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TEN WAYS TO CONSERVE 10%

ENERGY CONSERVATION

for Business, Industry, Government, and Institutions

The power is yours!

TEN WAYS TO CONSERVE 10%

Short-Term Strategies

1. Reduce the number of hours you operate your building's lighting, plug loads, and heating, ventilation, and air conditioning (HVAC) systems by adjusting the controls as needed.

2. Adjust the thermostat settings for electrically heated buildings to provide no more heating or cooling than is reasonably necessary for comfort.

3. Turn off unnecessary lighting in frequently unoccupied areas, such as backrooms:
   - Perimeter lighting circuits near windows (take advantage of day lighting)
   - Task lights in office areas when not needed
   - Holiday displays and permanent decorative lighting
   - External lighting (except for security requirements)

4. Adjust your building's housekeeping and custodial maintenance routines to minimize after-hours lighting.

5. Reduce office machine plug loads by turning off and/or reducing the use of computers, monitors, printers, and copiers. When purchasing new office equipment, look for the ENERGY STAR® label indicating energy efficient models. Be sure to *enable* all energy saving features in office equipment.

6. Enlist tenants and employees in the effort to save energy. Communicate the need to manage individual and collective energy use through posters, employee/tenant newsletters, group e-mails, etc.

7. Perform operations and maintenance procedures appropriate to your building to ensure that lighting and HVAC system are at optimal levels. (For example, clean filters and lighting fixture diffusers, and service your HVAC system regularly.)
   - Clean filters not only allow for unrestricted airflow but also keep the air smelling fresh.
   - Replace yellow lighting lenses with clearer, acrylic lenses. Clear lighting lenses give more light output.
   - Testing and tuning your heating plant may cost you up to $100 but may save you many hundreds and even thousand of dollars during a heating season.

	Optimum Heating Temperature	Optimum Cooling Temperature
Day	No higher than 68° F	78° F
Night	55° F	78° F

Example: *Each degree increment above or below 68°F makes a 3% change in heating energy use. When cooling, for each degree set above 78°F, you save 10%.*

Example: *By reducing consumption by 1000 watts (10 bulbs at 100 watts each), you'll see the following energy costs savings:*

Hours of Reduced Use	Annual Energy Costs Savings
5	$13
10	$26
15	$39
20	$52

Example: *Have a suggestion box and possible contest to save 10%. Celebrate your accomplishments and recognize achievements.*

Savings from Improving Air Conditioning or Heating Plant Efficiency				
If your energy costs:	Efficiency improvements save you:			
	10%	15%	20%	25%
$ 1,000	$ 100	$ 150	$ 200	$ 250
$ 2,500	$ 250	$ 375	$ 500	$ 625
$ 5,000	$ 500	$ 750	$ 1,000	$ 1,250
$10,000	$ 1,000	$ 1,500	$ 2,000	$ 2,500
$25,000	$ 2,500	$ 3,750	$ 5,000	$ 6,250
$50,000	$ 5,000	$ 7,500	$10,000	$12,500

Long-Term Strategies

8. Upgrade lighting systems.
   - Replace incandescent bulbs with compact fluorescent bulbs.
   - Install lighting system controls.
   - Install occupancy sensors to turn off lights when rooms are unoccupied.
   - Upgrade lighting systems to reduce the heat they generate, thus reducing your air conditioning needs.

9. Upgrade HVAC system components.
   - Improve the HVAC controls.
   - Install variable frequency drives on variable motor load applications.
   - Recommission all of your building's systems. Most HVAC recommendations are equipment and site-specific.

10. Upgrade other mechanical systems such as elevators, commercial refrigeration, air compressors, and adjust equipment settings.
    - Set water heater temperature for domestic use (i.e., hand-washing), at no more than 105°F.
    - Repair water leaks: 2 drops per second can waste 200 gallons of water per month.
    - Make sure to include regular maintenance of equipment, such as motors and cooling compressors, as part of your general operation.

How Many Watts?

Check the nameplate or other location on the machine for the energy rating. Usually the energy rating is in amps and volts, not watts. A good approximation for converting those numbers to watts is:

_____ amps x _____ volts* = _____ watts

Then multiply by .30 (i.e., 30%) to find the wattage to use for your energy calculations. This formula takes into account when the machine is not in use.

