

3 - ENERGY CONSERVATION AND EFFICIENCY

Reducing the amount of energy used daily in households and businesses is an important step towards achieving energy sustainability and independence in any community. This makes energy conservation and efficiency projects the cornerstone of any energy plan.

Energy conservation is the process of reducing energy use through changes in everyday behaviors. Turning off lights when leaving a room and lowering thermostats are some easy and effective examples of energy conservation—and changing behavior generally doesn't cost anything yet saves money.

Energy efficiency is the process of ensuring that mechanical systems—such as homes, businesses, and appliances—use energy as effectively as possible. Replacing leaky windows, using more energy efficient light bulbs, and buying ENERGY STAR appliances are some examples of easy systems modifications that save energy and money.

Heating and Cooling Homes And Buildings

More energy is spent in heating and cooling a home or business than in any other activity. A typical household spends 40% of its energy on heating and cooling, while an office building will spend 50–65% on heating, ventilation, air conditioning, and cooling (HVAC). This means that heating and cooling inefficiently can waste more money and energy than any other activity. It also means that conservation and efficiency efforts focused on heating and cooling are high priorities.

Conservation Strategies

Changing occupant behavior to conserve heat and cool the home or building is an easy and inexpensive way to conserve energy. The following are examples of occupant conservation that can save energy and keep utility bills lower:

- Choose the lowest comfortable thermostat setting in the winter and the highest in the summer.
- In the winter, save energy by simply opening blinds on sunny days and closing them at night to trap the heat generated during the day.
- Similarly, close blinds on hot summer days and open windows at night to keep homes cooler in the summer.
- Turn the home's thermostat down when individuals leave for a work day (or longer, say, for vacation).
- Program thermostats to heat or cool commercial space for the hours of occupancy. According to the Department of Energy, a 10 to 15 degree setback for only eight hours will save from 5 to 15 percent of total heating costs.

There are many other daily changes in behavior that can save heating and cooling energy. The list is really only limited by creativity. In general, the best way to help individuals save energy is by raising awareness through education and outreach projects (which are discussed later in this section). The more tribe members know—for instance, about how crucial efficient home heating and cooling is to conservation of money and energy resources—the better they will be able to make daily adjustments that help them

save money and energy.

Other great ideas to conserve heat and cooling energy can be found in the “Heating and Cooling” section of the DOE’s Energy Savers Website: <http://www1.eere.energy.gov/consumer/tips/index.html>.

Efficiency Strategies

Prefabricated and older homes are particularly bad culprits when it comes to inefficient heating and cooling. These homes can be drafty and difficult to heat in the winter, forcing residents to use large amounts of expensive fuel or electricity to provide enough heat. Homes can be made more efficient in two ways: through direct improvements to the heat source and HVAC equipment, or through weatherization and home improvement projects that increase heat retention.

Direct improvements to heating equipment can include upgrading older furnaces and boilers to newer, more efficient models. Particularly for homeowners, furnaces tend only to be replaced at the end of their lifetime. Unfortunately this often happens unexpectedly and at the worst possible time (air conditioners fail in the hottest part of the summer and furnaces fail during the coldest months of winter). This leaves people vulnerable to quick decision making with consequences that can last for years to come. First of all, it can be difficult to compare and understand energy differences in different types of heating systems. Second of all, being thrown into an emergency situation, people are usually unprepared to think long-term about costs. The more support provided to individual decision makers during these emergencies, the better. Tribes, either through education or through

contracts and bulk purchasing (particularly for low-income housing) can help steer individual decision makers toward better long-term decisions rather than just acting on impulse. For all efficiency strategies, it is particularly crucial to understand the difference between an upfront cost and a lifetime cost. Most inefficient furnaces (and appliances) are cheaper at first, but over time will cost much more to operate. Even “affordable” housing, can quickly become unaffordable with exorbitant monthly bills due to inefficiency.

Weatherization can include insulation upgrades, replacement of single-pane windows with more efficient models, and repairing leaks in walls and roofs. While these projects are crucial to improving a building’s efficiency in the long-term, there are also low-cost improvements that home owners can easily do themselves anytime to increase efficiency. Examples include:

- Using rope caulk to seal leaks around drafty windows
- Installing door sweeps under drafty doors

Other ideas for weatherization and home improvements to conserve heat can be found again on the DOE’s Energy Savers Website or in their Consumer Guide to Energy Efficiency and Renewable Energy: http://www.eere.energy.gov/consumer/your_home/.

