Best Green Practices:

An Ideal Green Office Model

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Just a word …

This paper is the product of the research that was conducted to select the best practices in the green office environments. The objective was to illustrate how the best green practices can be emulated in the offices.

This paper is structured in the following sections:

1. The Green Office Model (Diagram);
2. Prologue;
3. Lighting;
4. Office Equipment;
5. Paper Products;
6. Heating and Cooling;
7. Water;
8. Cars and Parking;
9. Further Considerations; and
10. Conclusion

It is critical to understand that in order to adopt the proposed green practices, an organization-wide sustainability policy is required to encourage employees to further save energy, conserve water, reduce waste, and if possible, switch to transportation alternatives.

This paper is based on the information available in the public domain and necessary hyperlinks are created to navigate readers to the respective sources where additional information can be accessed.

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1. THE GREEN OFFICE MODEL

2. PROLOGUE

The main objective of a green office is to **minimize chemical contamination or pollution of the environment.** Many of the products we use in our daily work contain ingredients that are harmful to the environment. The goal of an environmentally responsible office should be to keep these substances out of the air, water and solid waste stream.

The best way to minimize pollution from environmentally harmful materials is to reduce the use of products containing such materials to a minimum, by changing processes or by substituting more environmentally friendly products. Where reduction is not possible, chemicals should be reused (as long as this is permitted under applicable environmental, health and safety regulations). Similarly, chemicals that cannot be reduced or reused should be recycled wherever possible.

According to Environment Canada the term "hazardous" has specific connotations in the context of environmental and safety legislation. In addition to wastes and materials designated by current legislation as "hazardous", there are many wasted materials that can be considered "environmentally harmful". Many products and wastes contain toxic chemicals in insufficient quantities or concentrations to be deemed hazardous under current legislation, but should still be used and disposed of with care. Familiar office products such as correction fluid, markers, dry cell batteries, photocopy toner and cleaning products all contain small quantities of harmful substances, and wastes from their use (e.g., spent containers, soiled rags) can be considered "environmentally harmful". Although the quantity of harmful material in an individual product or waste container may be small, the cumulative effect on the environment of a large number of these wastes is significant. In effect, these wastes are comparable to the "household hazardous wastes" that are already collected separately for secure disposal in many jurisdictions.

There are rebates from the utility companies and tax credits from the states and federal governments are available in other countries where the concept of green offices is getting popular. A search is being conduct right now to investigate whether or not we have any rebates or tax credits in Canada for going green.

3. LIGHTING

According to a US Department of Energy (DOE) study, lighting accounts for about 29 percent of the energy use in a typical office. A number of energy saving opportunities for office can cut the energy used for lighting in half. Here are six options to consider:

1. **T-8 and T-5 Fluorescents:**
   Fluorescents lighting fixtures that are using T-12 lamps are 1 ½ inch diameter tubes in either 4 or 8 foot lengths. A better option, the narrow (1 inch diameter) T-8 lamp, is now available. T-8 fluorescents T-8 fluorescent lighting has better color, less flicker, and uses 20 percent less energy to produce the same light output. T-8 lamps are coupled with more efficient electronic ballasts. T-8s are also available with dimmable ballasts that allow greater light level control and energy savings.

   An even newer and more efficient fluorescent lighting technology has just arrived. T-5 lamps are smaller – only 5/8 inches in diameter – more efficient lamps. They are 10 to 15 percent more efficient than a T-8 lighting system;
2. **Exit Signs:**
   Exit signs may be small, but they are illuminated 24 hours per day, seven days per week, so their energy use adds up. Exit signs formerly used incandescent lamps (usually two 20 or 40-watt lamps). Some of these older exit signs have been converted to use compact fluorescent lamps (CFLs). The CFLs last longer and use less energy. The CFL powered exit signs draw 20 to 30 watts or less, resulting in energy savings of 50 percent or more. Other efficient exit signs use light emitting diodes (LEDs), neon lighting, or electroluminescent lighting technology. The total energy use for these exit signs ranges from 1 to 10 watts. These technologies offer a maintenance benefit as well. LED, neon, and electroluminescent lighting technologies last much longer than incandescent lamps;
3. **Occupancy Sensors:**
   Everyone forgets to turn off the lights sometimes, but in some cases the forgetting is chronic. This wasted lighting energy can add up quickly. One way to ensure that lights are used only when needed is with occupancy sensors. Occupancy sensors detect the presence of people in a room. When there's no one there, they turn off the lights. When someone returns, they turn the lights back on. This technology works quite well in storage rooms, conference rooms, break rooms, and even the boss's office. In a single small office where lights are on unnecessarily two hours a day, annual energy waste adds up to $10. Add many offices, meeting rooms, and other spaces together and the savings from occupancy sensors can be significant. Most occupancy sensors are inexpensive, and in many cases they are simple to install. In larger spaces, they work best when mounted in the ceiling. For smaller spaces, they can be installed in place of the room's light switch;
4. **Dimmable Ballasts:**
   Fluorescent lights are not like incandescent lights; they need to have special ballasts in order to operate. Dimmable ballasts are an option with most efficient fluorescent lighting systems. They allow you to lower the lighting levels—and cut the energy consumption—when you don't need the lights at their full brightness. Why pay for the light when you don't need it? The lower the light levels, the lower the energy use. Dimmable ballasts are often used where a skylight or some other kind of day lighting is in place. If your office space is subject to variable natural lighting levels, you can install dimmable ballasts to reduce—or even eliminate—the energy you use when more artificial lighting isn't needed. The savings depend on the space they're installed in. These ballasts are most cost effective during the installation of new light fixtures;
5. **Compact Fluorescent Lamps:**
   Not every light fixture in every office is already fluorescent. Some desk lamps, accent lighting, or lights in out of the way areas may be incandescent lamps. Incandescent lamps are the standard light bulbs used for the past century. They are much less efficient than the newer alternative, compact

