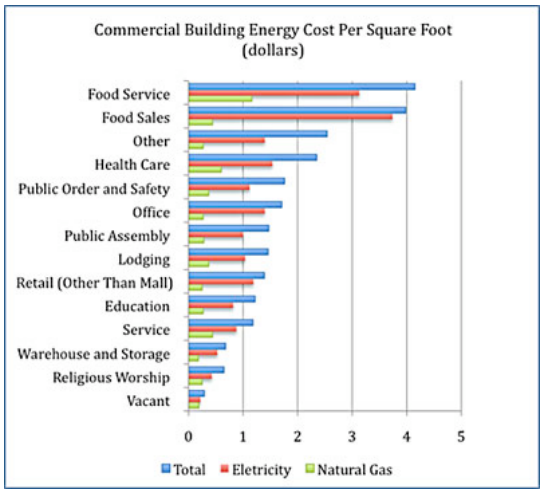
Energy Efficiency in Restaurants
Lots of Costs – Lots of Options

According to the US Department of Energy, Energy Information Agency, restaurants are the most energy intensive businesses, using 2.5 to 3 x the energy per square foot of a typical commercial facility. It is also generally the 3rd or 4th largest expense for a restaurant. And, yet, most restaurants treat energy as a non-controllable expense and do little if anything to try to reduce energy usage.



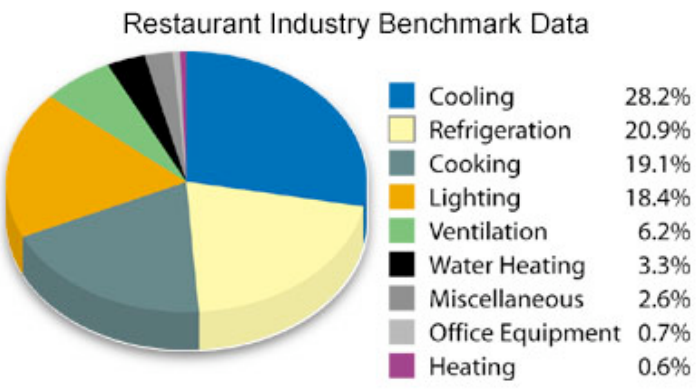
In fact, there are inexpensive things a restaurant can do to lower energy usage, and those things can add up and have a huge effect. For example, for a restaurant with a 10% profit margin for which energy is 5% of total costs (not unusual), a 20% reduction in energy usage would increase profit by 10%.

This Paper is intended as a very brief overview of some of the kinds of steps restaurants can take to lower energy costs; it is not intended as an in-depth assessment of the myriad options that are available.

1. Turn things Off

Turning things off when not in use sounds like a no brainer, but in fact this turns out to be a major cost issue and opportunity for most restaurants. Savings of 10% of energy costs is quite common in some facilities.

Lighting, of course, is a major culprit, but savings are also possible with HVAC systems, exhaust fans, office equipment, and other equipment that gets left on when the business is closed.



The problem is not restricted to things left on when the facility is closed. For example, fryers are a huge energy user; yet fryers, including back-up units, are often left on all the time during meals in anticipation of usage. Monitoring their usage and turning units off when they are not absolutely needed is another way to save. Similarly, if you have outdoor

seating with patio heaters; these heaters are very energy intensive, so make sure to turn them off in any vacant seating area.

Short of installing expensive automation systems to control all systems, the simplest thing to do is set up a clear set of processes and responsibilities and make sure they are enforced.

This is a zero cost approach that can return large benefits.

2. Control HVAC Costs

The simplest thing to do, of course, is make sure that HVAC settings consider comfort first, but also costs. Adjusting settings by as little as 1 or 2 degrees can actually have a significant impact on costs. (If you spend $1,000 per month on air conditioning, this alone can save you between $80 and $400 over the course of a summer; more in very hot climates), and may have minimal impact on comfort. Installing programmable thermostats – particular those that connect to the Internet and can be controlled remotely - can help ensure that policies on thermostat settings can be maintained.

Many restaurants have installed Economizers that reduce the need to run an HVAC compressor by pulling in outside air at certain temperatures. But, dampers on Economizers often need adjustment within a few short years. Dampers that are stuck in open position is a very common occurrence - and this can increase HVAC costs by as much as 50% by letting hot air in during the cooling season and cold air in during the heating season. Conversely, problems with these systems may result in compressors running even in temperature ranges when they should not be. Making sure systems are routinely checked and maintained can help reduce or eliminate these problems.

There are also a range of approaches to automatic monitoring of HVAC systems that can help avoid problems and keep costs down; these approaches cover the gamut from inexpensive to very expensive to implement.

For example, on the inexpensive side, it is possible to simply monitor the temperature of the return air going to the A/C system, and the air coming out of the nearest register. A temperature difference outside the range of 14_ F to 22_ F may suggest a problem, and therefore should result in the system being checked.

There are also systems in a variety of price ranges for performing a broader range of HVAC fault detection. These measure temperature readings, pressure levels, and humidity levels, and compare the results with expected levels to identify possible faults related to refrigerant charge, compressor valve leaks, condenser and evaporator fouling, and a range of other factors. (The National Institute of Standards and Technology has published a methodology for performing HVAC fault analysis). When

properly implemented, these systems can actually reduce the need for preventive maintenance, reduce repair costs, and increase the life of the equipment.

3. Refrigeration Challenges

Refrigeration is one of the biggest energy users in a typical restaurant, and there are some simple things that can be done.

Leaking gaskets are a major source of unnecessary energy usage, and can easily be corrected. Automatic door closers can be a cost-effective option for many walk-in units.

