

SMALL RESORTS' GUIDE TO ENERGY

2006



SUPPORTING THE SUSTAINABLE SLOPES ENVIRONMENTAL CHARTER

PREPARED BY NSAA AND
THE BRENDEL GROUP



**SUSTAINABLE
SLOPES**
The environmental charter for ski areas

NATIONAL
SKI AREAS
ASSOCIATION



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1.0 INTRODUCTION

Small ski areas constitute an integral part of the U.S. ski industry. The National Ski Areas Association (NSAA) commissioned this guide on their behalf as part of the Sustainable Slopes program. Our hope is that small resorts can achieve greater energy efficiency, realize cost savings, invest in green energy, and increase participation in the Sustainable Slopes program as a result of this guide.

While there may be a misconception within the industry that small resorts may not have the capacity to undertake many of the energy efficiency projects available to larger resorts and therefore are unable to reap the benefits of these projects, the truth is that they can and they are. Many of the Green Room entries that NSAA receives each year come from resorts with fewer than 300,000 skier visits annually. In fact, smaller resorts account for many of the successes related to lifts, snowmaking, and facilities energy use. This year's winner of the CLIF Bar Silver Eagle Award for Energy Conservation/Clean Energy was Buck Hill, MN. Based on the 2006 NSAA Annual Report data, 13 percent of energy savings from efficiency measures and 21 percent of renewable or green energy purchases are reported by small resorts.

Table 1 offers a sampling of what small resorts can and are accomplishing on the energy conservation and renewable energy front.

Table 1: Small Resorts in Action: Energy Efficiency and Green Energy Projects

Resort	EFFICIENCY PROJECTS		GREEN ENERGY PROJECTS	
	Buildings	Operations (snowmaking, lifts, outdoor lighting, etc.)	On-site Renewables	Purchased Renewables
Alpine Meadows, CA	lighting			
Angel Fire, NM	lighting; occupancy sensors	efficient snow guns; cooler for input water		
Arapahoe Basin, CO*	programmable thermostats	demand management		
Bogus Basin, ID			solar powered lighting	
Bretton Woods, NH	HVAC and controls upgrades; building envelope; lighting	efficient snow guns		
Buck Hill, MN*				renewable energy
Cascade Mountain, WI		efficient snow guns		
Crystal Mountain, MI				wind energy
Durango Mountain, CO		demand management		
Gore Mountain, NY*				wind energy
Hunter Mountain, NY				wind energy
Jiminy Peak, MA			on-site wind turbine	
Okemo Mountain Resort, Vermont				green energy certificates
Pats Peak, NH	lighting; occupancy	efficient snow guns;		

Resort	EFFICIENCY PROJECTS		GREEN ENERGY PROJECTS	
	Buildings	Operations (snowmaking, lifts, outdoor lighting, etc.)	On-site Renewables	Purchased Renewables
	sensors	motor upgrades		
Sierra-at-Tahoe, CA*			solar thermal radiant space heating	
Smugglers' Notch, VT*				SkiCool climate neutral skiing
Sugar Bowl, CA		heating system upgrades		100% wind energy
Waterville Valley, NH	building envelope	demand management		
Whiteface Mountain, NY*				green energy
Wisp at Deep Creek, MD	HVAC upgrades	efficient snow guns; automated snowmaking		
Wolf Creek, CO				wind energy

*Denotes past Silver Eagle Award winner.

This Guide is a practical resource to help your resort join with these and other small resorts in an ultimate win-win small business strategy that includes energy efficiency and renewable energy coupled with the beneficial effects of cost savings to the bottom line.

Most participants in the ski industry are realizing that proactive environmental management is ultimately more cost-effective than reactive or status quo environmental management. Moreover, ski areas are increasingly called upon to reach higher levels of environmental stewardship by regulators, customers, and interested organizations. However, the varied aspects of resort operations that affect the environment often are difficult to identify, measure consistently, and address systematically. And for the small resort with fewer than 300,000 skier visits annually, finding the resources to respond proactively can be particularly challenging. Rather than focus on the challenges, however, it is important to recognize the advantages that small resorts have and capitalize on them. Smaller resorts have less complex operations (for example, 3 to 4 electric meters versus 100) and fewer levels of management so that decisions can be made more quickly and can be implemented directly for speedy results. The key is to be empowered with the expertise to make good business decisions that also make good energy sense.

This guide will help small resort operators understand the opportunities available to them for energy conservation and the benefits that inevitably will follow. Specifically, the Guide will illuminate practical, proven techniques and technologies for conserving energy and resources at ski areas and will identify resources available to help small resorts achieve their conservation goals. Ultimately, the purpose of this guide is to help small resorts save money through energy conservation and realize that practical, proven techniques and technologies exist for reducing environmental impacts of ski area operations.

2.0 WHY ENERGY MANAGEMENT?

2.1 Immediate Cost Savings

There are many important reasons to implement conservation measures, including pollution prevention, cleaner air and fighting global warming. In addition to these reasons, one of the most compelling for smaller resorts may be the immediate cost savings that result from using less energy, water, and materials. By implementing a few relatively simple measures designed to reduce consumption (see Section 3.0), resorts can save money that they can then reinvest in other longer term conservation measures.

2.2 Long-term Benefits

Investing for the long term may mean an initial investment to get programs and measures up and running. However, these investments are offset over time with the savings achieved by their implementation. Not only are there financial paybacks for these investments, but many conservation measures involve aspects of ski area preservation that enhance the very basis upon which a resort exists and help sustain an environment that can support skiing into the future.

2.3 Other Business Case Benefits

A ski resort that engages in conservation and preservation activities will have a greater appeal to its customers and community, and will benefit from this public goodwill in ways that may be immeasurable in terms of customer loyalty and community support. In addition, thinking strategically about conservation raises standards, inspires employees, and wins the hearts and minds of customers and the community in which it resides.

The goal is to create win-win benefits from each energy project. For example, the obvious benefit of making lighting upgrades is the cost savings associated with using less energy. However, a residual benefit is often improved worker productivity. The same could be true of installing programmable thermostats to increase worker comfort and productivity and reaping energy savings as well. Furthermore, energy-saving projects that may involve installing new systems not only can reduce energy costs, but also can reduce maintenance costs associated with old, leaking systems. Energy-saving measures are rarely isolated and often exceed expectations overall.