_____ watts x .30 = _____ watts

**Use 115 volts if the machine rating states a voltage range.*

Example: *Many occupancy sensors cost less than $100 installed and can save between 20–40%.*

Example: *Programmable thermostats will help control temperature settings and allow for reductions during off-hours. Be sure the unit has battery backup to retain settings.*

How to Save $37 on a Light Bulb

Cost comparison between a compact fluorescent bulb and an incandescent bulb over 10,000 hours

	Compact	Incandescent
Watts	20w	75w
Light output	1200 lumens	1150 lumens
Energy use	200 kWh	750 kWh
Energy cost @ 9¢/kWh	$18.00	$67.50
Bulb life	10,000 hours	1,000 hours
Bulb replacements	0	9
Cost of bulb replacement	0	$6.75
Original bulb cost	$20.00*	$ .75
Total cost for 10,000 hrs.	**$38.00**	**$75.00**

Total saved @ 9¢/kWh by using a compact bulb: $37.00

Savings at these kWh rates:

5¢	7¢	9¢	11¢
$15	$26	$37	$48

**This is an approximate, typical cost for a compact. You can probably get compact bulbs at even lower prices, especially when buying in quantity.*

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Payback or Return-on-Investment

The first thing you are interested in is the length of time for an investment to pay for itself in energy savings (or cost avoided). The simplest way to calculate this is the **simple payback method**. Divide the installed cost of the improvement by the annual energy savings; the result is the payback period, in years:

$$\frac{\text{Cost of 8 Occupancy Sensors (installed)}}{\text{Annual Energy Savings}} = \frac{\$480}{\$240} = 2 \text{ Years}$$

If the payback period is long, or if you want to see if a particular energy conservation project would yield as high a return as some other investment, you may want to do a more comprehensive **life cycle/rate of return analysis**. Here is what you need to know:

- Annual savings (first year)—make this *conservative*
- Cost of improvement (including likely maintenance and replacement costs over its useful life)
- The ratio of the cost to the savings (how many times greater the cost is than the savings)—for example, a $600 investment that saves $100 a year is 6:1, or 6x (the cost is 6 times the savings)
- How long the improvement will last—make this *conservative*
- What you will assume to be future energy price increases per year
- What interest rate you must pay if you borrow, or what rate-of-return you want if you use your own capital

Life Cycle/Rate of Return Analysis Sample	
Annual savings	$100
Cost of improvement	$600
Ratio of cost to savings	600/100 = 6x
Improvement will last	10 years
Estimate of energy price increase	? % per year
My interest rate or rate-of-return	10%

Then the calculation is easy. Using the table below, find "6x" in the left-hand column and read across to the "10%" column. You can see that the payback period is over 9 years.

PAYBACK PERIODS
(if you assume energy prices will not change)

If the cost of the improvement is _____ times the first year savings:	Payback period in years, if you borrow at, or want a rate-of-return on your investment of:							
	6%	8%	10%	12%	14%	16%	18%	20%
1x	1.06	1.08	1.11	1.13	1.15	1.17	1.20	1.22
2x	2.19	2.27	2.34	2.42	2.51	2.60	2.70	2.80
3x	3.14	3.57	3.74	3.94	4.16	4.41	4.69	5.03
4x	4.71	5.01	5.36	5.77	6.27	6.88	7.69	8.83
5x	6.12	6.64	7.27	8.09	9.19	10.84	13.91	*never*
6x	7.66	8.50	9.61	11.23	3.99	21.89	*never*	
7x	9.35	10.67	2.63	16.17	29.86	*never*		
8x	11.22	13.27	16.89	29.86	*never*			
9x	13.33	16.54	24.18	*never*				
10x	15.73	20.91	*never*					
11x	18.51	27.55						
12x	21.85	41.82						
13x	25.99	*never*						
14x	31.45							
15x	39.52							
16x	55.24	*Never indicates that annual interest charges are equal to or exceed energy savings/costs avoided.						
17x	*never*							

Your Conclusion: The investment is probably a risky one, since the life of the improvement is only 10 years.