fluorescent lamps (CFLs). A 25-watt CFL has the same light output as a 100-watt incandescent. The 75 percent reduction in energy use is only one way in which these bulbs produce savings.

CFLs last much longer—typically ten times longer than incandescent lamps. So, if you're tired of changing burned out bulbs—and paying high electric bills—this could be the option for you. The prices for CFLs have come down recently although their initial cost is still more than an incandescent bulb. It's best to install them in a place where the light is usually on. In those locations, they can pay for themselves very quickly. If you pay $12 for a 25-watt CFL and install it in place of a 100-watt incandescent that usually operates 8 hours a day, it will pay for itself in two years. That's a 50 percent return on your investment; and

6. **Exterior Lighting:**

Some of your office's exterior lighting may be incandescent. CFLs could work there too. If you have larger pole-mounted lights in a parking lot, floodlights on your building, or an illuminated sign, there are other opportunities to cut your energy use. The first thing to do is to control the "On" time. If the lights are controlled by a time clock, you can install a photocell in that circuit too. That way the lights come on when it starts to get dark rather than at a preset time like 5 or 6 pm which may be earlier than necessary. The time clock can still turn the lights off at any time you select. For mornings, the time clock and photocell can be set to work in reverse. Another option is the type of lighting you use.

Some outside area lighting uses mercury vapor lamps. Switching a mercury vapor fixture to high-pressure sodium (HPS), typically used for street lighting, can cut the energy use in half. Metal halide lighting falls between the two from an efficiency standpoint. Metal halides are preferred because of their "white" lighting. Color-corrected high-pressure sodium is an option. Don't overlook fluorescents; fixtures with T-5 lamps can be more efficient than metal halides. The easiest and most cost-effective option is using only as many exterior lights as necessary and only operating them when they are needed. A simple photocell, time clock, or both can lead to significant savings.

4. OFFICE EQUIPMENT

According to DOE, office equipment accounts for 16 percent of an office's energy use. Years ago, a six-person office would have had one electric typewriter and one photocopier for a connected load of about 600 watts. Today, that same office could have six computers, six monitors, two printers, one larger photocopier, and one fax for a connected load of more than 7,000 watts. More and more powerful equipment has been added to nearly every office. However, there are energy-efficient options for virtually all office equipment. Here are four areas to look at:

1. Computers and Monitors:

A Lawrence Berkeley Lab study from 1999 estimated that one workstation (computer and monitor) left on after business-hours are responsible for power plants emitting nearly one ton of CO_2 per year. That could be cut by 80 percent if the workstation is switched off at night and set to go to "sleep" during idle periods in the day. If every US computer and monitor were turned off at night, the nation could shut down eight large power stations and avoid emitting 7 million tons of CO_2 every year.

Most offices have one computer per desk. Individual computers are not large energy users. But, as they get more powerful—and monitors get larger—they draw more power than they used to.

Even efficient computers that are on all the time still use more energy than they should. The first thing to know is that it's OK to turn computers off. There's a myth out there that says you shouldn't. That's not true. There's another myth that screen savers save energy. That's not true either. When you're not going to use a computer for more than two hours—and certainly when you're leaving overnight—the best thing you can do to save energy is just to turn it off. There are times during the workday when computers can be turned off too. Most computers have a "sleep" mode for when they're not in use. That feature is often overridden because people worry they may lose important data. To alleviate that, just enable the sleep feature for the monitor and not the computer's CPU. The monitor uses most of the energy and if it's shut down when nobody's at the computer, the savings add up.