3.0 TOP 10 COST-SAVING MEASURES

In order to make this Guide as useful as possible, NSAA identified a variety of measures that are applicable to small resorts, offer significant paybacks relative to investment, and are within reach for most small resorts. NSAA then pared down the list of measures to a manageable list of the top 10 most cost-saving measures shown below. These measures offer immediate savings and will help small resorts move toward increasing sustainability.

1. Lighting upgrades
2. Programmable thermostats
3. Sensors and timers (e.g., for heating units, snowmelting heat tape, etc.)

4. Infrared space heaters
5. High-efficiency snow guns
6. Rate structuring and peak shaving
7. EnergyStar® equipment
8. Sink aerators
9. Photovoltaic panels for remote electrical needs
10. Education and outreach

3.1 Lighting Upgrades

Because lighting consumes as much as 20 to 25 percent of all electricity sold in the United States, installing energy-efficient lighting alternatives in new buildings or as retrofits in existing buildings can be a significant area of savings for resorts of any size. Numerous energy-efficient alternatives exist for lighting that result in significant energy and cost savings, and Table 2 illustrates potential energy savings associated with particular lighting elements.

Table 2: Potential Lighting Energy Savings

Lighting Element	Potential Energy Savings
Lamps and ballasts	20-40 percent
New fixtures	30-50 percent
Task and ambient lighting	40-60 percent
Outside lighting	30-50 percent

Source: U.S. Environmental Protection Agency (EPA) Energy Star® Program

Resorts can use the list below when considering possible lighting upgrades (from *Putting Energy Into Profits: EnergyStar® Guide for Small Business* http://www.energystar.gov/ia/business/small_business/energyintoprofits.pdf#search=%22Putting%20Energy%20Into%20Profit%22):

- Replace incandescent light bulbs with compact fluorescent lamps.
- Upgrade fluorescent fixtures with T-8 fluorescent lamps and electronic ballasts.
- Remove or disconnect unnecessary lights.
- Convert exit signs to LED.
- Lower light levels where appropriate, such as around computer monitors.
- Install occupancy sensors in areas that are frequently unoccupied, such as bathrooms.
- Install timers or photocells on outside lights.

Alpine Meadows

Extensive lighting retrofits throughout the resort, efficient compact fluorescent lights, reduced lighting where possible, and motion sensors rather than light switches to mitigate the amount of wasted energy when rooms are unoccupied.

Lighting upgrades are within reach for most ski resorts and can be implemented over time in every area of a building and usually in every light fixture. Furthermore, lighting retrofits or

energy efficient lighting alternatives in new fixtures are relatively easy to implement and are guaranteed to have a speedy payback. More information on lamp comparisons and EnergyStar® suggestions can be found at <http://www.energystar.gov>.

3.2 Programmable Thermostats

Resorts can save as much as 10 percent a year on their heating and cooling bills simply by turning their thermostats back 10 to 15 percent for 8 hours a day. The easiest way to do this consistently is with an automatic setback or programmable thermostat. Thermostats can be used to schedule the operation of most heating and cooling equipment, including unit heaters, electric baseboards, forced-air furnaces, packaged rooftop units, and split-system air-conditioning units. The beauty of programmable thermostats is that they automatically adjust temperature settings, allowing resorts to save energy during unoccupied overnight and/or low-need times of the day. These thermostats use less energy, they contain no mercury, and they are more convenient and accurate than manual thermostats. Programmable thermostats typically result in a payback period of 1 to 2 years.

For more information about the specific benefits of programmable thermostats, go to the EPA's EnergyStar website (http://www.energystar.gov/index.cfm?c=thermostats.pr_thermostats) or the Department of Energy's Energy Efficiency and Renewable Energy web site (<http://www.eere.energy.gov/consumer/tips/thermostats.html>).

3.3 Sensors and Timers

The seasonal nature of resort operations, combined with having equipment spread across many facilities on mountain, raises a controls challenge for resorts. Savings can be achieved simply by ensuring that heaters, snowmelt tape, lighting, etc., are not operating when not in use, particularly during the off season.

Heating equipment, such as the heaters found in lift motor/operator houses or snowmelt tape, can be placed on programmable thermostats, as previously discussed, or on electronic time controls. Either of these control options can control daily and seasonal equipment operation. For example, electronic time controls on the heaters in a lift motor house can be set to provide morning warmup before operators arrive without heating the space throughout the night. Furthermore, the same controls can ensure that the heat is turned off at the end of the season. Electronic time controls and programmable thermostats are widely available from numerous manufacturers.

Pats Peak

*Motion detectors and timers to shut off lights
automatically when no one is in the office.*

Lighting controls present another opportunity for cost savings by ensuring that lighting is not left on in unoccupied or unused spaces. In building interiors, which might include lift motor houses, restrooms, or conference rooms, dual technology (ultrasonic and infrared) occupancy sensors are an effective control solution. The more fixtures controlled by a sensor and the more intermittent the occupancy, the better the resulting payback (e.g., conference rooms with four or more fixtures have a much better payback period than a single office with only two fixtures). For exterior lighting, photosensors can be used to ensure that lighting only operates during hours of dusk and darkness. Photosensors can be combined with timers to limit operational hours where security or operational needs do not dictate lighting all night. For more information on lighting controls, the

Whole Building Design Guide website (<http://www.wbdg.org/design/electriclighting.php>) is an excellent resource.

3.4 Infrared Space Heaters

Instead of using electric space heaters in resort buildings (particularly lift operator houses), small resorts should consider radiant heaters. Though space heaters are small, they can have a big impact on energy bills. Standard space heaters use 1,200 to 1,500 Watts, while radiant heaters use only 35 to 135 Watts.

In addition, radiant heaters operate at safer, lower temperatures, do not use a fan blower, and are available as rubber floor mats, carpeted floor mats, under desk panels, or overhead panels. These units range in price from \$70 to \$100 each.

