



Energy Efficiency: Challenge to Top Management



Self-Assessment Guide For Energy Saving Opportunities

A team approach to improve
financial performance, pursue
cleaner air, and reduce
dependency on foreign energy.

YOU HAVE THE POWER!





How to Use this Guide

The purpose of this guide is to inspire leaders to engage their organizations in striving for more efficient use of energy resources in the interest of improving financial performance, pursuing cleaner air and reducing dependency on foreign energy.

Each individual has a significant impact on the success of achieving energy efficiency goals at your business, industry, government or institution. The critical factors are leadership and individual behavior based on awareness of opportunity and positive expectations.

This Energy Self-Assessment Guide includes pertinent questions that can put your efficiency opportunities in perspective and give direction to what measures and priorities should be established.

Answer the checklist questions with your staff. Gain a better understanding of your organization's energy use and costs. Review potential energy savings on pages 18-19 and use the Next Steps and Resources sections in launching or renewing your energy efficiency initiatives.

YOU HAVE THE POWER!



Energy Use

Where do you use the most energy? The following information can help you develop your priorities and determine where your most rewarding energy efficiency opportunities are. Energy is a significant portion of your controllable and variable overhead expense and should be considered a critical financial performance factor!

<u>TYPE OF OPERATION</u>	<u>USAGE CATEGORIES (%)</u>					
	HVAC	LIGHTING	HOT WATER	FOOD PREP.	MISC. USE	PROCESS
<u>Office Building</u>	50	25	0	0	25	0
<u>Manufacturing</u>	26	2	2	0	0	70
<u>School</u>	65	15	3	7	10	0
<u>Hotel / Motel</u>	40	11	25	0	24	0
<u>Apartment Bldg.</u>	70	15	5	0	10	0
<u>Retail Store</u>	30	60	0	0	10	0
<u>Restaurant</u>	36	26	0	27	11	0
<u>Hospital</u>	58	23	12	3	4	0

Source: Handbook of Energy Engineering, 4th edition,



Administration & Communications

- Has the critical need to be more efficient in the use of energy at your location been delineated in an Energy Policy and broadly communicated?
- Have action teams been organized to provide leadership and enhance the success of reducing energy costs?
- Is there a program to recognize individuals who assume a proactive role in pursuing the objectives of the Energy Policy?
- Are Energy Conservation posters conspicuously displayed throughout your facility?
- If energy systems have not been recently upgraded, have you considered using an energy expert to conduct an efficiency assessment?
- Does your capital investment policy include criteria for financing energy upgrade projects?
- Are monthly bills reviewed and tracked electronically?

Energy Use Information

- Is energy usage and cost data made available/distributed to all major users?
- Is data monitored to question and pursue remedies to unusual variations from the norm?

- Is benchmarking used to determine performance goals?
- Are facilities with high costs surveyed to discover opportunities for cost reduction?
- Are energy costs and program performance included in monthly business reviews?

Measuring Energy Supply

- Are measures taken to discover billing errors and recover incorrect charges?
- Do you understand your electrical rate structures?
- Do you know your electricity costs associated with both use (kWh) and demand (kW)?

Energy Savings Example

Demand (kW) charges typically account for 25-35% of the total electric bill.

- On an annual basis, do you review rates with your supplier to ensure you are on the most favorable rate structure?
- When you change the use of your facility, do you also review the impact on your rates?

Lighting

- Are lights turned off when rooms or areas are not occupied?

- Are lighting systems wired so that lights throughout a large area do not have to be on when activity is taking place in only a small section of the area?
- Is task lighting used to allow background lighting to be reduced?
- Have energy conservation stickers been placed on light switches?

Energy Savings Example

Each 5000 watts of lighting turned off 20 hours per week will save \$260 per year.

