

Aloha Energy Group

Energy Efficiency in Hawaii

Fall 2012

Page 1

Has There Ever Been a Better Time To Invest in Energy Conservation?

By Richard Nelson

It's been 42 years now since I moved from California to Hawaii. Over that period, there has never been a better time or more compelling reasons for business owners to reduce their energy use. I will explain the reasoning behind this statement over the balance of this article.

Conservation As An Investment

Energy conservation requires an investment in time and/or money. Typically, a facility looking to lower its energy use will hire a consultant, purchase technologies, and implement certain energy conservation strategies. Some companies will do this largely for the environmental benefits. Others will be driven by dollar savings. Either reason is admirable.



Before committing to an investment in energy conservation, an experienced manager will compare the quoted cost of proposed measures with the projected annual savings, and then calculate the ROI (return on the investment). This ROI will then be compared to the interest paid by banks, or perhaps to the additional money to be made by expanding the

underlying business. Only then will a decision be made as to whether or not to proceed.

Of course, with banks paying 1% on savings, and businesses today struggling to make profits, the deck is heavily stacked in favor of energy conservation. A number of factors have contributed to this state.

Energy Costs

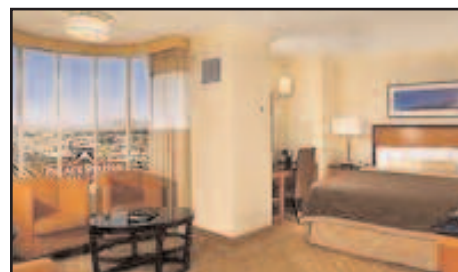
Energy today costs are historically high, particularly in Hawaii. That means that energy savings will translate into inordinately large dollar savings, and a higher ROI. Furthermore, energy costs figure to keep rising in the years ahead, so an investment in energy conservation today will yield even greater savings going forward.

Cost-Effective New Technologies

Another factor contributing to the increased interest in energy conservation is the greater availability today of cost-effective, reliable technologies. Twenty years ago, energy conservation was largely limited to lighting: incandescent bulbs were upgraded to fluorescents, or older fluorescents to newer, higher efficiency ones.

Today a host of viable non-lighting opportunities are available. These include:

- High-efficiency ECM motors for food store refrigeration systems and HVAC fan coil units.
- LED lights
- Refrigerated case night covers
- HVAC and lighting controls
- Exhaust hood controls
- High efficiency gas-fired heat pump water heaters



- HVAC systems with integral heat recovery wheels.

These are just a small sampling of today's available technologies, many of which offer an ROI of 50% or higher. Whatever the number, it is many times greater than the 1% offered by banks, and a great deal safer than most alternative investments.

Utility Rebates

The financial rewards from an energy conservation measure may be further enhanced by taking advantage of the energy conservation rebates being offered by Hawaii Energy. Prescriptive rebates are easy to obtain and quite generous. Custom rebates require detailed calculations but may cover 25% or more of the installed cost of an approved technology. In addition to reducing out of pocket costs, these rebates can greatly improve the ROI.

Summary

For all the reasons stated above, it can be easily seen why energy conservation in Hawaii today is such a compelling investment. Businesses partaking in these opportunities can achieve extraordinary returns while helping to improve the environment we all depend upon.

Richard Nelson has been a Hawaii resident since 1970. Since then, he has served as chairman, officer, or director of a number of state, county, and community organizations. He launched Aloha Energy Group to help commercial and government entities reduce their carbon footprints through energy conservation and application of renewable technologies.

Featured Technology: ECM Fan Motors for Food Stores and Hotels

The time to convert to ECM motors is now! By replacing old, low efficiency Shaded Pole and PSC motors with high-efficiency ECM motors, fan-related energy use can be reduced by 65% or more. Furthermore, Hawaii Energy is offering generous rebates on ECM motors, thereby lowering your out-of-pocket costs.

By Marc Sandofsky

Ultra high-efficiency ECM fan motors have been available since 1985. Only in recent years, however, have they achieved widespread use. And yet today, it is difficult to purchase a new fan coil unit, refrigerated case, or walk-in box that does not have ECM (electronically commutated) motors.

The ECM motor is an ultra high-efficiency, brushless DC motor with variable speed capability. While traditional small, single-phase motors are only 12-45% efficient, ECM motors have efficiencies of 65-72% and provide energy savings on the magnitude of 65%. They also offer smooth, quiet operation and proven reliability.

ECM Motors In Food Stores

Food store refrigeration motors are quite small. Case motors are typically 1/47 HP and draw 46 watts. Walk-in box motors are 1/15 HP and draw 136 watts. Despite their size, there may be many of them in a full-sized store, so together they consume a great deal of energy.