Radiant heaters do produce a moderate electro-magnetic field (EMF). If EMF is a concern, there are underdesk, ceiling, or wall-mount units available. EMF field strength drops dramatically as a person moves away from the source (even over a foot or two). By using a radiant heater that does not have direct body contact, these issues should be eliminated.

3.5 High-efficiency Snow Guns

Cost savings associated with more efficient snowmaking can range from a few thousand dollars to tens of thousands of dollars annually for many resorts. Of course, initial costs to reap the benefits of higher efficiency can be significant in terms of installing modern snow guns and air compressors. Real-time controls, sensors, and monitoring systems that optimize snowmaking systems also involve an investment. However, these systems and efficient equipment reduce electrical demand that will continue to affect costs over the long term. In addition, many resorts use distributed, on-site power generation to avoid or reduce peak demands from the utility grid, thereby lowering their electricity costs. For more information, see *Greening Your Ski Area: A Pollution Prevention Handbook* (January 2002) on the NSAA web site, www.NSAA.org.

It is important to realize that the most high-tech snow making system can be made inefficient if there are air leaks in the compressor or water leaks in the system. A simple measure for ensuring greater efficiency of any snowmaking system is to repair both air and water leaks so that the system operates effectively.

Bretton Woods

Snow Economics HKD snowmaking tower guns capable of blanketing a half-acre of slope overnight with tremendous efficiency (the annual compressed air energy savings for 60 guns totals more than \$75,000). Guns expected to save 350,000 kWh of electricity annually.

Pats Peak

Efficient snow guns that reduce energy use by more than 8 percent, while increasing coverage. Guns cut snowmaking hours from 700 to 400 in less than 3 years (each hour of operating snowmaking equipment compared to the power used in 3 homes for a month).

3.6 Rate Structuring and Peak Shaving

Many resorts are engaged in energy contracts with their local energy providers. These contracts may be determined on the basis of peak energy demands or may vary depending on use during peak periods. Small resorts can benefit by reviewing their energy contracts and determining what the variables are in their service, when peak periods occur, and how the energy company calculates rates and charges. Once a resort understands this process, it can implement measures to reduce energy use during peak periods by cutting back demand or switching to alternative sources of power. By closely monitoring and managing peak demand, resorts can reduce their use during high-cost periods and can avoid setting new peaks that will affect their rate calculations.

As an example, A-Basin conducted a baseline analysis of actual energy use (kWh), maximum rate of use in a month (kW demand), load factor, and ratio of kWh costs to kW demand costs for each of its seven meters by month. As a result of the analysis, the resort realized that when it ran a lift in the off-season for maintenance, it set the peak demand for that month even though it actually only ran the lift for a short time. Simply by running its lifts on backup diesel fuel generators instead of electricity in the summer months, the resort reduced its lift operating costs. In addition, the analysis also indicated that four of A-Basin's lifts were coupled together in pairs of two meters. By implementing a management policy never to operate two lifts coupled together on the same meter simultaneously in the summer, the resort saves additional peak demand costs with no significant implementation costs.

3.7 Sink Aerators

Typical water faucets waste significant amounts of water due to high flow rates and associated splashing. In situations where hot water is being used, resorts can gain significant energy savings by addressing this issue. Installing appropriate faucet aerators is a low-cost way to reduce hot water consumption and has a short payback given related energy and water savings. Under many circumstances, aerators provide better wetting and rinsing than a normal water stream while reducing the flow rate of the faucet.

For applications where higher flow rates are desirable, such as filling pots in the kitchen, a flow rate of 1.5-gallons-per-minute is usually sufficient. In most other applications, such as restroom faucets, a flow rate of 0.5-gallon-per-minute is appropriate.

Small resorts will find faucet aerators inexpensive and relatively easy to install, making the return on investment almost immediate. They are readily available at most hardware stores.

3.8 EnergyStar® Equipment

In replacing kitchen, office, and lighting equipment, resorts should consider purchasing EnergyStar® products that are designed to reduce energy and resource consumption over a relatively short payback period. There are products in more than 40 categories that are eligible for the EnergyStar® label, and they are readily available in most areas. These products use less energy, save money, and help protect the environment. For example, an older clothes washer might use 40 to 60 gallons of water per load, while an EnergyStar®-rated washer uses only 15 gallons per load. The EPA's EnergyStar® website (www.energystar.gov) is a good resource for determining where to begin and what products are rated.

3.9 Photovoltaic Panels for Remote Electrical Needs

The cost of installing electrical infrastructure for remote operations, such as a lift operator houses or patrol huts, can be prohibitively high. In some cases, solar photovoltaic panels might provide the electrical needs of a remote operation while avoiding the high cost of running electrical lines. Such panels have been used at Bogus Basin to provide lighting for the Nordic course, at Breckenridge to power ticket scanners, at Vail to power a self-composting toilet, at Mammoth to heat remote shacks, and at The Canyons Resort to provide power for a bus shelter. When convenient access to electrical distribution is not readily available, small resorts should consider the possibility of using onsite photovoltaic panels. For more information on photovoltaic installations, visit the Solar Electric Power Association website (<http://www.solarelectricpower.org/>).

3.10 Education and Outreach

An important aspect of cost savings is employee education. At small resorts, changing behaviors may make a considerable difference in energy conservation. Resorts should offer conservation training at the onset of employment, and update that training with existing employees as new systems and features are installed so that these systems run as efficiently as possible. As with any corporate program or initiative, employees must be aware that (1) the company is serious about the program, and (2) widespread employee participation is critical to the success of the program.

In order for conservation education programs to be effective and to accommodate relatively high employee turnover, resorts should educate regularly using a multi-media approach that includes both written and verbal instruction. For example, when new employees attend orientation, they might be given a reusable cup or mug and shown a presentation that outlines a resort's energy philosophy, clarifies expectations about employee responsibility, and encourages improvements in all activities and operations. Many organizations also offer their employees incentives that reinforce desirable energy efforts.

Once employees are set on the path toward conservation, the next step is to educate guests on the importance of conservation and savings so that they can do their part as well.

A-Basin has an employee-sponsored Environmental Fund that supports local environmental organizations. Employees can voluntarily make pre-tax donations that the resort matches up to \$1,000 per year.