- Have occupancy sensor controls been considered to automatically turn off unused lights in meeting rooms, offices, etc.?
- Have incandescent lamps been replaced with compact fluorescent lamps?
- Have T-12 34W fluorescent lamps and old ballasts been replaced with T-8 lamps and electronic ballasts?
- Are low wattage tubes used in existing fluorescent lighting fixtures?
- Have measures been taken to remove unnecessary lights or de-lamp fixtures in over-lit areas?

Energy Savings Example

The elimination of 25 75 - watt bulbs will save \$244 per year.

- Are old ballasts upgraded when lamps are

replaced?

- Are Light Emitting Diode (LED) lighting fixtures used in EXIT signs?
- Has unnecessary lighting in snack and beverage machines been removed?
- Has housekeeping and security staff been advised to keep lights turned off in unoccupied spaces?
- Is it possible to schedule all or some housekeeping duties during daylight or operating hours?
- Are exterior light photo cells/controls working properly?
- Has use of decorative or unneeded exterior lighting been discontinued?
- Are lights controlled by an Energy Management System?

Space Conditioning - HVAC

- Is there a service contract agreement to provide for regular safety and efficiency maintenance to the systems?

Energy Savings Example

Typical energy savings generated by a regular tune up of HVAC systems is 10%.

- When replacing an inoperative system or component, do you use the opportunity to upgrade efficiency as opposed to installing

an exact replacement?

- Are energy efficient heating and air conditioning thermostat set points maintained throughout your facility (70°F heating, 76°F cooling)?
- Are thermostats routinely calibrated?
- Are thermostats tamper-proof?
- Are thermostats properly located to provide balanced space conditioning?
- Are safety rules enforced to prohibit the use of personal heating and cooling devices?
- Are air conditioning or heating setback when weather conditions permit?
- Is air conditioning or heating setback when facility is not occupied?
- Are off-hour meetings scheduled in locations that do not require HVAC in an entire facility?
- Is housekeeping scheduled to minimize the use space conditioning?
- Are air filters inspected on a regular basis to ensure that they are cleaned or replaced when necessary?
- Are heat exchanger surfaces such as cooling coils, heat exchangers and condensing units regularly cleaned?
- Are exhaust fans turned off with the HVAC systems when space is unoccupied?

- Has supply air from air handling units been adjusted to match the volume of space conditioning requirements?
- Has direct conditioning of unoccupied areas (corridors, stairwells, storage rooms, etc.) been minimized by turning off fan coil units and unit heaters and by closing supply air diffusers?
- Are outside air dampers controlled to close when conditioned space is unoccupied?
- If economizers are present in your HVAC systems, are they modulated to take advantage of free cooling when outside temperature is below 65°F?
- If you use cooling towers, have water meters been installed to record makeup water usage (losses due to blow-down, evaporation and drift) that should result in sewer charge credits?

Building Envelope

- Is weather stripping on windows and doors well-maintained?
- Are blinds and shades adjusted to take advantage of daylight and to utilize or avoid the impact of solar heat?
- Do doors and windows operate properly?
- Have thermal windows been installed to minimize heat and cooling losses?
- Are operable windows used for ventilation

during mild weather conditions?

- Are window air conditioners covered during the heating season?
- Can insulation of a building be improved?
- Have you considered flexible windbreaks and interior doors for loading areas?

Electric Motors

- Are premium efficiency motors used to replace defective motors and to avoid the use of declining efficiency rewind motors?

Energy Savings Example

- Are areas adja-

When purchasing a new motor, the additional cost of a “premium” efficiency motor will be paid back in less than 2 years.

cent to motors uncluttered and well-ventilated?

- Are motor air vent ports clean and unclogged?
- Are heavy-duty bearings used when conducting maintenance?
- Are cogged belts used in belt-driven applications or when replacing worn V-belts?
- Are electric motors correctly selected to assure that excessive capacity and inefficient power are not used?

