RETI

Renewable Energy in Tourism Initiative
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Renewable Energy in Tourism Initiative

Best Practices in the Public Lands Sector

Colorado
University of Colorado at Boulder

NREL
National Renewable Energy Laboratory

East Carolina
UNIVERSITY

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EXECUTIVE SUMMARY

Tourism, most likely, has the largest impact on public lands spanning the globe. Therefore, it is of great interest that public land agencies educate the tourist in renewable energy and eco-friendly practices as well as initiate efforts towards accomplishing renewable energy initiatives.

Historically there has been the thought that public land agencies are leaders in sustainability, given the environment in which they are located. Unfortunately, studies show that the opposite holds true. However, global efforts are currently changing this misconception into best practices.

The magnitude of land and sea mass which make up public lands is immense. With increasing numbers of tourists visiting these national forests, parks, and monuments, maritime and inland waterways, and recreation areas, today's public land agencies are seeking cleaner energy resources and better methods of energy efficiency to protect these treasures for tomorrow's visitors.

Opportunities abound for educating visitors and employees. Employing energy efficient lighting and utilizing renewable energy power sourcing for visitor centers, providing cleaner and more efficient boat motors in the waterways, and choosing to follow green building specifications are just three ways public land agencies are progressing in their sustainable endeavors.

This ***March 2008*** edition of the Renewable Energy Tourism Initiative (RETI) *Best Practices in the Public Land Agency Sector* draws upon the experiences, insights, and resources provided by the U.S. National Park Service Pacific West Region (NPS PWR), Queensland Parks and Wildlife Service (QPWS), U.S.D.A. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), and the University National Parks Energy Partnership Program (UNPEPP). Additional input is expected from these and others in the coming months.

Researchers reviewed information published on- and off- line, including media reports and information supplied by these providers and conducted telephone interviews, when possible. Independent verification of claims made was not available to the researchers. Difficulties and challenges in implementing renewable energy practices plus return on investment information may also be currently incomplete.

Three major areas of renewable energy investment emerged from this research, each falling into one of two general categories. The first highlights short term efficiency projects that require modest capital investment. The second addresses long term initiatives that involve more structural changes, recycling technologies, and renewable energy resources. In all the areas identified below, management focus and staff buy-in are critical.

The full Best Practice document provides additional detail and links to resources on each of the outlined best practices.

Public Land Agency Best Practices at a Glance:

Short-term Initiatives

1. **Highlighting Energy Conservation** – Replacing worn/aged appliances with Energy Star appliances is one of the easiest conservation methods any agency can undertake along with replacing light bulbs with compact fluorescent bulbs. A conversion to gas appliances also produced savings, both financially and in energy emissions. Educational materials featuring these efforts of the public land agency can be produced via brochures and. coloring books.

Long-term Initiatives

1. **Photovoltaic (PV) System** – Two of the featured public land agencies discovered that the benefits of a PV system far outweighed the cost of installation. Other sites implemented solar powered systems on a smaller scale and realized benefits, also.

2. **Fleet Management** – Agencies are not only downsizing fleets, but also using vehicles no larger than the needs of the task at hand and investing in hybrid and biodiesel motors. Even more effective has been an effort to reduce the need for travel altogether by utilizing videoconferencing technologies to hold meetings and trainings online.

Further Questions & Concerns

1. ***Retrofits to Historical Buildings*** *– Many buildings within public lands have historical significance, yet their antiquity often correlates to energy inefficiency.*

   Q: *How can energy-efficient retrofits be made without compromising the historical value?*

2. ***Quality Information –****Many of the practices presented in this draft do not contain Return on Investment or other critical metrics to allow rigorous comparison of renewable energy options. Without this type of information or a method of independent, objective assessment it is difficult to distinguish 'PR' speak from substantive progress.*

   Q: Are there mechanisms to provide third-party assessments of renewable energy practices within the tourism industry?

3. ***Carbon Offset Verification*** *– There is no independent verification of carbon offset programs. This includes verification of the calculations of the cost of offsets and the certification that funds are being invested as promised and having the desired effect of offsetting, reducing, or otherwise mitigating CO2 emissions.*

   Q: Are independent standards and verification necessary for a robust carbon offset program?