4.0 ENERGY AUDITS

For any industry, it is important to understand that energy expenses are part of the cost of doing business. However, it also is important to proactively measure energy use in order to better manage operations and identify opportunities for improving efficiencies. Without a baseline level of information, small resorts find it difficult to identify areas of operation and infrastructure that offer the greatest energy return. In addition, resorts need to understand their energy use in order to realize financial gains from improvements.

The best way for any resort to identify opportunities for energy and cost savings and move forward with energy-saving initiatives is to determine an energy consumption baseline. For this

reason, energy audits are a great first step in energy efficiency programs because they offer a realistic view of how, where, and to what level energy is used.

4.1 Free Audits

While not consistent from one utility company to another or even among states, free energy audits are available in some areas. To determine whether your resort is eligible for a free audit, contact the local utility company. In addition, check with your state energy office (go to <http://www.naseo.org/members/states.htm> for listings), which may offer free audits or could direct you to consultants that offer for-fee auditing services.

[Add box here: Alta Ski Area (UT) received a free energy audit and energy analysis report from Utah Power in 2005.]

In addition, resorts may find it valuable to join an environmental energy program, such as an ELP (environmental leadership program) in their area. These programs offer communication and collaboration with peer organizations, mentoring opportunities, grants and technical support for implementing innovative projects, and environmental guidance. As an example, the EPA has a program called the National Environmental Performance Track that offers regulatory and administrative incentives to participating organizations. For more information about activity in your area, go to <http://www.epa.gov/performancetrack/benefits/regadmin.htm>.

4.2 Self Audits

Developing a utility baseline and an ongoing measurement system is important and necessary in order to demonstrate the success of energy-saving measures. Furthermore, creating a baseline/measurement system and subsequent reporting are important elements of any comprehensive energy program. One of the most tangible benefits of a utility baseline is that managers finally have accurate knowledge of high-waste operations and associated costs and can implement measures that address these operations directly. And, of course, resorts participating in NSAA's Sustainable Slopes Program can use performance data to credibly demonstrate the positive impacts of the Environmental Charter at their resort.

There are seven basic steps necessary for developing a utility baseline, and completing these steps may take anywhere from 20 to 100 hours depending upon the complexity and organization of the available data (modified from *Greening Your Ski Area: A Pollution Prevention Handbook* (<http://peakstoprairies.org/p2bande/skigreen/>)).

1. *Determine the scope of the baseline.* It is important to define the type(s) of energy to be measured (e.g., electricity, heating fuel, transportation fuel, etc.). By clearly defining the scope, gathering the data will be more manageable.
2. *Determine a reporting cycle.* By delineating a specific time frame for the data (e.g., calendar year, fiscal year, or business season), especially one that coincides with internal or external reporting deadlines, it will be easier to compare data from cycle to cycle to measure improvement.
3. *Collect information.* Gather utility bills and meet with individuals that are aware of billing and operations to fully understand how resources are consumed. For example, it is helpful to correlate particular electric meters with particular operations. Commonly,

- multiple energy uses are consolidated on one meter; therefore, it is important to talk with individuals at the local utility and within resort departments to parse out electrical use by key operations.
4. *Create a data management spreadsheet.* Using Microsoft Excel® or other software capable of manipulating and charting data, develop a spreadsheet that will keep data organized by type of use (snowmaking, buildings, vehicles, equipment, etc.) but that can produce summary tables to consolidate information.
 5. *Normalize data.* Normalizing data allows managers to interpret baseline numbers relative to an appropriate metric, such as skier visits. Dividing energy data by skier visits (or other metrics) makes the data relevant in terms of energy use in a busy year versus a slow year. This type of metric/normalization helps resorts benchmark their energy performance relative to other ski areas. It also is important to convert different units of energy measurement to the same unit for comparison sake. A common unit for comparing various baseline data is equivalent carbon dioxide (eCO₂) emissions.
 6. *Chart data and results.* Graphic data displays help to identify trends, emphasize areas of consumption, and help managers identify glaring errors in calculations.
 7. *Develop a continuing recordkeeping, review, and reporting program.* Establish a system that transforms the process of determining a baseline into a continual process of monitoring environmental improvements against the baseline.

In addition to these steps, a simple checklist is provided below to help resort managers take stock of their operations and get a better sense of priority areas for improvement. There also is a variety of assistance and information in

Putting Energy Into Profits: EnergyStar® Guide for Small Business at http://www.energystar.gov/ia/business/small_business/energyintoprofits.pdf#search=%22Putting%20Energy%20Into%20Profit%22.

NAME:	DATE:					
<p>Check off your progress as you work through the Guide!</p>	Not applicable	Desire to implement	Not yet implemented	Early stage efforts	Near completion	Fully implemented
	ENERGY					
Do you purchase ENERGY STAR ® products when available?						
Do you purchase wind energy ?						
Have you installed compact fluorescent lamps for incandescent bulbs?						
Have you installed T-8 or T-5 lamps in overhead fluorescent fixtures?						
Have you installed reflectors in fluorescent or other fixtures?						
Are lights and equipment typically turned off in areas where no one is						
Are switches located conveniently so that employees can turn them off						
Are outside lights on timers or lights sensors?						
Are all outside walls adequately insulated?						
Have you installed occupancy sensors or light timers in appropriate areas?						
Are windows insulated and/or coated to reduce heat gain or loss?						
Are all doors and windows closed during cold seasons to maintain inner						
Are drafts and gaps caulked, sealed, and insulated to reduce heat loss (e.g., around doors and windows, outlets, chimneys, vents, pipes etc.)?						
Are furnaces, boilers etc., maintained on a regular basis?						
Are thermostats kept low when buildings are not occupied?						
Are thermostats set on timers?						
Are all computers set to sleep when not in use for 15 minutes or more?						
Comments:						
POLICY/PROGRAMMATIC						
Do you have a resource/energy conversation policy?						
Have you measured your energy use baseline?						
Have you set energy reduction targets/goals?						
Do you have a systematic resource conservation program?						
Do you have a measurement and/or accounting system to track energy savings and costs?						
Comments:						
EDUCATION/AWARENESS						
Are employees aware of water conservation practices?						
Are employees aware of energy-efficiency practices?						
Do you provide occupant education and awareness to reinforce participation						
Are conservation procedures posted?						
Are employees incentivized to practice conservation?						
Comments:						

5.0 TAX REBATES AND INCENTIVES

While not consistent from state to state, there may be rebates and incentives associated with installing energy-efficient and renewable energy systems at small resorts that could help to offset capital expenses and make paybacks even more real. Table 3 outlines some of these opportunities by state. However, if your state is not included, check with your local utility provider and your state energy office.

