



Renewable Energy in Tourism Initiative

Best Practices in the Cruise Line Sector



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EXECUTIVE SUMMARY

Cruise lines today are accepting the call to chart a new course as they are tasked to become more environmentally responsive. They are increasingly being called upon to be responsible guardians of our maritime waters and to initiate and practice renewable energy measures.

Most individuals conceptualize cruise ships as mini-cities and it is easy to understand this as the ships become more specialized. In the past, ships were compared to “floating hotels” but the inclination now is matching the current trend of amenity living environments. Many of the newer behemoths are styled as small communities that offer luxury living arrangements, fine dining, indoor and outdoor activities, exclusive shopping, and specialized entertainment. Therein lays the impetus for renewable energy initiatives in the cruise line industry.

The International Council of Cruise Lines and Cruise Line International Association, Inc are acknowledging and implementing protocol for renewable energy, energy efficiency, and eco-friendly issues. These topics may focus on water quality control, energy efficiency while in port, and effective recycling operations. Many of these are defined by the port cities and by leading conservation groups.

This **March 2008** edition of the Renewable Energy Tourism Initiative (RETI) *Best Practices in the Cruise Line Sector* draws upon the experiences, insights, and resources provided by Holland America Line (HAL), Ecoventura, Lindblad Expeditions (LEX), Captain Cook Cruises (CCC), and Royal Caribbean Cruise Ltd. (RCC). 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. This publication is a work in progress and information will continue to be refined and distilled to enable a quick comparison of renewable energy options in future editions.

Four 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.

Cruise Line Best Practices at a Glance

Short-term Initiatives

1. **Electrical Use Modifications** – Shore power modification is perhaps one of the leading measures. Called “cold ironing”, ships “plug in” to the port’s electric service provider while docked. Lighting retrofits are easily introduced, with LED lighting as a main source.
2. **Global Warming Education** – Considered being outside the usual realm of renewable energy initiatives, global warming is actually hand-in-hand. Several cruise lines address this through specific expeditions that focus on application and education.



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Long term Initiatives

1. **Energy Efficiency** - Optimization of cruising speed, replacement of 2-stroke motors with more efficient 4-stroke models, and nano-particle oil filtration systems all increase ships' fuel efficiency.
2. **Solar/Wind-Powered Ships** - With the ample and reliable sunlight and breezes found on the open ocean, powering ships entirely with on-board solar and wind energy is truly the wave the of the future.

Further Questions & Concerns

1. **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?

2. **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?

3. **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.
4. **Q: How does the industry address the issue of information sharing?**



*Cruise lines whose boats take backstage to the environment
(Photo courtesy of Ecoventura)*



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. (These documents will soon be placed in a Wiki web environment so that STI can invite public comment and so that each individual document can be continuously updated and improved upon over time.)

Industry Overview and Sustainability Initiatives

Cruise lines across the globe serve as stewards of our oceans. Unfortunately, marine travel can be a dirty business, particularly as some ships can be larger size and population than some of its destinations. Large cruise ship companies, in particular, have come under increasing public scrutiny regarding practices related to fair labor, local destination community and environmental impacts, waste management practices at open sea, and more recently, their significant climate impacts. To combat these negative effects, many companies are beginning to adopt eco-friendly practices regarding their use of energy and water, as well as supply chain management issues.