4. ***Technical Information*** *- Many of the suggested best practices require complex technical and operational information for implementation. There is currently no easy way to share and access the information in these best practices, distinguishing important areas of co-operation from legitimate areas of competitive advantage.*

5. ***Q: How does the industry address the issue of information sharing?***

BACKGROUND

RETI Best Practice Manuals

The Renewable Energy in Tourism Initiative (RETI) was developed to feature industry leaders that have adopted best practices in renewable energy and energy efficiency, and to provide information and guidance to businesses interested in realizing these benefits. The best practice manuals were designed for tourism businesses of all sizes. Through the use of case studies, each manual highlights and outlines renewable energy adoption and adaptation strategies that maximize energy efficiency, minimize environmental impacts, and result in cost savings or increased profitability across six tourism sectors: accommodations, airlines, cruise lines, public lands agencies, ski resorts, and tour operators.

These best practice manuals are intended to serve as an inspiration and guide to other businesses interested in realizing the benefits of adopting renewable energy initiatives and supporting a healthy planet. RETI is part of a broader objective of creating a comprehensive set of best sustainable business practices in each designated tourism sector.

Best Practice by Definition

A best practice is a process, technique, or innovative use of resources – such as technology, equipment, personnel, and data – that has resulted in outstanding and measurable improvement in the operation or performance of a tourism business. Each best practice will have demonstrated success by significantly and measurably improving outcomes in one or more of the following three areas of business performance:

- Operational factors;
- Financial objectives; and
- Marketing objectives

In addition to business outcomes, the best practices outlined in the RETI manuals help to eliminate, minimize, or mitigate the environmental impact of the business through pollution prevention, carbon emissions reductions, and/or carbon offsets, etc.

Content Acquisition and Validation

Sustainable Travel International (STI) was responsible for acquiring and validating the content included in this document. To identify industry leaders in each segment, STI made public announcements via its E-newsletter, other online outlets, and through word of mouth, then accepted nominations from various stakeholders and completed a due diligence process. Interviews were then conducted with representatives from each company or organization identified, representatives were asked to review each applicable best practice document, verify the information contained therein, and provide constructive feedback. No on-site verification of researched activities was involved, though many of these activities have been verified through other procedures.

Industry Overview and Sustainability Initiatives

As stewards of our highly prized public lands - including include national parks, forests, recreation areas, monuments, and waterways - public lands agencies juggle a two-sided sword. They have the dual responsibility of maintaining these natural and man-made environments for public and private use and also preserving them for future enjoyment. The commitment of these agencies to environmental stewardship has often created the false perception that renewable energy efforts within public lands are highly developed. In many cases, public lands agencies are actually struggling simply to catch up with the public's perception. Fortunately, this perceived discrepancy has led public lands agencies to impressive energy initiatives and plans, oftentimes emanating from both the executive management and grass-roots levels simultaneously. Though much work has yet to be done, there is a great deal of progress and innovation taking place within these organizations at the present time.

Case Study Participants

The best practices case studies discussed below include the U.S. National Park Service Pacific West Region (NPS PWR), Queensland Parks QP (QP), U.S.D.A. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), and the University National Parks Energy Partnership Program (UNPEPP).

A number of the most effective best practices adopted by public lands agencies include:

- Solar photo voltaic energy systems, both standalone and grid-tied (NPS PWR, QP, USFS, UNPEPP)
- Other renewable systems (wind, micro-hydro, etc.) (QP, USFS, UNPEPP)
- Fleet management strategies to limit fuel use and emissions (NPS PWR, USFS)
- Carbon sequestration combined with native habitat restoration (USFWS, USFS)
- Green building and facilities management practices (USFS)

BEST PRACTICE CASE STUDIES

Case Study: U.S. National Park Service Pacific West Region (NPS PWR)

The United States Congress established the world's first national park on March 1, 1872, creating Yellowstone National Park in the Territories of Montana and Wyoming "as a public park or pleasuring-ground for the benefit and enjoyment of the people."[i] Forty-four years later, President Woodrow Wilson created the National Park Service to manage the growing number of protected areas. The founding of Yellowstone National Park and the National Park Service initiated a worldwide land preservation movement that continues today in countries around the globe. Nine decades after its creation, the National Park System of the United States now comprises 390 areas covering more than 84 million acres in 49 States, the District of Columbia, American Samoa, Guam, Puerto Rico, Saipan, and the Virgin Islands.[ii]

The National Park Service is divided into seven regions across the United States. To date, the Pacific West Region has led this agency's renewable energy efforts.

