Light and Life in the Bush

BUSH LIGHT

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Bawaka

The Setting

This case study looks at Bawaka, a small Yolŋu Homeland in East Arnhemland. Bawaka is right on the beach at Port Bradshaw, near Cape Arnhem. There are two occupied houses, one old shelter and other outbuildings.

The community was established in the early 1970s. It's about 1 1/2 hours drive across sand dunes from Yirrkala. The people at Bawaka have strong cultural associations to the sea, they hunt and collect dugong, turtle, fish, crab, stingray and oysters. Several of the women craft weavings and some of the men carve artefacts which they sell through Buku Larrnggay arts centre in Yirrkala.

At various times there are lots of children related to the Bawaka families staying at Bawaka. They are taught to fish and hunt and many aspects of culture.

Friends from interstate often stay over the dry season. Bawaka recently featured in the final episode of SBS TV series Going Bush with Cathy Freeman and Deborah Mailman.

Bushlight's Approach

Bushlight has established a process for use with homeland communities to plan and manage their energy services. This process involves a series of facilitated workshops and is called the Community Energy Planning Model (CEPM). Bushlight regional staff work with community residents through this process. The process informs residents and helps them to choose and manage energy services that are best for them and that will help them achieve their aspirations.

Residents are provided with technical and other information so they can choose sustainable – that is, affordable and reliable – RE services that will meet their current and future energy needs. In making decisions about energy services, residents take into account the technical and financial limitations that are associated with their various energy service options.

At 12 months Bushlight undertakes a CEP Review with the community to obtain feedback on Bushlight services and assess community outcomes

Energy Service Goals

When Bushlight first started working with the people of Bawaka they stated that their aspirations for energy services consisted of:

- 24 hour reliable power
- 24 hour refrigeration and freezing facilities
- Reliable power for medical equipment

With access to a reliable, affordable electricity supply Bawaka residents aspired to have effective refrigeration and freezing facilities. Bawaka residents provide the community with food from fishing and hunting. 24-hour refrigeration would ensure that fish, dugong, turtle, kangaroos and bullocks would keep longer. Supplies purchased from Yirrakala would also have longer shelf life.

Another important goal was to have a reliable energy supply for a nebuliser for a resident who suffers from asthma.

Existing Energy Services

In the initial discussions it was determined that the community used:

- Wood for cooking
- Diesel for power generation and transport
- RE for lights and pumping water

Cooking was done on wood fires, with firewood plentiful in the area. Community members said they would consider using gas for cooking in the future.

The community had a 5kVa diesel generator which provided electricity to both houses for about seven hours each night for fans, appliances and a freezer. Power was provided to houses from the generator shed by means of strings of long extension cords, stretching 140 metres to house one and 75 metres to house two. To cover this distance with extension leads required many leads joined together . This meant substantial power losses over the distance, but also meant that there were joins in the leads that were exposed to water ingress from heavy wet season rains.

Extension leads used before the installation

The community used about 4,380 litres of fuel a year for power generation. Each year they were spending an estimated $13,000 including costs transport diesel to the homeland.

A small DC RE system powered lights and a nebuliser at house one.

A RE powered bore provides water for Bawaka. Water from the bore is pumped into a header tank from which it is reticulated to the two houses.

Energy Services Planning

During this stage of the CEPM Bushlight provides education about energy service options and finds out about the community's energy needs and issues, social structures, mobility and household members. Bushlight investigates all of the energy sources available to the community. It then discusses the various sources with residents to assist people with making decisions about the best energy outcomes for their needs.

Community Energy Planning at Bawaka

The end result of the process is the Community Energy Plan (CEP), a document that details the most appropriate use of available types of energy. This document includes details of the proposed RE system.

The main factors that were considered during energy planning with Bawaka residents included the need for:

- 24 hour power for medical equipment;
- Reliable refrigeration to keep seafood fresh
- Power for lamps that shine on a burial site at night for cultural reasons

Bushlight developed Bawaka's CEP in consultation with the community and Yirrkala based resource agency Laynhapuy Homelands Association Inc.

It was decided that two Bushlight Household Systems would be installed at Bawaka, one for each house. This decision was based on the distance between the two houses being prohibitive to installing a Bushlight Community RE System.

The following decisions were made about future community energy use:

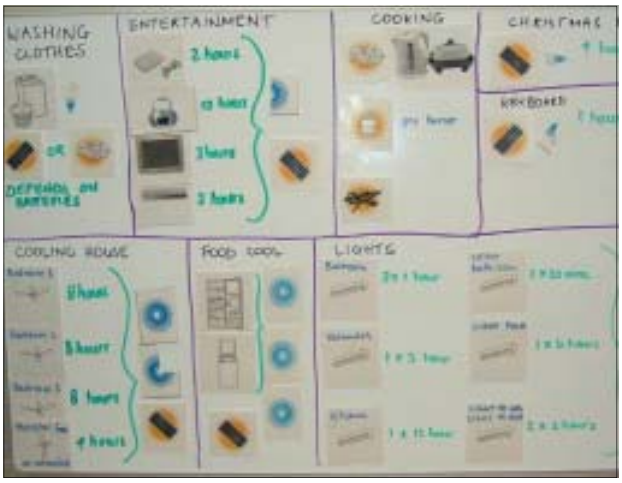
- Wood would continue to be used for cooking,

Major System Component Specifications

	PV arrays	Battery Banks	Inverters	Charge controllers
System 1	3kWp (40 x 75W)	2400Ah @ 24V	2.2kW @ 40°C	2 x 60A @ 24 VDC
System 2	2.55kWp (34 x 75W)	1700Ah @ 24V	1.5kW @ 40°C	2 x 60A @ 24 VDC

and the community would also think about using gas.