Case Study Participants

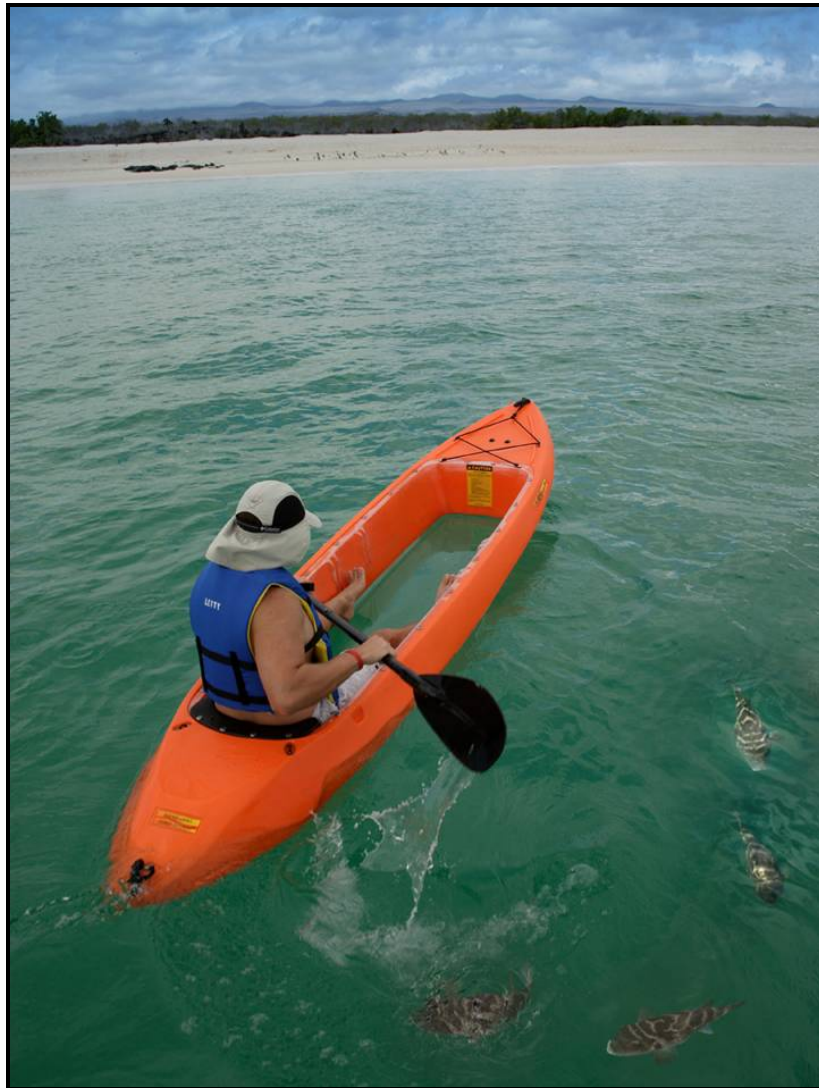
The best practices case studies discussed below include Holland America Line (HAL), Ecoventura, Lindblad Expeditions (LEX), Captain Cook Cruises (CCC) and Royal Caribbean Cruise Ltd. (RCC).



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Some of the most effective energy practices include:

- Using shore power while docked in port (HAL)
- Providing educational and eye-opening direct exposure to the effects of global warming, coupled with unique networking opportunities (LEX)
- Employing solar and wind energy onboard (CCC)
- Reducing fuel consumption through speed optimization, new filtration systems, and four-stroke engines (Ecoventura)



Ocean cruising can't get more sustainable than this! (Photo courtesy of Ecoventura)



BEST PRACTICE CASE STUDIES

Case Study: Holland America Line

With over 130 years of experience, Holland America Line (HAL) is recognized as a leader in the cruise industry's premium segment. Their fleet is comprised of 13 ships, and they offer nearly 500 cruises from more than 25 homeports. They offer itineraries from two to 108 days and sail to all seven continents.