Appliances And Lights

After space heating and cooling, electric appliances are the next biggest energy cost for a house. Similar to heating and cooling, energy used by appliances and lights can also be reduced through conservation and efficiency.

Conservation Strategies

Conservation of energy used by appliances and lights is as simple as turning off the lights when leaving a room or using electronic appliances less. Significant savings of energy can be achieved, again, with the right education and awareness. Appliances and lights are visible energy-users that children understand and thus make good topics for early conservation education. Motion sensors installed in commercial buildings to turn lights on and off based on occupancy are also a technical-solution that can provide significant savings through conservation.

Many appliances still draw small amounts of electricity even when they are turned off. When considering the number of appliances in each building, the number of homes and buildings, and the fact that this occurs 24 hours every day, these “phantom loads” can really add up. The solution is to unplug appliances or use power strips with an “off” function.

Efficiency Strategies

Generally, the most effective way to decrease the energy use and save money on an electric appliance is to purchase a more energy-efficient model. Replacing appliances is more likely to be cost effective if the appliance is relatively cheap, or if there is a large difference in energy efficiency between the old appliance and the new appliance. The greater percentage of a home or building’s energy that is dedicated toward a single appliance, the greater the priority to evaluate the efficiency of that particular appliance. There will be more return in replacing an inefficient refrigerator, washer, or dryer with an efficient model, than replacing something like a radio with a new model. Again,

when replacing appliances, it is important that decision makers understand the concept of upfront cost versus lifetime cost.

The US Environmental Protection Agency and the US Department of Energy set standards for energy efficient appliances through the ENERGY STAR program. ENERGY STAR appliances use 10–50% less energy and water than average models. The federal ENERGY STAR website (<http://www.energystar.gov/>) and the regional ENERGY STAR website (<http://www.northwestenergystar.com/>) each have searchable lists of qualifying appliances and vendors that sell them. Buying ENERGY STAR appliances can save money not only through energy savings, but also through tax credits and incentives — see the Section 7 for more information.

Lighting deserves a special mention. Although individual bulbs do not use much power, many light bulbs used for many hours a day are cumulatively as significant as larger appliances. Just like with other electric devices, there are two ways to reduce energy usage: use light bulbs less, and buy new efficient bulbs. In this case, upgrading to energy efficient light bulbs is very cost effective and strongly recommended. Compact fluorescent lamps (CFLs) use up to 75% less energy than standard incandescent light bulbs. They also have a life span that is up to 14,000 hours longer than standard incandescent bulbs—that’s well over a year! The savings and ease of switching to CFLs are so clear that many utilities are offering incentives to switch.

Water Heating

Water heating is the third largest energy cost for a typical household. This is because water

heaters, like refrigerators, draw energy frequently, whether or not it is actively in use. Hot water is used frequently in daily household activities such as bathing, cleaning dishes, and washing clothes. In commercial buildings, use varies depending on the purpose of the building. In a hotel, for example, use will be high.

Conservation Strategies

Measures that use less hot water are doubly cost effective because they save money both on water bills and on electricity bills. Some, like taking shorter showers, are also conveniently free. Others, like installing low-flow faucet heads, cost less than \$20 initially and pay for themselves within months.

Efficiency Strategies

Water heating can be made more efficient with upgrades to new energy efficient model heaters. Similar to heating and cooling systems, there are many types of water heaters available and it can be difficult to compare different options, particularly in a crisis when a system unexpectedly fails. The ENERGY STAR program is again, a great guide. In addition to replacing an inefficient water heater, the following strategies can improve the efficiency at which an existing heater operates:

- Use a tank-wrap to add insulation to an electric hot water storage tank to reduce heat losses. Significant heat loss is occurring in any water tank that is warm to the touch.
- Add foam insulation around exposed hot water pipes
- Adjust the temperature of the tank to 120°F (some manufacturers set water heater thermostats at 140°F) which not only wastes

energy, but can be a safety hazard.

Solar energy may also be a feasible way to meet a home or building's domestic hot water needs. More information about solar energy technology can be found in Section 4.

Special Concerns for Commercial Buildings

Commercial buildings have the same basic types of energy use as residential buildings—space heating and cooling, water heating, lighting, electric devices—but the balance between these can be quite different. Almost every commercial building dedicates more of its energy budget to lighting than a household. Large commercial buildings require more complicated and more finely controlled HVAC systems to produce a comfortable interior environment. Requirements for hot water, food preparation appliances, communications and entertainment electronics, etc., will vary widely by the purpose of the building. Thorough energy audits (discussed next) are essential to identifying the most cost-effective targets for energy efficiency improvements, and the assistance of a consultant or contractor is highly advisable. Information resources for a wide variety of building types are available on the EERE site at <http://www.eere.energy.gov/buildings/info/energysolutions.html>.