New flat panel liquid crystal display (LCD) monitors use quite a bit less energy than the conventional cathode ray monitors. The LCD monitors are expensive, but if you are considering new monitors, the energy savings may justify the extra expense;

2. Printers:

[1]ENERGY STAR® printers can cut a printer's electricity use by over 65 percent. A printer with a duplexing mode can also save around $30 a month in paper costs. There are several printer types—laser and ink jet—and several control options—standby mode and manual switching—to consider.

- Laser printers are available with different printing speeds—the maximum energy draw of faster printers is greater than that of slower ones. Another Lawrence Berkeley Lab paper showed that an eight page per minute (ppm) laser printer used 60 watts while a 24 ppm printer used 100 watts. Comparing the wattage alone is misleading, however. Since the larger printer prints faster, it doesn't operate as long as the smaller one. In fact, the 24 ppm printer could use about 40 percent **less** energy for printing.

  ENERGY STAR® laser printers don't need to be switched off manually. When no print commands have been received for a preset time period, these printers automatically switch to a low-

[1] *Under the program, manufacturers can display the ENERGY STAR logo on their equipment if it meets established, ever-tightening energy efficiency standards. An important driving force behind this program was the United States Environment Protection Agency (USEPA).*

power standby mode. The energy savings are significant: Laser printers save 65 to 75 watts in standby mode. While in standby, printers produce less heat, reducing air-conditioning costs too. With fewer operating hours and less heat buildup, these printers can last longer and be more reliable; and

- Ink jet (or bubble jet) printers use much less energy. Instead of drawing 60 to 100 watts, they require only 10 to 15 watts. The trade-off with these printers is partly the speed of the printer; these printers are slower than the fastest laser printers, and partly quality. Ink jet printers do not have quite the printing quality of laser printers. With the opportunity to cut printing energy by 75 to 90 percent, there may be times—for draft documents for example—where an ink jet printer is appropriate;

3. **Copiers:**
   Like printers, copiers use energy all day (and night) even when making copies only a small fraction of that time. ENERGY STAR® labeled copiers are equipped with a feature that allows them to automatically turn off after a period of inactivity. This can cut electricity use by over 60 percent. Even non- ENERGY STAR® copiers can be manually turned off in the evenings and over the weekend. All office staff can help with this. The right copier can also save you paper. Copiers with duplexing capabilities set to automatically make double-sided copies can cut your paper costs. You'll use less paper, have more profits, and help save trees all at the same time;
4. **Scanners:**
   When you buy scanner, follow the general principles for buying green office equipment. Only turn your scanner when you want to use it.

   To meet the standards scanners must be able to enter a sleep mode of 12 watts or less in no more than 15 minutes. There are some scanners on the market with a power rating for sleep mode of about 3 watts, but most are three to four times that amount. Generally high resolution scanners use more energy in sleep mode than lower quality ones. However, there are a few high resolution machines at the energy-efficient end of the scale.
5. **Faxes:**
   Fax machines operate like copiers and printers. They use energy even when "just sitting there." For some infrequently used fax machines, the standby energy use can be 10 to 20 times more than when operating. Unlike printers and copiers, the fax machine isn't something you typically turn off at the end of the workday. For all future fax machine purchases, specify an ENERGY STAR® model. They have a sleep feature that can cut energy costs by almost 50 percent. A typical ENERGY STAR® fax machine will save energy with a sleep mode and still be ready to send or receive faxes immediately. ENERGY STAR® faxes can also scan double-sided pages. This reduces both copying and paper costs. Fax modems can also be added to a computer or network. This allows for paperless faxing and electronic storage of faxes received. This uses less paper and takes up less storage space, and may make the documents more retrievable than paper copies; and
6. **Other Equipment:**
   Other equipment in a typical office includes refrigerators and vending machines. There are more energy efficient options for both of these. Refrigerators operate better when the coils are clean, the freezer compartment is defrosted, and they are relatively full. Be sure to clean and defrost (if needed) a couple times a year. If a refrigerator is too large for the number of people using it, fill the additional space with bottles of water. For new refrigerators, specify an ENERGY STAR® model. This change can save you at least 30 percent over your current refrigerator. Replacing older, less efficient models with new ENERGY STAR® refrigerators will cut energy use in half—saving at least $30 to $40 per year.

Many offices have refrigerated beverage vending machines. These machines use quite a bit of energy in part because they operate all day and night. Adding a time clock or a Vending Mi$er™ control can cut energy use significantly. The Vending Mi$er™ is an occupancy-based control device that shuts the vending machine off when the break room has been vacant for a preset period of time. This device costs less than $200. In some cases, electric utilities are giving them away at no cost.