Holland America Alaska cruise (www.destination360.com)

HAL's best energy practices include:

- Vista-class cruise ships - ms Westerdam, ms Noordam, and ms Oosterdam - connect to shore power at the Port of Seattle to reduce both fuel consumption and air emissions.
- Cruising at the slowest speed that will still meet the published schedule for arrival at a port. Software on the ms Noordam is designed to optimize speeds in order to achieve this result, taking into account multiple factors including weather and currents.
- Revolutionary emissions reduction technology involving a seawater scrubbing system that uses the natural chemistry of the water to remove virtually all sulfur oxide and significantly reduce particulate matter emissions. Seawater is then treated to remove harmful components while the calcium carbonate in the water renders the sulfur oxides harmless via conversions to sulfates and natural salts.ⁱ

Background Information on Best Practice

HAL strongly believes in using technology to protect the environment, and they decided to adopt shore power for a number of reasons. Their corporate headquarters is located in Seattle, Washington, and most electricity in Seattle is provided by a clean source, hydropower, which emits very little in terms of greenhouse gas emissions. Seattle City Light and the Port of Seattle approached HAL with the idea to install shore power equipment at Terminal 30 at the Port of Seattle as a means of reducing potential environmental impacts of cruise vessels home-porting there. HAL's corporate culture, the abundance of clean electricity, and the opportunities provided by their public partners paved the way for them to adopt shore power for their home-ported ships.

Steps in Implementation

Shore power, also known as "cold ironing", enables ships to turn off their diesel engines and connect to local electric power that travels to the ship from a specially designed transformer at the dock. The electrical power is transmitted from the landside transformer to the vessel via four 3 1/2-inch diameter flexible electrical cables. The actual cable connection on the vessel is a traditional, though quite large, male/female plug and socket.ⁱⁱ

After docking under their own power, the ms Oosterdam and ms Westerdam are hooked up to shore power within 20-30 minutes. Power generation is transferred back to the ship shortly before departure.ⁱⁱⁱ

Partnerships for the project included Port of Seattle and Mayor Nickel, Puget Sound Clean Air Agency, Seattle City Light, Cochran Electric, and other engineering consultants. Seattle City Light will pay up to US\$10,000 annually to purchase greenhouse gas offsets resulting from the use of shore power as part of the Seattle's program to reduce greenhouse gas emissions.



Best Practices in the Cruise Line Sector

Resources Required

The capital costs for investing in shore power are significant. HAL has spent approximately US\$4.8 million to invest in shore power for three ships and one terminal in Seattle. The shore side facilities cost approximately US\$1.5 million and the investment in each ship is approximately US\$1.1 million. Other than a grant of US\$25,000 from the Environmental Protection Agency and the Puget Sound Clean Air Agency, HAL has assumed all of these costs.

Based on the price they paid for fuel oil in the summer of 2007, HAL has saved approximately US\$70,000 in the Seattle season by plugging these two ships into shore power. Using traditional financial analysis tools, the payback period on their investment is very long, 10 to 15 years, depending on the frequency with which a vessel can “plug in.” However, this does not account for the savings from emission reduction activities such as carbon offsetting if HAL had continued to shore dock with diesel power and absorb these costs on its own.

Monitoring and Evaluation

In 2007, the ms Oosterdam and the ms Noordam used between 55,000 and 65,000 kWh per day for the eight hours they were plugged into shore power. They saved approximately 12 metric tons of fuel oil during each port call.^{iv}

In 2006, the ms Westerdam and ms Oosterdam each made 21 calls to the Port of Seattle’s Terminal 30 Cruise Facility. CO₂ emissions per call without shore power are equal to 95.2 tons; with shore power the CO₂ emissions are equal to 8.2 tons. In 2006, Holland America Line’s use of shore power at the Terminal 30 Cruise Facility eliminated an estimated 789.6 tons per year of CO₂, representing a 29% decrease in CO₂ emissions.^v

Replicability

The specific engineering and logistics for shore power will vary with each vessel (as will the renewable energy or emission reduction benefits). Other operators would need to consider the specific electrical engineering of their vessel(s), the number of times an individual ship

will call at a particular port terminal, the source and reliable availability of electrical power, the proximity of power to the dock, the price of power versus the price of alternate fuel, and the willingness of all the parties to work together to successfully complete the project (i.e. the cruise line, the port, and the power company).^{vi}