Table 3: Tax Rebates and Incentives by State

State	Tax Incentives	Rebates
New Hampshire	Local Option Property Tax Exemption for Renewable Energy	Keyspan Energy Delivery - Commercial Energy Efficiency Programs
		KeySpan Energy Delivery - Solar Thermal Rebate Program
		Northern Utilities - Non-Residential Energy Efficiency Programs
		National Grid (Granite State Electric) - Commercial Energy Efficiency Incentive Programs
		Unitil - Commercial and Industrial Energy Efficiency Programs
Colorado		Aspen Solar Pioneer Rebate Program
		Colorado Springs Utilities - Renewable Energy Rebate Program
		Holy Cross Energy - WE CARE Rebates
		Xcel Energy - Business Energy Efficiency Rebate Programs
		Xcel Energy - Solar*Rewards Program
Pennsylvania		Sustainable Development Fund Solar PV Grant Program (PECO Territory)
Maine		Efficiency Maine Business Program - Financial Incentives
		Solar Rebate Program
		Northern Utilities - Residential Energy Efficiency Programs
Montana	Deduction For Energy-Conserving Investment	NorthWestern Energy - E+ Natural Gas Savings Rebate Program

State	Tax Incentives	Rebates
	Alternative Energy Investment Corporate Tax Credit	NorthWestern Energy - USB Renewable Energy Fund
	Renewable Energy Systems Exemption	
California	Property Tax Exemption for Solar Systems	Marin County - Solar Rebate Program
		Anaheim Public Utilities - PV Buydown Program
		Burbank Water & Power - Residential & Commercial Solar Support
		Glendale Water & Power - Solar Solutions Program
		IID Energy - PV Solutions Rebate Program
		LADWP - Solar Incentive Program
		Pacific Power - Irrigation Initiative
		Palo Alto Utilities - PV Partners
		Pasadena Water and Power - Solar Power Installation Rebate
		Redding Electric - Earth Advantage Rebate Program
		Riverside Public Utilities - Energy Efficiency Construction Incentive
		Roseville Electric - PV Buy Down Program
		Sierra Pacific Power - SureBet Program
		SMUD - Commercial/Industrial PV Rebate
		SMUD - PV Pioneers Residential Buy-down
		SMUD - Solar Water Heater Rebate Program
		Southern California Edison - Non-Residential Efficiency Programs
		Southern California Gas Company - Non-Residential Energy Efficiency Rebate Programs
		Ukiah Utilities - PV Buy-down Program
Minnesota	Wind and Solar-Electric (PV) Systems Exemption	State of Minnesota Solar-Electric (PV) Rebate Program
	Solar Sales Tax Exemption	Alliant Energy-IP&L - Business Energy Efficiency Rebate Programs
	Wind Sales Tax Exemption	Great River Energy - Solar-Electric (PV) Rebate Program
		Minnesota Power - Energy Star Lighting and Fixture Program

State	Tax Incentives	Rebates
		Minnesota Power - Energy Star Qualified Appliance Program
		Minnesota Power - HVAC Energy Efficiency Incentives Program
		Minnesota Power - Power Grant Energy Efficiency Rebate Program
		Minnesota Power - Solar-Electric (PV) Rebate Program
		Otter Tail Power Company - Energy Efficiency Rebate Program
		Xcel Energy - Business Energy Efficiency Rebate Programs
New York	Green Building Tax Credit Program - Corporate	Smart Equipment Choices Program
	Energy Conservation Improvements Property Exemption	Energy Smart New Construction Program
	Solar, Wind & Biomass Energy Systems Exemption	PV Incentive Program
	Solar Sales Tax Exemption	Small Commercial Lighting Incentives Program
		Wind Incentive Program
		LIPA - Solar Pioneer Program

6.0 REINVESTING FOR THE FUTURE

6.1 Renewable Energy

NSAA's Environmental Charter suggests that all resorts invest in cleaner technologies for generating power, including wind, micro-hydro, geothermal, solar, fuel cells, and natural gas turbines. While not all resorts can take on the capital costs of on-site renewable energy infrastructure, they can purchase renewable green power, such as wind-generated power, from their local energy providers or other green energy providers. Examples of green energy providers that partner with or are members of NSAA include the following:

- **Bonneville Environmental Foundation** (contact Pat Nye at (503) 248-1905 or patricknye@b-e-f.org)
- **Renewable Choice Energy** (contact Rita Weakley at (303) 468-0405 ext.221 or rita@renewablechoice.com)
- **3-Phases Energy** (contact Steve McDougal at (415) 370-6487 or smcdougal@3phases.com)

So far this guide has focused on helping resorts reduce on-site energy use and thus lower energy utility costs. The savings generated by taking energy efficiency measures can be used to further reduce a resort's impact on the environment by reinvesting these savings into renewable energy and carbon offset purchases. A savings of \$100 a month from energy efficiency measures could potentially be used to purchase over 4,000 kWh of wind power (based on Renewable Choice prices of \$2.50 per 100 kWh).

Already, many resorts are buying wind energy to power a percentage or all of their operations. Some resorts, such as Sugar Bowl, Aspen, Vail, and Crested Butte, have committed to purchasing 100 percent of their electric energy needs from renewable resources. Other resorts have chosen to power a portion of their operations with renewable energy, such as chair-lifts, snow-making systems, or buildings. NSAA estimates that approximately 30 resorts currently are purchasing green power for some aspect of their operations.

In order to make it easier and more cost-effective for resorts to buy renewable energy, NSAA currently is coordinating a group purchase of renewable energy with Renewable Choice, one of the nation's largest suppliers of wind energy. Through this group purchase, resorts will be offered the opportunity to buy renewable energy at a discounted rate, making clean energy an affordable option for resorts of all sizes. For more information about Renewable Choice, visit www.renewablechoice.com.

