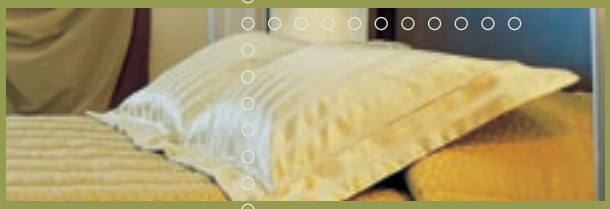
Energy Innovators Initiative
Hospitality Sector

Saving Energy Dollars
in Hotels, Motels and Restaurants





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In This Guide

Throughout this guide, we list Web sites that offer useful energy efficiency information for hotels, motels and restaurants. Just look for the ☝ symbol. All Web addresses are in bold.

Although some of these sites sell goods or services, Natural Resources Canada (NRCan) does not endorse one company over another. We identify these Web sites solely for the informative content they provide.

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Please note: Facts and figures in this document are drawn from a number of sources. All financial payback figures are approximate estimates based on real examples, and may not be true for your facility size or area of the country.

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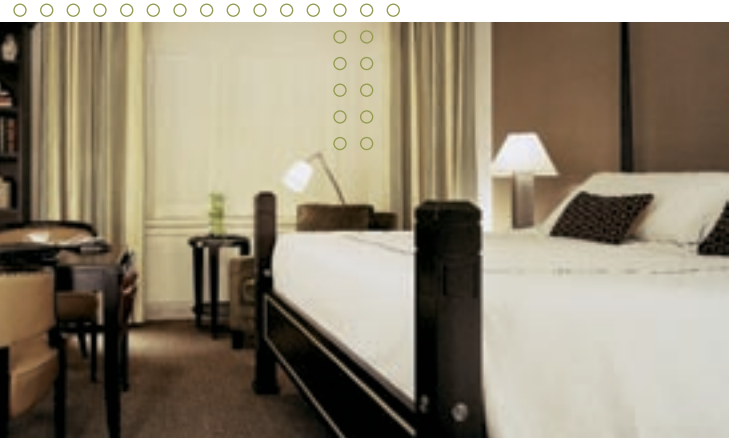
Saving Energy Dollars:

Hotel, Motel and Restaurant Energy Statistics

Between 1990 and 2000, the average annual energy cost of Canadian hotel guest rooms rose by over $500. Restaurants saw similar trends where costs increased by over $35 per square metre ($m^2$) during that period.

Among commercial and institutional sectors, hospitality ranks as one of the most energy intensive with correspondingly high energy costs. Hotels, motels and restaurants account for approximately 1.1 percent of the total end-use energy consumed in Canada with approximately $1.5 billion in energy bills, 84 million gigajoules (233 million equivalent kilowatt hours) of energy consumption and 5 million tonnes of greenhouse gas (GHG) emissions each year.



Getting Started

Among all your operating costs, energy utilities are one of the most controllable. Through energy-efficient equipment and practices, even new facilities can achieve savings of 20 percent or more. This degree of cost cutting can improve your bottom line, increase profits and put your facility in a more price-competitive position – allowing you to concentrate on guest occupancy and traffic.

In addition to the advantage of utility savings, energy efficiency measures can

- improve guest comfort and satisfaction levels;
- add to the aesthetic appeal of your facility;
- reduce maintenance costs and system failures;
- increase equipment life and building value; and
- enhance corporate citizenship – building retrofits and other energy efficiency measures help reduce GHG emissions that contribute to climate change.

This guide is written for hospitality managers and is meant as an introduction to energy efficiency. It will help expand your knowledge so you can successfully work with engineers, energy consultants and other contractors to develop and implement an Energy Management Plan (see the ☝ box on Energy Management Plans and, in *Step 3: Determine Where You Use Energy*, the box entitled You Cannot Manage What You Do Not Measure).

On the following pages, you can learn the basics of how to

- calculate your facility's current energy use;
- compare your operation with others in Canada;
- adopt measures that could lead to both cost and energy savings; and
- calculate those potential savings.

The guide also includes a number of low- and no-cost *Energy Tips* compiled specifically for the hospitality industry.

Whether you run a five-star hotel or a small café, this information should give you ideas on how to save energy dollars in your organization.

A Change in Thinking: Steps in the Right Direction

In most cases, a successful energy efficiency program will require your facility to make some basic changes in the way you use technology, in the way staff acts and in the way you set internal policies or procedures. These changes need not be drastic or costly, and in fact, even minor improvements can often result in savings. What is most important to remember is that none of these changes alone will deliver substantial savings. The greatest benefits of an energy efficiency program will be realized only when you have senior management support and implement the following changes concurrently throughout your entire operation.

Technological Change Lighting, motor, HVAC (heating, ventilating and air conditioning), domestic-water, energy-control and building-envelope technologies are constantly improving and becoming more efficient.

Behavioural Change Guests and employees use energy, and their habits have a tremendous effect on whether or not it gets used wisely. There are opportunities to save energy dollars by influencing behaviours, improving knowledge and skills – and offering rewards.

Organizational Change Policies and procedures can help drive down utility costs, and support from senior management is crucial. Set up an energy committee, include energy-reduction goals in job-accountability forms, present cost-reduction progress reports in staff meetings and regularly track utility costs through a bill-monitoring program in your accounting department.

Employees: Your Energy Efficiency Ambassadors

Although energy-efficient equipment and energy-saving measures contribute to lower costs, it is important to remember that equipment is used and measures are implemented by *people*. While you can suggest environmentally-conscious actions to your guests, you have a greater influence over those who work for you.

If employees are to consider themselves a part of an *energy-efficient organization*, they need clear and factual information to help improve their understanding. Familiarize your team with your facility's heating, lighting and ventilation systems. Make sure they know the location of major pieces of energy-consuming equipment. Tell staff in advance about any new initiatives and retrofits. The better informed employees are, the more qualified they will be to act as effective energy efficiency ambassadors to your guests.

Encourage your employees to participate in an energy efficiency campaign by asking for their input, establishing clear and realizable goals, and agreeing on responsibilities. Acting without consultation will discourage their participation.

Employees are your eyes and ears. In their front-line roles, they are ideally positioned not only to identify drafts, leaks, unnecessary lighting and other signs of energy waste in your facility, but also to provide energy efficiency advice. Listening to staff input could help you save even more money.

Remember to report results. Let employees know when their efforts have contributed to energy savings that benefit the company and the environment. Show them *what's in it for them* with incentive and recognition programs – paid directly out of the energy savings.

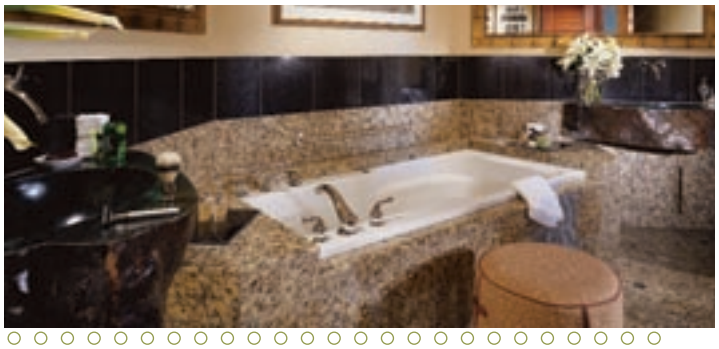
Check out the *Energy Tips* section of this guide for other staff-related hints.

Training and Awareness

Staff training and awareness can cut your energy costs – often from 2 to 10 percent – in addition to other energy efficiency measures.

Consider specialized training for engineering and maintenance staff. Courses in building systems and energy efficiency will enable technical staff to modify operations and increase efficiencies. Non-technical staff will benefit greatly from in-house seminars, staff meetings and demonstrations that target energy efficiency in your facility. Internal communication programs can employ a variety of tools – including posters, flyers and newsletters – to create awareness of energy efficiency and its relation to saving money and the environment.

Communicate your energy concerns and achievements to guests as well. As their awareness of energy efficiency and the environment increases, so do their expectations of you as their host. You could post friendly reminders about turning off lights or provide information on how a recent energy retrofit is helping the environment and keeping prices low. Some hotel guests are happy to have the choice to use the same towels and linens for the duration of their visits rather than incur the environmental costs of laundering them each day. You might even show them techniques they can use at home. Remember: you can increase guest satisfaction and loyalty by showing that you care about energy efficiency and climate change.



Energy and Climate Change

Energy efficiency helps protect the environment by reducing GHG emissions that contribute to climate change. The more energy we produce and fuels we burn, the more we release carbon dioxide, methane, nitrous oxide and other harmful gases into the atmosphere – gases that add to the global-warming potential.

GHG emissions calculations differ across the country due to the different methods of electrical generation and types of fuel.

Learn more about these environmental and energy issues at **www.climatechange.gc.ca**.

The Energy Management Matrix

At the end of this guide you will find an energy management matrix. Each column pertains to a key aspect of organizational energy management, and the five rows indicate levels of achievement. Follow these steps to determine your organization's current energy management rating and to track your progress over time:

- Photocopy the matrix on pages 46 and 47.
- Complete the matrix by marking an "X" in each square that corresponds most closely with your current energy practices (mark only one "X" per category).
- Join the selected "Xs" to form your profile. Any dips in the profile indicate areas that need the most attention. Aim to climb the matrix in a balanced fashion rather than committing yourself in too many areas at once.
- Ask others in your facility, including engineering and housekeeping staff, to complete clean copies of the matrix. Their individual perspectives will ensure a more detailed view of your operation.
- Conduct this exercise once a year to help gauge your progress.

Energy Management Plans (EMPs) are tools that help organizations initiate, monitor and track energy savings. These plans focus on activities that will lead to real, measurable results that will save you money. EMPs also offer guidance as you seek commitments from staff and key decision-makers. You can view a sample plan at the Energy Innovators Initiative (EII) Web site at **oee.nrcan.gc.ca/eii/tools.cfm**.

NRCan offers one-day workshops across the country on developing energy management plans and related topics through **Dollars to $ense** at **oee.nrcan.gc.ca/workshops**.

Seneca College's **Building Environmental Systems** diploma course is available across the country through distance learning. Find out more at **www.senecac.on.ca/bes**.

View EMPs from other organizations at the Web site for **Canada's Climate Change Voluntary Challenge and Registry Inc.** (VCR Inc.) at **www.vcr-mvr.ca**.

