

Electricity Conservation: The New Trend

Outcomes:

- Identify different approaches taken to answer questions, solve problems, and make decisions (109-7);
- Compare examples of past and current technologies developed to meet a similar need (110-9);
- Analyse the design of a technology and the way it functions on the basis of identified criteria such as cost and impact on daily life and the community (113-5);
- Make informed decisions about applications of science and technology, taking into account environmental and social advantages and disadvantages (113-9)

Introduction

Inflation and the resulting high cost of living have made saving money a daily concern. People are constantly looking for ways to “stretch out” their money and to “make it go further”.



Figure 1: Try it and you'll quickly discover that it is impossible to actually "stretch out" money to make it "go further"!

When it comes to household electricity use, conservation is the primary means of saving money. Saving money on an electricity bill has obvious financial rewards. However, there is an equally important savings, which is a reduction in the demand for fossil fuels.

Oil, coal, and natural gas are the fuel fossils that are used to generate much of the world's electricity. While Newfoundland and Labrador produces relatively little electricity from fossil fuels, in Canada, approximately 25% of all electricity is generated using fossil fuels. Burning fossil fuels contribute to the production of greenhouse gases such as carbon dioxide (CO₂ (g)), which are the main contributors to the global warming effect (i.e. climate change). Burning fossil fuels also produces other harmful gases that cause acid precipitation and which lower air quality. Thus, electricity conservation results in both saving money and helping the environment.

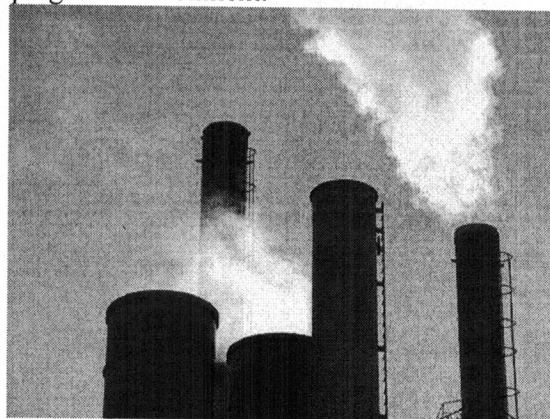


Figure 2: A plant that generates electricity by burning fossil fuels. The actual greenhouse gases are not visible but steam and unburned by-products such as soot are. Photo courtesy of Wikipedia Commons.

One of the issues associated with attempting to conserve electricity is that the results of peoples' actions are not immediately visible. As an example, how much electricity would be conserved if a person decided to take a shorter shower on a given morning? Or, how much would be conserved if a person decided to turn off the second light in their bedroom on a given evening? While we "know" we would reduce the amount of electricity being used in these cases, how much would we actually save? Would it be worth the effort?

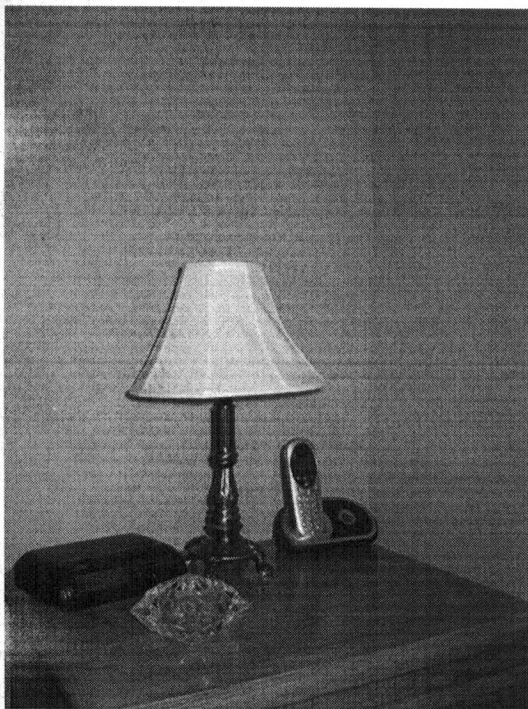


Figure 3: Unless you need additional light for reading or other activity, there is no need to turn on this lamp if the other lamp is already turned on in the same bedroom.

