Lady Elliot Island Eco Resort

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Located on an offshore island in the Great Barrier Reef Marine Park, Lady Elliot Island Eco Resort is required to operate with minimal impact on the environment. Their sustainability journey has, however, taken them beyond what is required to what contributes to the sustainability of the island and beyond and to what makes sense economically.

A remote island, Lady Elliot Island is located at the southern tip of the Great Barrier Reef. The island boasts an array of wildlife including dolphins, turtles, a large variety of coral, fish and a resident population of more than 40 manta rays as well as up to 200 000 birds in season. Lady Elliot Island Eco Resort is one of only three island resorts on the Great Barrier Reef and is located within the highest possible protection zone of the Marine Park.

Established in 1984 using prefabricated buildings, the eco resort has undergone a series of transformations to improve the visitor experience while at the same time reducing its footprint on the island and its surrounds. This case study showcases the recent progress that Lady Elliot Island Eco Resort has made to become leaders in the field of sustainability. It also addresses challenges faced as a way of sharing the lessons learned along the way.

1. Getting started

Installation of a hybrid power system

In 2007 island management undertook research into options to replace the three diesel powered generators supplying power to the island with renewables. The findings of an energy audit identified the possibility of reducing energy related fuel consumption from around 500-600 litres per day to around 300 litres per day – a savings of 40-50% - and reducing carbon emissions and costs by combining comprehensive load management with a hybrid power system.

With the assistance of Federal Government's Renewable Remote Power Generation Programme funding the hybrid power station was installed in late 2008.

The hybrid system combines 140 square metres of solar panels, battery banks and inverters and a new and smaller generator (see System Details).

When installed, the hybrid power system was one of a kind in Australia. As such learning relating to the system's capacity and ability to perform in a harsh island environment has been ongoing. As would be expected the system requires regular and ongoing learning. Unexpected circumstances however have been the failure of one generator within months of installation and the

System details

- Free-standing hardwood timber structure 18.25m x 8.20m , 25" tilt to true north, 143m^2 active solar surface area
- 20kW of Solar PV modules (96 x Kyocera 205w PV panels) 3 x SMA SMC 7000TL PV inverters
- 2 x 3000Ah 48V Battery Banks (48 x Sonnenschein A600/3500 batteries) 6 x SMA Sunny Island 5048 Inverters
- 56 kW encapsulated genset,
- 100 kw 3-phase 415 V system capacity

impact that the island's 200 000 birds have had on the system (that is a lot of bird poo!). That said, the original solar panels continue to produce energy at the same level as the day they were installed and the system has more or less paid for itself in the three and a half years since installation.

Recognising the savings made since installing the system, resort management have invested in its expansion. By the end of 2012 the resort will double the number of solar panels from 96 to 192 and have already added a 3rd bank of batteries (24 additional batteries bringing the total to 72). New solar panels will be REC Solar Peak Energy Panels, the world's best performing panels according to Photon Magazine[1]. Increasing the number of solar panels is designed to bring the system closer to peak solar efficiency while increasing storage capacity will better enable stored power to meet the resort's night time requirements reducing the reliance on generators.

Introduction of low-cost energy saving measures

While installing the hybrid power system would reduce the cost of producing power for the island and reduce carbon emissions, noise and the reliance on fossil fuels, Lady Elliot Island Eco Resort also introduced a series of measures designed to reduce the level of power consumed resulting in further savings. Energy savings measures introduced included:

- Replacing halogen globes with compact fluorescents which last longer and cost less to use;
- Removing clothes dryers from the staff quarters; and
- Introducing energy efficient design to new and upgraded buildings on the island.

"The fact that we are creating our own electricity has made staff and guests very conscious about the need to conserve power and not waste it. Apart from the obvious benefits for the Reef, this culture shift has been the most positive spin-off of all."

Peter Gash
Owner/Operator

Shifting from electrical to gas appliances also resulted in significant savings. This included the removal of all electric hot water systems and replacing them with instant gas systems and replacement of electric convectional ovens with fitted gas convectionals for fast cooking.

2. Continuing the journey

Energy related savings are only the tip of the iceberg for Lady Elliot Island Eco Resort. Savings relating to waste and water have been made equally important.