Step 1:
Calculate Your Energy Costs and Consumption

To prepare an energy management plan, you must first know the types and amounts of energy your facility uses. The chart on page 9 will help you and, since your energy consumption is measured in a number of different ways, it will also convert your consumption to a common figure – gigajoules (see *What Is a GJ?* below). The results will help you compare your facility against others in Canada in *Step 2*.

Use your records from any recent 12-month period (last 12 months, calendar year or fiscal year). If you or your accounting department do not have the necessary energy information, most utilities retain customer data for at least 12 months. To create a *baseline* from which you can track your progress, fill out the chart every year and compare it against these initial numbers.

For a more detailed analysis, consider hiring an energy consultant to conduct an energy audit of your facility (see *You Cannot Manage What You Do Not Measure* in *Step 3*). A GJ calculator can be found at **oee.nrcan.gc.ca/eii/tools.cfm**.

What Is a GJ?

A gigajoule (GJ) is the equivalent to 1 billion joules. A joule is a measure of the energy required to send an electrical current of one ampere through a resistance of one ohm for one second. One GJ is equal to 277.8 kilowatt hours (kWh), 1.055 million British thermal units (Btu) or 0.17 barrels of oil. Burning 1 million wooden matches completely at one time releases one gigajoule of energy. One GJ of electricity could make 1000 pots of coffee or keep a 60-watt light bulb continuously lit for six months.

A GJ can measure energy from various types of power, such as electricity, natural gas and oil. Similar to *equivalent kilowatt hours*, the GJ provides a standard measurement that lets you calculate a single energy-intensity figure – a number you can then use to compare with those of other facilities.

To convert from kWh to GJ, multiply by 0.0036. To convert GJ to kWh, multiply by 277.8. There is a GJ calculator at oee.nrcan.gc.ca/eii/tools.cfm.

Source	Annual Cost	Annual Consumption With Conversion Factor			Annual Consumption (gigajoules)	
Electricity*	$ _____	_____	kWh × 0.0036	=	_____	GJ/yr
Oil No. 2 (light)	$ _____	_____	L × 0.0387	=	_____	GJ/yr
Propane	$ _____	_____	L × 0.0266	=	_____	GJ/yr
Natural Gas**	$ _____	_____	m^3 × 0.0372	=	_____	GJ/yr
Steam	$ _____	_____	kg × 0.0023	=	_____	GJ/yr
Other	$ _____	_____		=	_____	GJ/yr
Total	$ _____				_____	**GJ/yr**

Annual Energy Intensity by Room

Total cost ÷ _____ rooms = $ _____ **per room/yr**

Total GJ/yr ÷ _____ rooms = _____ **GJ/room/yr**

Annual Energy Intensity by Floor Area***

Total cost ÷ _____ m^2 = $ _____ **per m^2/yr**

Total GJ/yr ÷ _____ rooms = _____ **GJ/m^2/yr**

* Electricity prices are blended costs that include demand charges (kW or kV·A) and other service charges billed by electrical utilities above the regular cost per unit (kWh).

** Some utilities bill in GJ, no conversion required.

*** To convert sq. ft. to m^2, divide your total floor area in sq. ft. by 10.76.

Calculations Example

Here are the calculations for a 175-room hotel that has 12 000 m^2 of serviceable floor area, including a restaurant and a swimming pool. The facility uses 2 500 000 kWh of electricity (at $0.07 per kWh, including demand charges) and 450 000 m^3 of natural gas (at $0.26 per m^3) every 12 months.

Source	Annual Cost	Annual Consumption With Conversion Factor	Annual Consumption (gigajoules)
Electricity	$175,000	2 500 000 kWh × 0.0036	= 9 000 GJ/yr
Natural Gas	$117,000	450 000 m^3 × 0.0372	= 16 740 GJ/yr
Total	**$292,000**		= **25 740 GJ/yr**

Annual Energy Intensity by Room

$292,000 ÷ 175 rooms = **$1,668.57 per room/yr**

25 740 GJ/yr ÷ 175 rooms = **147.1 GJ/room/yr**

Annual Energy Intensity by Floor Area

$292,000 ÷ 12 000 m^2 = **$24.33 per m^2/yr**

25 740 GJ/yr ÷ 12 000 m^2 = **2.1 GJ/m^2/yr**

How to Read Your Energy Bill

Energy consumption charges reflect the *amount of energy you consume*. This is usually charged in dollars per kilowatt hour (kWh) for electricity or dollars per cubic metre (m^3) for natural gas. Propane and fuel oil are usually sold on a per-litre basis. These calculations are different across the country and could also be influenced by other factors – such as time of year, size of facility, amount of consumption and customer discounts – depending on the policies and rate structures of your local utilities.

Demand charges reflect *the rate at which energy is used*. This is often listed in the electricity bills of large energy users as a cost per kilowatt (kW) or kilovolt ampere (kV·A). Utilities must be able to supply customers at all times based on peak usage. A 20-minute spike in your electricity consumption could result in a correspondingly high charge for the entire month. This demonstrates the need to reduce energy in your peak times during the day and assign energy-intensive activities to the middle of the night when possible.

Another major consideration is **power factor** (pf), which measures how effectively your equipment converts electricity to useful power. Power factor is expressed as a percentage or decimal (90 percent or 0.9), which equals real power (the amount you use in kW) divided by the total power supplied to you (in kV·A). Ideally, your pf should be as close to 1.0 as possible since some utilities charge penalties when users fail to maintain power factors of 0.9 or greater. These lower percentages are sometimes referred to as *poor* or *low power factors*. The key to avoiding penalty charges is to control *reactive power*, which is the difference between the power supplied to you and the power you use, measured in kilovar hours (kVarh). Reactive power performs no useful work, but must be supplied to your facility to generate magnetic fields used in motors, transformers and lighting ballasts. One way to correct pf is to install pf correction capacitors, described in the *Motors and Drives* section.

Other bill items can include transportation or supply charges (usually the cost of producing energy or bringing a fuel like natural gas to your province or territory), distribution or delivery charges (usually the cost of bringing this source of energy to your facility) and basic monthly or service charges. It is your company's money, so ask your utility or check its Web site if you are not completely sure about all the items on your bill.

Talk to a business representative from your utility to see if you qualify for any discounts.

To simplify calculations in this guide, energy rates are averaged at the following:

- **$0.07 per kWh** or **$20 per GJ** for electricity (including demand and other charges); and
- **$0.26 per m^3** or **$7 per GJ** for natural gas (including all charges).



Step 2:

Compare With Other Facilities

Benchmarking is the practice of comparing your operation's energy consumption with that of similar facilities. Factors such as the building age and the number of "degree-days" in your region (a measurement of the energy required to heat or cool your facility to maintain a comfortable temperature) may differ. However, if you compare these figures with your calculations from *Step 1*, you should get a good idea of your energy performance.

Please note: Full-service hotels may have higher energy costs due to the energy-intensive nature of additional facilities such as restaurants and pools. Similarly, fast-food restaurants generally have higher energy costs than traditional restaurants because of larger meal numbers, different equipment types, higher lighting intensities and longer operating hours.

We can use the table on page 13 to compare the hotel example described in *Step 1* – a full-service, 12 000-m^2 facility that includes a restaurant, pool and 175 rooms. Its energy use was calculated at 2.1 GJ/m^2 per year or 147.1 GJ per room per year. The table shows that our example hotel is within the typical annual energy-consumption range, but is a slightly higher-than-average consumer of energy compared with similar hotels.

Typical energy costs in the hotel industry range from \$15/m^2 to \$50/m^2. For restaurants, the range is \$50/m^2 to \$275/m^2. Although it may be tempting to measure energy performance in dollars, utility prices can vary from day to day, and those used to calculate the national averages in the tables on page 13 likely differ from prices in your area. So while it is wise to track energy prices closely, the performance measure that truly responds to changes in technology, behaviour and procedures is consumption. When benchmarking, gigajoules – not dollars – really count.

Hotels and Motels	Typical Annual Energy-Consumption Range*	Average Annual Energy Intensity*
Basic Accommodations (without restaurant or pool)	40 to 100 GJ per room 0.7 to 1.8 GJ/m^2	55 GJ per room 1 GJ/m^2
Full-Service Facilities (with restaurant and pool)	100 to 200 GJ per room 1.4 to 3.6 GJ/m^2	130 GJ per room 2 GJ/m^2

CIBEUS Gross Annual Average Energy Intensities Results for Hotels and Motels**

Region	Gross Average Annual Energy Intensity (GJ/m^2)
the Atlantic provinces	0.9
Quebec	1.4
Ontario	1.8
the Prairies	1.6
British Columbia	1.7

Year Built	Gross Average Annual Energy Intensity (GJ/m^2)
1990–99	1.3
1980–89	1.2
1960–79	1.7
1920–59	1.5
Before 1920	1.7

Gross Floor Space (m^2)	Gross Average Annual Energy Intensity (GJ/m^2)
90–459	0.7
460–929	1.9
930–4644	1.2
4645–9289	1.1
9290$^+$	1.8

Restaurants	Typical Annual Energy-Consumption Range*	Average Annual Energy Intensity*
Fast Food	5 to 12 GJ/m^2	7 GJ/m^2
Full Service	3 to 10 GJ/m^2	5 GJ/m^2
All Restaurants	**3 to 10 GJ/m^2**	**6 GJ/m^2**

* Benchmarking figures from Roche ltée based on various sources.

** The *Commercial and Institutional Building Energy Use Survey* (CIBEUS) was completed in 2002 and was the first national energy survey in these sectors. More information is available at **oee.nrcan.gc.ca/neud**. Gross average annual energy intensity is determined by dividing the sector's total energy use (GJ) by its total area (m^2).

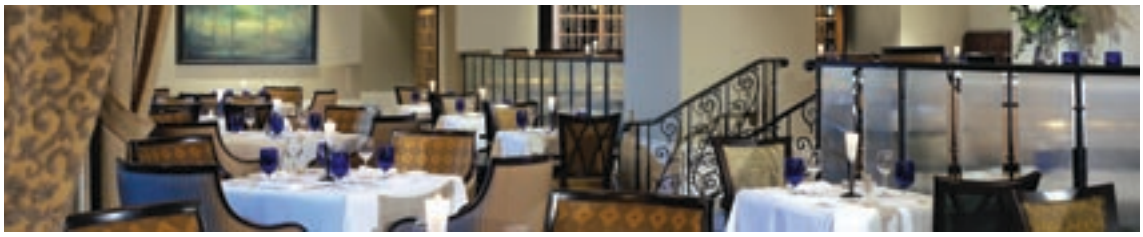
Real Examples

The following data describe a range of facilities across Canada. All are members of the Energy Innovators Initiative, a program within NRCan's OEE (see *Take the Next Step: Join Us*).