To address this problem a Newfoundland and Labrador company (Blue Line Innovations) have developed a device called the PowerCost Monitor. This device is placed in a person's home and takes information from that person's electricity meter, which is located on an outside wall (i.e. outside of house). The PowerCost Monitor displays the "real time" electrical usage

on a small monitor, which is located on an inside wall (i.e. inside of house). The benefit of a device such as this is that the monitoring is done in real-time, thereby allowing the results of the person's conservation actions to be immediately visible. A person can obtain a measurement of the electricity conserved by such things as "turning down" a heater, taking a shorter shower, turning off lights, etc. Such a device can motivate a person to continue trying to conserve electricity because they can visualize the immediate results of their actions.

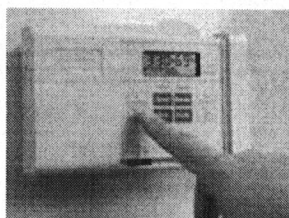


Figure 4: This device allows for real-time monitoring of electricity usage.

This assumption was shown to be correct by a study undertaken in the years 2007 and 2008. In this study, customers of Newfoundland Power participated in a program that allowed them to monitor the amount of power that they were using in their homes. The program revealed that these families decreased their electricity consumption by an average of 18%. In dollars, this would equate to a savings of approximately \$54.00 on a \$300.00 electricity bill or more than \$600 per year.

It is important to understand that it was not the PowerCost Monitor that was responsible for saving electricity. The device simply provided people with measurements of real-time electricity usage, which provided them with immediate feedback on their actions to conserve electricity and motivated them to make small changes in behaviour which had big impacts in their electrical usage.

Options for Saving Electricity, Money, and Protecting the Environment

Our “savings options” can be grouped into two categories: (1) spending money and modification, or (2) changing attitudes and habits.

1. Spending Money and Modification.

This category would include such savings options as: buying energy-wise appliances, doors, windows, and electronics; insulating basements and attics with more insulation; and using programmable thermostats.

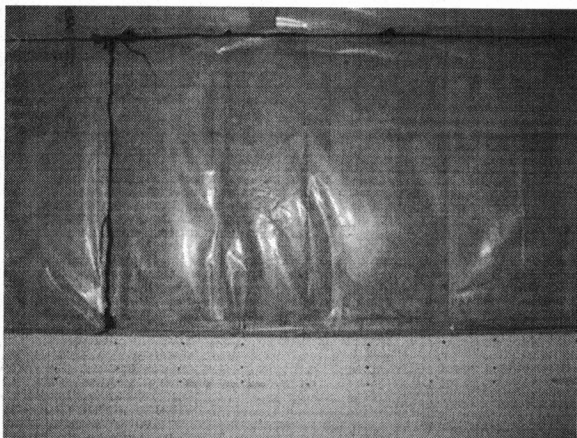
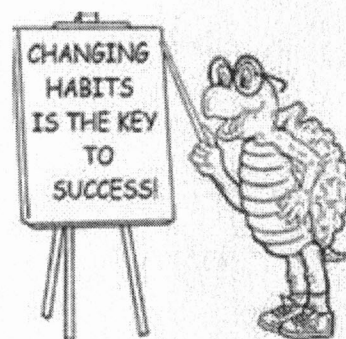


Figure 5: A well insulated basement will help reduce the amount of electricity needed to keep the rest of the house warm.

Sometimes this savings option is not always practical. For example, why replace an old refrigerator, which is working perfectly, with a new refrigerator that uses less electricity? The money savings would never pay for the new refrigerator! Why tear up a finished basement to add more insulation? The money savings would never pay for the materials that would be destroyed or ruined in the renovations.

2. **Changing Attitudes and Habits.** This category represents a cheap, effective and easy way of conserving electricity and saving money.



Many people would be surprised to discover how changing their habits in relation to how they use their home appliances dramatically influences (i.e. lowers) their electricity bills.