Water

Getting water to the island is an expensive and unsustainable exercise. The island resort originally used rain and well water as there was few birds in the early days, but successful tree planting by previous operators have brought the birds back in force making the rain water unusable (the impact of that bird poo!). The tradeoff, however, is that the operators have returned the island back closer to its original state prior to the guano mining that occurred in 1860s. Resort operators have now put in place actions to produce their own water to drinking standard, process waste water for use on the island and to reduce water consumption as follows:

Drinking water on the island is produced by a reverse osmosis desalination plant. In layman's terms, the desalination plant draws 3 litres of salty water from the waters surrounding the island to produce 1 litre of drinking quality water. The remaining two litres of water with increased levels of salt are discharged back to the ocean. The level of water taken from the lagoon for desalination purposes cannot exceed 0.005% and independent research using 24 hour testing has verified that there is no measurable environmental impact around the discharge point.

TOP TIP

Install water fountains where guests can refill aluminium water bottles branded with your logo.

[1] www.energymatters.com.au/solar-panels-rec-solar-c-148_406.html

The desalination plant is operated for up to 15 hours a day in peak periods. Management are currently exploring ways to improve power usage of the plant. Some improvements have already been made including replacement of filters in the pre filtration system which increases water production from 15 litres per minute to 30 – 35 litres per minute thereby reducing operational time required and saving power.

Waste water - Lady Elliot Island Eco Resort operates a Southern Cross Waste Water Treatment Plant on the island. All treated waste water is used on land in irrigating the island's air strip. As the island is a coral cay and lacks top soil there is no run off into the surrounding lagoons. This is a significant achievement when compared to run off into the ocean from coastal communities, where 90% of Australia's population live.

Water saving initiatives Recognising the benefits of minimising consumption and waste of water on the island management has implemented the following actions:

- Installation of water saving shower heads;
- Laundryis undertaken on the mainland, freighted by guest flights to and from the island; and
- Encouraging guests to use aluminium water bottles purchased on the island to minimise waste from purchased water bottles. To make it easy for guests to refill their water bottles the management has installed a number of water fountains across the resort.

Waste

An old washing machine, plastic drink bottles, pre-loved building materials – it doesn't matter what general waste is produced it must be removed from the island on one of the barges that service the island every 3 or 4 months. Only organic waste goes on or in the ground.

A number of actions are taken to minimise and manage waste as follows:

- Encouraging guests to eat in a central point minimising the use of take away packaging;
- Reducing the use of individual portion packaging (e.g. for breakfast jams and spreads);
- Using recyclable materials such as eco-straws made from corn starch;
- Staff and guests are encouraged to separate food, plastic, paper, aluminium and glass on the island and separated waste is then stored in industrial sized skips before transfer to the mainland (Gladstone) where it is distributed to relevant recycling or land fill centres;
- Food waste is composted on the island in a pit system using a combination of lime and dirt. While the method sounds familiar, the process must take account of time taken for food to break down on a coral cay;
- Planes to the island are back-loaded with plastic bottles and cans reducing the need for storage and minimising pests attracted to stored waste;
- Actively reducing the amount of packaging coming onto the island via new products and improved food usage skills;
- Green waste is wood chipped or left to nature (not processed); and
- Petroleum based oil wastes are removed to approved facilities on the mainland.

THINK OUTSIDE THE BOX

Consider ways to use or re-use waste. Coconuts on the island are used for games of lawn bowls as well as satisfying drinks for guests.

Other actions

Guest information – Lady Elliot Island Eco Resort offers ad hoc information sessions for visiting schools, universities and other interested parties about climate change, what you can do at home and past and future initiatives.

Sharing knowledge – Management and staff of the island are keen to share their experience with others. They have participated in interviews with national and international journalists and have worked with experts and researchers wanting to learn more in the field.

One example was a visit in May 2011 by TURANOR PlanetSolar, the world's largest solar powered boat. On hearing of the activities undertaken on Lady Elliot the crew of TURANOR – global leaders at the forefront of sustainable technology - went out of their way during their 18 month circumnavigation of the globe to visit the island to swap ideas. Consider that the vessel was travelling at 8 knots per hour this really was a significant compliment.

Additionally the island works with Lizard Island Research Station, also located in the Great Barrier Reef Marine Park, on a regular basis. Facing similar conditions the two islands share their experiences and learn from each other.