Best Western Charlottetown

Owned and managed by CHIP Hospitality.

Built:	1961 (retrofit: 1988)	
Area:	8785 m^2 (146 rooms)	
Energy types:	Electricity, oil, propane	
Annual energy costs and consumption:	$170,642	11 800 GJ
Energy intensity per room:	$1,168.78	80.8 GJ
Energy intensity per square metre:	$19.42	1.3 GJ



Quality Inn and Conference Centre Grande Prairie

Also owned and managed by CHIP Hospitality.

Built:	1979 (no retrofits)	
Area:	10 358 m^2 (102 rooms)	
Energy types:	Electricity, gas	
Annual energy costs and consumption:	$236,010	23 357 GJ
Energy intensity per room:	$2,313.82	229 GJ
Energy intensity per square metre:	$22.78	2.3 GJ

Fairmont Château Laurier

Located in Ottawa and a winner of the
2002 Energy Innovators Achievement Award.

Built:	1912 (retrofit: 1998)	
Area:	61 300 m^2 (429 rooms)	
Energy types:	Electricity, gas	
Annual energy costs and consumption:	$1.1 million	90 832 GJ
Energy intensity per room:	$2,564.10	211.73 GJ
Energy intensity per square metre:	$17.94	1.48 GJ

Harvey's/Swiss Chalet

Figures for 12 franchises owned by Famz Foods in Sarnia, Ontario.

Retrofit:	2002	
Area (12 facilities):	7200 m^2	(average 600 m^2)
Energy types:	Electricity, gas	
Annual energy costs and consumption:	$665,175	55 770 GJ
Energy intensity per square metre:	$92.39	7.7 GJ

These Web sites will help you compare your hotel with facilities in other countries:

Hotel Benchmarking Web at www.benchmarkhotel.com

Environmental Protection Agency Benchmarking Tool for Hotels at 208.254.22.6/index.cfm?c=business.bus_index

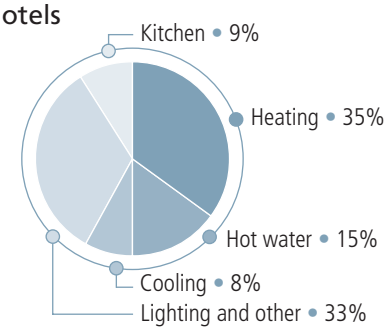
Step 3:
Determine Where You Use Energy

Before you can reduce consumption, you must determine how you are currently using energy. With this knowledge, you can identify areas in which you have the greatest opportunity to save.

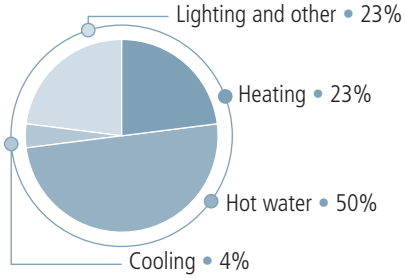
If you run a hotel, your major energy expenditures will include lighting for guest rooms and common areas, HVAC (heating, ventilating and air conditioning) and motors in equipment such as elevators. Energy use in restaurants, on the other hand, is concentrated in kitchen areas, although lighting consumption is also a major factor in fast-food restaurants. This guide presents more details on the sources of energy consumption and the retrofits that can decrease your consumption in *Step 4: Invest in Energy Efficiency Retrofits*.

Without conducting an energy audit, it is difficult to calculate exact energy-use statistics, but the following charts can help since they show typical energy-use breakdowns.*

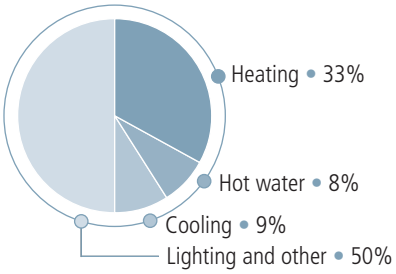
Hotels



Full-Service Restaurants



Fast-Food Restaurants



*Typical energy-use breakdown figures from Roche Itée based on various sources.



You Cannot Manage What You Do Not Measure

An audit by an energy professional can help you determine amounts and types of energy consumed in your facilities, as well as feasible retrofit options. Audits provide the data needed to prepare an **Energy Management Plan** for your organization (see the box on page 7). Consult with an energy professional to determine the audit type that best suits your facility and budget.

- **Preliminary audits** are basic inspections in which utility and facility data are gathered and analysed. These audits establish baselines and define a building's average energy consumption.
- **Walk-through audits** involve a review of a facility's energy-use profiles, as well as overall assessments of energy-consuming systems.
- **Energy audits/feasibility studies** are the most complex audits – providing detailed analyses of facility energy-use profiles, as well as exhaustive descriptions of building systems and their operations and levels of performance. These audits can help you fully understand your facility's energy consumption, including the potential to deliver energy management savings.

Detailed descriptions can be found in the publication ***Federal Buildings Initiative – Audit Standards Guidelines*** located at **oee.nrcan.gc.ca/publications**.

Step 4:

Invest in Energy Efficiency Retrofits

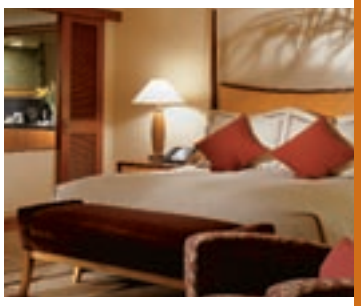
Cherry Picking Versus Multiple Measures

Retrofits will not only save energy dollars, but also increase your building's value if you ever decide to sell your property. When conducting retrofits, there is a temptation to tackle each measure – one at a time – favouring those with the shortest paybacks. In energy management circles, this practice is known as *cherry picking*. Once all short-payback retrofits have been completed, you are left facing a number of long-payback measures that will become increasingly difficult to justify. The wise approach is to bundle multiple short- and long-payback measures. You will be more likely to complete all retrofits sooner, and you will be able to subsidize long-payback projects with savings you realize through fast-recouping capital improvements. See *Step 5: Calculate Your Savings* for definitions of simple and incremental paybacks.

The OEE offers a range of documents that provide additional or more complex technical information on specific energy efficiency measures:

Buildings and Industry Publications Catalogue
Technical Fact Sheets
Energy Management Series
CADDET Analyses Series Reports (international)

These and other documents can be ordered through the EII's Publications Web site at **oee.nrcan.gc.ca/eii/publications.cfm** or the OEE Energy Publications Web site at **oee.nrcan.gc.ca/publications**.



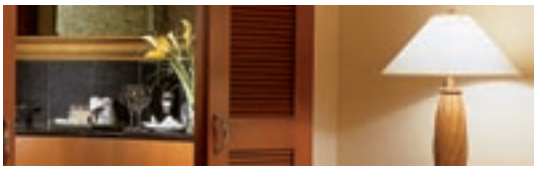
Capital investments in equipment are almost sure to save you energy and money. In fact, energy retrofits can reduce your costs and consumption by an average of 20 percent or more. In addition to cost savings, these measures can add to your facility's aesthetics and increase comfort levels so guests are encouraged to visit again, which translates into additional dollar savings that you can invest in your facility.

This section highlights some possible investments you may want to consider as you work to improve the energy efficiency of your hotel, motel or restaurant. Later in this guide, you will find a number of low- and no-cost *Energy Tips* for saving energy and money.

Energy Savings From Retrofits

System	Estimated Energy Savings*	Approximate Payback*
Lighting and Electrical	0.06 GJ/m^2	4 years
Motors	0.02 GJ/m^2	5 years
HVAC	0.20 GJ/m^2	6 years
Domestic Water	0.09 GJ/m^2	4 years
Controls	0.07 GJ/m^2	5 years
Building Envelope	0.03 GJ/m^2	8 years

* Figures are estimates from projects that have received energy-retrofit financial incentives through the EII.



Lighting

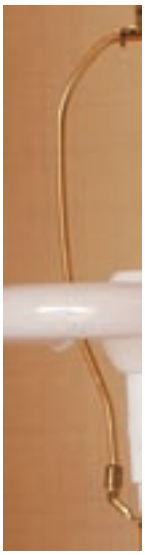
In a hotel or motel, lighting is usually required around the clock to help create an environment in which guests feel comfortable and safe. Lighting must also remain on for long hours in restaurants to create atmosphere and enhance food presentation.

In the 1970s, energy efficiency in the hospitality industry meant removing every second light bulb. Although there are still savings from reducing the number of lights – including switching from four- to two-tube fluorescent fixtures – new lighting technologies generally use less energy without reducing the quality and quantity of light.

- **Exterior lighting** must create a positive impression not only to attract people to your establishment, but also to provide a sense of comfort and security between the parking area and entrance. Use photo-cells to ensure outside lights operate only at night. Metal halide and other high-intensity discharge (HID) lamps last longer than either incandescent or mercury-vapour sources, offer energy savings from 75 to 90 percent and provide the same safe and inviting illumination.

- **Lobbies** set the ambience of your establishment. Lobby lighting also helps highlight artwork and other interior design features. Save up to 50 percent on energy costs by using halogen lights. Some are not only brighter than traditional incandescent bulbs; they also provide a more focused beam and can be aimed for more controlled illumination.
- **Bathrooms** often use incandescent lamps that waste energy or cool-white fluorescent lamps that make guests' skin tones appear washed out. Higher-quality fluorescent lamps reflect truer flesh tones and bring out the colours in the décor while saving energy.

- **Guest rooms** require a degree of lighting that ensures comfort for a number of tasks, including reading, relaxing, entertaining and watching television. One of the most common complaints about hotel rooms is poor lighting. Traditional incandescent bulbs generate heat and, as a result, increase cooling loads that waste even more energy. Compact fluorescents, on the other hand, usually fit in traditional fixtures and offer the similar amount of light while using up to 75 percent less electricity. Fluorescent and compact fluorescents bulbs have seen significant improvements to their colour-rendering abilities in recent years.
- **Corridor lighting** must often remain on at all times, so energy-efficient fixtures are particularly important. T8 and T5 fluorescent bulbs are as much as 30 percent more efficient than incandescent bulbs. If corridors are too bright, consider switching to low-ballast-factor (LBF) fixtures that use standard bulbs but consume less energy. Many hotels are realizing significant savings by using light-emitting diode (LED), electroluminescent, photoluminescent and light-rope exit signs that have approximate paybacks in less than two years.
- **Ballrooms and conference rooms** require lighting for many occasions – from sales presentations to wedding receptions. Decorative halogen lights are dimmable and offer a similar quality of light as incandescent bulbs. Halogens also produce a bright white light that can add sparkle to crystal, china and chandeliers.