Easy Conservation Tips

Office Equipment

- Turn off PCs, monitors, printers, copiers, and lights every night and every weekend. If you can't turn off the whole computer, turn off the monitor and the printer.
- When purchasing PCs, monitors, printers, copiers and fax machines, consider ENERGY STAR® models that "power down" after a user-specified period of inactivity.
- If appropriate, use laptop computers—they consume 90% less energy than standard desktop computers.
- If appropriate, use ink-jet printers—they consume 90% less energy than laser printers.
- Implement paper-reducing strategies, such as double-sided printing and reusing paper.
- Use e-mail instead of sending memos and faxing documents.
- Purchase appropriately sized copiers for your company's needs.

Lighting

- Retrofit T12 lights that use magnetic ballasts with T8 lights that use electronic ballasts.
- Retrofit incandescent light bulbs with compact fluorescent lights.
- Consider removing excess fluorescent lights and installing reflectors.
- Install motion detectors to control lighting in frequently unoccupied areas, such as restrooms and copy rooms.
- Retrofit incandescent or fluorescent exit signs with long-lasting, low-energy LED exit signs.
- Clean dusty diffusers and lamps every 6–12 months for improved lumen output.
- Rewire restroom fans to operate with the lights.
- Remember that dark walls require more power to produce the same amount of light.

HVAC

- Consider replacing old HVAC systems with new energy-efficient systems.
- Install time clocks or setback-programmable thermostats to maximize efficiency.
- Check accuracy of thermostat setting and have it calibrated if in error.
- Install locking covers on your thermostats to prevent employee tampering with temperature settings.
- Perform scheduled maintenance on units including cleaning condenser coils, replacing air filters regularly, and checking ducts and pipe insulation for damage.
- Clean condenser coils and replace filters regularly.
- Install ceiling fans, blinds, or solar screen shades to cool the office.
- Install reflective window film or awnings on all south-facing windows.
- Close shades or blinds during early morning and late evening to reduce solar insulation heat gain.
- Consider installing an air conditioning economizer to bring in outside air when cool outside.
- For optimal energy savings, set thermostats at 78°F for cooling in the summer and 68°F for heating in the winter.
- Install ceiling and wall insulation.
- Insulate water heaters and supply pipes.

Refrigeration

- Perform scheduled maintenance on units.
- Keep evaporator coils clean and free of ice build-up.
- Adjust door latches and replace worn door gaskets.
- Use night covers on display cases.
- Disconnect anti-condensation heaters.
- Keep refrigerators full (jugs of water make good fillers).
- Install auto door-closers and strip curtains on walk-in freezers or coolers.

Food service equipment

- Purchase insulated cooking equipment whenever possible (e.g., fryers, ovens, coffee machines). Insulation maintains more heat in the equipment and transmits less to the environment.
- Preheat cooking equipment no longer and at no higher setting than the manufacturer's recommendation.
- Use cooking equipment to capacity. Fully loaded equipment uses energy more efficiently.
- Turn off backup fryers during low-production periods.
- Filter fryer oil at least once a day to extend the oil life.
- Don't overload fryer baskets beyond recommended capacity. Overloading increases cooking time.
- Where applicable, replace broilers with grooved or smooth griddles to significantly reduce the associated energy consumption.
- Turn ovens down or off during low-production periods.
- Make sure oven doors fit tightly and gaskets are in good condition.

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Lighting Efficiency

Replace bulbs even before they burn out

If your fluorescent bulbs are used very infrequently, it may not pay to replace them with new energy-efficient bulbs. But, wherever lights are frequently used, you can usually justify installing new bulbs and throwing the old tubes out, even if they still work! So much energy may be saved that its value will soon offset the cost of the new bulbs. This is true even if your present standard bulbs are relatively new—since the life of a fluorescent is as much as 20,000 hours. At this rate, it might take you 10 years to wear out a recently installed standard fluorescent, during which time you would use extra electricity, worth considerably more than the cost of a replacement bulb.