The U.S. National Park Service Pacific West Region's energy-related best practices include:

- Solar energy systems
- Transportation fleet management – Downsizing fleets, when possible, to reduce energy use and introducing electrical vehicles, where appropriate. Included in this initiative is a major focus on vehicles are appropriately sized and only driving when necessary.
- Educational in-house publications and Web sites that focus on energy conservation. These resources highlight high impact/low cost opportunities, such as a guide to lighting and green maintenance practices, to provide geographically diverse staff access to information that will lead to best practice adoption in each specific situation and location.
- Employee-targeted, region-wide marketing campaign publicizing the negative impacts of excessive energy consumption as well as the positive results of adopting energy efficiency best practices.
- Ambitious plans for a large-scale solar energy system for southern Nevada, intended to offset the carbon emissions of the region, and the entire National Park Service and its partner lands agencies, U.S.D.A. Forest Service and U.S. Fish and Wildlife Service, making these three agencies energy neutral. Private industry equipment suppliers, National Renewable Energy Laboratory, and higher education institutions also participated in the joint effort..[iii]

Solar panels cover much of this NPS office roof.
(Photo courtesy of Steve Butterworth)

Background Information on Best Practices

The Pacific West Region produces 80 percent of the renewable energy generated by the entire National Park Service (NPS) due to a variety of issues, including financial incentives, energy crises, and availability of more sun. Early efforts toward sustainability in the Pacific West Region were focused in remote locations where the NPS relied on diesel generators. These efforts were driven by a desire to eliminate exhaust, noise, and the hazardous materials required for operation. Recently, these three factors have been expanded to include reducing the region's carbon

footprint, pursuing eco-friendly business practices, and driving operating costs down through reduced fuel consumption. The NPS also has an obligation to maintain a positive public perception, particularly when it comes to managing environmental impacts. As mentioned earlier, many visitors are under the impression that the NPS is heavily involved in renewable energy initiatives. Pressure from the general public for the NPS to be early adopters of energy initiatives has been a strong driver in this process, and living up to these expectations is a high priority for the NPS.[iv]

Solar PV systems at NPS lodging
(Photo courtesy of Steve Butterworth)

Steps in Implementation

Partnerships have been essential to the National Park Service's energy initiatives. The NPS has relied on the solar technology expertise of the Bonneville Power Administration and the financial incentives provided by the utility companies. Both of these partnerships facilitated and catalyzed a faster and more efficient adoption of solar energy in the region. The adoption of solar power was further eased by other government agencies that already had existing contracts with renewable energy suppliers, preventing time-consuming contract negotiations. The foresight displayed in planning for future expansion has also reduced the barriers to implementation. By purchasing a large system at the outset, the NPS received rebates and incentives that allowed for the creation of auxiliary systems at no cost. Retrofitting buildings for future solar panel installation has dispersed costs over time, easing the financial pressures of implementing large-scale systems. Actions such as these have enabled the NPS to implement their solar PV systems with the greatest efficiency possible.[v]

Resources Required

"I would say that over four million U.S. dollars have been invested into renewable energy systems," said Steve Butterworth, the Regional Energy Program Coordinator for the U.S. National Park Service.[vi] The largest current system in the NPS, a 64kW photovoltaic system at Joshua Tree National Park, cost US$570,000. Southern California Edison, the regional utility company, paid US$290,000 of that cost through a rebate. The balance was paid through non-appropriated government funds (funds coming from non-governmental sources), thus no taxpayer dollars were spent for the project.