5. PAPER PRODUCTS

The paperless office is still more promise than reality. With today's new technologies it is closer. For efficient paper use, follow the environmental standard: reduce, reuse, and recycle. Improving in each of these areas will bring paper cost savings and cut the need for storage space. Paper is bulky to store in boxes or file cabinets. By using fewer sheets, you can put storage space to more productive use. Also, fewer sheets mailed may mean reduced postage. A single-sided 10-page letter costs $0.55 to mail; that same letter, copied onto both sides of the paper, uses only five sheets and $0.34 in postage. Some paper-saving options to consider are:

1. **Paper Use Reduction**:
   Offices use nearly 1.5 pounds of paper per person per day, according to a survey of Los Angeles offices. You can cut this number by using less paper, reusing paper where appropriate, and recycling. Create hard copies only when absolutely necessary.

   In many cases you don't need a paper copy of a document. An electronic copy may be fine. The advantages of electronic copies are paper, postage, and storage space savings. They also allow electronic search capabilities you don't have with paper documents. Electronic filing and retrieval can save time when you need the document again.

   Review and edit draft documents on screen rather than on paper. If you need to print large reports, consider adjusting margins, line spacing, and page settings that allow more information to fit on each page. Use e-mail to share documents and ideas. If possible, bookmark WebPages rather than printing them out, and print e-mails and internet documents only when necessary.

   When faxing, use a stick-on label on the first page of the fax message instead of a full-page cover sheet. This will save energy, paper and long-distance phone costs. You can also save with reusable inter- and intra-office envelopes. Maintaining shared files and reviewing external mailing lists and internal distribution lists for accuracy can cut paper use too;
2. **Two-Side Printing/Copying:**
   Two-Sided Printing/Copying Paper has large embodied energy content. It requires 15 watt-hours of energy to make a virgin sheet of copy paper. That's more energy than the paper would use in a copier, printer, or fax machine. The embodied energy has become a concern in offices that want to reduce the environmental impact of their activities. One simple but highly effective step to take is to change printer and copier settings to duplex. This saves a substantial amount of paper—and money. Purchase new or change the current copiers and printers that automatically print on both sides. Many copiers can be easily programmed for that. Most new laser printers have a duplex option. Some can do both traditional book style duplexing (also called "flip on long edge") and legal form duplexing ("flip on short edge"). The latter is preferred by attorneys and others who use file folders that clip at the top. Individual PCs can also be programmed to make duplex printing the default norm;
3. **Post-Consumer Recycled Content:**
   Natural systems ultimately recycle everything. We can do the same with resources such as paper. Paper is a large component of the Waste going into landfills and offices are a primary source of that paper. Consider using recycled paper. The term "recycled" is often used to describe paper that includes scraps and wastes generated in the paper production process. Postconsumer fiber content is what really counts. Look for post-consumer content that is at least 30 percent or more. There are a number of paper products with 100 percent post-consumer content.

   How many toner cartridges do you go through in a year? Waste disposal volumes and costs can be reduced with the use of re-manufactured toner cartridges for printers, copiers, and fax machines.

Many office equipment suppliers will take back old toner cartridges when supplying a re-manufactured replacement;

4. **Unbleached and Uncoloured Paper:**

Paper manufacturers use chlorine to bleach paper bright white. This chlorine makes its way into the environment and creates dioxins, which causes cancers, birth defects, immune system damage and other health problems. Paper produced without bleach is no less functional than bleached paper. Unbleached paper alternatives are available for a wide range of paper products. This includes writing paper, copier paper, printing paper, toilet paper, paper towels and napkins, file folders, note pads, and even cash register tape. Unbleached papers are whitened with other, more benign chemicals. Some brands are available in brightness comparable to standard chlorine-bleached stock. They're competitively priced and suitable for a wide range of printing applications.

Think about your need for coloured paper. Some heavily-colored paper is harder to recycle. If you don't really need it, stick to white or off-white papers. And, if you do need some colored paper stock, use the lightly-colored (pastel) papers; and

5. **Recycling Paper/Reducing Packaging:**

A ton of 100 percent recycled paper saves the equivalent of 4,100 kWh of energy, 7,000 gallons of water, 60 pounds of air emissions, and three cubic yards of landfill space. Conserving energy and natural resources can be as simple as recycling and buying recycled paper products. Look for the recycling symbol.

In the Victoria area, like many other communities, nearly all paper products are recyclable. Letterhead and white copy paper have the most value, but you can also recycle colored paper, magazines, newsprint, and corrugated cardboard. Almost all of the waste stream from a typical office can be recycled. Less waste means smaller garbage containers and lower garbage bills. Another way to cut down on waste is buying products in bulk. Bulk purchases minimize packaging and are often less expensive than smaller, individually packaged items. When bulk items are not available, suppliers may be able to eliminate extraneous packaging if asked. It usually saves them money too. And, if you're shipping or mailing materials from your office, you can find similar savings as well.