Consider "group relamping"

Whether or not you have installed more efficient bulbs, you will be interested in a practice that is becoming quite common among building owners and tenants with a large number of ceiling lights: group relamping, or replacing all bulbs in all areas that are near the end of their useful life. When done efficiently, you can cut replacement labor costs in half by going from fixture to nearby fixture. In addition, it can assure proper light levels as fluorescents tend to dim as they age. It will also help prevent unwanted interruptions in work or some other activity when individual bulbs burn out at random.

Why it pays to replace bulbs that still work

This example uses 4-foot fluorescent bulbs; the same sort of analysis works for any bulb replaced with a more efficient one.

Old bulb	New bulb
40 watts	**34 watts**
x 8 hours/day	x 8 hours/day
320 watt-hours/day (0.32 kWh/day)	272 watt-hours/day (0.27 kWh/day)
0.32 kWh/day	0.27 kWh/day
x 260 days/year	x 260 days/year
83.2 kWh/year	70.2 kWh/year
x 5 years	x 5 years
416 kWh	**351 kWh**

416 kWh - 351 kWh = 65 kWh SAVED over 5 years

Install more efficient ballasts

The ballast is an integral, energy-consuming part of a fluorescent or HID (high intensity discharge) fixture. It provides proper starting and running voltage and current for the bulbs. A ballast draws power whether the fixture is switched on or off. It is an important determinant of the energy efficiency of the entire lighting system.

Magnetic Ballasts

Current federal standards require that magnetic ballasts meet specific levels of efficiency for use in 4-foot and 8-foot fluorescent fixtures. Any replacement you're likely to purchase will have met these standards. Ballasts that meet these standards have a certification label with an encircled "E" for efficiency, like this:

Electronic Ballasts

Federal standards only establish a minimum acceptable ballast efficiency level. For the highest efficiency, you may buy an electronic ballast that uses less power than a magnetic one and can operate all the common types of fluorescent tubes. This type of ballast reduces both flicker and waste heat generated. Dimming ballasts are also now available in electronic versions.

Savings Tables You Can Use

Save by substituting lower-wattage bulbs

Your electricity cost per kWh:	ANNUAL ELECTRICITY SAVINGS* If each replacement bulb saves:					Calculate your savings:
	6w	8w	20w	40w	75w	
5¢	$ .62	$ .83	$ 2.08	$ 4.16	$ 7.80	_____ Number of lower wattage bulbs
7¢	.87	1.16	2.91	5.82	10.92	x $ _____ Energy dollar savings for each (From table at left)
9¢	1.12	1.50	3.74	7.49	14.04	= $ _____ Your energy dollar savings per year
	*Assumes lights are used 2,080 hours/year (8 hours/day, 5 days/year, 52 weeks/year)					

Save by removing bulbs

Your electricity cost per kWh:	ANNUAL ELECTRICITY SAVINGS* For each bulb removed:					Calculate your savings:
	Fluorescent** 40w	75w	110w	Incandescent 60w	150w	
5¢	$4.16	$ 7.80	$11.44	$6.24	$15.60	_____ Number of bulbs removed
7¢	5.82	10.92	16.02	8.74	21.84	x $ _____ Energy dollar savings for each (From table at left)
9¢	7.49	14.04	20.59	11.23	28.08	= $ _____ Your energy dollar savings per year
	* Includes electricity, but not cost of replacement bulbs. Assumes lights are used 2,080 hours/year (8 hours/day, 5 days/year, 52 weeks/year) **Additional savings will result if ballast is disconnected, too. See table below.					

Save by disconnecting ballasts

Your electricity cost per kWh:	ANNUAL ELECTRICITY SAVINGS* For each ballast disconnected when fluorescent bulbs are removed:		Calculate your savings:
	6.5w ballast for 2 40w bulbs	12.5w ballast for 2 75w bulbs**	
5¢	$ .68	$ 1.30	_____ Number of ballasts disconnected
7¢	.95	1.82	x $ _____ Energy dollar savings for each (From table at left)
9¢	1.22	2.34	= $ _____ Your energy dollar savings per year
	*Assumes lights are used 2,080 hours/year (8 hours/day, 5 days/year, 52 weeks/year). **In some eight-foot fixtures, the ballast disconnects automatically.		

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NOTES

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