Steam Systems

- Are boilers inspected and maintained by a qualified technician on a regular basis to achieve maximum efficiency and safety?
- Is the most cost-effective fuel used?
- Are burners tuned on an annual basis?
- Are steam traps inspected and maintained on a regular basis?
- Are steam lines properly insulated?
- Are hot water storage tanks, heat exchangers and piping well-insulated?
- Is there a leak repair program maintained to deal with steam and condensate lines and valves?

Energy Savings Example

A steam leak of 1/16" diameter at 100 PSIG represents \$400 per year of wasted energy.

Compressed Air

- Is a regular leak repair program maintained for compressed air?

Energy Savings Example

A 1/16" diameter compressed air leak at 100 PSIG wastes \$608 per year.

- Are systems turned off when possible?
- Are system - wide pressure settings maintained at lowest possible operating levels?



Energy Savings Example

A 60 HP air compressor operated at 95 PSI instead of 110-PSI can save \$316 per year.

Office Equipment

- Are computers, monitors, printers, copiers, and other office equipment turned off and/or set for “sleeper” mode when not in use?
- Is Energy Star equipment specified for new purchases?

Energy Savings Example

Using Energy Star Office Equipment saves about \$50 per employee per year.

Miscellaneous Equipment

- Is miscellaneous equipment turned off where possible?
- Are refrigeration units in drinking fountains turned off or set to no lower than 60°F?
- Have non-essential refrigerated vending machines and refrigeration/ice machines been taken out of use?
- Have electric-heated defrost cycles on refrigerated walk-in boxes been minimized and scheduled for off-peak energy consumption hours (night)?
- Are controls adjusted (temperature, speed, other settings) to minimize energy but accomplish the task?

New Construction

- If you are expanding your facility or constructing a new building, are you giving due consideration to facility orientation, design, layout, lighting, equipment and control selections that will result in maximum energy efficiency?

Energy Management Systems

- Have you considered using or upgrading an EMS?
- Is your EMS used to limit electrical demand peaks on key equipment to avoid high demand charges and penalties?

Energy Management Systems

EMS automatically monitor and control HVAC, lighting, and equipment to conserve energy, maintain function, and provide occupant comfort. EMS can accomplish the following and more:

- Control lighting system by the hour and dim for daylight harvesting
- Optimize HVAC operations based on environmental conditions and changing uses
- Turn off/set back HVAC during non-working hours
- Deactivate water heaters when appropriate
- Activate and monitor security systems
- Control peak loads to reduce demand charges



Vehicle Use & Selection

- Are employees provided incentives for car pooling or using mass transit?
- When purchasing company vehicles, are gas mileage and emission levels included in your deliberations?
- Have you considered using alternative fuel vehicles (AFV) or cooperating with community AFV efforts?

Next Steps: Action Items for Top Management

- Brief organization on energy efficiency responsibilities and the economic and environmental justifications
- Establish an efficiency team with guidelines to:
 - Develop an Energy Policy
 - Create an Action Plan
 - Train & Motivate Staff
 - Evaluate Performance
- Set Energy Saving Goals
- Communicate management goals and report progress
- Obtain external assistance, if appropriate



Resources

“How to Reduce Your Energy Cost” Fourth Edition, Advantage Publications and Insights
EPA - Energy Star

www.energystar.gov

Dept of Energy – energy efficiency

www.energy.gov/efficiency/index.html

State Energy Office

www.energync.net

N.C. Project Green

www.sustainablenc.org

Division of Pollution & Environmental Assistance

www.p2pays.org

Federal Energy Management Program

www.eere.energy.gov/femp

Conversion Factors

Fuel Oil = 140,000 BTU / gallon

Coal = 14,000 BTU / pound

Natural Gas = 1,000 BTU / cubic foot

1 Therm = 100,000 BTU

1 kilowatt (kW) = 1.341 horsepower (hp)

1 horsepower (hp) = 0.746 kilowatt (kW)

1 kilowatt - hour (kWh) = 3412 BTU

1 Ton of Cooling Capacity = 12,000 BTU / hour

To generate 1 kilowatt - hour (kWh) requires
10,000 BTU of fuel burned by average utility.