An Aloha Energy Group audit conducted at a food store this year found 273 case fan motors and 49 walk-in box motors. Each motor was shaded pole, which is the least efficient available. The calculated energy use and savings are detailed in the following table. As you can see, the savings are substantial.

	Case Fans	Box Fans	Total
Number	273	49	322
Watts Each	46	136	
Annual kWh	95,877	19,803	115,680
kWh Savings	62,320	12,872	75,192
\$ Savings	\$24,928	\$5,149	\$30,077

ECM motor savings are derived from two sources:



1. They use 65% less energy when they run.

2. They give off 65% less heat so the compressors have to run less.

In summary, on a total project cost of \$65,075, at 40¢/kwh, the store projected to save \$30,077 annually, for a payback of 2.2 years.

It should be noted that these projections were enhanced by the generous rebates being provided by Hawaii Energy. They do not take into account any tax benefits that may be derived, nor the expected maintenance savings from the store having all new motors.

ECM Motors In Hotels

ECM motor opportunities in hotels include food service walk-in boxes, air conditioning units, and fan-powered VAV boxes.

Guest room ECM candidates include ceiling-hung horizontal units, vertical stacked units, and PTAC units. Fan coil units and packaged systems work equally well.



Guest room ECM motors differ from those used in refrigeration systems in that are typically 3-speed. This is important because as the speed of the motor is reduced, the energy sav-

ings increases.

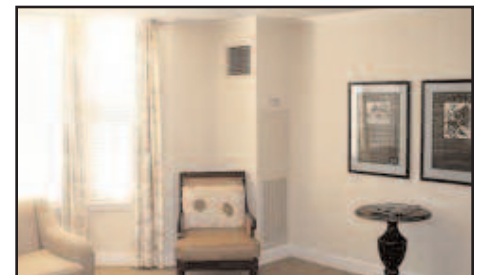
Looking first at PTAC units, in the table below we see energy savings of 52% at high speed, 74% at medium speed, and 80% at the low speed. The actual savings is site-specific.

Speed	SP Watts	ECM Watts	Savings
High	197	94	52%
Medium	188	49	74%
Low	152	30	80%

The same savings/speed relationship holds true for ceiling-hung and vertical stacked units. The energy savings at full speed is impressive. The savings at lower speeds typically increases.

Improved Humidity Control

Reducing the speed of ECM motors provides an added advantage in hot humid climates: as the fan speed is reduced, the air stays in contact with the evaporator coil longer, so it extracts more moisture. This can eliminate the need to overcool and then reheat the supply air in order to lower humidity levels. Since most reheat coils are electric, the energy savings can be substantial.



As with the food store application of the ECM motor, hotel room applications often yield paybacks of two years or less, a 50% ROI, and improved system operation. Hawaii Energy is offering rebates on ECM motors for hotels as well.

Knocking the Bottom Out of Hot Water Heating Costs

Because of the high propane prices in Hawaii, the cost to create hot water here is roughly 700% higher than on the mainland. For hotels, hospitals, and other large users of hot water, this creates a great hardship. Now, with the gas engine-driven High Efficiency Water Heater by Ilios, that expense can be cut in half.

By Marc Sandofsky

Living in Hawaii, one gets used to high costs. Housing, food, clothing, and entertainment, most everything is more expensive than on the mainland. We justify this by saying it is the price we pay to live in Paradise, and perhaps this is true.

One commodity, however, stands out as being inordinately expensive: the gas we rely on for cooking, heating, and turning cold water to hot. In Hawaii, we use propane or synthetic gas for this. On the mainland, they mostly use natural gas. Today, propane prices in Hawaii are roughly 700% higher than natural gas prices on the mainland. That is significant.

The following table demonstrates the disparity between gas prices on Honolulu and other major US cities.

Metro Area	\$/MMBtu
Atlanta	\$14.93
Honolulu	\$35.09
Miami	\$11.09
New York	\$10.72
Phoenix	\$12.15
San Diego	\$7.75

As the table demonstrates, it costs a great deal more to heat water with propane in Hawaii. What can be done to correct this disparity? Certainly, we can use electricity, but at 30-40¢ per kWh, it's not much better.

We can also take steps to use less hot water. We can upgrade to low-flow shower heads, more efficient laundry equipment, and improved cooking technologies. This will save energy, but it does not attack the underlying issue: the cost of heating the water.

A better strategy may be to upgrade to more efficient equipment. Systems are available today with efficiencies of 90% or more. While that is better, it is not sufficient to overcome the 700% price differential.



The Best Available Technology

Perhaps the best available technology today is manufactured by Ilios Dynamics of Waltham, MA. Ilios is a majority-owned division of Tecogen, which is well-known for their gas engine chillers and their CHP (Combined Heat and Power) systems.