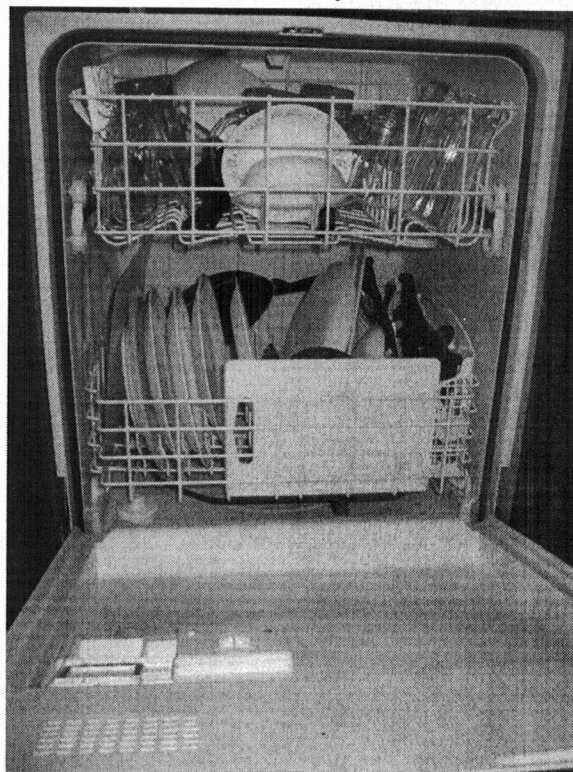


Figure 6: Whether the dishwasher is a new, energy efficient model or an older model, waiting until the dishwasher is fully loaded before starting the wash cycle results in less hot water being used. This means less electricity is used.

Ways to Conserve Electricity

1. **Hot Water Tanks:** Heating water accounts for approximately 20% of the energy use in the home. Usually hot water tanks come from the manufacturer with the thermostat preset to keep the water at a temperature of 60 °C. As a result, the heating elements will try to maintain this temperature at all times, which is hotter than is needed for normal family use (e.g., washing hands, washing dishes, showering, etc). Lowering this setting to 50 °C will cause the heaters to “cut in” less. It is estimated that every 10 degree reduction results in a savings of about 4% on the cost (and energy used) to heat water each year.

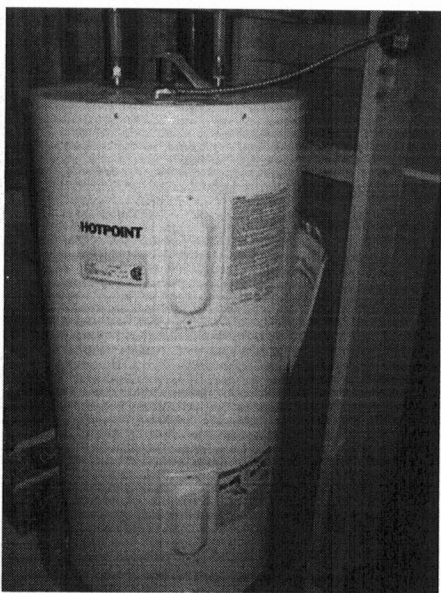


Figure 7: Hot water tanks often come preset at 60 °C. To keep the water at this temperature, the tank uses more electricity than it would if the temperature was set a five or ten degrees lower. While the savings would be huge, the amount of hot water available to the household would not be reduced.

To further reduce the amount of energy used to keep the water in a hot water tank hot, you can insulate the hot water tank and any exposed hot water pipes. Finally, using low-flow shower heads will greatly reduce the amount of hot water used for each shower, thereby reducing the amount of electricity used.

2. **Dishwashers and Clothes Washers:** Dishwashers are most efficient when they are loaded to capacity. If you run the dishwasher when it is only half full, it will use the same amount of hot water as it would if it was full of dirty dishes. Not waiting until the dishwasher is full means you will use more energy cleaning dishes.

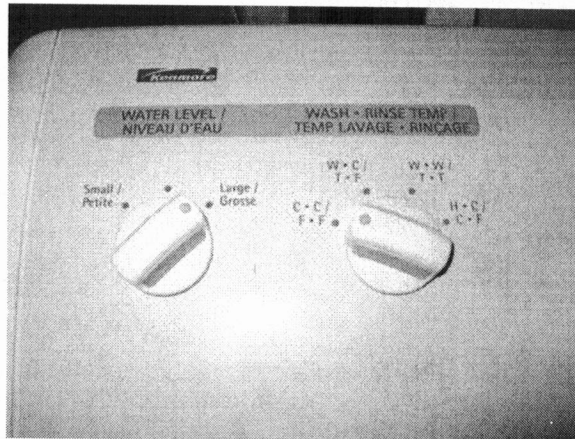


Figure 8: The cold-wash and cold-rinse setting (C-C) means less hot water is used during the wash cycle. The hot-wash, cold-rinse setting (H-C) requires more hot water. If you make sure you wash only large loads (high water setting) the energy savings will be even greater.

