

Leading your healthcare organization toward energy efficiency: A call to action

PREMIER

By Alan R. Neuner, CHFM, Associate Vice President, Facility Operations
Geisinger Health System

EXECUTIVE SUMMARY

Energy costs are soaring exponentially (as much as 60 percent in some regions), sapping ever-valuable dollars from vital patient care activities and consuming up to 3 percent of hospital's total operating budgets and up to at least 15 percent of their annual profits. ¹ Worse, billions of dollars are wasted annually because hospitals' may not have energy-efficient building systems. Compounding matters is the fact that access to capital has become more strained and expensive throughout the recession, making it challenging for hospitals to pursue necessary upgrades. ²

There has never been a better time for healthcare executives to take a leadership role in investing in energy efficiency.

There are proven energy efficient initiatives that can positively — and relatively quickly — impact your hospital's bottom line. Up to 30 percent of a hospital's consumed energy can be saved at little or no cost, without sacrificing the quality of care through energy efficient technologies and improved management practices. ² Even in an environment of tight funding, there are many ways to finance improvements. And, investments in energy efficiency are among the soundest ones today. Most energy projects yield a one- to five-year payback, which translates to a yield of 20 to 100 percent with little or no risk.

TOP 10 BENEFITS OF ENERGY INVESTMENTS

- ▶ Net profit increases — energy savings go direct to bottom line
- ▶ Reduces operating and maintenance costs
- ▶ Low- or no-risk investments
- ▶ High ROI, fast payback
- ▶ Bottom-line savings that can finance capital needs and patient care investments
- ▶ Improves average age of plant
- ▶ Mitigates inflationary effects of volatile energy costs
- ▶ Improves environmental performance and reduces carbon footprint
- ▶ Improves facility/community health — *the right thing to do*
- ▶ Provides *excellent* public/community relations

GEISINGER'S ENERGY SUCCESS

- More than \$6.3 million annual savings
- Average ROI of 3.7 years on investments
- 80 percent annual reduction of greenhouse gas emissions (more than 42,000 tons)
- 20 percent annual water use reduction (25 million gallons)
- Doubling of campus square footage since 1988 with no increase in electrical demand

“Investing in energy efficient systems is good business. It begins with thorough research and sound business plans, with positive returns on investments, ultimately improving our bottom line and the health of our patients, employees and community.”

Kevin F. Brennan, CPS, FHFMA
Executive VP, CFO Geisinger Health System

INTRODUCTION

Acknowledging that every healthcare organization is unique and there are no “cookie cutter” solutions to long-range cost reduction plans, this white paper will discuss the non-technical aspects of initiating a successful energy reduction program, with examples of projects that can be implemented in any facility and tips for investments, using Geisinger Health System successes as examples.

THE STATE OF ENERGY WASTE

Excess energy use should be viewed as waste, the same as any other business system or process. To fully understand the imperative for taking energy initiatives now, it's important to know the extent of healthcare's energy consumption.

- ▶ **Hospitals are the second largest energy consumer in U.S.**
According to the EPA, inpatient healthcare is the second most energy intensive industry in the United States (behind just foodservice), consuming more than twice as much energy per square foot as non-healthcare facilities.
- ▶ **Hospitals' \$5 billion/year energy bill keeps rising**
According to the Department of Energy, hospital energy costs rose 56 percent from \$3.89 per square foot in 2003 to \$6.07 per square foot in 2008, and those costs will continue rising in the near term.³
- ▶ **Energy demand is soaring – unabated**
A recent American Society for Healthcare Engineering (ASHE) survey found that electricity demand in the U.S. alone will grow by at least 40 percent over the next 25 years.⁴
- ▶ **Growing negative impact on the environment, and public health**
Healthcare alone accounts for nearly a tenth of the nation's emissions of carbon dioxide. One average-sized U.S. hospital annually produces approximately 18,000 tons of carbon dioxide,⁵ which has been linked to a host of illnesses, including premature mortality, chronic bronchitis, asthma attacks and various respiratory symptoms.⁶

“Investment in energy efficiency is the only investment that simultaneously results in lowering costs (increasing profitability) and boosting your organization's sustainability by improving the environment and the health of the communities we serve. It is the perfect 'win-win.'”