Many glass door refrigerators have built in heaters that keep condensation off the glass. While these heaters do not use a lot of energy, they are on 24X7, which can add up. Typically, they are not needed in dry climates or seasons, and can be safely turned off.

Simple controls can also be installed on evaporator fans to make sure they only run when they need to, which is typically only 50% of the time.

Replacing incandescent bulbs inside walk-in units not only saves energy for the bulbs themselves, but also results in less heat and therefore lower demand on the compressor.

For facilities with time-of-use electricity rates, whenever possible ice-making should be scheduled overnight when the rates are the lowest.

Finally, adding expensive strip curtains in a walk-in unit can reduce outside air filtration by up to 75%.

4. Focus on Food Prep

Food preparation has a huge direct impact on energy use – as well as a huge indirect impact in the form of ventilation requirements.

Broilers can be the most energy intensive food appliance, so assuming you are not prepared to simply replace broiling with frying – which uses about 1/6 as much energy – minimize broiler energy use by cutting pre-heat time, turning off unneeded sections of the broiler, minimizing idle time, and replacing missing knobs that are a source of energy leaks.

When looking to replace equipment, there is now a wide range of Energy Star certified kitchen equipment, including Fryers, Steamers, Convection

Ovens, Holding Cabinets and more, that can reduce energy use. Please see the later section on Energy Star.

In terms of ventilation, one cost-effective alternative is an intelligent, variable speed hood controller, which determines when and how much ventilation is needed and activates the exhaust fan accordingly. For a low to no cost approach to reducing ventilation costs, install side panels on your hoods to reduce spillage, and push each cooking appliance as far back as possible to maximize hood overhang and minimize air gaps between the appliance and the walls.

Makeup air systems are by far the largest contributors to ventilation costs. An EPA-sponsored design guide – **Improving Commercial Kitchen Ventilation System Performance: Optimizing Makeup Air** – provides a comprehensive set of strategies for minimizing the impact of makeup air on hood performance and energy use, while improving safety and comfort.

5. Water, Water

Hot water heating can be a major energy cost – even without supplemental heating systems. And, in some locations, the cost of water itself can be extremely steep.

If you have an older hot water heater (built earlier than 2000), an inexpensive insulating blanket, readily available on-line, can reduce heat loss and therefore energy costs. Keeping the temperature setting on the water heater in the 120-130 degree range provides hot enough water at lower costs than higher settings.

Low-flow pre-rinse spray valves (1.6 gallons per minute or less – and required on all spray valves since 2005) are an inexpensive way to cut down on hot water usage.

Always use the auto mode on conveyor-style dishwashers, since in that way the conveyor motor only runs when needed. And, pay attention to the pressure gauge on your dishwasher; readings over 25 psi suggests you are likely using more water than you need to.

6. Lighting Options

Most people are aware of Compact Fluorescent Lighting (CFL) by now. Not everyone likes the way they look, but they are dramatically cheaper to use than incandescents (using 75% less electricity), and are well worth the investment in parts of the restaurant that have incandescent lighting. (LED lighting is even more energy efficient, but prices are still a little high for LED lighting, EXCEPT for EXIT and OPEN/CLOSED signs, where they are definitely cost-effective).

If you have older "T12" standard fluorescent lights in your facility, replacing them with T8 lighting will pay for itself – particularly if there are utility rebates, as described later.

Of course, the most cost-effective option remains turning off the lights when not in use. To help with that, occupancy sensors may make sense in certain areas, such as offices and bathrooms. Motion Detectors on security lights can reduce energy costs – and have shown to be a better deterrent than flood lights left on all night.

7. Lower Demand Charges

Most restaurants pay not only for the amount of electricity they use in a month – measured in kilowatt hours – but also for their peak energy demand – measured in kilowatts – for any 15 (or 30) minute period in the month. (Some utilities even charge what is known as "full ratchet" demand rates, which are based on the peak demand at any time during the year, and retroactively charge at that level for every month regardless if a higher peak occurs later in the year).

In some cases, demand rates are fairly low, perhaps only a few dollars per kilowatt. But that can range up to $20 per kilowatt – or even more for utilities with tiered demand charges. A peak demand of 90 kilowatts and a rate of $12/kW will add $1080 to a monthly bill. If you can find out when your peak demands occur, you may be able to identify ways to turn off or turn down some equipment during typical peak periods in order to lower your demand charges.

8. Looking for Help

This document was by intent a very cursory overview of energy savings opportunities. But, there is a lot of help out there:

- ***Energy Star***, a program of the Department of Energy, offers tons of advice and resources on their web site: www.energystar.gov. Find out about Energy Star products, tax credits, potential rebates, case studies and energy efficiency ideas. There is even a section devoted to restaurants: http://www.energystar.gov/index.cfm?c=small_business.sb_restaurants.

- The National Restaurant Association offers sustainability guidance and education: http://conserve.restaurant.org.

- For more information on water efficiency, go to www.epa.gov/watersense.

- Most utilities offer a variety of energy efficiency programs for their commercial customers, including rebates for a wide range of products. Check with your local utilities – both electric and gas.

  Many utilities will also pay for or subsidize an *energy audit*, which is the starting point for identifying the most cost-effective energy efficiency options. There are literally hundreds, if not thousands, of companies around the country that offer energy efficiency services aimed at commercial operations.

- Audits are generally also the first step in building "Commissioning", which is a process intended to ensure that building systems are designed and continue to operate efficiently and effectively. "Monitoring-Based Commissioning" adds a monitoring system to the process to keep track of how systems are performing; a study by the California Energy Commission reported that such monitoring systems on their own lower energy costs by 10-15%.