Energy savings are even greater when the dishwasher has a high energy efficiency rating. Since all appliances sold in Canada must have an EnerGuide label, it is easy for consumers to choose appliances that are energy efficient. Consumers can compare both the immediate purchase cost as well as the long term operating (energy usage) costs of similar appliances. Choosing the most energy efficient model, within the purchaser's budget, will provide the greatest savings.

Another symbol, the Energy Star label, is also helpful when purchasing appliances. When included as part of the EnerGuide label, the Energy Star indicates that the appliance meets a premium level of energy efficiency. It also indicates that this appliance is among the most energy-efficient products available.

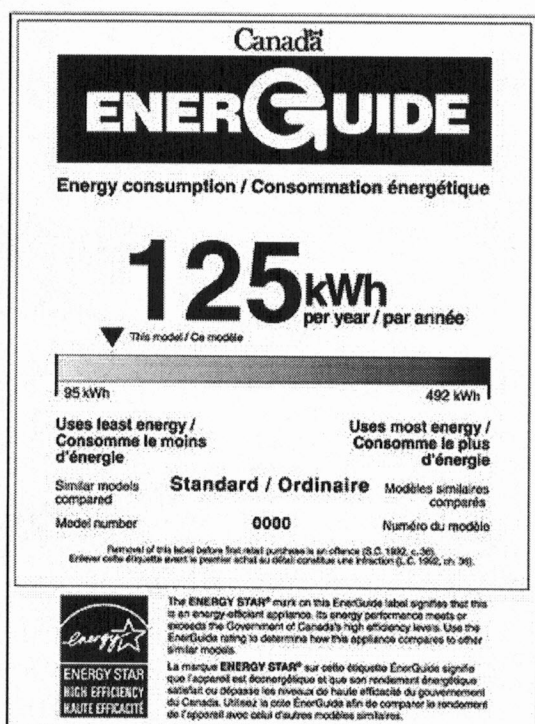


Figure 9: This EnerGuide label shows that the appliance uses very little energy as compared to other models/brands of the same type. The Energy Star symbol reinforces that this product is among the most energy-efficient in its class.

Clothes washers function similarly to dishwashers and as a result, the same conservation tactics apply. Clothes can be effectively washed in large loads and using cold water, particularly if a good detergent is purchased and used.

3. **Clothes Dryers:** These are simply large heating units. Air drying, whether on an inside line or an outside line, is a more environmentally-friendly method of drying clothes. If air drying is not possible, it is important to remember that full loads in clothes dryers are more efficient than half loads. Also, if a person has more than one load of clothes to dry, then he or she should do them one after the other in as short of a time span as possible. This will take advantage of an already heated dryer and as a result, less electricity (or energy) will be consumed.

When purchasing a new clothes dryer, one should reference the EnerGuide label. In addition, look for one that has a moisture sensing feature. This feature allows the clothes dryer to sense when the clothes are dry and immediately shut off, thereby using less electricity. For older models, the best way to conserve electricity is to use the timers to shorten cycle times, thereby reducing the amounts of electricity used. Remember that over drying clothes will cause them to shrink, which sometimes makes them wrinkly, charged with static electricity, and no longer wearable.



Figure 10: An outside line, which does not use electricity to dry clothes, is more environmentally friendly than even the most energy efficient clothes dryer. Photo courtesy of wikipedia commons.

4. **Refrigerators and Freezers:** These appliances work best when there is a lot of space all around them. This space allows for the warm air that is generated by the devices to escape. Allowing the warm air to escape prevents the appliance from working harder (i.e., uses less electricity). Refrigerators and freezers should be placed far away from heat sources such as ovens, hot air ducts, and windows. Such heat sources will cause the devices to use more electricity (or energy) to keep its contents cold. A temperature between 5 °C and 10 °C for a refrigerator and -5 °C for a freezer will not only maintain food, but will provide the best electricity savings.