- **Restaurant** lighting varies with the form and function of each establishment, and requirements differ greatly. As fast-food and family restaurants are typically brightly lit, these facilities can realize considerable savings by making the most of available natural light during the day. On the other hand, restaurants and pubs that rely on low-lighting levels to create a relaxing mood or intimate atmosphere can benefit from savings by installing dimmable halogen lights (described on page 20 under "Ballrooms and conference rooms"). Even when set to provide 100 percent illumination for cleaning and off-hour maintenance, these lights will save you as much as 50 percent in energy costs.
- **Kitchens** must be well lit to ensure efficient food preparation, minimize the risk of accidents and encourage thorough housekeeping. T12 fluorescents are currently the most common kitchen-lighting fixtures, but switching to T5s or T8s with electronic ballasts will save you energy and provide short paybacks. Consider also installing timed switches or low-temperature occupancy sensors in walk-in refrigerators and freezers.
- **Back-of-house areas** – such as employee break rooms, storage areas and office space – rarely require light 24 hours a day. Occupancy sensors ensure lights are on only when someone is in a room. With many models priced from $50 to $100, these sensors can reduce energy consumption 15 to 80 percent depending on usage. Replacing fixtures with T5 or T8 compact fluorescents will contribute to even greater energy reductions.

Old System	Old Watts*	New System	New Watts*	Annual Open Hours	Savings (per unit)	Cost (per unit)	Approximate Savings (per unit)	Approximate Payback
Incandescent	100	26-W compact fluorescent	29	8760	622 kWh 2.2 GJ	$25	$44	0.6 years
Incandescent exit signs	50	LED exit signs	4	8760	403 kWh 1.5 GJ	$45	$28	1.6 years
Two T12 34-W fluorescents with magnetic ballasts	81	Two T8 32-W fluorescents with LBF electronic ballasts	51	8760	263 kWh 1.0 GJ (for the pair)	$70 (for the pair)	$18	3.9 years
400-W mercury-vapour security lighting	424	250-W metal halide	285	4380	609 kWh 2.2 GJ	$250	$43	5.8 years

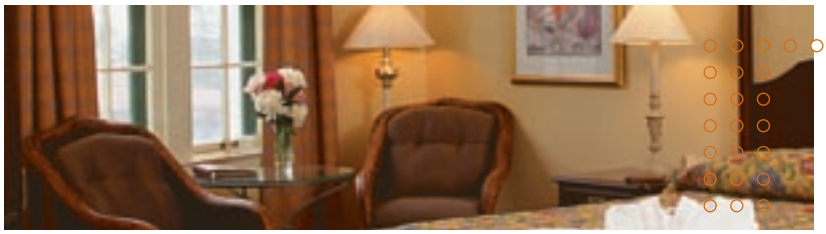
* Ballast energy will increase power draw, so actual wattage – both old and new – may be higher than indicated on the bulb or system.

Assumes electricity costs of $0.07/kWh, including demand and service charges.
Prices are estimated, so actual results may vary. There are 8760 hours in one year.
This chart does not reflect maintenance savings resulting from longer lamp lives.
Refer to *Step 5: Calculate Your Savings* to learn how to determine paybacks.

The Vocabulary of Lighting

Shape and size codes determine the many types and styles of bulbs on the market. For example, a *60A19* refers to a 60-watt *arbitrary* – or standard-shaped – incandescent bulb with a maximum diameter of 2⅜ in. (each unit equals ⅛ in., so 19 × ⅛ = 2⅜ in.). An *F32T8/841–48* is a 48-in.-long 32-watt tubular fluorescent bulb, 1 in. in diameter (8 × ⅛ in.), with a colour rendering index of 80 and a 4100°K colour temperature.

Light output (or luminous flux), measured in **lumens**, is the quantity of light per second. For example, a 100-watt incandescent produces about 1750 lumens compared with a 25-watt fluorescent at about 1550 lumens.



Lux is the amount of light that strikes a surface – such as a wall or floor – and is equivalent to lumens per square metre or 0.093 foot candles. In hotels, lighting levels are typically 300 to 400 lux. In most restaurants, dining areas are as low as 75 lux, but fast-food outlets are often 500 lux or more. Storeroom levels are typically low at 100 to 300 lux. These recommended lighting levels are rising to account for the *aging eyes* of the average Canadian – increasing the need for more energy-efficient lighting.

Efficacy measures the conversion of electrical energy into light in lumens per watt (lm/W). The efficacy of an incandescent bulb is only 10 to 20 lm/W compared with a compact fluorescent at 50 to 65 lm/W, T8 liner lamps at 80 to 100 lm/W, metal halide at 75 to 120 lm/W and a low-pressure sodium light at 120 to 190 lm/W.

Colour rendering index (CRI) is an objective measurement of how well colours can be seen. For example, incandescents have a rating of 97; fluorescents, 52 to 94; and metal halides, 65. Fluorescent and other bulbs can come in a range of colours – from white to pink to yellow – and for aesthetics, you should take care not to mix bulb colours in one area.

Lamp life is an important factor when choosing your lights since costs are incurred both when you buy the bulbs and each time your maintenance staff must change them. Incandescent bulbs have the shortest life at only 2000 hours. Fluorescents, metal halides and other energy-efficient bulbs often last between 10 000 and 30 000 hours. Some bulbs will dim with age, so read the specifications to learn the characteristics before purchasing.

Ballasts are electrical devices that limit the current and control the voltage in fluorescent lamps. Magnetic ballasts are an older technology that often hum and flicker. If produced before 1979, these ballasts may contain harmful polychlorinated biphenyls (PCBs). Electronic ballasts systems are often approximately 30 percent more efficient, eliminate flicker and noise and – unlike magnetic ballasts – can be dimmed for softer illumination and even greater energy savings.

Reflectors have mirror-like or reflective white surfaces that focus light and increase lumen output. By using reflectors, you can generally reduce the total wattage and number of lamps by 25 percent with no decrease in overall light levels.

Dimming controls are useful for providing supplemental illumination in areas where natural light is available during the day. Dimmers also help create an intimate atmosphere or control lighting levels for presentations. Dimming controls can extend lamp life and reduce lighting costs by 35 to 70 percent, with an approximate payback of 3.0 to 7.5 years. For more information, see the *Control Systems* section.

Daylighting refers to the use of natural light in interior and perimeter areas. Windows, skylights and translucent daylighting panels (described in the *Building Envelope* section) can reduce your daytime lighting requirements by over 50 percent. Research suggests that the presence of daylight also helps increase staff productivity and guest-satisfaction levels. Use bright interior colours to maximize the daylighting effect.

These Web sites contain useful lighting information for hotels, motels and restaurants. Many include energy efficiency recommendations for different types of rooms and uses:

Alliance to Save Energy at
www.ase.org/programs/lighting.htm

Berkeley Labs Virtual Lighting Center at
gaia.lbl.gov/vls/

GE Hotels at
www.gelighting.com/na/business/hospitality_solutions.html

GE Restaurants at
www.gelighting.com/na/business/restaurant_solutions.html

Lighting Research Centre at
lighting.lrc.rpi.edu

Philips' bulbs.com at
www.bulbs.com/lightingguide/hotellighting.asp

Motors and Drives

Motors are used to run HVAC systems, elevators and other equipment, and can account for up to 50 percent of your facility's overall energy use. Over a typical 10-year operating life, a motor can consume electricity valued at 50 times the original cost of the equipment. Using this calculation, a $1,000 motor running continuously for a decade could cost you up to $50,000 in electricity.

- **Energy-efficient motors** are good investments. Even if they yield only 2 to 8 percent in energy savings, these motors generally achieve incremental paybacks in 2.5 to 5.0 years compared with buying less-efficient replacement motors.
- **Adjustable-speed drives** (ASDs) – sometimes referred to as **variable-speed drives** (VSDs) and **variable-frequency drives** (VFDs) – regulate motor speeds according to the amount of work required. Reducing motor speed by 10 percent can cut power consumption by 27 percent, and a 20 percent speed reduction can cut consumption by 49 percent. These drives are particularly useful when combined with high-efficiency motors since they tend to run faster than conventional motors. An added benefit is their ability to reduce noise – an important consideration near guest rooms and small meeting rooms. These drives can save on your facility's total energy consumption, but tend to be expensive, with approximate paybacks between two and eight years.

The Vocabulary of Motors

Motors are classified as **AC** (alternating current from outlets), **DC** (direct current, usually from a battery) or **universal** (operating as either AC or DC). A motor's mechanical power is measured in either **kilowatts** or **horsepower** (1 hp = 0.746 kW). The two factors that determine power are **torque** (measured in newton metres or pound feet) and **speed** (measured in revolutions per minute [rpm]). The slower a motor operates, the more torque it must produce to deliver the same amount of power. A motor's **efficiency** is a measure of the energy it delivers (output) relative to the energy it uses (input).

- **Power-factor correction capacitors** are devices that store electrical charges and reduce the consumption of reactive power that motors need to generate magnetic fields. These are important only if you have demand charges on your electricity bills (see *How to Read Your Energy Bill* in *Step 1*).
- **Energy-efficient drive belts** have teeth or longitudinal grooves that improve grip, reduce slippage and are only slightly more expensive than standard V-belts. Ensure that drive-belt inspections are performed every few months as part of regular maintenance, and replace the belts when they wear out.
- **Choose the right motor** for the job. *Oversizing* is the inefficient practice of employing a larger motor than required for a task. This is a particular concern if the motor is loaded under 50 percent.

HVAC

Heating, ventilating and air conditioning (HVAC) account for some of your highest energy expenses, but these systems are also critical to your guests' comfort and satisfaction. If your facility is too cold or too hot, you can expect complaints. HVAC systems also contribute to your facility's air quality, and fresh air is particularly important in enclosed or high-odour areas. For optimum efficiency, ensure that the functions of each HVAC component complement the others – especially when ventilation systems help distribute warm and cold air.