In addition to purchasing wind power, resorts can buy carbon offsets from a variety of suppliers. Like wind power purchases, offsets help reduce a resort's impact on the environment. Carbon offsets, however, are different than wind power purchases. Each carbon offset represents a reduction in CO₂ that has been generated by a project elsewhere. Examples include methane sequestration from farms on tribal lands, reforestation projects, solar and wind power projects, and energy efficiency projects. These projects produce reductions in greenhouse gases, which are then sold to customers aiming to offset their own emissions.

Purchasing carbon offsets is a great way to minimize the environmental impact of operations that cannot be easily reduced through other measures. No matter how energy efficient a resort is, it is virtually impossible to eliminate all environmental impacts of its operations. There will always be emissions from transportation, waste disposal, and maintenance. Carbon offsets offer a cost-effective way to balance the climate impact of these activities without necessitating a dramatic change in the way a resort operates. Some suppliers of carbon offsets are listed here:

- Carbonfund - www.carbonfund.org
- Terrapass - www.terrapass.org
- The Bonneville Environmental Foundation - www.greengagsusa.org
- Climate Care - www.climatecare.org
- Native Energy - www.nativeenergy.com
- Offsetters - www.offsetters.com
- The Green Mountain Energy Company - www.emissionsolutions.biz
- CO2 Balance - www.co2balance.com

Resorts also can purchase emission reduction credits through membership organizations such as AtmosClear (<http://www.atmosclear.org/members.html>). AtmosClear offer members specific tools for calculating emissions, tips for reducing emissions, and guidelines for purchasing emission reduction credits.

6.2 Green Tag Programs for Guests

In addition to buying wind energy and carbon offsets to cover the environmental impacts from operations, resorts also can offer guests the opportunity to offset their own environmental impact. Among resorts responding to the NSAA's 2006 Green Power Purchase Survey, 21 percent are already offering guests the option to purchase Green Tags when they buy their lift tickets. For a few extra dollars, these tags balance the climate impact of a day of skiing, offering skiers the chance to limit the environmental costs of their activities. With no cost to resorts, the sale of green tags is a great way to raise visibility on the solutions to global warming. For more information about selling green tags to customers, see the Keep Winter Cool E-Resource Guide on the Member side of NSAA's website at www.nsaa.org or contact any of the following:

Patrick Nye
Bonneville Environmental Foundation
Tel 503.248.1905
Fax 503.248.1908
patricknye@b-e-f.org
www.skigreen.org

Ricardo Balazs
Clif Bar & Company
1610 Fifth Street
Berkeley, CA 94710
rbalazs@clifbar.com
(510) 558-7855

Sid Embree
AtmosClear Climate Club
CoolClimate LLC
888 393 6210 (toll free)
202 744 6704 (mobile)
sid@cleancommodities.com

As part of the Keep Winter Cool campaign, ski areas around the country are becoming more involved in environmental education and visitor outreach programs. To help support these efforts, resorts can provide visitors with information about the campaign and educate them about the impacts of global warming on skiing and snowboarding. Resorts can offer tips on how guests can take action against climate change, such as using public transportation, carpooling, buying clean energy for their homes, and buying offsets to reduce the environmental impact of skiing. Educating consumers about the nature of climate change and its effect on the ski industry is a crucial step in getting people on board with efforts to become more environmentally responsible. For more information on the Keep Winter Cool campaign, please go to www.keepwintercool.org.

7.0 EXAMPLES FROM SMALL RESORTS

This section contains success stories from small resorts around the country and illustrates the possibilities that abound for energy efficiency and renewable energy projects. Resorts of all sizes can realize the benefits of the relatively simple guidelines offered here, and can develop programs and practices that make a difference for their bottom lines and for the environment.

Alpine Meadows Ski Resort, California

Lighting Retrofits

Alpine Meadows has done extensive lighting retrofits throughout the resort, replacing incandescent lighting with efficient compact fluorescent lights, reducing lighting where possible, and replacing light switches with motion sensors to mitigate the amount of wasted energy when rooms are unoccupied.

Angel Fire Resort, New Mexico

Efficient Snowmaking

Angel Fire installed new guns that are considerably more efficient than the old guns. In addition, the resort installed a water cooler to lower the ambient temperature of the water for snowmaking, which requires less water to make the same amount of snow.

Energy Audit and Efficiency Upgrades

A company-wide energy audit is currently underway at Angel Fire. The resort is looking at possibilities for replacing electricity with propane. In addition, lighting timers are being installed in buildings so that lights are not left on during the day. Finally, low wattage lights and more efficient bulbs are being installed to replace current lighting fixtures.

Arapahoe Basin, Colorado

Peak Shaving

A-Basin conducted a baseline analysis of actual energy use (kWh), maximum rate of use in a month (kW demand), load factor, and ratio of kWh costs to kW demand costs for each of its seven meters by month. As a result of the analysis, the resort realized that when it ran a lift in the off-season for maintenance, it set the peak demand for that month even though it actually only ran the lift for a short time. Simply by running its lifts on backup diesel fuel generators instead of electricity in the summer months, the resort reduces its lift operating costs. In addition, the analysis also indicated that four of A-Basin's lifts were coupled together in pairs of two meters. By implementing a management policy never to operate two lifts coupled together on the same meter simultaneously in the summer, the resort saves additional peak demand costs with no significant implementation costs.

Programmable Thermostats

A-Basin remodeled the employee locker room to use a redesigned heating system so that it evenly distributes heat throughout the area. The resort used low-energy lighting materials and installed programmable thermostats to reduce energy consumption.