6. HEATING AND COOLING

Heating, cooling, and ventilation accounts for 39 percent of the energy consumed in a typical office. For smaller office spaces, the load may consist of mostly heating (just like it is for homes). However, larger offices have more cooling because of the internal heat gain from people, lights, and office equipment. Either way, heating, ventilation and air conditioning (HVAC) is a large part of energy bills;

The objectives of an HVAC system are to heat, cool, control humidity, and bring fresh air into a building. Employee and customer comfort is the main priority. But saving energy doesn't just mean colder spaces in the winter and uncomfortably warm spaces in the summer. As with lighting, it is generally possible to get better comfort while using less energy. HVAC systems are among the largest energy end-uses in commercial buildings. With greater energy use come greater opportunities for savings. Seven HVAC energy-saving options are:

1. **Proper Operation:**
   Turning your heating and cooling off when it's not needed is a simple way to save. Just as lighting is frequently left on when no one is around, the same happens with HVAC systems. Having someone responsible for switching off the system can work, but introduces the possibility of human error. A better option may be an automatic setback thermostat. They provide the added comfort of a pre-warmed or pre-cooled office when you arrive at work. Setback thermostats don't cost much and automatically adjust the settings up (or down) for evenings and weekends, eliminating the uncertainty and waste of manual control. Another opportunity with HVAC systems is adjusting the temperature settings to avoid overheating or over-cooling. An adjustment of only a degree or two can cut heating or cooling bills by two to three percent. Extending that to three or four degrees can produce savings of 10 percent or more. Try making small changes to find the optimal settings that maintain comfortable conditions for employees and customers. Allowing and encouraging employees to dress comfortably and seasonably will make them appreciate the changes more;
2. **Proper Maintenance:**
   Good equipment maintenance pays off in higher reliability of the equipment and reduced operation costs. Proper operation and maintenance (O&M) will uncover ongoing problems and eliminate nonproductive maintenance practices. Proper O&M is also important for energy performance. Aside from the obvious tasks like changing filters or calibrating controls, HVAC system maintenance can influence the energy performance of the total building. An overheating fan motor lowers the efficiency of the entire HVAC system. A leaking chiller pump will waste water, draw extra power, and also hurt the chiller efficiency;
3. **Efficient Products:**
   Older HVAC equipment is usually not as efficient as newer products. Inexpensive HVAC equipment costs more to operate than the premium HVAC technologies. When replacing heating and cooling equipment, specify the most efficient models. Some HVAC products, such as smaller air conditioners, are rated by ENERGY STAR®. Remember that bigger is not better—oversized HVAC equipment does not run as well as correctly sized equipment;
4. **Setback Thermostats/Other Time-Based Controls:**
   Programmable thermostats are simple microprocessor-based units that accurately maintain system start-up and setback schedules and eliminate unnecessary HVAC use during hours when a building is unoccupied. Many thermostat models are inexpensive, easy to program and operate, and can handle a different schedule for each day of the week. Improved controls are a small investment that can yield large improvements in HVAC energy efficiency;
5. **Outside Air Economizers:**
   Many commercial HVAC systems have an economizer feature. This brings in outside air for cooling when it's cooler than the air inside. Since many offices do not have operable windows, this is the next best alternative. Economizers save energy and get more fresh air inside. Victoria's climate is ideal for economizers. It's often cool enough outside that an economizer will be used frequently.

The savings from this "free cooling" can be big. Some HVAC systems enable this function very easily. Even when you have to add more equipment and controls, an economizer will pay for itself in two to five years.

Economizers can be used to pre-cool the building for additional energy savings. A nighttime building "flush" works well in larger offices that don't really cool down overnight. An hour or two of fresh outside air in the early morning provides additional free cooling. Even on the hottest summer days in western Oregon, the temperature drops into the 60's at night. Nighttime pre-cooling can mean the office is cool and comfortable when people arrive for work instead of hot and stuffy. That could help make your employees more productive. At the same time, you'll save by not from having to run your air conditioning as much during the day;