In the Northwest, commercial buildings are much more likely than residential buildings to have a cooling system. Because the cooling system is only used for a small part of the year, there is no reason to have over-sized cooling equipment. For both heating and cooling equipment, it is important to choose the correct size, which a commercial energy audit will help

determine. It is also crucial to periodically check controls to make sure that settings are correct. The temperature settings for both heating and cooling should correspond with the time and days of occupancy.

Hotels and resorts have a unique energy use profile, strongly weighted towards water heating for laundry and cleaning (see Figure 3.1). This means that switching from top-loading machines to more efficient front loading machines, for example, could make a big difference in the energy savings for a hotel or casino. The energy used by clothes dryers is also significant; using dryers with moisture sensors in the drum for automatic shut-off can save 15% of the drying energy compared to timed drying. The Alliance to Save Energy (http://www.ase.org/section/topic/ee_hotels) and ENERGY STAR (http://www.energystar.gov/index.cfm?c=hospitality.bus_hospitality) have other useful information about energy efficiency for hospitality on their websites.

Energy Audits

An energy audit is an important tool for identifying the most cost effective ways a home

or office could be improved to save energy. This is done through an inspection of a home or business to determine where and how the building may be wasting energy, and where improvements can be made. In a home, an energy audit can be as simple as a resident walking through the house with a wet hand to feel for major leaks. See Appendix B for specific steps involved in a residential audit.

A professional home energy audit will provide more detailed recommendations for weatherization, insulation, and appliance upgrades through an on-site inspection. A professional commercial or industrial energy audit is particularly important before major renovations are undertaken. Many utilities, including Avista, Puget Sound Energy, and Idaho Power, offer energy auditing services. If the local utility does not offer energy auditing directly, they should be able to recommend professional energy auditors in the area. ENERGY STAR also partners with professional energy auditors. If the utility offers energy auditing, their service is likely to be less expensive than that of a private energy auditing business.

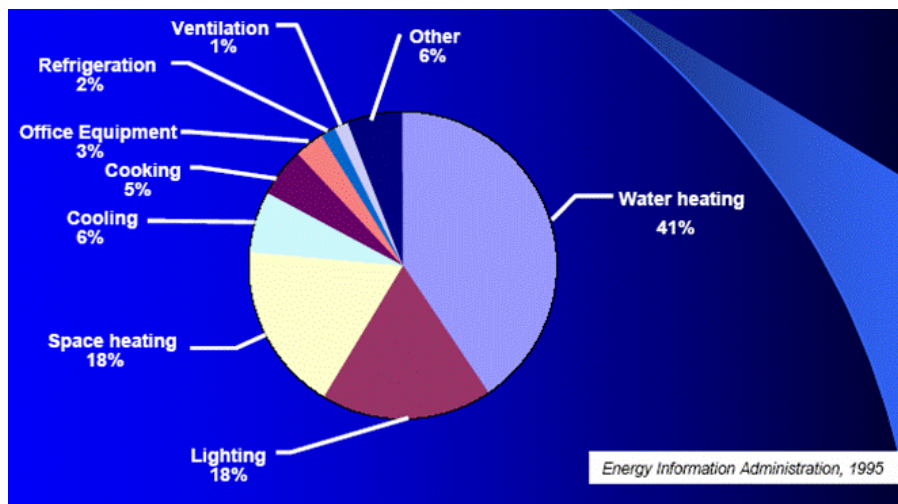


Figure 3.1 - Major energy expenditures in hotels include lighting for guest rooms and common areas, heating, ventilation and air conditioning systems (HVAC) and motors in equipment such as elevators.

Source: Energy Information Administration, 1995; from http://www.ase.org/section/topic/ee_hotels

Energy Efficiency Projects

Education Projects

Education and outreach projects focused on conservation and efficiency are perhaps the easiest and most cost-effective way for a tribe to make its energy use more sustainable. Because there are so many free and cheap ways to save energy, education projects are worthwhile to ensure that everyone understands how energy works and are aware of their options and opportunities for energy efficiency. In addition, an education project can be a forum for community discussion about energy, which could guide further energy planning.