- RE would be used for refrigeration, lights, fans and entertainment appliances such as television and stereos. I
- The diesel generator would be used on occasions when the community needed to use power tools, air compressors or battery chargers, spotlights or kitchen appliances such as electric frying pans. The generator could also be used for backup power for periods of cloudy weather or times when there were a lot of visitors.
- The washing machine would be powered by RE when there was enough power available.



Energy Budget for House One at Bawaka

System Specifications

The Bushlight Household RE Systems at Bawaka were commissioned in August 2004. Both systems are located on their respective houses' verandahs. At both houses a wall was erected on the west side of the enclosure to shelter the system from rain and sun.

The photovoltaic arrays for each system are roof mounted.

As well as providing power to the houses at Bawaka the systems each support additional street lights that provide some light between the houses and light up the abovementioned burial site. A double GPO connected to the generator only circuit was also installed at the camping shelter area.

To provide safe power from the generator, underground cables were laid to the houses from the generator shed.

Bushlight systems power non-critical appliances via "discretionary" circuits and critical appliances via "essential" circuits. To ensure continuous power to critical appliances, power to discretionary circuits is cut when the battery charge drops below a predefined level.

Costing Information

The two systems cost a total of $193,148. This figure includes costs associated with two service visits in the first year, system mobilisation and installations, data-logging equipment and additional works including installation of AC house wiring and reticulation. The Northern Territory Government Renewable Energy Rebate Program provided a rebate of approximately $96,574 on the total cost.

The total diesel offset by the provision of equivalent 24 hour power to Bawaka is 8,120 litres per annum. This equates to an annual cost saving of approximately $15,429, and a greenhouse gas abatement of 23.5 tonnes.

Bushlight Household System at Bawaka

Community Service Agreement

The Community Service Agreement (CSA) is an agreement between the community, its support or resource agency, the agency funding maintenance of essential services and Bushlight where each party agrees to work together, in a spirit of cooperation, to maintain and sustain the energy services. The CSA clearly articulates the roles and responsibilities of each party as well as describing maintenance and repair arrangements.

As of the 1 July 2006 Bushlight will be responsible for the maintenance and repairs of all Bushlight RE Systems. However the actual delivery mechanism will be determined by local circumstances. Existing CSAs will be renegotiated to include this new arrangement.

The CSA also covers the collection of user contributions to pay for future maintenance carried out by the Resource Agency. User contributions are being collected from all Bawaka residents on CDEP. Laynhapuy has been collecting these deductions since shortly after the systems were commissioned. In September 05 there were six people having a $20 per fortnight user contribution deducted from their pay. Some residents have since moved back to Yirrkala and at the time of writing four people are contributing $20.

Post Installation Community Training

Community Training was delivered to Bawaka residents with the aid of a pictorial based User Manual and their RE systems. This training included system operation and maintenance, basic troubleshooting and energy use management. Bushlight training was designed to be broken into stages to allow time to experience system use and operation.

Since installation Bawaka residents have repeatedly demonstrated a sense of ownership of the system and a desire to be fully knowledgeable about its operation through their questions and feedback to Bushlight staff. (see comments opposite)

After initial training was delivered, residents asked for further training for some household members, in switching between using the generator and the RE system. When at Christmas 2004, the House 2 household changed, residents asked for further training in system use for new residents.

Bushlight provided logbooks to allow the community to keep track of the system gauges. Both houses have recorded readings in the logbooks regularly. At House 1, Barbara has used the logbook to express satisfaction and pride with the RE system through her comments in the "Any problems?" section of her logbook.

In early 2005 Bawaka residents asked Bushlight for some educational resources to inform visitors to the community what appliances can and cannot be used on RE power. Bushlight has developed posters for this purpose.

Comments in Barbara's Bushlight logbook:

"no problems – only the voltmeter reading getting low. I love to write this everyday"

"no problem – bit cloudy, but still the system works very well. I am proud"

"no problem - but always walking around smiling looking at my solar system"

"no problems – it's four months now. The solar system has been working very well. I hope it will last long, until I die and my family will look after it like me."

"no problems – it's the good weather, the battery is charging very fast."

"enjoying myself reading the voltmeter and the wattmeter. The Bushlight system is working well, I hope it works forever"

Poster developed for use across a number of communities after a request from Bawaka residents

It has been important to residents to "do the right thing", so much so that at times too many precautions were taken.