Success Factors and Benefits

The largest benefit is to the community nearest the shipping terminals; plugging into shore power eliminates all emissions that are generated by a ship during dockside operations. The company’s reputation benefits and guests also benefit knowing that they are doing business with an organization that operates in an environmentally and socially responsible manner.^{vii}

Challenges and Pitfalls

The challenges that HAL faced were those typical of early technology adapters. Only one other company before HAL had done shore power installation for a cruise ship, and that was their sister company Princess Cruises. There was no technical standard for this type of installation thereby these requirements were developed as the process was completed. HAL’s personnel had not done this type of work before. It was a completely new learning experience for their shore side engineers as well as those on the ship. They were successful in the face of the project challenges because they believed in the opportunities that the project presented.^{viii}

Lessons Learned

There are at least five things to consider for a successful shore power project:

1. Availability of an adequate supply of electricity at a reasonable cost
2. Frequency of calls by cruise vessels equipped to connect to shore power
3. Availability of the same dock and pier facility for these vessels for every call
4. Adequate dock and upland space for equipment
5. Willing partners including – utility, port and government agencies



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Cruise lines considering shore power alternatives while in homeport need to weigh the benefits provided from burning cleaner sources of electricity rather than the ship's regular fuel source. Once the decision is made to commit to shore power, the company should find qualified engineers to design and oversee installation of the systems and work closely with port personnel and electric power providers to complete a pilot project for their fleet.^{ix}

Case Study: Ecoventura



(Photo courtesy of Ecoventura)

Ecoventura has led the way in expedition cruising in the Galapagos Islands since the company began in 1990. Their fleet consists of four custom designed motor-yachts including a dive live-aboard. These yachts transport small groups limited to 20 guests on a one week cruise and limit on shore visits to no more than ten per guide.

Their energy-related best practices include:

- Optimization of cruising speed to minimize fuel consumption
- Replacement of 2-stroke engines with more efficient 4-stroke engines
- Implementation of a high performance filtration system, reducing the frequency of oil changes

Background Information on Best Practices

In 1998, Ecoventura first began taking steps to reduce their environmental impact, with the hope to start a trend toward greening the cruise industry. Ecoventura felt compelled to give something back to the Galapagos Islands, and wanted to preserve the islands' pristine beauty for future generations. "We wanted to be part of the solution and also assure our clients that we were doing our part in the battle against climate change," says Santiago Dunn, Executive President. "To that end, we offer environmental holidays that minimize the impact of the tours. Initially, our motivation was to gain market share and to influence other operators to improve their own practices. As a result, our hearts have become much greener along the way. We are proud to be the first carbon neutral company in Ecuador and in South America in 2006. We are also delighted that others are now looking to us as a role model, and that our passengers are coming to us because of our green credentials."^x

Steps in Implementation

In order to optimize cruising speeds, Ecoventura first conducted an assessment to identify fuel consumption. Next, they looked to their captains, crew, and administration for suggestions on how to reduce fuel usage. By identifying the speed that would provide the greatest reduction in RPM, while not impacting the time spent ashore and ultimately customer satisfaction, they were successful in reducing consumption 18-20 percent.

The national park system in the Galapagos does not yet require the use of 4-stroke engines. Replacement of 2-stroke engines was done gradually as the natural life cycle of the current engines occur (approximately every five years).



Four-stroke engine (Photo courtesy of Ecoventura)



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The replacement of the filtration system began in 2004, when local representatives of the Trabold filter company approached Ecoventura. Dunn and his staff spent two years researching the company's product and speaking with their customers before making a commitment. In late October 2006, the decision was made to install the systems in their entire fleet.



Trabold filter (Photo courtesy of Ecoventura)

In addition, new environmental policies were established for the operation of the yachts that required the cooperation, and sometimes compromise of the Captains. In order to obtain a lower RPM, the Captains must be motivated to reduce fuel consumption. This alone has resulted in approximately \$70,000 of savings in fuel per year.^{xi}

Resources Required

Implementation of policies and the purchases were all done on a voluntary basis. There was never a requirement of imposition by maritime authorities to comply with these policies. All funding was financed through the company. No external funds were sought and no grants were awarded.