There are many types of HVAC systems, but the majority of hotels and restaurants in Canada use self-contained, packaged systems that combine heating, ventilating and air conditioning. **Rooftop HVAC units (RTUs)** are often used in single-zone, single-storey buildings, such as restaurants. **Incremental HVAC units** or **packaged terminal air conditioners (PTACs)** enable discrete control in each suite and are commonly mounted to outside-facing walls or below windows in guest rooms of small to mid-size hotels and motels. **Fan coil units** are a component of central systems used in mid-sized and larger hotel facilities. In these systems, air is blown over coils that have been heated by **boilers** or cooled by **chillers** in a central plant. Savings can also be realized with the efficient use of cooling towers, **air-to-air heat exchangers, air-handling units** (AHUs), **heat pumps** and other HVAC components.

Common HVAC Measures

- **Pick the right system** when replacing your HVAC unit, usually at the end of its life cycle. In addition to energy efficiency, the size, weight, maintenance costs and noise levels are important considerations.
- **Outdoor air economizers** should be included with air-handling units, so outdoor air can be used for *free cooling* during spring and fall or on cool summer nights when the humidity level is not too high.
- **Smart thermostats** provide preset limits for heating and cooling – overriding unnecessarily high or low settings by guests or staff. These thermostats also feature digital controls and readouts that ensure greater accuracy than the sliding levers on traditional units.
- **Night temperature setbacks** involve the installation of an automatic thermostat that controls the temperature when a restaurant, for example, is closed.
- **Heat recovery ventilators (HRVs)** and **energy recovery ventilators (ERVs)** have balanced exhaust and supply fans that meet all ventilation needs without creating drafts and air-pressure imbalances. HRVs can feature efficiencies as high as 85 to 95 percent, with payback in roughly 3.5 years. Consider these units whenever air is continuously exhausted and make-up or ventilation air is required.
- **Variable-speed drives (VSDs)**, described in the *Motors and Drives* section, can be used with **variable-air-volume (VAV) systems** to adjust fan speeds according to operating requirements at different times of the day. In kitchens, for example, fans can be linked to burners to reduce energy consumption during off-peak cooking periods. Be careful, however, not to cut exhaust to the point that kitchen odours permeate other areas of your facility.
- **Zone isolation** and **demand control ventilation (DCV)** reduce airflow when low carbon-dioxide levels indicate a room is not in use. Implementing these measures may involve the use of variable-frequency drives (see the *Motors and Drives* section) and shut-off dampers, as well as reductions in the amount of outside air used by your HVAC system. Energy is saved not only because air distribution is reduced, but also because less air must be heated or cooled.

- **Removable and re-usable insulation** for pipes, valves and fittings is made of non-combustible materials and can provide paybacks as short as four months. Traditional insulation is often not replaced once it has been removed or damaged during maintenance. This can lead to tremendous heat loss or gain, as well as condensation and safety hazards. Removable and re-usable insulation provides a solution by simplifying both maintenance access and thermal-barrier replacement.
- **Proper maintenance** is critical to any system, since it helps reduce operating costs, extends operating life and avoids costly repairs. This is especially true with cooling towers, which are subject to scale deposits, clogged nozzles, biological growth, poor airflow and poor pump performance. These factors can diminish performance and raise operating costs by 10 to 25 percent. For air-handling units, buying high-quality filters will reduce air-borne dust and contaminants. In new boilers, proper maintenance can deliver savings of up to 20 percent. Look for more maintenance information in the *Energy Tips* section of this guide.

Heating-Specific Measures

- **High-efficiency condensing boilers** will save you a great deal of energy when it is time to replace old boilers. These units can achieve seasonal efficiencies as high as 96 percent (compared with 75 percent for old boilers). Incremental paybacks of two to six years are common compared with purchasing mid-range replacement boilers, but initial costs can be twice as high. For example, the piping distribution and terminal-heating units may need to be redesigned for condensing boilers.
- **Boiler flue gas economizers** are heat exchangers that preheat water using boiler-stack and exhaust gases. With installed costs of approximately $35,000, economizers deliver a 5 to 10 percent increase in efficiency and, in large facilities, paybacks of four to 10 years.
- **Air preheaters** use hot stack gas to preheat fuel and air prior to combustion. These units cost approximately $15,000 and have paybacks in 2.5 to 3.5 years.
- **Boiler combustion** and **oxygen-trim systems** minimize energy loss by reducing the amount of excess air or fuel in a boiler stack. An automated oxygen-trim control system ensures the proper fuel-to-air mixture is maintained. With a typical cost of $10,000 for a 300-horsepower boiler, these units deliver energy reductions of 1 to 5 percent and paybacks of approximately five years.
- **Boiler blowdown heat recovery** uses a heat exchanger to extract thermal energy from hot water that is continuously drained from a boiler. Prices range from $10,000 to $35,000, depending on the amount of steam supplied. Paybacks are approximately 6.5 years.
- **Continuous boiler blowdown monitoring and control systems** reduce the amount of hot water continuously drained from boilers. These systems typically cost $2,500 to $6,000, with approximate paybacks of five years.
- **Automatic vent dampers for boilers** prevent residual heat from being drawn up the warm stacks, reduce the amount of air that passes through furnaces or boiler-heat exchangers and improve comfort conditions during the winter by helping retain humidity in a building.

Cooling-Specific Measures

- **Energy-efficient chillers** have better controls, condensers and compressors than regular units. Their costs, however, may not always yield reasonable paybacks and may not make up for inefficiencies in other parts of air-conditioning systems, such as pumps, cooling towers and controls.
- **Refrigerants** themselves can save you energy. For example, chillers that use an HCFC-123 refrigerant currently have the highest energy efficiencies, at 0.49 kW per ton.
- **Thermal energy storage** (TES) enables you to store cool water for later use as an air coolant. This function is particularly valuable for use at peak demand times during summer days. Approximate payback is 10 years.

The Vocabulary of HVAC

Btu/h, or British thermal units per hour, measure heat produced by boilers and cold produced by chillers. A single unit is the equivalent of 0.000295 kW or 0.000001055 GJ/h (one millionth of a gigajoule per hour).

Boiler hp (horsepower) measures boiler power and is equal to 33 520 Btu/h, 9.8 kW, 15.7 kg/h of steam or 0.0353636 GJ.

Boiler efficiency is calculated according to the formula: output energy divided by input energy multiplied by 100. Calculations are affected by factors such as thermal efficiency and fuel-to-steam efficiency.

Chiller efficiency measures power input per ton of cooling produced by larger chillers. A lower number indicates higher efficiency. The unit of measurement is kW/ton, in which ton is the amount of cooling produced when one imperial ton of ice melts. One ton equals 12 000 Btu/h or 3.516 thermal kW.

Energy efficiency ratio (EER) measures the performance of smaller chillers and rooftop units (as opposed to the kW/ton, which is used to measure the power of larger chillers). EER is calculated by dividing the cooling capacity in Btu/h by a chiller's power input in watts. The higher the EER, the more efficient the unit. Standard heat-pump units often have EER values of 8.9, where higher-efficiency units may reach 10.

Coefficient of performance (COP) is energy output divided by energy input. The higher the COP, the more efficient the chiller or heat pump.

Seasonal energy efficiency ratio (SEER) applies to rooftop units with cooling capacities less than five tons. SEER is a seasonally adjusted rating based on representative residential loads.

Water

Domestic Hot Water

Domestic hot water (DHW) – for showers, sinks, dishwashers and clothes washers – is supplied either by boilers within your HVAC system or by separate water heaters. Consider the following measures:

- **Pick the right system** for your facility. A unit that is too small may leave you and your guests without hot water, and too large a unit will consume more energy than necessary. In some facilities, water must be heated to high temperatures for laundry (71°C or 160°F) and then cooled to temperatures appropriate for guest-room faucets (49°C or 120°F). When purchasing new equipment, consider smaller, separate units for these functions. You may also be able to eventually switch to a smaller system if you follow other water-saving actions listed in the *Energy Tips* section.
- **Water heater timers** ensure the heaters operate only during the opening hours. **Insulating jackets** for water heaters are also an inexpensive investment with short paybacks.
- **Low-flow aerators or showerheads** often cut water flow in half. As a result, hot-water demand is similarly reduced, and payback is less than one year.
- **Low-flow and/or low-temperature commercial dishwashers** save 35 to 60 percent on water and water-heating energy. **Front-loading washing machines** use about 40 percent less water – and less water-heating energy – and deliver incremental paybacks in approximately five years, compared with purchasing less-efficient replacement washers.
- **Ozone laundry** uses electrically generated ozone gas to clean the laundry. This method reduces water and energy use by at least 30 percent, disinfects thoroughly, extends fabric life, reduces chemical use and contributes to a more comfortable work environment for laundry staff.

Cold Water

Domestic cold water is also an important consideration in the hospitality industry, since energy is often required to pump water for toilets/urinals, fountains, faucets, landscaping, water-cooled air conditioners, cooling towers and humidification. Many drinking-water purification processes also consume energy.

- Low-flow toilets, waterless urinals, urinal sensors and other water management measures can reduce cold-water usage by over 20 percent. Talk to a water management consultant or your water utility for more information.

Control Systems

Although hotels and many restaurants operate 24 hours each day, areas such as meeting rooms and laundry facilities do not. Use of these areas fluctuates considerably, and mechanical equipment serving them is often controlled independently and on different schedules, so it is inefficient to have your staff set the controls manually. Energy management control systems enable facility managers to improve energy efficiency by automating lighting and HVAC and other equipment.

- **Simple control systems** include time clocks, programmable electronic thermostats, programmable time controls, photocells and occupancy sensors. **Occupancy sensors**, which recognize the presence of people either through temperature change or motion, provide energy savings of 15 to 80 percent in rest rooms, small offices, storage or warehouse areas, staff rooms and other areas. Paybacks on most sensors are approximately five years. Although motion sensors mounted at light switches are the least expensive, they are appropriate only in small, open areas where occupants are constantly within range – not in large rooms or washrooms with stalls. **Carbon dioxide sensors** adjust ventilation depending on the number of people in a room.

- **Energy management systems (EMS)** are computerized systems that enable you to program various functions from a central point in your facility and provide early detection of operational problems. Some systems feature scheduling and monitoring functions that control temperatures and equipment in different zones – including fire or theft alarm systems. Many models are capable of turning off equipment or activating backup generators at peak demand times. Some systems can be controlled from the front desk – enabling activation of lighting and HVAC when guests arrive – while others are based on key-card access or occupancy sensors that manage lighting and HVAC based on room occupancy. A typical system for a mid-size hotel can cost $100,000 or less, with payback in as little as four years.

