2014-2005." http://www.nacubo.org/Documents/Endowment-Files/2014_NCSE_Public_Tables_Annual_Rates_of_Return.pdf.
2. Powell, C., "Energy as an Asset, Not an Expense: Undeveloped Investment Opportunities," webinar September 15, 2015. www.greeneru.com/resources/#verticalTab2.
3. Medeiros, M., "Hampshire Students Launch Hands-On Lessons in Building Systems," September 23, 2015. <https://www.hampshire.edu/news/2015/09/23/hampshire-students-launch-hands-on-lessons-in-building-systems>.
4. Williams College, "Williams College to Address Climate Change through Comprehensive Action and Investment of up to \$50 Million," September 10, 2015. http://communications.williams.edu/news-releases/9_10_2015_climatechange/.
5. Sustainable Endowments Institute, Greening the Bottom Line, 2012, p. 23. <http://greenbillion.org/wp-content/uploads/2012/11/Greening-the-Bottom-Line-2012.pdf>.
6. Ibid.
7. Chicago Tribune, "North Central College Expands Investment in Energy-Saving LED Lighting," February 25, 2015. <http://www.chicagotribune.com/suburbs/aurora-beacon-news/community/chi-ugc-article-north-central-college-expands-investment-in-e-2015-02-25-story.html>.
8. Hall, A., S. Bedecarre Ernst, J. Falino, J. Miller, N. Garafola, E. Norell, M. Cunningham, and B. Ho. "Internal Carbon

Accounting at a Small Liberal Arts College," September 2015. <http://sustainability.vassar.edu/docs/9-15InternalCarbonAccounting-at-SLAC.pdf>.

David Adamian is president and CEO of GreenerU, Inc., based in Watertown, MA. He can be reached at david.a@greeneru.com. This is his first article for *Facilities Manager*.

Leaking Shower Pans? Ugly Outdated Tile?

DON'T REPLACE, REFINISH!

Our proprietary surface refinishing process
eliminates costly replacement
of leaking showers, damaged tile, vanities & countertops.

BEFORE

AFTER!

Book now
for Summer
Renovations!

See case studies at:

MiracleMethod.com/collegehousing

All Work Guaranteed



Miracle Method[®]
SURFACE REFINISHING

Each franchise is independently owned and operated.

Call 800 444-8827 for an estimate or referral