Bogus Basin Mountain Resort, Idaho

Solar-powered Nordic Lights

Bogus Basin installed new solar-powered lights on its Nordic trails as a result of a 2-year partnership between generous donors, the Bogus Basin Nordic Group, and the resort. A 5-km (3.1 mile) trail loop is illuminated on Red Tail and Sappers Return Trails. A smaller section of the Nordic Highway Trail, with flatter terrain ideal for beginners, is also lighted from the Frontier Point Nordic Lodge for 0.5 km. The Nordic Group believes this system is the nation's first

permanent cross-country lighting operation powered by alternative energy. The stand-alone system uses photovoltaic panels to feed battery banks that, in turn, power highly efficient LED lights on 89 poles along the route. Automatic controllers turn the lights on at sunset and off at a designated time. The Nordic Group and its collaborators installed the full system over the past 7 months. According to Nordic Group President, Jeff Fereday, the non-profit group was committed to using cost-effective and environmentally sustainable energy to light the trails. "The cost of bringing a conventional power line to the remote area was more expensive and less environmentally friendly," said Fereday. The lighting project has benefited from hundreds of volunteers, from businesses who lent expertise and donations of equipment, from the Bogus Junior Nordic Team, Idaho Nordic ski club, and from five major grantors: Edwards Mother Earth Foundation, Idaho Women's Charitable Foundation, Recreational Equipment Inc., Key Bank and the Bogus Basin Foundation. The Nordic Group has no paid staff and has relied on the knowledge of its board member and project manager, Carl Hoerger (a manager at Hewlett Packard) and the group's other dedicated members.

Bretton Woods Mountain Resort, New Hampshire

Base Lodge Expansion

In completing the first phase of the Bretton Woods Base Lodge expansion, the resort made great strides in improving the efficiency of the building. Thirty-year-old forced hot air furnaces have been replaced with new forced hot water systems, a rooftop makeup air system, and a highly efficient array of component heaters that are controlled by a series of timers and thermostats for more efficiency. More than half of the walls and roof systems have been replaced or renovated to improve the overall insulating properties of the building. Forty percent of the windows have been replaced with new low-E panes. Several windows have been added to the south side of the building to improve natural light and warmth. The R-factor in the new structure is expected to be improved by 75 percent, resulting in a savings of tens of thousands of dollars per season. The resort has replaced or retrofitted 60 percent of the light fixtures in the building to use more efficient fluorescent light bulbs. Ultimately, this number is expected to jump to 80 percent. In Phases 2 and 3, slated for completion in time for opening day next winter, the resort will accomplish additional improved efficiency by replacing the remaining original windows, upgrading more light fixtures, replacing bathroom facilities with water conserving fixtures, adding more insulation, and creating airlock vestibules at all entrances.

Efficient Snowmaking

In 2002, Bretton Woods installed 60 new Snow Economics HKD snowmaking tower guns and 10 miles of new snowmaking pipe to increase the cover for the ski area's earliest season opening ever. Whereas traditional snowmaking guns use a ratio of seven parts of compressed air to one part water, the HKD guns use a one-to-one ratio. Each of the tall, quiet HKD tower guns is capable of blanketing a half-acre of slope overnight with tremendous efficiency. For example, based on a ratio of energy savings per acre-foot of snow production equaling \$.07 per kWh, the annual compressed air energy savings for 60 guns totals more than \$75,000. The new guns are expected to save 350,000 kWh of electricity annually.

Buck Hill Ski Area, Minnesota

Wind Energy

Buck Hill Ski Area is purchasing more than 8,000 blocks of Wellspring Renewable Wind Energy annually. This voluntary purchase from Dakota Electric Association means all Buck Hill's energy, except one generator account, is wind energy. Purchasing this large amount of wind

energy annually is the equivalent of planting more than 200 acres of trees. While wind energy is still more expensive to generate than using conventional means, technology advancements and government incentives have helped bring costs down. Buck Hill buys electricity in 100-kWh blocks, and one kWh of wind energy costs just slightly more than the standard price for electricity (only about one and one-half cent extra per kWh).

Cascade Mountain Ski & Snowboard Area, Wisconsin

New Snowmaking System

Cascade Mountain has installed a 119-gun automated snowmaking system. Mostly ground/carriage mount snow guns were replaced with York R-10-low energy air/water tower guns. Most of the 119 guns use a fixed amount of air, which helps keep the need for additional diesel air compressors to a minimum. Even with a low snow/cold weather year when snow making hours were up 10 percent, the energy demand was down 10 percent. The result was a savings of at least 216 kWh in a short snowmaking year.

Crystal Mountain Resort, Michigan

Wind Energy

Crystal Mountain Resort became the first Michigan ski area to commit to renewable wind energy by powering the Crystal Clipper (the resort's high-speed quad chair lift) entirely with wind power. In addition, Crystal is encouraging its employees and guests to join in the resort's renewable energy efforts by offering a free 1-day lift ticket (valid any time during the 2006/07 season) to anyone who purchases 1 year of wind power for their residence through Renewable Choice Energy.

Durango Mountain Resort, Colorado

Power Demand during Snowmaking Operations

Durango Mountain currently monitors peak power demand during snowmaking operations and discontinues operations during peak periods.

Gore Mountain Ski Area, New York

Renewable Energy

Guests of Gore Mountain in New York can sign up for green energy for their homes. In addition, Gore Mountain's Northwoods Gondola operates entirely on wind energy sponsored by Barton Mines. And furthermore, the resort is purchasing six megawatts of peak load energy, ten percent of which will be supplied through Constellation Energy's Green-e certified ElectricGreen(R) product.

Hunter Mountain, New York

Renewable Energy

Guests of Hunter Mountain New York can sign up for green energy for their homes. In addition, Hunter Mountain will make a donation to the Hudson River Sloop Clearwater and the Catskill Center for every home signing onto the Community Energy program on a designated day this season.

Jiminy Peak Mountain Resort, Massachusetts

Wind Turbine Project

Jiminy Peak Mountain Resort has announced plans to erect a single wind turbine near its summit reservoir on the western portion of the resort's lands. In pursuit of this goal, Jiminy has applied for and received a competitively awarded grant from the Massachusetts Technology Collaborative for \$582,000 to offset the project's total design and construction costs of approximately \$2.1 million. The 1 megawatt wind turbine project will produce enough electricity to power more than 350 homes or approximately 30 percent of Jiminy Peak's annual demand for electricity. Installing a wind turbine is an excellent measure for the ski resort because Jiminy uses more electricity in the winter months for snow making and lift operations, which is also the season when the winds will be the strongest and most steady. In addition, because of the existing trail and work road network at Jiminy Peak, transporting the turbine components will not scar virgin land.