Alan R. Neuner, CHFM
Associate Vice President Facilities Operations
Geisinger Health System

The cost reductions available from energy efficiency improvements increase profitability or margins more dramatically than revenue increases.

A LITANY OF BENEFITS

The list of benefits from implementing energy efficiencies in your hospital is too long for this paper. But this much is true: They are the only investment that simultaneously results in lowering costs (and thereby increasing profitability) and boosting your organization's sustainability by improving the environment and the health of the communities we serve — a perfect “win-win.”

Here's why:

- ▶ Increased profitability
- ▶ Reduced operating and maintenance costs
- ▶ Bottom-line savings enhance ability to fund patient care investments
- ▶ Low risk/high return
- ▶ Improved environmental performance and carbon footprint
- ▶ Mitigated inflationary effects of volatile energy costs
- ▶ Improved facility/patient/community health
- ▶ Improved community relations

Increased profitability

Any reduction in energy expense increases profitability as long as the cost to capture the savings doesn't exceed the savings. Every dollar the average hospital saves on energy is equivalent to producing \$25 in revenue (assuming a 5 percent profit margin and a ratio of 80/20 fixed to variable costs). Such investments have yields of 20 percent to 100 percent with little or no risk.

Moreover, the cost reductions available from energy efficiency improvements increase profitability or margins more dramatically than revenue increases. Consider that any effort to increase revenue also increases costs. You cannot add surgeries without adding to staff and facilities expenses. Most healthcare enterprises operate at a 5 percent margin (profit) or less. So, every dollar of revenue would add just 5 cents of profit. Since reducing energy expense goes directly to the bottom-line profit, the equivalent revenue to produce that profit would be 20 times the savings at a margin of 5 percent. Therefore, a project with a \$50,000 savings in an organization with a 5

percent margin would be the same as increasing revenues by \$1 million. Lower operating margins increase the multiplier effect even more.

Reduced operating and maintenance costs

It is well-documented that energy efficient buildings typically cost less to operate and maintain. And lowering your operations and maintenance costs can enhance employee productivity.

Bottom-line savings enhance ability to fund patient care investments

According to the Department of Energy, “investments in energy efficiency and renewable energy *complement*, rather than *compete* with, patient-oriented investments. As hospitals reduce energy costs (and mitigate the risks of future cost volatility), they are in a position to allocate additional resources to life-saving equipment and patient care.”

Low risk/high return

Many energy efficiency initiatives involve low risk and yield high returns. In most instances, in fact, the risk of energy projects is zero. Consider well-proven technologies such as lighting upgrades: If a lamp puts out the same amount of light, but consumes 50 percent less power, those savings are guaranteed. Most energy projects also have a payback period of one to five years and internal rates of return from 20 percent to 100 percent.

Improved environmental performance and carbon footprint

One average size U.S. hospital, each year, produces roughly 18,000 tons of carbon dioxide linked to a host of illnesses, including chronic bronchitis and asthma that, in turn, contribute to lost work days and unnecessary hospital and emergency visits. Energy efficiencies can result in lower greenhouse gas emissions and reduce your carbon footprint. Each kilowatt hour of electricity saved reduces CO₂ generated at your facility's power plant by one pound, and saves about half a gallon of water that won't be evaporated to cool the electricity production process. While these numbers may seem small, they add up quickly.

“Only companies that make sustainability a goal will achieve competitive advantage.”

Harvard Business Review

Many energy efficiency initiatives involve low risk and yield high returns. In most instances, in fact, the risk of energy projects is zero.