Operational costs for the systems are minimal, as the panels are self-cleaning, and the parts are all under warranty.[vii]

Monitoring and Evaluation

A web based monitoring system reports on a number of systems. The NPS solar energy data is available to the public on the Bonneville Power Administration's Energy Efficiency website.

Success Factors and Benefits

In addition to helping the NPS achieve renewable energy and carbon impact reduction goals, the resulting noise reduction has led to a rediscovery of the natural habitat among public lands users and a better quality of atmosphere in the public lands where these systems operate.

An innovative use of extra funds has also allowed the NPS to accomplish broader objectives. For the first time in the agency's history, excess funds at the end of the fiscal year were used to implement new PV systems. One system was enlarged significantly to offset the greenhouse gas emissions related to air travel of regional employees. Within four to five years, the

Pacific West Region calculates that their PV systems will produce enough green electricity to mitigate the greenhouse gas emissions produced by all air travel of NPS employees. Cost savings resulting from these systems are being poured back into public services and resource protection on site.

Photovoltaic systems have been expanded at many National Parks (Photo courtesy of Steve Butterworth)

Innovative design has also led to secondary benefits. At Joshua Tree National Park, the roof of a new structure built to shade a small building, parking area, and storage area was made out of solar panels, providing shade for the building and in turn, greatly reducing the cooling costs. Maintenance costs have also been reduced, as the air conditioning units previously burned out routinely each summer.[viii]

Challenges and Pitfalls

Bringing innovative ideas to fruition in a regulated environment has presented a number of challenges. Compliance issues sometimes make it necessary for the NPS to work around cultural and natural areas of importance. For instance, on San Juan Island, there was simply no appropriate space on the island for the PV system. To address this issue, the NPS utilized off-site locations and worked with local utility companies to facilitate the installations within government regulations. The NPS, the utility company, nor the solar contractor had faced this type of challenge before; however, their combined innovative planning successfully addressed the needs of all parties.[ix]

Lessons Learned

First, partnerships are critical. Allying an industry that is still young and rapidly growing with partners who have been in the business for years makes a positive difference in decision-making and planning. Second, the location of a proposed PV system can be flexible. When considering placement in public lands and fragile ecosystems, it is important to remember that the environment is the top priority. A PV system can be placed in a number of locations that do not disturb the flora and fauna of a region. Finally, in areas affected by weather phenomena, such as typhoons or hurricanes, it is important to have an adaptable design that incorporates protective measures, such as temporary underground storage.[x] These systems are far too expensive to be lost in a severe weather situation.

Case Study: Queensland Parks and Wildlife Service

Queensland Parks (QP) is managed and directed by the Queensland Environmental Protection Agency (EPA), a department within the government of Queensland, Australia. The Environmental Protection Agency and the Queensland Parks together strive to protect Queensland's natural and cultural heritage, promote the sustainable use of its natural capital, and ensure a clean environment.[xi] The EPA manages 480 national, marine and conservation parks and a further 254 nature refuges comprising 15.4 million hectares of protected areas. As a result of increasing environmental pressures on protected areas in Australia, the EPA has created a master plan for Queensland's park system, outlining directions for management of all protected areas in the region for the next 20 years.[xii] Part of this master plan is the development of the Queensland Parks Renewable Energy Program, which will progressively convert all remote, off-grid national parks to renewable energy power systems.[xiii]

As a component of the Renewable Energy Program, the EPA is implementing a number of energy efficiency and renewable energy initiatives:

- Gas-boosted solar hot water systems are being installed in all new developments and fitted to existing facilities as the systems are replaced
- Electric cooking appliances will be gradually replaced by gas-heated equivalents.
- When applicable, liquid propane gas engines will be installed in preference to diesel engines for power generation.
- Standard light bulbs have been replaced with compact fluorescent lighting .
- All new appliances are selected based on their energy efficiency rating .
- Where possible, refrigeration will incorporate eutectics (a chemical formula that freezes and thaws without changing temperature).
- All new building projects incorporate energy efficient design principles in their construction[xiv] including the Green Building Council's GreenStar rating.