Workshops are a traditional and effective educational tool, and they work well for energy conservation and efficiency education. In addition to standard workshop formats, energy conservation and efficiency education can also be particularly effective in home visits that resemble home energy audits with a focus on occupant education. Handing out small, inexpensive energy saving materials (such as CFLs, rope caulk, door sweeps, etc.) at workshops or in home visits is a great way to encourage implementation of conservation and efficiency techniques. Knowledgeable individuals from inside or outside the tribe can conduct workshops and home visits. Utilities, non-profit organizations, or government agencies may be willing to help fund your event and provide basic supplies. Training tribal members to conduct conservation and efficiency workshops and home visits is a great option if the goal is to create a long-term sustainable program. Interested individuals may be identified in initial workshops and home visits. See [Appendix C](#) for a list of specific suggestions for each step of planning an energy efficiency education event.

Case Study

Refrigerator replacement programs can make a big difference in the energy savings of individual households. Like water heaters, refrigerators use energy continuously, and those manufactured before 1990 use nearly twice as much electricity as more recent models. In the northwest, the Colville, Upper Skagit, Spokane, Yakama, Quileute, and Nisqually Tribes have worked with the non-profit organization Northwest Sustainable Energy for Economic Development to create successful refrigerator replacement programs. Programs involved conservation education, the distribution of home efficiency materials, and the replacement of inefficient refrigerators with new, Energy Star models. More than 180 refrigerators have been replaced through this program, resulting in approximately 200 Megawatt-hours of energy saved in tribal homes. Funding for these programs came from Puget Sound Energy, Bonneville Power Administration, Washington Consumer Education Fund, WA Department of Community, Trade, and Economic Development, and the Seattle Foundation. This program could easily be adapted to other appliances or to other program management formats.

Equipment Upgrades

Equipment upgrade projects benefit individuals by suggesting appropriate and cost-effective upgrades, providing the necessary supplies or money to purchase equipment, providing a timeline and personal contacts to push the project to completion, and potentially increasing the quality of life at home or work. Equipment upgrade projects benefit tribes by building capacity on technical energy issues, project planning, and securing grants for energy projects.

These projects may be as simple as distributing low-cost energy efficiency supplies—such as CFLs, low flow faucets and showerheads, and some weatherization materials—that residents or employees can install by themselves without assistance. This sort of project is most effective when coupled with an educational component.

Projects that involve more costly and complex appliance replacements or building improvements tend to take a greater degree of planning, financing, and coordination, but they also make a greater impact. Furnace upgrades, serious weatherization projects such as window or roof replacements or repairs, and refrigerator replacements are all examples of programs that may be funded or coordinated by local utilities, non-profit organizations, and governmental agencies. Again, these projects are most effective when coupled with conservation and efficiency education. Targeting those with the greatest need will also increase the impact and return on an equipment upgrade project.

Choosing a Project

Energy conservation and efficiency projects are the most cost-effective way to decrease energy costs. Reducing energy use also makes it easier

to meet the remaining needs with clean energy. Some factors to consider when choosing among energy conservation and efficiency projects include the following:

- Budget: existing funds and anticipated ability to raise funds for this project
- Lifetime costs: cost-effectiveness and impact of a project has to do not only with upfront cost and budget, but with the energy savings over time
- Efficiency goals: targets and priorities set in the energy plan to be met through this project
- Other goals: related plans for housing, economic development, education, etc.
- Internal capacity: areas of expertise of tribal members
- External capacity: areas of expertise of non-tribal partners (non-profit organizations, utilities, and contractors)

Budget and internal capacity are often the limiting factors. These two roadblocks can be addressed through grants and other funding opportunities and by supplementing internal capacity with contractors. Table 3.1 prioritizes a few energy conservation and efficiency measures by approximate upfront cost. Section 7 discusses financing for conservation and efficiency projects further.

Table 3.1 - Energy conservation and efficiency measures and approximate costs

Sources: Home Depot, Lowe's, ENERGYSTAR, Full Spectrum Solutions, Northwest SEED.

Note: costs do not reflect incentives or rebates.

Measure	Quantity	Estimated Cost
Caulk100	50 bottles	\$150
Weather stripping	200 ft	\$200
CFLs	50 bulbs	\$300
LED exit signs	10 signs	\$600
Conservation education meeting Speaker & bags of conservation supplies	20 attendees	\$1,300
Conservation education meeting (incl. speaker and bags of conservation supplies)	50 attendees	\$2,500
Bags of conservation supplies	100 bags	\$4,000
Commercial lighting upgrade	4000 sq ft	\$30,000
Refrigerator replacement program (incl. all costs)	60 home visits, 30 refrigerators	\$80,000