NORFOLK

Easy Ways to Save Energy
A Self-Assessment Guide

Energy efficiency doesn't require significant capital expenditures to make a big difference in your operating budget.

Use this checklist to make sure you are saving all you can. Make a positive impact on our environment and your bottom line by using the checklist to conserve energy, increase the useful life of building systems and improve occupants' comfort levels and productivity.

Contents

Thanks to North Carolina State Energy Office Waste Reduction Partners and Land-of-Sky Regional Council and to the Building Owners and Managers Association (BOMA) International.

Energy Use

Where do you use the most energy? The following information can help you 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.

Energy Usage Categories (%)

Type of Operation	HVAC	Lighting	Hot Water	Food Prep	Misc Use	Process/ Equipment
Office Building	40	29	9	2	5	15
Manufacturing	35	28	2	0	3	32
School/Education	50	20	22	3	3	2
Hotel/Motel	25	18	40	7	6	4
Apartment Bldg.	70	15	5	0	10	0
Retail Store	51	31	7	3	4	4
Restaurant	23	15	11	45	5	1
Health Care	30	16	26	7	14	7
Religious Institution	41	46	9	2	1	1

Adapted from: Handbook of Energy Engineering, 4th edition, EIA, and NREL 2000

A. Administration & Communications

YES **NO**

☐ ☐ **A-1:** Has the need to be more efficient in the use of energy at your location been incorporated into a Strategic Energy Plan and broadly communicated?

☐ ☐ **A-2:** Is there a staff position that includes responsibility for utilities management?

☐ ☐ **A-3:** Have Conservation Action Teams (CAT) or Green Teams been organized to provide leadership and enhance the success of reducing energy costs?

☐ ☐ **A-4**: Is there a program to recognize individuals who provide leadership and increase the success of the Energy Plan?

☐ ☐ **A-5:** If energy systems have not recently been upgraded, have you considered using an energy expert to conduct an efficiency assessment?

☐ ☐ **A-6:** Does your capital investment policy include criteria for financing energy upgrade projects?

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B. Utility Accounting

YES	NO	
☐	☐	**B-1:** Is energy usage and cost data tracked monthly and distributed to all major users?
☐	☐	**B-2:** Is data monitored to question and pursue remedies for unusual variations from the norm?
☐	☐	**B-3:** Is benchmarking used to determine performance goals?
☐	☐	**B-4:** Are facilities with high costs surveyed to discover opportunities for cost reduction?
☐	☐	**B-5:** Are energy costs and program performance included in monthly business reviews?
☐	☐	**B-6:** Are measures taken to discover billing errors and recover incorrect charges?
☐	☐	**B-7:** Do you understand your electrical rate structures?
☐	☐	**B-8:** Do you know your electricity costs associated with both use (kWh) and demand (kW)?
☐	☐	**B-9:** On an annual basis, do you review rates with your supplier to ensure you are on the most favorable rate structure?
☐	☐	**B-10:** When you change the use of your facility, do you also review the impact on your rates?

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C. Office Equipment

YES **NO**

☐ ☐ **C-1**: Are computers, monitors, printers, copiers, and other office equipment turned off and/or set for "sleep" mode when not in use?

☐ ☐ **C-2**: Is Energy Star equipment specified for new purchases?

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D. New Construction/Renovations

YES **NO**

☐ ☐ **D-1:** If you are expanding or constructing a new building, are you giving full consideration to a LEED certified or a "High Performance" designed and constructed facility, which addresses building orientation, design, layout, lighting, equipment and control selections that will result in maximum energy efficiency?

☐ ☐ **D-2**: If you are renovating a building, are you giving full consideration to incorporating LEED EB criteria into your renovation?

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E. Vehicle Use & Selection

YES	NO	
☐	☐	**E.1:** Are employees given incentives for car pooling or using mass transit, biking or walking?
☐	☐	**E.2:** When your organization purchases vehicles, are fuel mileage and emission levels considered?
☐	☐	**E.3:** Have you investigated using alternative fuel vehicles?
☐	☐	**E.4:** Does your organization have a vehicle idling policy?