Background Information on Best Practices

The EPA has impressive and ambitious goals for both their electricity grid-tied and remote off-grid grid facilities. Management has committed to supplying all of the grid-tied facilities with 100 percent green energy. EPA-managed remote off-grid sites will power all of their existing electrical functions with renewable energy by June 2008. One component of this transition includes incorporating a solar component in 40 percent of hot water systems.

In addition to reducing environmental impact, Queensland Parks' renewable energy initiatives are also directed at providing reliable, 24-hour electricity and hot water to the 20 remote, off-grid ranger stations under their management. With an excess of 5.5 peak sunlight hours per day throughout the year, Queensland has an ideal climate for the use of solar energy.[xv]

The EPA is incorporating a variety of types of renewable energy systems. When deciding which type of system is appropriate for each individual site, EPA officials take into account the site's environmental, cultural heritage, and management features. Based upon the site's unique circumstances, the project manager chooses to use green energy supplied through grid power (where it is economically viable), wind turbines, mini-hydro systems, or solar PV systems. In all cases, the renewable energy systems are connected to generators for periods of high peak loads, prolonged low sunlight or wind availability, and as a back-up.[xvi] The greenhouse gas emissions from back-up generators are counterbalanced by the use of carbon offset strategies.

Solar PV roofs take advantage of Queensland Parks ample sunlight. (Photo courtesy of Queensland Environmental Protection Agency)

Steps in Implementation

- Develop a Queensland Parks policy on renewable energy and energy efficiency
- Prioritize replacement of existing generator systems
- Undertake a Statewide evaluation of suitable sites for installation of remote renewable power systems
- Investigate opportunities for alternative forms of renewable energy supply
- Develop a Queensland Parks education and training package for Rangers
- Appoint 'authorized officers' to access and manage the systems
- Conduct a community promotion and education program to showcase the systems
- Demonstrate financial, lifestyle and environmental benefits

- Establish partnerships with other agencies and industry bodies to expand the use of renewable power systems in remote communities

Resources Required

Exact costs vary depending on site constraints and type of renewable energy source used, but the design and installation of a typical photovoltaic hybrid battery inverter system costs around $20 (AUD) per watt of rated output. Funding for many projects was obtained through the Renewable Remote Power Generation Program's Renewable Energy Diesel Replacement Scheme, which is a service of the Australian Government.

Solar panels both generate electricity and provide shade.
(Photo courtesy of Queensland Environmental Protection Agency)

Monitoring and Evaluation

A Strategic Asset Management System (SAMS) is being used to monitor the changeover to renewable energy systems at off-grid locations.

Success Factors and Benefits

Since 2000, nine new 10kW solar PV systems have been installed in remote ranger stations, and four existing systems have been upgraded to meet increasing energy demands. The total energy production of these systems currently stands at 145 megawatt hours of renewable energy, which displaces nearly 66,000 gallons of diesel fuel and 818 tons of greenhouse gasses annually.[xvii]

Replicability

Thorough testing and evaluation of various designs and products over a twelve-year period have resulted in the standardization of the remote renewable power systems; creating efficiencies in staff training and maintenance and increased system reliability. Photovoltaic systems have consistently delivered the best outcome in the harsh environmental conditions.

Lessons Learned

This program has demonstrated that there are significant ongoing savings to be gained from installing renewable energy systems in remote areas despite high initial capital cost. Specialized training and expertise are required for the installation and servicing of these systems, and ongoing training for users is important in enabling the acceptance and adoption of these new technologies. Solid policy implementation and structures, such as the government subsidy scheme available for this project, are a major incentive in implementing remote renewable power systems.[xviii]

Beta Box: U.S. Forest Service

Established in 1905, the Forest Service (USFS) is an agency of the U.S. Department of Agriculture (USDA). The USFS manages public lands in national forests and grasslands, encompassing 193 million acres of land, or an area equivalent to the size of Texas.

The USFS' goals for energy conservation reflect the most recent executive orders and policies mandated by the United States government. Though the agency as a whole often attains many of these goals, some regions have succeeded in achieving results above and beyond the baseline objectives. As a land stewardship and conservation organization, the USFS is working to engage conservation philosophies in all areas of their operations, including facilities management, fleet use, waste reduction, water use, and green purchasing.