Jiminy's decision to pursue this wind turbine project is one part of its decades-long effort to reduce fossil fuel consumption for both economic and environmental reasons. A wind turbine will provide the resort with a significant amount of low-cost energy. Finding a creative way to lower operating expenses will protect Jiminy Peak's financial health, support local jobs, and contribute to the economic vitality of the local community and Berkshire County. Another important factor in deciding to develop a wind turbine was the environmental benefits it can provide. The clean, emission-free electricity produced by the wind turbine means that a similar amount of electricity does not have to be generated by a coal-, oil-, or gas-fired power plant. Based on Massachusetts' current electricity generation profile, the wind turbine will offset the annual emission of 4,100,000 pounds of Carbon Dioxide (CO₂ is the leading cause of global warming); 18,000 pounds of Sulfur Dioxide (SO_x is a leading contributor to smog and the primary cause of acid rain); and 5,900 pounds of Nitrous Oxide (NO_x contributes to smog and is a leading cause of asthma). As the world's demand for electricity continues to grow, it is important to understand that we have the opportunity to select cleaner energy sources from available technologies. Jiminy Peak is blessed with an abundant, renewable wind resource and has chosen to use this natural power to make its own electricity. Jiminy Peak Resort management and employees are committed to being responsible stewards of natural resources, and the wind turbine will further this cause.

Okemo Mountain Resort, Vermont

Renewable Energy

The owners of Okemo Mountain Resort have entered into an agreement with Gunnison County Electric Association to purchase 27 million kilowatt hours of Sterling Planet's Renewable Energy Certificates from Gunnison County Electric Association, a member-owned, non-profit cooperative located in Colorado. By purchasing these renewable energy certificates, the owners can supply three resorts with enough energy to power all electrical needs for the next year. It will save an estimated 18,800 tons of carbon dioxide from being released into the atmosphere. This is equivalent to emissions produced by the annual electricity consumption of approximately 2,200 average homes or carbon dioxide emissions associated with the combustion of 1.9 million gallons of gasoline.

Pats Peak, New Hampshire

Motor Upgrade

Pats Peak upgraded its main chairlifts to the summit with state-of-the-art DC motors, which are the most efficient on the market.

New Night Lighting System and Detectors

Pats Peak rebuilt its entire night lighting system, which has brought its consumption down by approximately 80,000 kWh a year. The resort also installed motion detectors and timers to shut off lights automatically when no one is in the office.

New Snow Guns

Pats Peak spent more than \$400,000 on the most efficient snow guns on the market, cutting its energy use by more than 8 percent, while increasing coverage. The resort has cut snowmaking hours from 700 to 400 in less than 3 years (each hour of operating snowmaking equipment can be compared to the power used in three homes for a month).

Sierra-at-Tahoe Ski Resort, California

Solar Heating

Sierra-at-Tahoe's Grandview Bar and Grill at the top of the mountain is equipped with solar panels. The solar panels heat water that is piped into the building and circulated as radiated heat. The system provides 100 percent of the heating for the entire building. Using clean, solar energy reduces emissions of greenhouse gases associated with climate change.

Smuggler's Notch Resort, Vermont

Renewable Energy Education Program

As part of Smuggler's Notch's SkiCool program, guests are offered climate-neutral skiing for \$10. The resort matches 25 percent of funds raised, and the proceeds go to the renewable energy company Native Energy.

Sugar Bowl Ski Resort, California

Heating System Conversion

In the summer of 2001, Sugar Bowl completed a 12-year-long project to convert its heating system from diesel to propane in an effort to transition toward cleaner, more efficient fuels.

Renewable Energy

In partnership with 3 Phases Energy, Sugar Bowl is supporting California wind farms by purchasing renewable energy to offset 100 percent of its energy use. Sugar Bowl was the first resort in the U.S. to purchase 100% green power for its operations. This purchase of 4,272 megawatt hour (MWh) per year reduces Sugar Bowl's consumption of fossil fuels, cleans the air, and keeps 4,588,000 pounds of greenhouse gasses out of the atmosphere each year. This is equivalent to planting 310,000 trees or taking 400 cars off of the road for 1 year.

Waterville Valley Resort, New Hampshire

Energy Conservation on Lifts

Waterville Valley Resort runs auxiliary engines on lifts to limit electrical consumption on peak demand days. In addition, the resort has replaced certain buildings to conserve on heat loss, and has installed new, energy-efficient glass in one lodge.

Whiteface Mountain Ski Center, New York

Renewable Energy

Whiteface Mountain is purchasing eight megawatts of peak load energy, ten percent of which will be supplied through Constellation Energy's Green-e certified ElectricGreen(R) product.

Wisp at Deep Creek Mountain Resort, Maryland

Automated Snowmaking

For the 2006 ski season, Wisp Resort opened the largest expansion of skiable terrain in its 50-year history: 34 acres with lighting, snowmaking, and two new fixed grip quad chairlifts. The expansion features the most advanced, energy efficient, automated technology in snowmaking systems available. The resort made every decision related to the expansion, from erosion control and water retention to energy efficient lighting, with resource conservation in mind.

Boiler and HVAC System Upgrades

During 2005, Wisp Resort replaced both the hot water boiler systems servicing public areas and kitchens and the HVAC systems in the Wisp base lodge. The new systems are state-of-the-art, high-efficiency systems that will significantly reduce propane gas consumption. The resort will calculate savings over the 2006 calendar year.

8.0 CONCLUSIONS

The bottom line is that resorts of all sizes, and small resorts in particular, need to take a closer look at their energy needs and consumption, identify areas for improvement, implement efficiency measures that are reasonable and manageable, and know that there are resources available to help them be successful.

Small measures can make a big difference, especially when combined and practiced over time. And once these measures become part of a resort's standard operating procedures, the cost savings will support additional efficiency projects and sustainability programs that involve renewable resources for the long term.

NSAA hopes that this Guide will be a catalyst for small resorts, and we invite any resorts that are not currently part of Sustainable Slopes to endorse the program and begin to take advantage of the resources available to its members. Please contact glink@nsaa.org for an endorsement form.