Mitigated impact of increases in energy costs

Institutions that exploit opportunities to reduce energy will increasingly benefit from these investments as energy prices continue to escalate. The recent global recession has depressed the energy commodity prices by 30 percent to 60 percent. If energy prices double the next five years, that effectively reduces the payback period of energy projects by half and doubles their internal rate of return.

Improved facility/patient/community health

Numerous studies have confirmed that buildings with cleaner air and “free” natural lighting directly result in better patient outcomes and more productive staff.

Improved community relations

“Green” has no downside in the media, and your hospital will reap the dividends of positive press in your community. Building upgrades will improve your facility’s appearance, present your products or services in a comfortable, well-lit environment, and boost patient and visitor satisfaction.

POSITIVE NEWS ABOUT ENERGY FINANCING

There are many options for financing energy improvements. Certainly scarce capital expenditure dollars need to be allocated wisely and the medical staff is more likely to ask for a Da Vinci robot than a cogeneration plant. But not all energy projects require capital expenditures.

Self-funding infrastructure renewal funds

A planned approach to infrastructure renewal can become self-funding through the savings you realize from energy efficiencies, and ensures reliability and reduces operational costs. The key is identifying where the opportunities are in your facility and getting a return for every dollar spent. Several methods of estimating facilities’ renewal funding exist. By using the value of the asset base, and the desired

average replacement frequency, an annual value can be determined. Geisinger Health Services leveraged the savings generated by energy reduction projects to create an infrastructure renewal fund. This allows us to continue investing savings to generate further energy savings, as well as funding routine equipment replacements.

Operating leases

Since energy projects produce a cash flow (savings) and are low risk, they can be financed via operating leases or some other financial instrument, and still produce a positive cash flow. For example, Geisinger implemented a \$1.8 million lighting upgrade project financed by an operating lease. The annual savings were \$460,000 with a lease payment of \$300,000, yielding a net positive cash flow of \$160,000. Upon fulfillment of the lease, the full savings of \$460,000 annually was realized. (For additional information on the lighting upgrade project, see Appendix B.)

Grants and rebates

These are also common as supplemental funding for energy conservation projects due to the environmental enhancements of reducing pollution. For example, in the past year, Geisinger’s facilities group has received \$156,000 from the local utility for lighting upgrades and the installation of occupancy sensors, which were fully funded by the local utility, and \$2,250,000 from the state for the installation of a combined heat and power system (cogeneration). In the lighting and cogeneration projects, this accounted for 40 percent of the total project costs, and 80 percent in the occupancy sensor project. While these projects had the ability to meet financial hurdles on their own, the infusion of outside capital increased the ROI significantly — to just two years. The anticipated savings from the cogeneration plant are anticipated to exceed \$1,400,000 annually.

Geisinger implemented a \$1.8 million lighting upgrade project financed by an operating lease. The annual savings were \$460,000 with a lease payment of \$300,000, yielding a net positive cash flow of \$160,000. Upon fulfillment of the lease, the full savings of \$460,000 annually was realized.

Start small. Choose low-risk projects such as lighting upgrades first. Get some savings under your belt to prove the concept. Early successes spawn even bigger successes later.

HOW TO EMBARK ON THE PATH TO ENERGY EFFICIENCY

Every hospital and healthcare system is different. But here are a few key ways to get started.

Engage your facilities manager

The most important step is to have a conversation about reducing energy consumption with the true experts about your infrastructure and plant: facilities management. Solicit their ideas for projects to reduce costs.

Keep an energy-efficiency mindset

This will contribute to a more comfortable environment, promoting faster healing and increased staff satisfaction. As with clinical redesign, it takes more than a memo to staff requesting a change to achieve the change. You must plan for and measure the change you desire.

Create an energy management program

Develop an infrastructure master plan. Challenge your staff to reduce consumption by a certain percentage. Plan at least one energy project every year to demonstrate progress. Establish annual funding for improvements and reinvest savings to accomplish more projects.