6. **Solar Shading:**
   In larger buildings, most of the air conditioning load comes from the lights, equipment, and people inside. In smaller offices, a larger share comes from outside. When it's hot and sunny, air conditioning use will increase. But there are ways to cut the solar heat gain and the associated cooling costs. Solar heat gain occurs through a building's roof, windows, and walls. There are "shading" opportunities for all three surfaces—reflective roof coatings, window films and shading, and vegetative shading. However, not every office building can take advantage of all three;
7. **Reflective Roof Coatings:**
   Simply painting a roof white can cut some of the sun's heat. Studies in sunnier climates show substantial savings. Instead of the sun's heat being absorbed by a dark roof, it is reflected back to the atmosphere. In Victoria's climate, the summer savings outweigh the added winter heating. A lighter roof means reduced intake air temperatures for offices with rooftop cooling systems. Since lighter roofs stay cooler they last longer too;
8. **Window Films and Shading:**
   Windows let in light...and heat. You don't have to sit next to one for long on a summer day before you feel the effects. Interior shades and blinds can help keep the heat out. However, shading windows from the outside is even more effective. Shading options include awnings, solar shade screens, or tinted window film. Daytime air temperatures can be three to six degrees cooler in tree-shaded neighborhoods than in treeless areas;
9. **Vegetation and other Shading:**
   Before air conditioning, shade trees helped keep buildings cool. It still works today. Planting trees or other vegetation on the south and west side of your building will cut cooling costs—and look nice, too. Deciduous trees work well because they lose their leaves during the winter, when sunlight is desired. Eco-roofs take this issue to a higher level by using vegetative material as actual roof surface. This technique, which is already widely used in Europe, lowers heat gain through the roof, reduces the roof's stormwater runoff, and survives the effects of sun and rain longer than other roofing materials; and
10. **Insulation/Weather Stripping:**
    Insulation is a key method for saving energy at home. It's not as important in office buildings, but it still shouldn't be overlooked. If an office has little or no insulation in the floor, ceiling, or walls or if there are drafty gaps around doors or windows, adding insulation, caulking, and weather stripping will produce real savings. Weatherization contractors who insulate homes and apartment buildings can do the same thing for smaller office buildings.

Collectively adding up the millions of small savings achieved by energy-efficiency measures such as caulking and sealing now saves our country two-fifths more energy than the entire domestic oil industry produces.

7. WATER

Water heating in an office can account for nine percent of the total energy load. While the energy costs alone are modest, you pay for your water more than once. It costs to buy the water, to heat it (for hot water), and then to get rid of it (sewage charges). Saving water can have a compound benefit. Four hot water savings opportunities to consider are:

1. **Set Temperature Appropriately:**
   In an office, water heaters do not need to be set higher than 120 degrees. Many water heaters come from the factory with settings of 130 or 140 degrees. Save energy—and increase employee safety—by turning the temperature down. Reducing the setting from 140 to 120 degrees could save over 18 percent of the energy used at the higher setting. Even a 10-degree reduction will save more than 6 percent in water-heating energy;
2. **Re-size Your Water Heater:**
   Many small offices have 50-gallon water heaters, just like homes. With no showering, laundry, or dishwashing, that may be much more capacity than you need. A smaller tank will reduce the "stand-by" losses from your water heater. New tankless water heaters cut standby losses even further. They are worth considering whenever you need to replace a failed water heater. United States residents use three times as much water a day—1,300 gallons per person—as the average European and this should also apply to Canadians;
3. **Low-Flow Fixtures:**
   Sink faucets in your restrooms and kitchen may use more water than you think. New faucets are one way to deal with this, but there's a lower cost option. Add aerators to your existing faucets. These simple devices—available in most hardware stores—can cut faucet water consumption in half. When you're using hot water, they're saving energy too.

   Most offices don't have showers, but some do. Where there are showers, low-flow showerheads should be used. A five-minute shower with a showerhead using five gallons per minute (gpm) will use 25 gallons of water, plus energy to heat the water. A 2.5 gpm showerhead will cut that in half, with no reduction in comfort. New 1.5 gpm showerheads are even better; they cut the water and energy use by another 40 percent;
4. **Solar Pre-Heating:**
   The sun's energy can help heat water. Residential-style solar water heating systems can work on office buildings too. A solar collector can cut hot water bills in half. The amount of solar radiation that reaches the earth's surface in approximately three days equals roughly the total energy content of all known supplies of fossil fuels. Don't overlook water-saving options where hot water is not use either. In an office, these options include:

   i. **Low Flush/No Flush Toilets:**
   Typically, toilets and urinals account for about one-third of all water consumed. Older toilets use 3.5 to 7 gallons per flush while most urinals consume 3 gallons per flush. Efficiency standards for new toilets require them to use 1.6 gallons or less per flush. The new low-flush toilets have corrected the performance problems experienced with some earlier versions. Where the plumbing code allows, no-flush toilets are an option; and

   ii. **Fix Leaks:**
   Repairing water leaks is a great way to reduce water waste. Small drips of water can add up quickly. A leaky toilet or dripping faucet can waste thousands of gallons of water a year. If the drip is hot water, you are paying for wasted energy too. Fix leaks as soon as you find them. A leaking faucet is frequently the result of a bad washer and is relatively easy to fix with the right tools. Leaks won't go away unless you fix them and repairing water leaks will always save you money. Toilet leaks can range from small to large, constant or random. Many are even silent.