Monitoring and Evaluation

When Ecoventura officially became carbon neutral in 2006, we immediately reduced our consumption of fossil fuels from 430,000 gallons per year to 340,000 gallons per year. Subsequent to the reduction through carbon offsetting, we experienced an 18% reduction in diesel consumed. This was accomplished by reducing the RPM of the sailing's as well as altering the use of two engines (one at a time) instead of two when available. As a result, we have had a reduction of fuel consumption from the usage of 4 stroke engines

(compared to the prior 2 stroke engines): 4,800 gallons per year to 770 gallons per year - a 38% reduction. In addition, we have reduced the oil consumption from 156 gallons per year with the 2-stroke engines to zero gallons with the 4-stroke engines - a 100% reduction.

Replicability

Other boat owners in Galapagos are making attempts to replicate Ecoventura's policies. For some of these companies, it is to become more environmentally responsible. And, for others, it is to offset the ever rising cost of fossil fuels making the alternative of becoming green also more profitable. Some issues can be implemented by merely a change of policies and others require an investment of capital.

Success Factors and Benefits

The greatest result in fuel reduction can be attributed to the optimization of cruising speed from 1550 RPM to 1350 RPM. This saves Ecoventura 4,800 gallons of fuel per month. As stated earlier, this 18-20 percent reduction in total fuel usage saves the company approximately US\$70,000 annually (based on 2007 fuel prices).

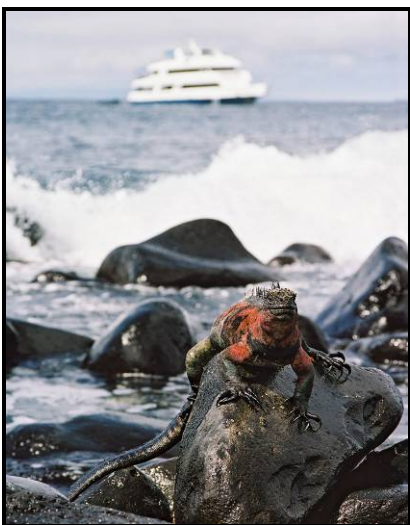
With the installation of 4-stroke engines, the company realized a fuel reduction of 240 gallons per month. Oil consumption was also drastically effected as the new engines burn no oil, unlike their 2-stroke counterparts. This provided a 13 gallon reduction per month. The 4-stroke engines are 35-40 percent more expensive to purchase, but realized savings will lead to a full return on investment in one year. Also of note, since the life of the engine averages five years, one could feasibly see a full four years of profits. "It is definitely economically feasible," notes Dunn, "and they also produce far less noise and emissions, so you can take your passengers closer to the wildlife they are there to enjoy."^{xii}

The nano-particle Trabold filtration system also provides a drastic decrease in oil consumption. Due to the decrease in frequency of oil changes, Ecoventura saves 115 gallons per month, equivalent to 40 percent of their previous usage, and in today's prices, US\$8,000 annually. When Ecoventura adopted the new system, they replaced the filters for all four boats with eight



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filters required per boat. The cost for filters and installation was approximately US\$14,000, setting the ROI to less than a year and a half. Dunn also notes that the systems have produced benefits above and beyond longer oil life. When taken in for overhaul, the engines have actually been in better shape than before because the increased viscosity of the oil serves to coat and protect other parts of the engine, preserving its life as well.^{xiii}



Galapagos iguana (Photo courtesy of Ecoventura)

Challenges and Pitfalls

Our biggest challenge has been to alter the cultural norms of the crew members. Becoming greener sometimes can result in restriction of privileges, such as arriving faster to reach port. Today, we arrive to port later and the crew has less free time to relax. Classification of garbage is also a burden for them as it is now more time consuming than before when it was disposed of all together.