Gather data and manage information

Decide what data is critical to understanding your facility's infrastructure (age of plant, etc.) and your energy consumption statistics. The effective collection and analysis of data is the key to finding and realizing these savings. And you must continually measure and monitor

your success. This information will help you and your team identify savings opportunities; provide indicators to perform predictive maintenance and reduce equipment downtime; and direct reduced utility costs to mission-critical needs.

Start small

Choose low-risk projects such as lighting upgrades first. Get some savings under your belt to prove the concept. Early successes spawn even bigger successes later.

CONCLUSION

A 2009 article in the *Harvard Business Review*⁷ notes that “only companies that make sustainability a goal will achieve competitive advantage.” Indeed, this is healthcare's calling as it enters a new decade, emerging from one of the worst economic periods in our nation's history. “Investing in energy efficient systems is good business,” according to Kevin F. Brennan, CPA, FHFMA, Geisinger executive vice president and chief financial officer. “It begins with thorough research and sound business plans, with positive returns on investments, ultimately improving our bottom line and the health of our patients, employees and community.”

Alan R. Neuner, CHFM, is associate vice president, facilities operations, for the Geisinger Health System located in central Pennsylvania. He has more than 30 years of facilities management experience in iron and steel production, cryogenics and healthcare. For questions regarding this paper, he can be contacted at 570.271.5515 or at aneuner@geisinger.

FOOTNOTES

- 1 US DOE report; “EnergySmart Hospitals: Creating Energy Efficient, High Performance Hospitals”
- 2 Betterbricks report, “Healthcare: A business and ethical case for sustainability;” http://www.betterbricks.com/sites/default/files/teasers/bb_article_ethicalandbusinesscase.pdf
- 3 U.S. Department of Energy; “Energy Efficiency and Your Hospital's Bottom Line;” http://www1.eere.energy.gov/buildings/energysmarthospitals/bottom_line.html
- 4 “The energy picture: Where Are We Now? Where Are We Headed?;” Inside ASHE; March-April 2008
- 5 Targeting 100 Research Study; May 2010; http://integrateddesignlab.com/Seattle/Resources/HD_Research.html
- 6 U.S. Department of Energy; Commercial Building Energy Alliances; http://www1.eere.energy.gov/buildings/alliances/hospital_energy_alliance.html
- 7 “Why Sustainability is now the Key Driver of Innovation;” Harvard Business Review; September 2009; <http://hbr.org/2009/09/why-sustainability-is-now-the-key-driver-of-innovation/ar/1>

APPENDIX A

The Geisinger story: A path toward energy efficiency

Geisinger Health System, based in Danville, PA, has been recognized nationally and internationally for innovations in healthcare delivery and population health management. Geisinger has been applying this same innovation to non-clinical processes, including energy and facilities management. Their path toward energy efficiency began in the late 1980s to improve their environmental stewardship and “do no harm” as part of their mission to enhance the quality of life. Geisinger has never looked back since that time, and today is fully committed to the green building movement, recognizing that energy efficiency and environmental stewardship should form the basis of design, rather than be an afterthought. Geisinger also recognizes there are even great returns on these investments as most energy projects, with little or no risk, yield a one-to five-year payback that translates to a yield of 20 to 100 percent.

MORE THAN \$6 MILLION IN ANNUAL SAVINGS

Of the \$20 million Geisinger has invested in infrastructure during the past nine years, \$8 million was invested in energy conserving equipment. To date, its energy management program has resulted in:

- ▶ More than \$6 million of annual savings from energy efficiency;
- ▶ An ROI on energy investments averaging 3.7 years;
- ▶ An 80 percent reduction of greenhouse gas emissions (more than 42,000 tons);
- ▶ Doubling of campus size (from 1.2 to 2.5 million square feet) and no increase in utility expense and electrical demand since 1988; and
- ▶ A 20 percent annual reduction of water usage (25 million gallons).