A small, silent leak can easily cost $50 per year in water and sewer costs. Large leaks can cost much more. In a properly functioning toilet, no water should move from the tank to the bowl, unless the toilet is being flushed. Fortunately, most toilet leaks are relatively easy to fix. A single dripping faucet can waste up to 20 gallons of water a day.

5. Landscape Care:

The right plants in the right location will yield beautiful landscaping with lower costs for watering, fertilizer and pest control. Where possible, change the landscaping around offices from lawns to native plants that don't require additional irrigation. Alternatives to lawns are ideal for steep slopes, shady areas, or locations near streams and lakes.

If you stick with a lawn, there are five things you can do to minimize water use and keep the lawn healthy:

- **A.** Mow high, mow often, and leave the clippings;
- **B.** Fertilize moderately with a "natural organic" or "slow-release" fertilizer;
- **C.** Water deeply but infrequently to moisten the root zone;
- **D.** Improve poor lawns with aeration and over-seeding; and
- **E.** Think twice before using pesticides or "weed-and-feed."

6. Watering Control:

Overwatering lawns is a leading cause of water waste in the summer. Watch the weather; don't water if it's going to rain. Remember to turn off automatic sprinkler systems when the fall rains start. Do any replanting in the fall or spring to avoid additional watering. Besides wasting water, overwatering promotes lawn disease and leaches nutrients from the soil. Lawns don't need more than one inch of water per week during July and August. Use less in late spring or early fall—let the weather be your guide. Grass does better when the root zone partially dries out between waterings. Avoid frequent shallow watering, which causes shallow rooting. Water slowly, or start and stop, so the water permeates the soil rather than running off. Water either early or late to minimize evaporation loss.

8. CARS AND PARKING

Don't overlook the energy use or environmental impact represented in a parking lot. The daily energy used in transport to and from a building can exceed the energy used by the building itself. Parking lots that aren't shaded collect and radiate heat on hot, sunny days. This ends up adding to the cooling load of the vehicles and buildings in the area. Parking lots are typically impervious surfaces that generate a lot of stormwater runoff when it rains. This runoff can have detrimental impacts on local waterways. Commuting opportunities for offices include:

1. **Subsidize Transit for Employees:**
   Many businesses find that a transit subsidy for their employees is a valuable employee benefit. Employees will save money on gas and parking when taking the bus and employers save too. Parking spaces around your office will become available, attracting additional customers. It may be possible to eliminate part of your parking lot and convert it to more productive uses. A transit bus with as few as seven passengers uses less fuel per passenger mile than a single-occupant car. A transit bus with full rush hour load of 44 passengers uses much less fuel than 11 cars with four passengers each;
2. **Carpool/Vanpool Parking Preferences:**
   Not everyone can take transit every day. The next best alternative is to encourage sharing rides by reserving as many parking spaces as possible for car and vanpools. A carpool is just two or more people commuting together. They don't have to both work together; one of them could work for a nearby business. Vanpools use larger vehicles to take more people and usually travel farther. In either case, there's a significant savings in gasoline, parking spaces, and greenhouse gas emissions. Unfortunately, carpool or vanpool investments cannot be qualified in Canada for Business Energy Tax Credit (BETC) as they do in the States.

   Be sure to put carpool and vanpool parking spots where employees prefer to park, and sign them prominently. This serves as a nice benefit to employees who can't use transit and might remind solo drivers of the possibilities. Boosting the US rush hour traffic from one to two people per car would save 40 million gallons of gasoline a day, over 15 percent of US gasoline consumption;
3. **Bike Parking/Shower/Lockers:**
   Although Victoria has an extensive network of bike lanes and bike paths and a climate that is ideal for bike riding (at least part of the year), many bike-riding employees will elect not to ride to work unless their office has two things: secure bike parking and shower/locker facilities. Nobody wants to leave work only to find that his or her bike has been stolen during the day. Bike riders nearly always have effective bike locks, but they still need something to lock them to. A bike rack is inoffensive and unobtrusive and makes a quiet statement about a company's commitment to the environment. Make the bike parking visible, accessible, and consider covering it. Your bike-riding employees—and customers—will thank you.

   Lockers or showers are another valuable amenity for bike riders or those who exercise during their lunch hour. When available these facilities get frequent use. Bike riders will often use them in the morning and runners will be there during the lunch hour. Where showers and lockers aren't feasible on site, there may be a place nearby that will allow access to these facilities; and
4. **Flexible Work Arrangements:**
   Most employees consider flexibility a key element of their work life. Offering flextime, or flexible working hours, not only benefits them; it's better for the company. A recent Business Week survey found that 42 percent of employees believed work had a negative impact on their home life. Unhappy employees are more likely to be distracted, less productive, and to seek other employment. Flexible work schedules can help in recruiting and retaining high quality employees. With some employees arriving early and others leaving late, you may even be able to expand your hours of operation.