One instance relates to caution stickers on battery enclosures warning people not to light fires near the system. Residents have been too nervous to light a fire in their combustion stove, which is under the same verandah as the Bushlight system some 10m away. This concern has persisted, despite Bushlight assurances that there would be no danger. As a result Bushlight plans to light a fire and cook a meal with residents at the next visit to Bawaka.

It has also been found that residents are being excessively cautious when leaving the community for short trips away. On these occasions they implement the full emergency shutdown procedure. Bushlight advises system users that full emergency

shutdown is only necessary in times of emergency such as cyclones, electrocution, live wire etc. When the community is vacated all that is necessary is to turn the main switch of. This switches off power to the house, but leaves the batteries connected to the PV panels. Bushlight staff further worked with Bawaka residents to follow the appropriate shut down procedure.

Bushlight Level 2 training at Bawaka

In May 2005 Bushlight delivered its Level II Training at Bawaka. Participants included Bawaka residents and Laynhapuy employees. Key areas of training delivered include: basic electrical concepts; RE system components and what they do; basic maintenance tasks; common problems and how to fix them; managing energy use; working safely with RE equipment.

Laynhapuy staff told Bushlight that the Bushlight L2 training had been 'really good', and that the organisation would like further training. He said that a number of Laynhapuy staff, including the electrician, would like more training in RE system maintenance. This would ensure continued support of the RE on the Laynhapuy homelands. Bushlight will accommodate this request in 2006.

Maintenance Issues

One occasion when emergency shutdown was appropriate was when Cyclone Ingrid passed over north east Arnhemland in February 2005. Residents performed an effective emergency shutdown on both systems before evacuating the homeland. While Bawaka was not hit by the cyclone, it did experience severe storms and high tides. On return the residents started up the systems successfully.

On 7 September 2005 the fault light in the system on House 1 came on, but power was not lost. When this happened residents called Laynhapuy Homelands for assistance. In the mean time they had looked in the user manual and followed the procedure for fault finding and shut the system down, following the instructions in the user manual. According to Laynhapuy staff, residents had a really good understanding of how to use the system and what to do if something went wrong.

Laynhapuy then phoned Bushlight and together Bushlight and Laynhapuy (with input from Bawaka residents) conducted some trouble shooting over the phone. The Bawaka systems were due for their 12 month service around the same time as this occurred and Bushlight was planning to visit. When the 12 month service was conducted two weeks later the system was switched on by Bushlight staff and found to be operating without any faults. It's not clear whether the fault light came on because of overheating or because a circuit breaker was left off.

At the time that this problem occurred residents were getting ready to leave for a week to go to a funeral – this mean that residents didn't have to resort to using the generator and could just leave the system switched off.

> *"They did really well actually. They followed the manual, switched everything off and went through the checks in the book."*
>
> *Laynhapuy Housing Officer Johnny Rika*

Laynhapuy Homelands monitors use of the systems at Bawaka. When ever they visit the community they make a check of the systems. According to Housing Officer Johnny Rika, it is obvious that residents take good care of the system and consult the user manual when necessary.

Community Outcomes

The community has achieved its goal of 24-hour power for fridges, freezers and the nebuliser. With these appliances on "essential" circuits, they should never lose power.

The community told Bushlight that they are making big savings on previous diesel costs, with the diesel generator now only used occasionally for power tools or a battery charger. With the cost of diesel in Yirrkala approaching $2 a litre, this saving on fuel costs has had a positive impact on the family's finances.

Residents are also grateful to be avoiding the logistical challenges of transporting diesel. Bawaka is about 40km from Yirrkala, but with half the drive across sand hills, the trip takes about an hour and a half, and vehicles often get bogged. With the additional weight of drums or jerry cans of fuel, getting bogged is more likely. This has also freed up time taken in the transporting of fuel which be can used for advancing livelihood strategies.

Underground power reticulation has ensured that the community is a safe place for the residents to live and removed the worry of unsafe power cords connecting the generator. As power reticulation has been placed underground, there is no longer the unsafe situation with power cords running along the ground.

For several years, Bawaka residents have been planning to start a small tourism operation running cultural tours. This is finally starting to come to fruition. Day trips were due to start in late 2005, with the possibility of overnight stays in the future. Funding has been sourced to renovate an older house at Bawaka, and promotional material and business plans have been developed. As mentioned above reliable power will help the community advance this initiative.

Laynhapuy Housing Officer Johnny Rika told Bushlight, as far he was aware residents had not needed to use the generator for backup power. Johnny said that people were saving money even on small things like torches and batteries and that before the BL installation there were battery disposal problems for the community. The RE system has helped towards alleviating this problem.

Johnny said Bawaka residents had readily taken on responsibility for the system, were knowledgeable in its use, and did not hesitate to check the user manual for information. The area around the system is kept clean.

He told Bushlight that community members are “rapt” with the power system, and that improvements such as access to cold water on hot days due to 24 hr refrigeration and fans for sleeping, which also deter mosquitoes, have greatly improved people’s standard of living.

Fishing is an important part of the Bawaka lifestyle.

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