LEED PROJECTS TO NET BIG SAVINGS

Geisinger is a pioneer of LEED (Leadership in Energy and Environmental Design) certified initiatives in Pennsylvania.

- ▶ Using green technology and construction materials at LEED Gold-certified Geisinger-Gray’s Woods, a multi-specialty clinic in State College, PA, added no more than 1-2 percent to costs, and Geisinger will recapture those costs in energy savings.
- ▶ Energy costs at Geisinger’s LEED Silver-certified Hood Center for Health Research in Danville, PA, average 75 cents per square foot, well below the national average. In fact, the center uses 13 percent less energy than originally anticipated.

APPENDIX B

GEISINGER ENERGY PROGRAM CASE STUDIES

Project: Lighting (upgraded 24,000 fixtures)

Cost: \$1.8 million (operating lease – seven years, \$300,000/year)

Annual savings: \$460,000

While no two facilities are alike in terms of energy reduction opportunities, there are common areas that bear low hanging fruit, the first of which is lighting. Lighting generally accounts for nearly 40 percent of a hospital’s electric bill. Depending on the technology installed, savings approaching 50 percent are possible. These savings are achieved by adding reflectors to existing fixtures, changing lamps and ballasts, installing occupancy sensors or adding controls. While these changes can be made on a maintenance basis over time, it is recommended to implement them *en masse* to quickly achieve the savings and ensure all spaces are upgraded.

This type of project is based on proven technology, generally has a payback period of two to three years and has high potential for utility rebates or grant money to further reduce the cost. In addition to this project, our facilities group received \$156,000 from the local utility for lighting upgrades and the installation of occupancy sensors. The utility reimbursed approximately 40 percent for the lighting upgrades and 100 percent of the cost to purchase the occupancy sensors.

Project: Energy distribution upgrades

Cost: \$500,000 project cost

Annual electrical savings: \$100,000

Energy distribution systems transport the converted energy to its final point of use. They can be comprised of pumps in the case of water or fans for air. Older buildings used constant volume systems, which are extremely wasteful. A good analogy would be fixed staffing versus flex staffing based on census. The flex model for energy distribution would be variable flow systems.

This is accomplished by adding an almost magical device called a variable frequency drive that varies the speed of the device (pump or fan) to match the required load. The result is that the power saved (electricity) is the cube of the amount of flow.

For instance, if a system only required half the flow, it would only consume 12.5 percent of the energy of a constant volume system. While it’s not quite as simple

as wiring in these devices, the mechanical modifications required are generally not difficult to achieve. Virtually all systems have been converted to variable flow, saving approximately \$100,000 annually.

Project: Energy conversion systems

Cost: \$2,000,000

Annual savings: \$600,000

Energy conversion systems are major consumptive systems that may provide significant opportunities. In layman's terms, these are the systems that provide cooling (converting electricity to chilled water or air), heating (converting natural gas to steam or heat), medical air, vacuum, etc.

Since these systems have high operating hours and are large consumers of energy, even small improvements in efficiency can produce substantial savings. As a general rule, if the energy conversion equipment is approaching 20 years old, there's a high probability that a project with a positive ROI can be implemented to meet your organization's financial hurdles. An example of a successful energy conversion project at Geisinger is the replacement of boiler burners and controls, saving \$400,000 annually with a one year ROI.

Project: Chiller consolidation

Cost: \$1,500,000

Savings: \$300,000

Chilled water storage reduces electrical demand and mitigates investment in chiller capacity. When Geisinger was building the 70,000-square-foot Hood Center for Health Research, the original design called for chillers to be installed only in that building, which was physically connected to the Weis Center for Research, a structure with more than 20-year old chillers.

The Facilities staff convinced the organization to fund an additional \$1.5 million (from the department's infrastructure capital fund) to create a new chiller plant

in the basement of the new building to replace the existing plant in the Weis Center. The net result is that the electrical savings of the new chiller plant were greater than the energy consumption of the new building, thereby lowering the net electrical consumption of the entire campus.