Technical assistance for the 4 stroke engines as well as for the non-particle filters is harder to find and sometimes we have difficulties to have all the engines operative at 100%. The constant monitoring of the non-particle filters has shown us that these systems would be more efficient with new engines or engines with fewer hours of operation.

Lessons Learned

- Savings can be done with minimal efforts such a change of policies.
- Capital investments can be recovered in terms of less than two years
- Clients' positive reaction to greening efforts has become a great source of sales revenue.
- Employees, once motivated and involved in the process become a great asset toward greening the operation.
- There is a lack of technical support due to the fact that there are fewer companies using the technology (either 4 stroke engines or nano-particle filtering).

Case Study: Royal Caribbean Cruise Ltd.

With 450 ports of call worldwide and 31 vessels, Royal Caribbean Cruise Ltd. (RCC) is prominent in the cruise ship industry. Along with other initiatives, RCC has created a partnership with Conservation International to develop a sustainability strategy focused on the following four areas:

- *Atmosphere and Energy*, primarily through the implementation of energy efficiency replacement and upgrade measures
- *Destinations*, including environmental protection guidelines for their land-based tour operators. (A green leaf is used to notify guests that a tour has less of an environmental impact.)
- *Greening their Supply Chain*, by working with high volume vendors to reduce packaging, increase recycling, and reduce waste
- *Waste and Water*, including water conservation installations, a *Save the Waves Program* for recycling, and waste management practices that go above regulatory requirements



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(Note that while all of these areas are not directly related to renewable energy/efficiency, they have energy conservation or efficiency implications, so they have been included here.)

RCC's sustainability strategy was created to unify the company's environmental practices, whether in place, being tested, and/or developed into one document focusing on standardize best practices and new innovative technologies that worked well. Best management practices are reviewed before inclusion in the company's Safety Quality Management system (SQM). In addition, RCI is an ISO 14001 certified cruise line for environmental management, and their ship and shore side offices are audited based on these policies. Their environmental objectives and targets are determined based on internally identified Significant Environmental Aspects (SEA).

Background Information on Best Practices

RCC installed light emitting diode (LED) lights, replacing 60-watt bulbs with 5-watt LED lights that produce less heat and are rebuilt after 5-7 years of service. (This reduces manpower requirements and, since the lights are rebuilt, minimal waste is generated.) RCC's research is continuous and they are now having 1.5-watt LED lights designed and tested. 3M solar reflecting film has been applied to windows to cast back sunlight, reducing the load on the A/C system and lowering RCC's carbon footprint. According to the 3M company Web site, 3M solar reflecting film is a clear, non-metallic, multi-layered film laminated in glass to reflect infrared radiation and increase cabin comfort. Intersleek hull coatings are applied to the hull to reduce the growth of organisms and save fuel. Operationally, RCC has implemented the use of timers and dimmer options to use low-level lighting when large theaters and small spaces are not in use. In larger spaces, the A/C temperature is raised when they are not occupied. Electronic usage meters are used to target high consumption electronics and take them off-line when possible.

RCC also employs strategies that provide indirect benefits related to reducing energy use and increasing energy efficiency in tourism. RCC has installed water conservation devices in sinks and showerheads to

reduce water consumption and produce savings on the fuel used to convert seawater into freshwater.

RCC's *Save the Waves* initiative includes "Reduce-Reuse-Recycle" programs to recycle aluminum and tin cans, scrap metal, plastic, cardboard, paper, magazines, books, fluorescent lamps, batteries, electronics, cooking oil, oily rags, toner cartridges, and glass. In some ports, these items cannot be recycled but when they are, all proceeds are returned to the "crew fund" for events and activities, thereby encouraging crew members to be good environmental stewards.