With a heating capacity of 500,000 BTU/hour, and an efficiency of up to 180% under high ambient conditions, Ilios can cut fuel consumption and carbon emissions in half. It accomplishes this by using a 50 HP gas engine to power a reciprocating compressor connected to an evaporator coil that extracts heat from the environment. Since this works best in hot environments, it is an ideal system for Hawaii.

Ilios delivers hot water at temperatures of 120°F, 140°F, or 160°F. The



lower the required temperature, the greater the water volume.

As Ilios has a small internal generator to provide electricity for the fan motors, pump, and controls, the external electrical requirements are minimal: 115V, 15 A.

Applications for Ilios include: domestic hot water, pool heating, space heating, laundry, and process heating. Targeted facilities include hotels, nursing homes, hospitals, water parks, and universities.

The installation of an Ilios is generally quite simple. It arrives on a skid as an assembled package. Water,



propane, and low voltage wiring connections are required. If the system is to be installed indoors, a flue must be added. Since Ilios comes with a web-based control system that allows for remote monitoring, an internet connection is also advisable.

Financial Implications

The financial benefits from an Ilios installation are impressive. A single system in Hawaii can be expected to provide more than \$100,000 in annual savings. Tax incentives may include a 10% ITC (investment tax credit), and 50% bonus depreciation under the Modified Accelerated Cost-Recovery System (MACRS). All told, users can expect a payback of about 1 year, and a 100% ROI. The actual numbers are site dependant.

Every Ilios installation begins with a detailed audit. Information is gathered on existing hot water usage, required water temperatures, and existing propane or electric usage. From that, Aloha Energy will generate a detailed engineering analysis and a proposal.

Conservation or Renewables? Which Makes More Sense?

Often, a facility looking to save energy is forced to choose between renewables (solar panels, wind turbines) and energy conservation. Renewables may seem like the sexy choice as they are visible to passers by and provide free energy. Beginning with energy conservation, however, may make more financial sense.

By Richard Costello



A curious trend has emerged in the world of energy conservation. The sale of renewables (wind and solar) has been expanding, often to the detriment of energy conservation.

At first glance, one might question why this is an issue. After all, isn't "free" energy as good as it gets? Isn't it then a better alternative to energy conservation? If rapid payback on your investment is a critical consideration, the answer is probably no.

At this point you may be wondering if I have brought up this question because I am in the energy conservation business. I am, but I am also in the wind and solar business. When customers ask me if they should invest in renewables or energy conservation, I invariably point out that doing one does not necessarily preclude the other. Then I counsel them to define their objectives in installing renewables. Typically, there are three:

1. To reduce their energy costs
2. To do the environmentally responsible thing
3. To demonstrate to others that they are environmentally responsible

For the purpose of this article, we will define being environmental re-

sponsible as making a sincere effort to minimize one's carbon footprint. Renewables and energy conservation can both accomplish that task. What then is the difference?

The difference is largely financial. Even with the high energy costs on Hawaii, a solar or wind investment may yield a 5-10 year payback, or even longer. Energy conservation, by comparison, may provide a 1-2 year payback. That is a huge difference.

Does that mean you should just do energy conservation and forget about renewables? Certainly not. There may be overriding reasons why you would want to include renewables as part of the mix. At the very least though, from a financial standpoint, energy conservation should not be ignored.



This brings to mind an article I read about a school in Kazakhstan where a solar panel had been installed on the roof. The students expressed great pride over their new technology, which was quite understandable under the circumstances. This was the first time many of them had ever seen an electrically powered light bulb, much less a solar panel.

I noted in an accompanying photo

that the light bulbs were incandescent. It occurred to me that had they been fluorescent or LEDs, the electricity generated by the solar panel would have gone a great deal further.



My point as it pertains to this article, is that by implementing energy conservation measures first, the renewable energy will handle more of the remaining load.

A Viable Plan

Be it energy conservation or renewables, every energy project should begin with a detailed audit. To determine how much energy can be saved, we must first learn where the electricity is being used, when, and in what quantities.

Next, we must examine what measures can be implemented to reduce energy use, and their cost. With those numbers in hand, we can accurately calculate the ROI for each measure.

Likewise, turning our attention to renewables, we need to know their cost and the amount of energy they will generate.

With all this data before you, you may find that by implementing the energy conservation measures first, you will need a smaller wind turbine or solar panel, so your costs for the renewables will be reduced. By definition, that's a win-win situation.

Richard Costello is a registered professional engineer and the president of Acela Energy Group. He is based in Norfolk, Mass. The former International President of the AEE (Association of Energy Engineers), he teaches CEM and Energy Procurement courses across the US. He can be reached at (781) 883 5256 or at Richard.costello@acelaenergy.com