According to Anna Jones-Crabtree, the Sustainable Operations Coordinator for the Rocky Mountain & Northern Regions of the USDA Forest Service, in fiscal

year 2007, the USFS spent roughly US$26.1 million to light, heat, and cool its facilities (totaling 1,434 billion BTUs) with the resulting greenhouse gas emissions estimated at 154,800 metric tons.[xix] The USFS is working on a variety of different initiatives to reduce their energy consumption and reliance on non-renewable energy sources. Through a partnership with Western Area Power Administration, Region 2 of the USFS entered into a five-year agreement to purchase a minimum of 550 MWs of Renewable Energy Credits (REC) at a reduced rate of $2.70/MW. This is the equivalent of approximately five percent of the region's annual power usage. At least 50 percent of the RECs are from biomass energy developed within the region and located in the state of Colorado. Region 3 is utilizing renewable energy to power water pumps that provide water to wildlife and livestock, sourced from 48 wood windmills, 821 steel windmills, and 139 solar-powered submersible pump wells on rangelands across the region.

Throughout the agency, various other strategies are being employed as well. Many buildings have been constructed to LEED certification, a biomass gasification system is currently being installed at White Mountain National Forest, a ground source heat pump is used at Inyo National Forest's Visitors Center to pre-heat or pre-cool the surrounding air, and a number of micro-hydro, solar, solar hot water, and wind projects are also in place.

Fuel consumption also weighs heavily in the USFS's energy use and their resulting conservation efforts. Excluding fuel used in personal vehicles, rental vehicles, off-road vehicles, or aircraft, the USFS burns over 9.5 million gallons annually. This total includes the use of diesel fuel and also natural gas, propane, E-85, biodiesel, and gasoline. The agency is taking steps to ensure that their vehicles are appropriately sized for the job at hand, and are looking for other fuel reduction and management strategies. Some of the most successful fuel-saving initiatives currently employed by the USFS include videoconferencing and online training workshops, use of electric and hybrid vehicles, and increased use of biodiesel blends.[xx]

Beta Box: U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) has implemented a unique carbon sequestration initiative in its Southeast Region. In this program, energy companies buy land, aid in the restoration of native wildlife habitats by planting trees, and then donate the land to USFWS, in exchange for discounted carbon credits that will remain the property of the participating companies.

Habitat restoration as part of USFWS Carbon Sequestration Projects (www.fws.gov/southeast/carbon)

This program began with a conversation between a representative of an energy corporation and a USFWS field supervisor in Jackson, Mississippi. The field supervisor was hoping to restore 50,000 acres of agricultural land back to native bottomland hardwood, and the energy representative was looking to offset emissions. As the conversation continued, they both began to realize the opportunity that was at hand.

From this exchange, this type of program has grown to become a key element of the conservation work going on in the Southeast, with the USFWS working to expand these efforts across the country. To date, approximately 80,000 acres of native wildlife habitat has been restored and 40,000 acres have been added to USFWS jurisdiction. According to Jeffrey Fleming, Assistant Regional Director for External Affairs, Southeast Region, US Fish and Wildlife Service, the relationship is entirely symbiotic; the USFWS is pleased to have the habitat restoration occur and the energy companies are happy to get carbon credits at a reduced cost. The logical next step for the USFWS is to expand the program to include private landowners as well (which is currently in the works but not likely to be realized for quite some time).[xxi]

Beta Box: University National Parks Energy Partnership Project

Though the NPS has made significant strides in their energy management with the creation of renewable energy projects, there is still much to be done. Energy managers often do not have the time or resources to devote to the development of additional projects or the analysis of energy consumption data. University students, however, often have the time and are eager to gain industry experience, whereby they offer a valuable resource to agencies such as the NPS. It is this relationship that sparked the University National Parks Energy Partnership Project (UNPEPP). This project began in 1997 when NPS personnel and university students and faculty got together to conduct energy efficiency and renewable energy work at Shenandoah National Park.