(Saving Potential Estimates Based on kWh
Rate of 5¢)



Environmental Savings

NC Power Plant reductions:

Conserving 1000 kWh will :

- Reduce 1.1 ton CO₂ (greenhouse gas)
- Reduce 5.31 lbs of nitrous oxides (precursor to ozone)
- Reduce 9.07 lbs of sulfur oxides, SO_x (acid rain and visibility pollutant)

Passenger Car Emission Equivalents

4500 kWh/year = carbon dioxide emissions from one vehicle

Forrest Equivalents

3310 kWh/yr = carbon dioxide removed by one acre of forest

Estimating Savings Potential

Lighting	Energy Reduction, %
Using Energy Saving Fluorescent Lamps	15%
Upgrading old T-12 Fluorescent Lighting and ballast with T-8 and electronic ballast	30-35%
Replacing incandescent lamps with Compact Fluorescents	66-75%
Upgrading 400-watt Metal Halide Suspended fixture	10-28%
Replacing incandescence Exit signs with LED	87%
Replacing Mercury Vapor with high pressure sodium	60%
Using Occupancy Sensors in	
Office	25-50%
Restroom	30-75%
Meeting room	45-65%

HVAC

Overall HVAC Saving potential ³	30+%
Cooling upgrade opportunities ⁶	
Central Chiller	15-35%
Unitary A/C	20-35%
Heating upgrade opportunities ⁶	
Boiler	10-30%
Furnace	5-25%
Periodic heating system maintenance ³	5-10 %
Nighttime temperature setback ³	10-33%
Reducing heating temperature 3° ³	12 -13%
Fan Optimization, variable speed drive ³	50-85%

Building Envelope

Reduction air infiltration in large office building heating and cooling	1-5%
---	------

Estimating Savings Potential

Motors	Energy Reduction, %
Specifying "premium" efficiency motor vs. Standard efficiency	3.3-6.9%
Using cog-belt instead of V-belts ⁵	2-8.4%

Air Compressor System Improvements

Energy Savings ¹	20-50%
Redirect air or compress intake to use outside air	5-7%
Lowering system- wide pressure by 10 psi ⁵	3-6%

Office Equipment

Using Energy Star vs. non-Energy Star rated ⁴	
Energy Star Refrigerators	20%
Dishwashers	10-25%
Refrigerators	10-40%
Clothes Washers	50-62%
Copiers	40%
Computers	30-70%
Monitors (LCD)	70-90%
TV & VCRs	25%

Energy Management Systems

Typical Energy Use Savings using EMS's ³	10-20%
---	--------

References:

1. Source Improving Compressed Air System Performance: A Sourcebook for Industry, USDOE, Motor Challenge Program, April 1998
2. Motor Challenge Fact Sheet: Buying an Energy-Efficient Electric Motor
3. How to Reduce Your Energy Cost: The Energy Efficiency Guide for Business, Industry, Government and Institution, Third Edition, 2001 Advantage Publications.
4. EPA Energy Star website
5. "A self-Assessment workbook for small manufactures, Version 1.0 Rutgers University Office of Industrial Productivity and Energy Assessment
6. EPA Energy Star Building Manual, October 2001, Air & Radiation 6102J Handbook of Energy Engineering, Fourth Edition, Albert Thumann & D. Paul Mehta, The Fairmont Press, 1997

For more information contact

Waste Reduction Partner
Land-of-Sky Regional Council
25 Heritage Drive
Asheville, NC 28806
Phone:(828) 251-6622
Fax: (828) 251-6353
Web: www.landofsky.org/wrp
E-mail: wrp@landofsky.org

Funded By:



Produced By:

**WASTE
REDUCTION
PARTNERS**



dedicated professionals sharing expertise

1000 copies of this public document were printed at
a cost \$x.xx or \$x.xx each.