Project: Remote chiller plant

Cost: \$7,000,000

Savings: \$500,000 annually

During the planning of Geisinger's latest patient tower, the \$100 million, 334,000-square-foot Hospital for Advanced Medicine, facilities staff convinced the organization to add a fourth unplanned chiller to a new remote central chilled water plant adjacent to a building whose existing chiller served the majority of the campus.

The plant was originally designed to comprise three 900-ton chillers, and a fourth was to be added to replace the older chiller. Geisinger sold the relocation of the plant on several points:

- ▶ Building a new plant would free up valuable space in the existing building, requiring less space to be built in the addition (value: \$3 million).
- ▶ By relocating the plant, Geisinger could add a chilled water storage tank, thereby eliminating the need to add additional chillers, cooling towers, pumps, etc., as well as reducing the size of the emergency generator (value: \$2 million).
- ▶ By being able to make cooling at night, Geisinger reduced the operating costs due to lower off-peak electrical rates, as well as improved efficiencies due to lower approach temperatures.

Geisinger was also able to use the new chilled water storage tank as a demand response tool, providing revenue from our electrical suppliers (value: \$75,000 annually). Bottom line: Geisinger added 334,000 square feet of structure to the campus without adding any additional cooling capacity or increasing electrical demand.

Project: Central plant in lieu of unitary systems

Cost: \$1,500,000

Savings: Preserved LEED rating and reduced operational expenses by \$20,000 annually

In the planning of our Gray's Woods facility in State College, PA (the first of three phases), budgetary concerns prompted unitary systems in lieu of efficient central plant equipment. Unitary systems combine heating, cooling and fan sections all in one or a few assemblies for simplified application and installation. Geisinger made the case that utilization of the unitary equipment could jeopardize the building's LEED rating, and that spending the additional capital up-front would result in reduced expenditures on subsequent phases, as well as provide operational savings.

After further review, executive leadership funded the additional capital to include the central plant based on the facilities staff's recommendations. The building was awarded LEED Gold certification, and is now planning phase two construction at lower cost since the central plant equipment is already installed (value: \$500,000).

Project: 69,000-volt substation

Cost: \$560,000 project cost

Annual rate savings: \$250,000

This was Geisinger's very first energy cost reduction project. By increasing the service voltage of the campus from 12,500 to 69,000 volts, Geisinger was able to get a rate reduction from the utility of approximately 10 percent. This required the construction of a substation, the installation of a transformer and some electrical cabling.

Project: Waterside economizers

Cost: \$150,000

Annual savings: \$50,000/year

In all Geisinger's chilled water plants, they have installed heat exchangers between the condenser and chilled water circuits. In winter months, this allows Geisinger to provide cooling to the hospital without running mechanical cooling (chillers), saving 1,400 chiller run hours per year per installation.

Project: Medical air upgrade

Cost: \$100,000 investment

Annual savings: \$20,000

As the hospital grew over 85 years, medical air compressors were added with each patient pavilion, taking the total to 20. This project consolidated all the loads onto two variable speed efficient compressors. These compressors also use a waste heat air dryer that uses the waste heat from the compressor to remove the moisture from the dryers with no air loss (typically 10 percent).

Energy resources from Premier

This white paper was developed by the Premier Safety Institute® in collaboration with the author and is one of the resources from Premier's energy program, SPHERE® (Securing Proven Healthcare Energy Reduction for the Ecosystem). Visit www.premierinc.com/sphere for a copy of this white paper and other resources, tools, educational programs, and a listing of Premier contracted suppliers.



▶ 13034 Ballantyne Corporate Place
P.O. Box 668800
Charlotte, NC 28277

▶ T 704 357 0022
F 704 357 6611

▶ 444 N Capitol Street NW
Suite 625
Washington, DC 20001-1511

▶ T 202 393 0860
F 202 393 6499

Transforming
Healthcare
Together®

premierinc.com