Originally founded by Terry Brennan of the National Park Service and James Winebrake of James Madison University (now with the Rochester Institute of Technology), this program pairs university students and national park managers to plan a project. The participating universities then submit a proposal to UNPEPP for funding which, upon approval, goes to the university to support the activities of the project. One of the key goals of the project is to educate tomorrow's energy professionals, so student involvement and student learning is paramount. In addition, the project must save energy at the parks or enhance the park's use of renewable energy.

University students help parks install solar energy systems. (Photo courtesy of James Winebrake)

In addition to providing students with hands-on learning experience, other goals of the program are to conduct energy assessments of park facilities, train NPS personnel on sustainable energy practices, create more sustainable National Parks (through improved efficiency or through the implementation of renewable energy projects), and to create opportunities for park visitors to learn about energy management and to witness first-hand the NPS's commitment to the environment.

Park staff and students learn from each other. (Photo courtesy of James Winebrake)

Since 1997, UNPEPP has leveraged close to US$1.2 million for energy projects in the National Parks, spreading the wealth over all National Park regions in 30 individual parks. Nearly 70 projects have been completed utilizing solar power, alternative fuel, wind power, hydropower, tidal power, and software development. All told, hundreds of students and NPS personnel have taken part in the program.

Perhaps one of the least-recognized benefits of the UNPEPP program is the remarkable efficiency with which it spends NPS budget dollars. The average UNPEPP project costs US$15,000 – a fraction of the cost of a professional consulting team, yet the projects yield professional quality results for the NPS and help train the next generation of energy professionals.

Energy savings from energy audits and recommended energy conservation measures have ranged from 500 kilowatts (kW) to 212,000 kW per project, with average annual savings of 52,000 kW per project. For projects that quantified energy savings, identified conservation measures have saved an average of about 40 percent of the analyzed facilities' energy use. The average cost

savings per relevant project was US$6,000 — more than one-third of the facilities' energy expenses. Emissions reductions were also significant. Of the projects that quantified them, the average annual reductions were 87 tons of carbon dioxide, 47 tons of sulfur oxides, and 1,600 pounsa of nitrogen oxides.

Program director James Winebrake believes that the project could be easily replicated, particularly at the state or local level. "Universities are always looking for experiential learning opportunities for students, and students really enjoy working at the parks. The key factor of success is building a relationship between the park and the university and having clear expectations for the project and what the students and faculty can do for the park."[xxii]

ADDITIONAL RESOURCES

- US National Park Service: www.nps.gov
- US National Park Service Solar Meter Site (Bonneville Power Administration): www.bpa.gov/Energy/N/Tech/EEMeteringData/Federal/Federal.cfm?Group=Federal_NPS
- Australian Government Renewable Energy in Parks project: www.environment.gov.au/commitments/publications/renewable.html
- QP Energy Manual: www.epa.qld.gov.au/publications?id=1880
- USDA Forest Service: www.fs.fed.us
- US Fish and Wildlife Service: www.fws.gov
- University National Park Energy Partnership Project: www.energypartnerships.org/index.htm

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The authors wish to acknowledge each of these businesses' participation. In most instances, the background information and best practices highlighted were taken from direct communications with these participants or obtained from affiliated Web sites.

Credits

The Renewable Energy in Tourism Initiative (RETI) is a joint venture whose partners include the University of Colorado's Energy Initiative (EI), the North Carolina Center for Sustainable Tourism (NCCST) at East Carolina University (ECU), and the National Renewable Energy Laboratory (NREL).

Sustainable Travel International was subcontracted by the above partners as the lead author of the RETI best practices series, with guidance provided by an industry advisory board. Board members include Mr. Chris Adams, Director of Online Marketing, Miles Media, Inc. and Mr. Tim King, Program Manager, Colorado State Parks. Coordination for the

RETI project has been provided by Tara Low and Wendy Kerr, Leeds School of Business, University of Colorado at Boulder. Principle Investigators for the project include Dr. Patrick Long, Director, NCCST and David Corbus, Senior Mechanical Engineer, National Wind Technology Center, NREL.

The best practices are a collaborative effort, and final information reflects consensus from the editorial board and contributors. Further contributions are welcomed from all industry members, should be merit- and science-based, with participation being nonexclusive.

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