Building Envelope

Better quality windows, doors and insulation will help keep your utility costs down and also help reduce street noise – a particularly important factor in the hospitality industry. Building-envelope improvements are generally more cost-effective when they are conducted as part of new construction or major retrofits.

Windows

- Various window options improve on the relative energy inefficiency of single-pane standard glazing. These include double- and triple-pane glazing, tinted glazing, reflective glazing, spectrally selective glazing and insulated glazing with inert gas between the layers. Wood and vinyl frames are more energy efficient than aluminium. Storm-window systems reduce heat loss in winter.
- A more cost-effective option than new windows is the installation of solar glazing or reflective film inside existing windows. Energy savings can be as high as 25 percent, with approximate paybacks in less than three years.
- Daylighting panels are translucent units that diffuse the light throughout the space and reduce glare, with higher R-values than conventional windows.
- Other window coverings such as shutters, shades and draperies provide insulation benefits, especially in summer when they reduce the amount of sunlight – and heat – entering rooms.

Doors

- When replacing exterior doors, choose well-insulated, energy-efficient models.
- Revolving doors are the best choice for keeping wind and weather out of lobbies. Check these doors periodically to ensure there are no leaks along their edges or bottoms.
- High-quality weatherstripping that is durable and long lasting will assist in combating unwanted drafts.
- Install plastic secondary-door curtains inside delivery doors and bays.

Insulation

- Energy-efficient insulation types include fibre (usually available in loose-fill and batts) and foam (usually available in rigid sheets and sprays). Exterior reflective materials are also available, but offer poor insulation value.
- Seal air leaks and cracks by using foams, caulking and weatherstripping. Stuff fibreglass or glazier's foam *backer rod* insulation into areas too large to be caulked.
- Wall- and roof-insulation upgrades are best undertaken as part of larger renovation projects. Upgrades to insulation in basements and top-floor ceiling crawl spaces can be done anytime.
- If wet insulation is detected, replace it immediately once the source of the moisture has been identified and repaired.

Other Building-Envelope Measures

- Paint the exterior of your facility a light colour, if possible. This can help reflect summer heat, ease cooling loads and reduce energy consumption.
- Light-coloured roofing materials not only reduce cooling-energy consumption by 25 to 65 percent during the summer, they also extend roof life.
- "Living" or "green" roofs are becoming more common in Canada. Popular in Europe, these roofs are planted with grass and other vegetation. In addition to excellent insulating properties, this roof style could present multiple uses – and aesthetic appeal – in hotels and restaurants.

The Vocabulary of Building Envelopes

R-values measure the resistance to heat flow that occurs due to temperature differences between the interior and exterior (window and wall) of an envelope. The higher the R-value, the better the insulating properties.

U-values are the inverse of R-values (U = 1/R). In other words, they measure the amount of heat that will move through material rather than resistance to the movement.

Window performance is measured by shading coefficient (SC), solar heat-gain coefficient (SHGC), visible transmittance (T_{vis}), luminous efficacy (K_e) and R- or U-values.

Other Energy Efficiency Retrofits

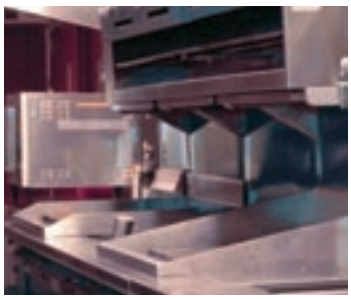
Public Areas

- **Swimming-pool covers** help to retain heat and have a payback of less than two years.
- **Vending-machine controls** use passive infrared sensors to reduce energy consumption when corridor traffic is low. These controls also monitor temperatures inside and outside machines to ensure quality products while consuming minimum energy. More important, the controls reduce the energy used by vending-machine lights by as much as 70 percent and deliver monetary savings of approximately $70 per year in low-traffic areas. Although most vending machines are owned by soft-drink companies, you pay the power bills, so encourage your supplier to install only the latest and most efficient vending machines that contain energy controls.
- **Remote air-cooled ice machines** are more efficient than traditional models, because heat is discharged outside the building during the summer or can be captured and recycled by heat-recovery systems in the winter. Remote units deliver incremental paybacks in approximately three years compared with buying less-efficient replacement machines. Self-cleaning units reduce maintenance costs by eliminating the manual cleaning that is required every two to six weeks.
- **Energy-efficient computer monitors**, including flat-panel LCDs, consume up to 90 percent less energy than models without power-management features such as sleep modes. Look for the **ENERGY STAR®** label.

Back-of-House Areas

- **High-efficiency cooking units**, such as gas-fired equipment, should be considered when old equipment needs replacing. Some of the latest deep fryers are nearly twice as efficient as older models, delivering savings of approximately $500 per year.
- **Walk-in cooler controllers** automatically adjust fan speeds. These controllers are particularly effective in coolers that operate at –2˚ to 4˚C (28˚ to 40˚F). Savings range from 10 to 60 percent, and approximate payback is less than one year.
- **Heavy plastic curtains** outside your walk-in refrigerator or freezer keep cold air in and warm air out.
- **Cogeneration**, or combined heat and power (CHP), systems produce two useful forms of energy – usually electricity and steam heat – from a single fuel source. Although conversion to such a system can be very expensive, overall efficiencies of 85 percent are often achieved. CHP fuel costs are up to 35 percent lower than those in separate generation systems.
- **Heat recovery systems** capture and re-use heat that would otherwise be lost from refrigeration systems and other appliances, especially units that are water cooled. Grey-water heat recovery can be highly cost-effective in hotels where kitchens, pools and laundries account for significant water-heating energy use. Compressors also generate heat that can be captured for other uses.
- **Compressed-air systems** power many tools, pneumatic controls and fire-control equipment, but can waste as much as 40 percent of their overall operating costs. **Multiple-compressor control systems** are much more efficient than independently controlled systems. Repairing leaks and regularly replacing filters can achieve additional efficiencies.

Remember: Energy efficiency measures do not have to be expensive. A list of low- and no-cost energy and maintenance measures is found in the *Energy Tips* section.



NRCan provides valuable information on energy-efficient equipment and appliances: **EnerGuide** at **oee.nrcan.gc.ca/energuide** and **ENERGY STAR®** at **oee.nrcan.gc.ca/energystar**.

NRCan's **Energy Resources Branch** offers information on renewable energy at **www2.nrcan.gc.ca/es/erb**.

Berkeley Labs offers a number of links to energy-simulation software packages for buildings, including DOE-2 and EnergyPlus at **gundog.lbl.gov**.

The **International Hotelier Environmental Initiative**, a non-profit organization that encourages energy-efficient practices in the hospitality industry, offers tools and advice at **www.ihei.org**.

Find simple explanations about the inner workings of equipment – such as air conditioners, electric motors, light bulbs and refrigerators – at **How Stuff Works** at **www.howstuffworks.com/big.htm**.

Step 5:
Calculate Your Savings

Before deciding to go forward with an energy investment or retrofit, senior management usually wants to know the payback, or how many years it will take a measure to pay for itself.

If you are looking to install new equipment or adopt new measures, **simple payback** will indicate the amount of time needed for energy savings to equal the purchase price. For example, if a new energy-efficient measure costs $10,000 and will save you $1,000 in energy costs each year, its simple payback is 10 years.

If your old equipment is at the end of its life cycle, **incremental payback** is the amount of time needed to pay for the difference between an efficient and less-efficient replacement unit. For example, an energy-efficient replacement model costs $700 and a less efficient model costs $500. If you can save $100 a year by buying the efficient model, the incremental payback of the efficient replacement model is two years compared with buying the less efficient replacement model.

Although more detailed formulas such as **rate of return** or **return on investment**, both incorporating life cycle costing, are better measures for investment decisions, the template on page 35 can help you calculate approximate savings for each type of lighting upgrade in your facility. There is also an on-line simple-payback calculator at **oee.nrcan.gc.ca/eii/tools.cfm**.

Calculate Your Lighting Paybacks

A. Number of new units = _____ units

B. Purchase and installation costs per unit = $ _____

Multiply A × B **Total cost** = $ _____

C. Number of new units* = _____ units

D. Old wattage – New wattage ÷ 1000 = _____ kW saved

E. Usage in hours per day = _____ hours per day

F. Usage in days per week = _____ days per week

G. Usage in weeks per year = 52 weeks per year

H. Average local cost per kWh of electricity = $ _____ (including demand charges)

Multiply C through H **Annual savings** = $ _____

Simple payback = Total cost ÷ Annual savings = _____ **years**

*This assumes that the number of new lights is the same as the number of old lights.

For example, a hotel has fifty 100-watt incandescent lamps that stay on 24 hours each day. The lamps are to be replaced with 25-watt compact fluorescents that cost $25 each, including installation. The average local cost of electricity is $0.07 per kWh, including demand charges. Calculations are as follows:

Total costs = 50 × $25 = **$1,250**

Annual savings = 50 units × 0.075 kW saved × 24 hours per day × 7 days per week × 52 weeks per year × $0.07 per kWh = **$2,293.20 per year**

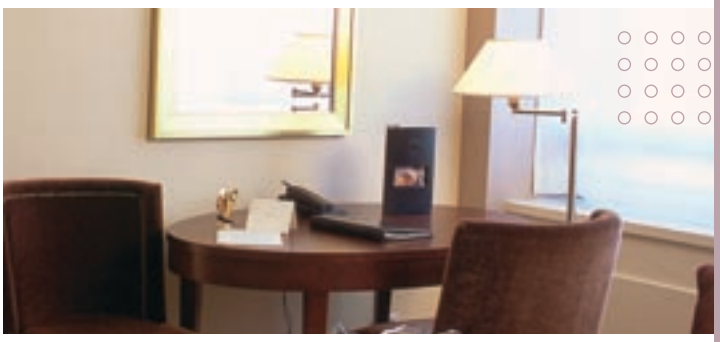
Simple payback = $1,250 ÷ $2,293.20/yr = **0.5 years**

Energy Tips

Retrofits and equipment upgrades are important aspects of any utility cost-reduction strategy, but there are also a number of low- and no-cost actions you can take to reduce energy consumption and save money. These tips are divided into four sections:

- Seasonal Checklist
- Year-Round Checklist
- Hotel Tips
- Restaurant Tips

Carefully review the sections that apply to you, and consider compiling a list of measures to help guide energy efficiency procedures at your facility. You can copy and paste from this guide by accessing electronic HTML and PDF files found at **oee.nrcan.gc.ca/publications** or at **oee.nrcan.gc.ca/eii/publications.cfm**.