Cleaning the dust from the condenser coils at the back or bottom of both devices will help to also maximize their efficiency. A vacuum or brush can be used to do this, but first make sure that both devices are unplugged. Switching to manual defrost mode will save about 33% of a refrigerator's electricity use. Finally, limit the number of times and the length of times that the doors on both devices are open. This prevents warm air from entering and also reduces the number of times that the devices "cut in".

5. **Ovens and Stove Tops:** To reduce the amount of electricity used in preparing food, use a microwave oven to warm/cook the food. Microwave ovens use much less electricity than a conventional electric oven. Also, glass dishes can be used to cook food in ovens because the food can be cooked at lower temperatures and preheating the ovens is not necessary.

When cooking on a stove top, using covered pans will prevent a large portion of the heat from escaping and will allow the food to cook faster. Also, use the burners that matches the pot size. Bigger pots will require the smaller elements to be turned on for longer and smaller pots will result in the bigger elements giving excess heat off to the surroundings.



Figure 11: Electric ovens use large amounts of energy to cook food.

6. **Lighting:** Lighting a house is responsible for about 15% of the household electricity bill. Advances in lighting technology have resulted in opportunities for savings of both electricity and money. Compact fluorescent light bulbs conserve electricity and they give much more light than incandescent light bulbs. For example, a 20 to 25 watt fluorescent light bulb (i.e. an energy-saving light bulb) is equal to a 100 watt incandescent light bulb. (It is important to realize that fluorescent light bulbs operate differently from incandescent light bulbs. Fluorescent light bulbs pass electricity through a gas, which causes it to give off light, whereas incandescent light bulbs pass electricity through a high resistance wire (e.g. tungsten), which causes it to glow white hot.) For example, over a seven hour period while producing the same amount of light, an 8 watt fluorescent light bulb will conserve about 280 watts of electricity in comparison to an incandescent light bulb. The fluorescent bulb also lasts up to nine times longer.



Figure 12: A compact fluorescent light bulb.

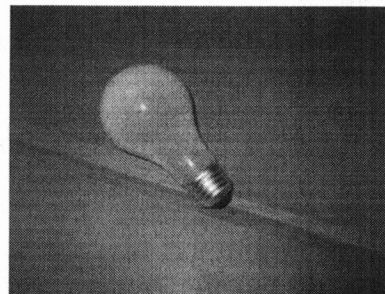


Figure 13: An incandescent light bulb.

Turning off incandescent light bulbs whenever a person leaves a room saves energy. However, for fluorescent light bulbs, a person would need to be gone for more than 15 minutes in order to accumulate any savings. The amount of electricity needed to start a fluorescent light bulb is roughly about equal to the amount it burns in 15 minutes. Finally, keeping the fixtures and light bulbs clean can result in fewer light bulbs required and therefore, less electricity being used

Did You Know?

As much as 20% of the light produced can be lost due to dust that has collected on the light bulb and/or fixture.

Conclusion

The ways to help the environment, conserve electricity (or energy), and ultimately save money are not limited to the things discussed here. Turning off such things as lights, televisions, DVD players, computers, when not being used or not being needed are good first steps that lead in the direction of electricity conservation. Also, reducing the thermostat settings in rooms, when they are not occupied, will conserve a great deal of energy.



Figure 14: Why not substitute warmer clothes instead of increasing the thermostat setting when it is possible (e.g., late spring/early fall)? Would you be willing to sacrifice a little comfort in order to reduce the energy consumed in your house?

Everyone can play a part in electricity conservation and no part is too small. People need to challenge themselves, their families, and their friends to conserve as much electricity as possible. It not only makes sense, it frees up money that could be spent in other enjoyable ways.

Questions

1. Why do you think the PowerCost Monitor and the associated program proved to be so successful?
2. Describe five occurrences in your house that wastes electricity.
3. List and describe five actions that you could take to conserve electricity in your home.
4. Describe two electricity conserving ideas that have not been discussed.
5. Research the concept of “vampire energy”. How much energy and money is being consumed by energy vampires in your home?

Potential Group Activities

1. Describe ways in which others in your school and community can be involved in electricity conservation.
2. Create a poster that promotes electricity conservation.
3. How can your school conserve electricity? Your group could present their ideas and/or plan to the school administration.