3. Key outcomes

Well researched investment in Lady Elliot Island Eco Resort has resulted in significant savings contributing to the financial sustainability of the island and ensuring that the resort has a place in the island's long-term future. Key results include:

Energy

- ROI achieved within 3.5 years;
- In 2009 – estimated 24% reduction in energy costs and 40% reduction in fuel consumption and emissions;
- In 2011 this has grown to an estimated 65% (or $270 000) saving per annum in fuel consumption and emissions;
- Cost savings are expected to grow annually due to rising fuel costs; and
- Solar panels continue to produce power at the same level as when installed. NB: *Panels come with a guarantee that in 25 years they will continue to generate 80% of the power generated at the time of purchase.*

> *"If we can achieve these results on a remote, offshore island, imagine what guests can achieve at home".*
>
> **COURTNEY ADAMSON**
> **ISLAND MEDIA & BUSINESS DEVELOPMENT MANAGER**

Water

- Production up from 15 litres per minute to 30 – 35 litres per minute using same level of power; and
- Introduction of water saving shower heads which will reduce the current water demand by over 50% or between 4000 litres and 5550 litres per day based on every guest and staff have one 4 minute shower per day. As most guests and staff have two showers the actual usage and savings would be even greater. As well as reducing the run time of the desalination plant, a significant water reduction has a major flow on affect including a significant reduction in heating the water (gas), pumping the water (power) and waste water treatment (power/maintenance);

Waste

- By replacing 2litre milk containers with 3lt milk containers the island has reduced waste by 1560 plastic 2 litre containers– the equivalent of 2 plane loads of plastic containers - per year. Also saving 7c per litre of milk purchased; and
- By replacing tinned foods with larger cans (chunky tomatoes, diced apples etc) and satchels resulting in cost savings and a reduction in packaging by 75% (every pallet reduced to ¼ of a pallet).

> **TOP TIP**
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> Replacing 2litre milk containers with 3 litre containers not only reduces waste but saves 7 cents pre litre. It might not seem much but how many people drive around looking for service stations that discount fuel by 0.4 cents a litre?

4. Major challenges

Island conditions are akin to being on a boat, being wet and humid most of the time, and can be more challenging than some other environments. Lady Elliot Island has needed to understand how systems will stand up to the elements including moisture from high humidity and corrosion from the salt air. For example, when purchased batteries for the hybrid power system were expected to have a 10 year life span. The reality is however that they will be likely to last around 6 to 7 years – still enabling sufficient ROI to make the investment worthwhile.

Managing power fluctuations from peak to non-peak periods. Guests on the island require seamless services and do not expect to experience periods of blackout or low energy caused by technical difficulties. All systems on the island require sufficient back up to enable smooth delivery of services.

Trial and error As a leader in the introduction of new technologies on offshore islands, the resort has faced unforseen challenges and needed to respond accordingly. For example, solar hot water systems were installed once but the units purchased perished in the harsh climatic conditions before they had time to pay themselves off. Hot water is now produced utilising a gas system with gas bought to the island on the barge.

Being prepared Lady Elliot Island is serviced by a barge on a demand basis, generally around every 3-4 months. Ensuring that the island has the necessary back-ups for possible equipment or systems failure requires systematic measurement of what is used and what is required.

Personal challenges Living and working on a remote offshore island includes a number of personal challenges for management and staff. Maintaining harmony and staff satisfaction is key to delivering quality guest experiences and minimising staff turnover.

5. Advice to operators

Management and staff at Lady Elliot Island Eco Resort have learnt a lot on their sustainability journey. When asked what advice they would give to other operators in Queensland and beyond the following pearls of wisdom were shared:

- Come and talk to us. There are so many things to consider – learn from others - go and see for yourself. You will save time and money in the long run;
- Don't be afraid, start somewhere; and
- Look for help – We couldn't have done it without the knowledge of the teams of people brought together for various projects. Government funding has also helped.

"I can't stress enough, talk to other people with an open mind about what you want to achieve. It can result in huge savings for you in what would otherwise involve a lot of research"

ROBERT THOMAS
PROJECTS MANAGER

6. Next steps

Lady Elliot Island Eco Resort recognises that sustainability in a continual journey with incremental steps continuing to be taken as knowledge and technology improves.
The next steps for the island include:

- Doubling the number of solar panels on the island from 96 to 192 by the end of 2012;
- Installing LED lights in new construction on the island including the Education Centre;
- The introduction of a wind tower in 2013 to contribute to energy savings;
- Researching a new waste water treatment plant, including discussions with GBRMPA on systems that meet best practice standards, to replace the existing one which is getting old and is requiring increasing levels of maintenance; and
- Upgrade of the island's Education Centre with the assistance of a TQUAL grant. The centre is a large common space on the island where guests learn about marine life, the reef system and coral cays. The centre upgrade incorporates sustainable design elements including creating natural air flow in the design and installation of whirlybirds, utilisation of natural light through use of sky lights and installation of floor covers to contribute to the lifespan of equipment. Additionally the centre will include showcase action taken on the island to minimise the resort's impact.

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