Seasonal Checklist

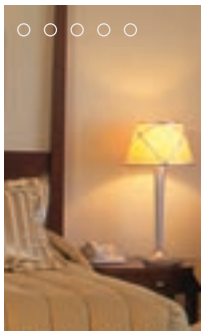
Spring

- ○ Adjust heating systems to ensure that they are comfortable, but not too warm (recommended: 20°C or 68°F).
- ○ Reset time switches where daylight-saving time is in effect.
- ○ Turn off heating earlier in the day, and ensure your building's warm-up period is shorter than in winter.
- ○ Service all chillers and pumps.
- ○ Check air-conditioning units in each room to ensure they are working efficiently and that controls are correctly set.
- ○ Avoid simultaneous heating and cooling, which often occurs when daily temperature fluctuations can lead to the activation of both systems.
- ○ Examine your building's external envelope for damage that could result in heat loss or gain.
- ○ Ensure ceiling insulation is dry and at the recommended thickness.

- ○ Check all external doors to ensure that they close and fit properly, and that automatic door-closing mechanisms are working efficiently.
- ○ Ensure all windows fit and close properly. Repair damaged handles and catches.
- ○ Install weatherstripping, where required, around external doors and windows, and check for damage to existing weatherstripping.

Summer

- ○ Consider maintaining temperatures in your facility 1° to 2°C higher than normal. Set your thermostats so that air conditioning does not engage until temperatures hit 23°C (73°F).
- ○ If possible, do not turn central air conditioning on and off, as systems will have to work harder and use more energy to re-cool and remove humidity. Maintaining a comfortable, consistent temperature will ensure optimum energy efficiency.
- ○ When buildings are closed for extended periods, ensure all non-essential HVAC and lighting systems are switched off.
- ○ Close curtains and blinds during the day to reduce heat buildup generated by sunlight.
- ○ Reverse the operation of heat recovery equipment to reduce energy consumed by air-conditioning systems.



Fall

- ○ Adjust heating systems to ensure temperatures are comfortable, but not too cool (recommended: 20°C or 68°F).
- ○ Check and reset timers at the end of daylight-saving time.
- ○ Activate heating not according to the calendar, but only when required to offset cold temperatures.
- ○ Once the heat is activated, ensure room temperatures are set to comfortable levels.
- ○ Avoid simultaneous heating and cooling, which often occurs when daily temperature fluctuations can lead to the activation of both systems.

Winter

- ○ Drop thermostat settings by 1°C for reductions in space-heating needs of 2 percent or more.
- ○ Check heating-system controls to ensure they respond to weather changes. Minimize heating-energy consumption by setting temperatures at cool but comfortable levels.
- ○ Discourage the use of portable heaters.

Year-Round Checklist

General

- ○ The most energy-efficient lights and appliances are those that are not turned on. Make *Turn it off when not in use* your operation's catch phrase.
- ○ Negotiate contracts with your electrical and other utilities and commit the savings toward retrofits.

Lighting

- ○ Zone light switches so they can be used selectively. Label or colour-code light switches to ensure lights are on only when and where required.
- ○ Keep lights off in service areas – including storage rooms, employee lounges, housekeeping closets and walk-in refrigerators – when closed or unoccupied. Turning lights off even for a few minutes at a time will save energy over the long run.
- ○ Ensure that housekeeping staff use lighting wisely. Lighting levels should provide minimum sufficient illumination for effective cleaning and staff's safe movement between work areas. Clean during daylight hours to take advantage of available natural light.
- ○ Relocate hidden and inconveniently placed light switches, if possible. People are more likely to turn lights off when switches are easy to find.
- ○ Make sure lighting controllers (time clocks and photocells) are well maintained and properly set. Check to ensure exterior lighting is off during the day.
- ○ Remove lamps where there is more lighting than needed, especially near windows.
- ○ Use task lighting whenever possible. Carefully focus directional and spot lighting to minimize the amount of spill light.
- ○ Open curtains and blinds to allow more natural light into your facility, especially in winter and at dawn or dusk when open curtains will not increase heating loads.
- ○ Reduce lighting during daylight and early-morning hours.
- ○ Dust lamps regularly. Dirty lamps and fixtures can reduce effective light output by as much as 50 percent.

HVAC

- ○ Do not heat or cool storage areas that are seldom occupied, and use dampers to close off ducts to these areas. Reduce outside-air intake and circulation during periods of low occupancy to reduce the energy needed to warm or cool that air. Turn off ventilation when it is not required, such as during off-hours or while facilities are closed.
- ○ Ensure timer switches and thermostats are set to meet only minimum heating, ventilating and cooling loads – when and where needed.
- ○ Adjust HVAC equipment to accommodate changes to the building envelope and to heat gains and losses in a building.
- ○ Ensure that all vents – including return-air vents – are unobstructed by items such as boxes, curtains and displays. Blocking airflow reduces the efficiency of HVAC systems and increases energy costs.
- ○ Clean debris from outside air vents.
- ○ Avoid placing televisions, computers, lamps and hair dryers near thermostats. The heat from these and other appliances or equipment may affect thermostat readings and lead to increased energy consumption for cooling.
- ○ Remove obstructions that restrict the free flow of air through heating and cooling units. Make sure air supply or return grilles are not blocked by furniture, books or magazines, which waste energy by making the air-handling units operate longer than necessary.
- ○ If pipe insulation is removed or damaged after maintenance, ensure it is replaced promptly or consider removable insulation.

- ○ Make sure a qualified technician regularly maintains your HVAC equipment. Ensure cooling towers are serviced regularly since they are subject to scale deposits, clogged nozzles, poor airflow and poor pump performance.
- ○ Cover and lock thermostats in common areas.

Compressed-Air Systems

- ○ Check regularly for the hissing sound of leaks and fix them promptly.
- ○ Check filters and drain traps, and watch for pressure drops as part of regular maintenance.
- ○ Monitor both use and pressure requirements. Every pressure reduction of 0.14 kilograms per square centimetre (two pounds per square inch) reduces total system horsepower by 1 percent.

Insulation

- ○ Keep windows and outside doors closed when the heating or air-conditioning equipment is on.
- ○ Seal air leaks and cracks with foam, caulking and weatherstripping. Use fibreglass or glazier's foam *backer rod* insulation in areas too large to be caulked.
- ○ Watch for wet insulation and replace it immediately once the source of the moisture has been identified and repaired.
- ○ Check for worn and cracked caulking and weatherstripping on doors and windows of all rooms, including those that have been permanently closed.

Motors

- ○ Ensure drive belts are replaced as part of regular maintenance.

Water

- ○ Monitor water use in landscaping operations to minimize waste.
- ○ Encourage housekeepers and cleaners to tighten all faucets, and to report dripping faucets promptly.
- ○ A toilet that runs between flushes can waste about 750 litres (200 gallons) per day. Encourage housekeepers to report leaks promptly. To test toilets, place dye or food colouring in the tank and check the bowl for colour after 15 minutes.
- ○ Place awareness stickers in every bathroom to remind guests and staff of the environmental benefits of wise water use.
- ○ Limit the general-use hot-water temperature to 43°C (110°F) except where sanitation is required, such as in dishwashers. If the faucet water is too hot, users will add cold water, which increases both water and energy use.
- ○ Set back hot-water tanks to 60°C (140°F), and re-insulate hot-water supply lines at tanks.
- ○ Turn down gas water-heaters to 24°C (75°F) when closing kitchens and laundries. Turn back up two hours before opening.
- ○ Check insulation on hot-water storage tanks, pipes and steam lines. Look for missing and damaged insulation. Replace any insulation that is hot to the touch.
- ○ Drain and flush hot-water heater tanks semi-annually or more often if water is exceptionally hard.

Hotel Tips

Guest Rooms

- ○ Discourage housekeepers from turning on televisions while cleaning. Once a room has been made up, all lights and appliances should be turned off and thermostats set to minimum.
- ○ Open drapes and shades to take advantage of natural light when servicing rooms. Close drapes and shades after cleaning to prevent heat loss or gain.
- ○ Install a weatherboard in your housekeeping area to remind employees how to set guest room cooling-and-heating equipment. Post colour-coded guides based on daily weather forecasts. These guides should include the day's temperature, appropriate thermostat settings and fan-switch positions:

● Black (range: 13° to 27°C [55° to 80°F])	*Equipment off*
❄ Blue (range: 27°C [80°F] and up)	*Set air conditioning to **low cool***
☼ Red (range: 13°C [55°F] and below)	*Turn units to **low heat***

- ○ Encourage housekeepers to not let the tap run while they clean tubs and sinks.
- ○ Check for worn and cracked caulking and weatherstripping on doors and windows of all rooms, including those that have been permanently closed.
- ○ Install low-wattage bathroom and foyer night lights to discourage guests from leaving on less-efficient lights.
- ○ Increase guest-room light levels by installing translucent lampshades.
- ○ Place tent cards and decals in guest rooms to offer specific energy efficiency suggestions for guests.

Front Office and Public Areas

- ○ Keep windows and outside doors closed while heating and air-conditioning systems are operating.
- ○ Reduce thermostat settings in winter and raise them in summer when preparing and clearing meeting rooms. Reduce lighting levels as well. Shut off heating, cooling and lighting when rooms are not in use.
- ○ Shut down office equipment, such as photocopiers and computer monitors, when not in use.

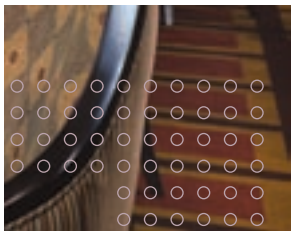
Swimming Pools

- ○ Cover pools when not in use to limit evaporation and reduce heat loss.
- ○ Backwash filters only when pressure loss through filters reaches the prescribed or recommended values indicated in manufacturers' instructions.
- ○ Eliminate or reduce any pool-area lighting not needed for safety and security.
- ○ Check pool temperatures regularly to ensure heater thermostats are working properly. Pool temperatures should not exceed 27°C (80.6°F).

Laundry

- ○ For maximum efficiency, ensure washers and dryers run only when fully and properly loaded.
- ○ Use the lowest water temperature at which proper cleaning and disinfecting can be achieved.
- ○ Consider cold-water washing. Ask your chemical supplier for a cost-benefit analysis.
- ○ Check belts, pulleys, drain valves and balance of pressure.
- ○ Schedule machine operations at off-peak periods to reduce possible demand charges.