A Royal Caribbean ship (www.destination360.com)

Company policies prohibit anything going overboard. RCC's Above and Beyond Compliance Policy (known as their ABC policy) sets a company standard above any regulatory requirement. One such example: oily water is treated through the oily water separator until it contains 5 parts per million (PPM) oil or less, even though the regulatory requirement is 15 PPM. The equipment purchased to comply with this policy is technologically advanced to achieve this goal. Further investments also include advanced wastewater treatment plants (AWP) onboard. RCC has committed to putting AWP's onboard their entire fleet by 2010. These systems treat both gray and black water to the highest standards available in the industry. In addition, RCC is pledging to remove all Perc dry-cleaning systems with alternative cleaning systems. Another interesting measure is that all cabins have been retrofitted with soap and shampoo dispensers to avoid the unnecessary waste of disposable bottles.



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Replicability

The Atmosphere & Energy innovative products, such as LED light installations and 3M solar reflecting film, have been tested and can be installed and applied with a high rate of success. The AWP systems technology has required a great investment and must be modified for individual use.

Beta Box: Captain Cook Cruises

Captain Cook Cruises (CCC) is a family-owned Australian “small-ship” cruise line that has been in operation since their first “Captain Cook Coffee Cruise” around Sydney Harbor in 1970. Today they operate a fleet of 16 vessels, employ over 500 people, and offer a choice of over 150 cruises weekly throughout Australia and Fiji.^{xiv}



MV Solar Sailor (www.ibiblio.org)

CCC is the first and only cruise line to utilize onboard renewable energy, and they do so on one of their newest ships, the MV Solar Sailor. The first of its type in the world, the Solar Sailor is a renewable energy hybrid, powered by solar, wind, battery and liquid petroleum gas, either individually or in combination. The Solar Sailor produces very little noise, fumes, vibration, wash, or air pollution, and no water pollution.^{xv}

According to the Solar Sailor Web site:

- Hybrid marine power combines electric drives with the power and range of hydrocarbon/alternative fuels, is controlled and optimized by a computer, and takes advantage of renewable energy available on the water such as solar and wind power.

- Solar Wing technology draws inspiration from the dual use of insect wings and is very flexible, making use of solar and or wind energy depending on weather conditions. The wings move automatically, tracking the sun for optimal solar collection, the wind for optimal sail power, and in extreme wind situations, they fold down against boat.
- Additional benefits include reliability, maneuverability, reduced fuel and maintenance costs, and increased passenger comfort.

Beta Box: Lindblad Expeditions

Lindblad Expeditions (LEX), formerly Lindblad Travel, was founded in 1958 by Lars-Eric Lindblad, a pioneer of expedition travel in Antarctica and beyond. In 2004, LEX joined forces with National Geographic in the areas of expeditions, research, technology, and conservation to provide extraordinary travel experiences and to disseminate geographic knowledge around the globe.^{xvi}

Lindblad Expeditions has a long history of partnering with conservation organizations and supporting conservation efforts. In addition, Lindblad Expeditions works to maximize its environmental efficiency throughout the fleet and in its offices. As environmental leaders in expedition travel LEX has sought to minimize its environmental impact whenever possible. On board the vessels, various waste streams are separated so that they may be recycled in those ports that offer recycling (i.e. batteries, cans, cardboard, glass, paper, plastic, toner cartridges, etc.).

The vessels do not offer photo development or dry cleaning services and therefore do not deal with the hazardous wastes associated with those activities.

Vessel operations are continuously examining and fine tuning shipboard systems to ensure optimum fuel efficiency. Where feasible, the latest technology is adopted onboard (e.g. LED lights).

Vessel personnel are actively engaged to come up with ways of reducing LEX's environmental impact. A variety of programs have emerged from this including our



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menu sign-up program in which on our smaller vessels guests sign-up for their preferred dinner entrée during lunch, helping our chefs reduce waste.