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F. Lighting

YES	NO	
☐	☐	**F-1:** Are lights turned off when rooms or areas are not occupied?
☐	☐	**F-2**: 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?
☐	☐	**F-3:** Is task lighting used to allow background lighting to be reduced?
☐	☐	**F-4:** Have energy conservation stickers been placed on light switches?
☐	☐	**F-5:** Are occupancy sensors considered which can automatically turn off unused lights in meeting rooms, offices, etc.?
☐	☐	**F-6:** Have incandescent lamps been replaced with compact fluorescent lamps?
☐	☐	**F-7:** Have T-12, 34-W fluorescent lamps and old ballasts been replaced with T-8 lamps and electronic ballasts?
☐	☐	**F-8:** Are low wattage tubes used in existing fluorescent lighting fixtures?
☐	☐	**F-9:** Have measures been taken to remove unnecessary lights or de-lamp fixtures in overlit areas?
☐	☐	**F-10:** Are old ballasts upgraded when lamps are replaced?
☐	☐	**F-11:** Are Light Emitting Diode (LED) lighting fixtures used in EXIT signs?
☐	☐	**F-12:** Has unnecessary lighting in snack and beverage machines been removed?
☐	☐	**F-13:** Are exterior light photo cells/controls working properly?
☐	☐	**F-14:** Has the use of unnecessary decorative or unneeded exterior lighting been discontinued?
☐	☐	**F-15:** Are lights controlled by an Energy Management System?

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G. Space Conditioning - HVAC

YES	NO	
☐	☐	**G-1:** Do you have a service contract agreement to provide for regular safety and efficiency maintenance to the systems?
☐	☐	**G-2:** When replacing an inoperative system or component, do you use the opportunity to upgrade efficiency as opposed to installing an exact replacement?
☐	☐	**G.3:** Does your organization have a policy for maximum and minimum indoor air temperatures?
☐	☐	**G.4:** Does your organization have a policy for setbacks in unoccupied building areas?

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H. Electric Motors

YES	NO	
☐	☐	**H-1:** Do you have a motor management policy that mandates "premium" efficiency motors?
☐	☐	**H-2:** Do you require repair shops to maintain the efficiency of motors when they are rewound?
☐	☐	**H-3:** Are motor air vent ports clean and areas adjacent to motors uncluttered and well ventilated?
☐	☐	**H-4:** Are heavy-duty replacement bearings used when conducting maintenance?
☐	☐	**H-5:** Are electric motors selected to avoid power inefficiency and over-capacity?

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I. Steam & Hot Water Systems

YES	NO	
☐	☐	**I-1:** Are boilers and burner units inspected and maintained by a qualified technician on a regular basis to achieve maximum efficiency and safety?
☐	☐	**I-2:** Is the most cost-effective fuel used?
☐	☐	**I-3:** Are steam traps inspected and maintained on a regular basis?
☐	☐	**I-4**: Is there a leak repair program maintained to deal with steam and condensate valves?
☐	☐	**I-5:** Are steam lines, hot water storage tanks, heat exchangers and piping well-insulated?
☐	☐	**I-6:** Are low flow showerheads, faucet aerators, and flow restrictors used?

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J. Compressed Air

YES	NO	
☐	☐	**J-1:** Is a regular inspection for leaks conducted on compressed air lines?
☐	☐	**J-2:** Are systems turned off whenever possible?
☐	☐	**J-3:** Are system-wide pressure settings maintained at lowest possible operating levels?

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K. Miscellaneous Equipment

YES	NO	
☐	☐	**K-1:** Is miscellaneous equipment turned off whenever possible?
☐	☐	**K-2**: Are refrigeration units in water fountains turned off or set @ no lower than 60 degrees F?
☐	☐	**K-3**: Have non-essential refrigerated vending machines and refrigeration/ice machines been taken out of use?
☐	☐	**K-4**: Are energy efficient heating and air conditioning thermostat set points maintained throughout your facility (70 degrees F heating, 76 degrees F cooling)?
☐	☐	**K-5:** Are thermostats regularly calibrated?
☐	☐	**K-6:** Are thermostats tamper-proof?
☐	☐	**K-7:** Are thermostats properly located to provide balanced space conditioning?
☐	☐	**K-8:** Are safety rules enforced to prohibit the use of personal heating and cooling devices?
☐	☐	**K-9:** Are air conditioning or heating controls set back when weather conditions permit?
☐	☐	**K-10:** Are air conditioning or heating controls set back when facility is not occupied?
☐	☐	**K-11:** Are off-hour meetings scheduled in locations that do not require HVAC in the entire facility?
☐	☐	**K-12:** Is housekeeping scheduled to minimize the use of space conditioning?
☐	☐	**K-13:** Are air filters inspected on a regular basis and cleaned or replaced when necessary?
☐	☐	**K-14:** Are surfaces on cooling coils, heat exchangers and condensing units regularly cleaned?
☐	☐	**K-15:** Are exhaust fans turned off along with the HVAC systems when a space is unoccupied?
☐	☐	**K-16:** Has supply air from air-handling units been adjusted to match the volume of space conditioning requirements?
☐	☐	**K-17:** 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?
☐	☐	**K-18:** Are outside air dampers controlled to close when conditioned space is unoccupied?
☐	☐	**K-19:** If economizers are present in your HVAC systems, are they modulated to take advantage of free cooling when outside temperature is below 65^{O} F?