A compressed workweek will cut your employees' commutes. A schedule of four 10-hour days per week cuts commuting time, cost, and emissions by 20 percent. A schedule of nine nine-hour days over two weeks will save 10 percent. Even in situations in which people adjust their shifts within a typical Monday through Friday work schedule, worker productivity benefits. The City of Los Angeles found that its employees were 18 percent more productive when they were allowed to select their own work schedules.

Some people may even want to telecommute or work from home one or more days per week. This staffing tool is frequently used by businesses that have space constraints. With today's technology, many employees can work from home and still do almost everything they could in the office. Removing the distraction and worry of the commute adds to employee morale, which can boost productivity.

9. FURTHER CONSIDERATIONS

Other options for saving energy, increasing efficiency and greening the bottom line include:

1. **Establish Resource Conservation Manager:**
   Important business efforts require direct management. If you're serious about boosting energy efficiency, recycling levels, or employee commute alternatives, consider establishing someone (or even multiple people) to manage these operations. An energy manager doesn't have to be an engineer. It merely requires someone who is interested in energy efficiency, takes time to track energy use, research new products, and do what's needed to take advantage of utility incentives. For a small office, this work may be only a small fraction of someone's time. Companies with energy managers have shown that the savings are much greater than his or her salary.

   As with energy, solid waste management is a critical business operation. Many firms have recycling coordinators, a person who tracks recycling activities to ensure that recycling is maximized, that costs are reasonable, and that new waste reduction opportunities are pursued. This person could also be your energy manager.

   Many firms are also establishing transportation coordinators. This position is typical at firms that have 50 or more employees. Companies with fewer employees can still benefit from a transportation coordinator. This position educates employees about commute options to improve transportation service or facilities near the office, and sometimes helps develop flexible work policies;
2. **Form an Employee Green Team:**
   Employees are a great source of ideas and initiative. When engaged and excited, they can accomplish a lot. That's why some firms have encouraged the development of voluntary employee-based green teams. These teams can take the most interested and inspired employees and focus their attention on resource conservation and other green opportunities. In some cases, a green team can be put in place in lieu of formal resource conservation managers;
3. **Specify Non-Toxic Cleaning Products:**
   Many firms would like to use environmentally preferable cleaners, and a number of pilot projects have had success. Still, millions of tons of cleaning products are washed down drains every month. These products often contain toxic chemicals that can find their way into groundwater or waterways. Cleaning products are also responsible for 10 percent of the poisonings reported to Poison Centers nationally in the states. Suggest that your janitorial team use more environmentally responsible cleaning products. Even if the costs are slightly more, you—and the janitors—will benefit. Switching to green cleaners will result in fewer adverse health effects from toxic compounds, fewer hazards in the municipal solid waste stream, less ecosystem destruction from persistent chemicals, fewer toxic releases from manufacturing, and less smog and ozone depletion.

   Remember that even the packaging of cleaning products has environmental impacts. Secondary packaging and non-refillable containers contribute unnecessary waste to landfills. Also consider options for using less water and fewer chemicals during any exterior pressure washing. If you're doing any painting, consider recycled paint or paints with no or low levels of volatile organic compounds; and
4. **Sponsor Environmental Causes:**
   You can only do so much yourself. That's why some businesses sponsor an environmental cause at a local school or in a nearby neighborhood. The causes could include tree planting, community gardens, or other similar activities. Teachers, students, and community groups always appreciate more help. Organizations that have participated in partnerships like this have found them to be very rewarding.

10. CONCLUSION

The model presented in this paper illustrates a comprehensive view of a green office which may not be applicable in its entirety to a typical office environment. It is also possible that some of the green practices included in this paper may have been already adopted in some of the offices. With the objective to enhance these green practices, we need to adopt an organization-wide sustainability policy in order to further save energy, conserve water, reduce waste, and if possible, switch to transportation alternatives.

A policy statement on the subject of sustainability, preferably signed by the CEO, will set the scene. The policy statement is a broad statement that addresses how sustainability efforts will be addressed now and in the future will make it easier to coordinate resources, personnel, and operations. The proposed policy statement should highlight the specific practices that are relevant to the office environments and it should be based to develop implementation strategies.

The proposed policy statement should not be more than two pages.

REFERENCE:

1. Guidelines, Environment Canada;
2. Green Office Guide, A Guide to Greening Your Bottom line through a Resource-Efficient Office Environment, City of Portland; and
3. Green Office Guide A guide to help you buy and use environmentally friendly office equipment.