Energy efficiency and renewable energy are a critically important element of LEX's environmental efforts. LEX has adopted and begun implementation on the following 5-part energy and emissions strategy:

1. Measurement of their greenhouse gas (GHG) footprint on a bi-annual basis using the World Resources Institute GHG Inventory Protocol, with oversight and guidance from Clean Air Cool Planet
2. Education of both shipboard and office personnel
3. Reduction of GHG emissions through onboard efficiency gains, technology upgrades, and offsets
4. Creation of the Arctic Summit
5. Engagement of guests on our environmental initiatives

While LEX understands that its platform for offering tourism services is limited by current technology in terms of renewable energy use, it has begun researching alternative energy options including the use of biofuels and the potential installation of renewable energy technology at its headquarters in New York City. The company also supports the development of renewable energy resources in the areas that it operates.

LEX utilizes a unique approach to creating environmental consciousness by bringing people together and showing them firsthand what is at stake. By doing so, they have found an effective way to instigate change. "That's how we've operated for over 50 years," says M. J. Viederman, Vice President of Communications for LEX. "We know that if we take

affluent, curious, smart travelers to places that are remote and pristine, and we create whole constituents of stewards who care about these places in the long term, it has a greater impact. Our business exists in the Arctic and Antarctica, and it has for decades. We've seen these changes first hand, so we know that our naturalists have an enormous impact on our guests, and that's where our greatest sphere of influence lies."^{xvii}

While LEX has impacted many of their guests in profound ways, they also realize that more has to be done to enhance and engage public opinion when it comes to climate change. To this end, they are planning an Arctic Summit in 2008 in collaboration with The National Geographic Society and the Aspen Institute. This groundbreaking expedition will bring together world leaders across many disciplines, including science, religion, business, policy, and youth leaders, among others. LEX is hosting this expedition in the hopes that witnessing the effects of climate change first hand will inspire these leaders to collaborate, come up with creative solutions, and then, upon returning home, communicate their experiences, so that the collective impact will be very far-reaching.



Lindblad Antarctica cruise (Photo courtesy of Lindblad)



ADDITIONAL RESOURCES

- 3M Solar Reflecting Film: www.3m.com/product/information/Solar-Reflecting-Film.html
- Aspen Institute Arctic Commission: www.aspeninstitute.org
- Captain Cook Cruises: www.captaincook.com.au/home.asp
- Clinton Climate Initiative project summary: www.c40cities.org/bestpractices/ports
- Cochran Electric: www.cochraninc.com
- Ecoventura: www.ecoventura.com/home.aspx
- Holland America Line: www.hollandamerica.com
- Intersleek hull coatings: www.international-marine.com
- Lindblad Expeditions: www.expeditions.com
- National Geographic: www.nationalgeographic.com
- Port of Seattle: www.portseattle.org
- Princess Cruises: www.princess.com
- Royal Caribbean Cruise Ltd.: www.royalcaribbean.com
- Solar Sailor's technology: www.solarsailor.com.au
- Trabold: www.trabold.net

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Credits

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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.



REFERENCES

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- i Press releases provided by Chris Giekel, 11/15/2007.
ii www.c40cities.org/bestpractices/ports/seattle_vessels.jsp
iii Giekel, 11/15/2007.
iv William Morani Jr., Vice President, Environmental Management Systems, Holland America Line, 12/03/2007.
v www.c40cities.org/bestpractices/ports/seattle_vessels.jsp
vi Morani, Jr., 12/03/2007.
vii Ibid.
viii Ibid.
ix Ibid.
x Santiago Dunn, Executive President, Ecoventura, 11/27/2007.
xi Ibid.
xii Ibid.
xiii Ibid.
xiv www.captaincook.com.au/home.asp?pageid=2654141987AD57E0&mgid=182
xv www.solarsailor.com.au/technology.htm
xvi www.expeditions.com/National_Geographic52.asp
xvii Mary Jo Viederman, Vice President of Communications, Lindblad Expeditions, 11/20/2007.