Restaurant Tips

Lighting

- ○ Set documented lighting shut-off procedures for closing and make an on-duty staff person responsible. Switch energy-intensive lights off as soon as the restaurant closes. Add a *Last Person Out* switch.

General Kitchen

- ○ Establish and periodically review start-up and shut-down schedules for all major kitchen equipment, especially air-deck ovens.
- ○ Follow manufacturers' suggestions for operating all kitchen equipment. You can reduce energy use by scheduling pre-heating times for ovens, grills, broilers, fryers and other equipment.
- ○ Break the habit of turning everything on first thing in the morning. Leave equipment off until it is needed and turn it off when it is no longer needed.
- ○ Cover pots and pans to retain heat and decrease cooking times.
- ○ Turn off all but one of each type of equipment immediately following rush periods.
- ○ Do not allow fans to blow directly onto any cooking surfaces and equipment.
- ○ Use sinks full of water rather than running water for washing pots and cleaning vegetables.
- ○ Rotary toasters consume relatively large amounts of energy. Turn off these units when not in use, and clean them regularly.

Dishwashers

- ○ Add extra insulation to reduce standing heat loss in water heaters and storage tanks.
- ○ Do not over-dry dishes. Adjust power dryers to deliver heated air just long enough to dry dishes.
- ○ Schedule regular rinse-water checks to ensure that boosters generate the minimum required temperature.
- ○ Regularly remove hard-water lime deposits from spray nozzles, tanks and heater coils.

Food Refrigeration

- Refrigerators and freezers operate most efficiently when the refrigerator is set at 3.2°C (37°F) and the freezer is set between –18° and –15°C (0° and 5°F).
- Allow hot food to cool before storing it in refrigerators and freezers.
- Do not overfill refrigerator shelves. Proper cooling occurs when air can circulate throughout.
- Schedule regular checks for fans, condensers and compressors. Clean these items regularly since dirt buildup reduces efficiency.
- Ensure doors fit and close properly. Maintain door gaskets and seals in good condition. Insert a piece of paper between a door and its frame – if the paper can be withdrawn easily, then the gasket is not sealing properly.
- Ensure refrigerator compressor belts maintain proper tension. Replace damaged and worn belts promptly. Regularly inspect compressor lines since the presence of frost may indicate a breakdown in insulation.
- Defrost freezers frequently since frost buildups reduce efficiency. Install a thermometer in each freezer to enable frequent temperature checks. Defrost and re-cool during off-peak hours.
- Ensure freezer curtains remain in a vertical position to retain cool air and keep out warm air.
- Oil stains near compressors may indicate leaks that should be serviced promptly.

Fryers

- Turn fryers off – or cover and reduce them to idling temperatures – during slow periods.
- Turn thermostats only as high as necessary to reach frying temperatures. Temperatures ranging from 325°F (163°C) to 350°F (177°C) are ideal in modern high-speed fryers. If temperatures are too high, oil will break down. Regularly check the temperature of cooking oil with a reliable commercial thermometer to ensure heating elements and thermostat controls work properly.
- Regularly clean grease and food particles from exhaust hoods.

Griddles

- During slow periods, turn off as many griddle burners as possible, and turn down other sections.
- Have your service contractor periodically check gas-griddle fuel mixtures and adjust pilot lights to their lowest possible flames.

Broilers and Ovens

- ○ The broiler is one of the most energy-intensive and inefficient appliances in the kitchen. Preheat no longer than manufacturers' instructions recommend, and heat only as many sections as required by the cooking load.
- ○ Turn char-broilers to medium as soon as briquettes are hot.
- ○ Turn broiler flames to low between broiling operations. Shut them off during slow periods.
- ○ Inspect and clean burner orifices on gas broilers.
- ○ Have a service contractor check gas burners at least once every six months.
- ○ Rearrange ceramic material in under-fired broilers once a month to ensure even heat.
- ○ Check ceramic and metal surfaces for deterioration. Replace when blackened or cracked.
- ○ Most foods can be placed in ovens during pre-heating. Only bakery goods must wait until ovens reach the correct temperature.
- ○ Plan baking and roasting so that food requiring the same oven temperature can be cooked simultaneously, to make optimum use of oven capacity.
- ○ Load ovens to capacity whenever possible, but remember to maintain two-inch clearances around pans in standard ovens to ensure proper air circulation. Forced-air convection ovens require less clearance.
- ○ Maintain a baking and roasting schedule so that oven capacity is always fully utilized and operating hours reduced.
- ○ Load and unload ovens quickly, and do not open doors unnecessarily. Food cooks faster and loses less moisture when oven doors are kept closed, and temperatures drop approximately 5°C (10°F) for every second that doors are open.
- ○ Clean interior oven walls and elements to improve heat transfer.
- ○ Adjust door hinges, gaskets and mouldings to maintain proper fits.

Ranges

- ○ Make sure pot sizes match element sizes.
- ○ When gas elements are set on high, flame tips should just touch the bottom of pots, pans and kettles.
- ○ Check gas burners periodically. If flames are yellow or uneven, clean the burner with a wire brush and make sure holes are unobstructed.
- ○ Regularly inspect safety controls and automatic lighters.
- ○ Check thermostats for accuracy and recalibrate, if necessary.

Steam Cooking

- ○ Flush boilers at least once each week, following manufacturers' instructions. Use commercial-strength cleaning chemicals occasionally, especially if water is hard.
- ○ Remove all deposits – such as rust, lime, film and scale – from water jackets and the outsides of containers.
- ○ Repair all steam leaks, no matter how small.

Take the Next Step: Join Us

You should be proud of your organization's efforts to reduce energy consumption. Display the details and results of your program to guests and competitors – after all, a commitment to saving energy and protecting the environment involves convincing others to do the same.

Another way you can demonstrate your commitment is by joining the Energy Innovators Initiative (EII). As part of NRCan's OEE, the program encourages commercial businesses and public institutions to invest in energy efficiency. Energy retrofits help cut energy costs, increase competitiveness and reduce GHG emissions that contribute to climate change. By becoming a member of the EII, your organization will gain access to tools, publications and financial incentives for energy retrofits – delivered through an account manager assigned to work with you after you join.

Energy Innovators Initiative
Office of Energy Efficiency
Natural Resources Canada
580 Booth Street, 18th Floor
Ottawa ON K1A 0E4
Tel.: (613) 992-3245
Fax: (613) 947-4121
E-mail: info.services@nrcan.gc.ca
Web site: oee.nrcan.gc.ca/eii

Other OEE Resources

Information and knowledge are two of the keys to any successful venture, and the same holds true for energy efficiency programs. The more you know, the more energy – and money – you can save.

Publications, including this guide, are available from the OEE in HTML, PDF and hard-copy formats at **oee.nrcan.gc.ca/publications** and at **oee.nrcan.gc.ca/eii/publications.cfm**.

Dollars to $ense is a series of one-day workshops that provide practical information to help you identify opportunities to reduce energy consumption, implement energy efficiency strategies and realize energy savings throughout your organization. Held throughout the year in cities across the country, Dollars to $ense workshops can also be customized to meet the needs of individual associations and large companies. Workshop descriptions, locations and dates are available at **oee.nrcan.gc.ca/workshops**.

Canada's Climate Change Voluntary Challenge and Registry Inc. (VCR Inc.) is a public-private partnership that encourages you to demonstrate your organization's commitment to reducing energy consumption and GHG emissions through voluntary measures. Register your energy management plan and GHG savings at **www.vcr-mvr.ca**.

Energy Matrix for Hotels,

Refer to page 7 for instructions on how to use this chart.

Rating	Energy Policy	Information Analysis and Gathering	Implementing Energy and Water Management
4	• Senior management is committed to an environmental strategy that includes an energy policy and action plan with regular review ☐	• A comprehensive system is established to track consumption and budget expenditures, and to identify faults and savings opportunities • Savings are reported to employees and guests ☐	• Excellent housekeeping and purchasing practices • Positive discrimination in favour of *green* schemes that include investment appraisals of all new building and retrofit opportunities ☐
3	• Formal policy established but with only minimal commitment from senior management • Policy reviewed irregularly • Limited knowledge among staff of policy's existence ☐	• Tracking system established for premises and major users, where possible • Savings are not reported to employees and guests ☐	• Very good housekeeping and purchasing practices • Same payback criteria employed as in all other investments ☐
2	• The policy set by facility managers is not adopted ☐	• Consumption tracking is based on actual meter readings • Analysis of trends and input is part of budget planning ☐	• Reasonably good housekeeping and purchasing practices • Energy efficiency investments based only on short-term payback criteria ☐
1	• An unwritten set of guidelines is used ☐	• Annual reporting of costs is based on analysis of utility bills with some analysis of yearly trends ☐	• Limited good-housekeeping and purchasing practices • No investments in energy efficiency upgrades ☐
0	• No explicit policy on energy management ☐	• Meter readings are not recorded, and bills are not analysed ☐	• Poor housekeeping practices • No consideration of investments in energy efficiency or purchasing practices ☐

Motels and Restaurants

Organizing for Energy Efficiency	Communications	Education
• Energy management fully integrated into operational structure • Clear delegation of responsibilities for monitoring energy consumption ☐	• Formal and informal two-way channels of communications established among facility's energy coordinator, staff and guests ☐	• Appropriate involvement of staff and guests in facility's energy management ☐
• Role of facility-resource manager is recognized • Resource manager is accountable to senior management on issues of energy efficiency ☐	• Campaign established to raise awareness of energy efficiency; it includes regular publicity aimed at staff and guests ☐	• Coordinated approach to energy efficiency education includes links to facility's energy policy ☐
• An energy coordinator is in place, but line management and authority are unclear ☐	• Some ad hoc awareness training exists for all building users ☐	• Some opportunities to teach about energy efficiency are identified ☐
• Energy management responsibilities have been identified but are not coordinated ☐	• Informal contacts established to communicate facility's performance on energy and water, as well as plans for improvement ☐	• Uncoordinated delivery of energy efficiency education in the facility ☐
• No resource-management personnel, nor any formal delegation of responsibility for enery consumption ☐	• No communication of facility's energy-consumption performance ☐	• No teaching of energy-efficient practices ☐

Leading Canadians to Energy Efficiency at Home, at Work and on the Road

The Office of Energy Efficiency of Natural Resources Canada strengthens and expands Canada's commitment to energy efficiency in order to help address the challenges of climate change.

Canada