☐ ☐ **K-20:** 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?

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L. Building Envelope

YES	NO	
☐	☐	**L-1:** Is weather stripping on windows and doors well-maintained?
☐	☐	**L-2:** Are blinds and shades adjusted to take advantage of daylight and to utilize or avoid the impact of solar heating?
☐	☐	**L-3:** Have thermal windows been installed to minimize heat and cooling losses?
☐	☐	**L-4:** Are operable windows opened for ventilation during mild weather conditions?
☐	☐	**L-5:** Are window air conditioners covered during the heating season?
☐	☐	**L-6:** Can the insulation of a building be improved, particularly in the roof area?
☐	☐	**L-7:** Are light-colored, reflective roofs specified?
☐	☐	**L-8:** Have you considered flexible windbreaks and interior doors for loading areas?
☐	☐	**L-9:** Have electrically heated defrost cycles on refrigerated walk-in boxes been minimized and scheduled for off-peak energy consumption hours (nights)?
☐	☐	**L-10:** Are automatic controls adjusted (temperature, speed, other settings) to minimize energy use but accomplish the task?

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M. Energy Management Systems (EMS)

YES **NO**

☐ ☐ **M-1:** Have you considered using or upgrading an Energy Management System (EMS)?

☐ ☐ **M-2:** Is your EMS used to limit peak electrical demand on key equipment to avoid high demand charges and penalties?

A Note about Energy Management Systems (EMS)

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

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Best Energy Management Practices

1. Commitment by top-level management.
2. Clearly defined energy reduction goals.
3. Communication of the goals to all organizational levels.
4. Assignment of responsibility and accountability at the proper level.
5. Tracking of energy use.
6. Continuous identification of all potential savings.
7. Adoption of project investment criteria reflecting project risks and returns.
8. Provision for recognition and reward for achieving the goals.

Next Steps: Action Items for Top Management

- Brief your organization on energy efficiency responsibilities and the economic and environmental justifications.
- Establish Conservation Action teams (CAT) with the guidelines to:
    - Develop a Strategic Energy Plan
    - Create an Action Plan
    - Train and motivate staff
    - Evaluate performance

- Set energy saving goals.
- Communicate management goals and report progress.
- Obtain external assistance, if appropriate.

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Resources

- "How to Reduce Your Energy Cost" Fourth Editions, Advantage Publications and Insights EPA – Energy Star. www.energystar.gov
- Department of Energy – energy efficiency; www.energy.gov/efficiency/index.html
- State Energy Office; www.dmme.virginia.gov
- Division of Environmental Quality; www.deq.state.va.us
- 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 (kW)-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 CO_2 (greenhouse gas)
- Reduce 5.31lbs of nitrous oxides (precursor to ozone)
- Reduce 9.07lbs of sulfur oxides, SO_x (acid rain and visibility pollutant)

Passenger Car Emission Equivalents:

4,500 kWh/year = carbon dioxide emissions from one vehicle

Forest Equivalent:

3,310 kWh/year = 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	Energy Reduction %
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[o3]	12-13%
Fan Optimization, variable speed drive[3]	50-85%

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

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 Reduction %
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	Energy Reduction %
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	Energy Reduction %
Typical Energy Use Savings using EMSs[3]	10-20%

References:

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4. EPA Energy Star website
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6. EPA Energy Star Building Manual, October 2001, Air & Radiation 6102J Handbook of Energy Engineering, Fourth Edition, Albert Thumann & D. Paul Mehta, The Fairmounts Press, 1997