



Galawdjapin

The Setting

Galawdjapin is the home of Robert Gural and his wife Margaret Myall. Robert is the traditional owner of Galawdjapin. They have a steady stream of visitors ranging from 2 up to 20 especially children in the school holidays. Robert's son Keith visits on the weekends

Galawdjapin is approximately 20km from Ramingining in Arnhemland in the Northern Territory. And 7 hours drive from Darwin. Access to the community is on a good dirt road, with access from Ramingining during the wet. The road from Darwin is cut at Cahill's Crossing during the wet season.

The community has a small plantation of mango, banana, tamarind and lime trees and supplement their food supplies with hunting and fishing.

This case study looks at the Bushlight Household Renewable Energy System that was installed at Galawdjapin in December 2004.

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 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.

12 months after installation Bushlight undertakes a Community Energy Plan (CEP) Review with the community to obtain feedback on Bushlight services and assess community outcomes.

Energy Service Goals

Galawdjapin have a number of energy service goals. These include:

- 24 hour reliable power usage for refrigeration, fans, lights and other appliances
- Reduced dependence on outside supply of diesel
- Reliable power would encourage more family members to live on the homelands

Pre-Bushlight Energy Services

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

- Legacy RE system for lights and fans
- Firewood for cooking and heating water
- Thermal solar hot water service
- Diesel for power generation, transport and some cooking
- RE bore

Prior to engagement with Bushlight, Galawdjapin community had a small solar system for lights and fans. This had been installed for five years. There is no data available as to the output of this system. However, due to the relatively small capacity of the solar system most energy needs were met using a 5kVa single phase generator, which was run up to 8 hours a day and provided power for occasional refrigeration, kitchen electrical appliances, power tools and backup when the RE system's batteries were flat. The generator was connected to the buildings by a power board and extension leads.



Galawdjapin's Generator

The community obtained diesel from Ramingining in drums and jerry cans. If transportation was available the community could pick up fuel themselves, otherwise they relied on Ramingining Homelands Resource Centre Aboriginal Corporation (RHRCAC) to supply the diesel. Local cost of diesel at the time of the CEPM was \$2.00 per litre. The community was spending approximately \$6,200/ year on diesel for power generation, including transport costs.



*Bushlight staff and Robert Gural outside his home
Legacy RE System PV arrays on roof*

Robert is a mechanic and has good knowledge of operating and maintaining the generator with the assistance of Ramingining

Firewood is plentiful and the community is surrounded by flat wooded country. Transporting wood is problematic when reliable transport is not available to the community. Gas is not available at Ramingining and the community is hesitant to use it as a fuel source.

Energy Services Planning

During the Energy Services Planning 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, household members and daily activities. Bushlight looks at all the energy sources available to the community in order to assist people with making decisions about what would be the best energy options for their homeland.

Bushlight developed Galawdjapin's CEP in consultation with the community and RHRCAC.

Robert and Margaret agreed on the following:

- Firewood would be continued to be used for cooking and heating water
- The diesel generator would provide back-up power during the wet season and run other heavy load appliances
- Thermal solar HWS
- The Bushlight RE system would provide

power at the house for refrigeration, lights, fans and entertainment appliances (TV/video/stereo)

- RE Bore

Galawdjapin residents understood that using RE would have limitations. They were particularly aware of this in regard to their use of the legacy RE system. They were happy to continue using generator power for heavier electrical loads and also in extended cloudy or wet weather. They agreed to use power from the RE system to run the washing machine only when the batteries were fully charged or trade off power needed to run the washing machines with another power load.

It was also agreed that only the main house would be connected to the RE system as the second shelter was not habitable.



Robert and Bushlight staff member during the CEPM

System Specifications

A Bushlight Household RE System has been located at the south east corner of the house next to the steps entry and is designed to provide an average daily AC load of 7.7 kWh/day. The photovoltaic arrays are free standing.



Bushlight systems power non-critical appliances via “discretionary” circuits and critical appliances via “essential” circuits. To attempt to ensure continuous power to critical appliances (like fridges and freezers), power to discretionary circuits is cut when the battery charge drops below a predefined level.

Costing Information

The total installed cost of the two RE systems was \$132,589. This figure includes costs associated with two service visits in the first year and additional works, i.e. reticulation connecting the generator, additional house wiring and lighting, energy management fittings, construction of the concrete slab, side wall and extension of the veranda to the existing house. The Remote Renewable Power Generation Program (RRPGP) provided a rebate of approximately \$53,787 on the total cost.

The total diesel offset by the provision of 24 hour RE power to the community is equivalent to 5,500 litres per annum. This equates to an annual cost saving of approximately \$11,000, and greenhouse gas abatement of 16 tonnes.

A new generator shed was purchased and installed by RHRCAC Homelands.

Major System Component Specifications

PV Array	3.2kWp (40x 80W)
Battery Bank	2,400Ah @ 48VDC
Inverter	2.2kW @ 40°C
Charge Controller	120A @ 24VDC

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. At Galawdjapin arrangements for user contributions have not been finalised. The community are happy to contribute under an arrangement of dual signatories (Community/RA) on the contribution account. They have indicated they will contribute \$20 x 5 persons per fortnight.



User training delivered at Galawdjapin

Post Installation Community Training

Community Training was delivered to Galawdjapin 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.

The community have demonstrated improved confidence in attending to tasks assigned to the community for care of their RE system and troubleshooting. The CEP Review recorded that the system is well looked after, there is no gear stored near or on the enclosure and the panels are kept clean. Robert looks at the voltmeter on the RUI everyday to see how much power is available especially when visitors are over. Their prior experience with RE has also contributed to their capacity of working with the system.

During the CEP Review Robert said that more training was needed for Margaret's family. Margaret agreed and said it should cover appliance use and be for her 3 sons, their wives and kids. Bushlight was able to deliver this training at the 12 month post install visit. However, only one member of the family was available. Bushlight will explore further options for future training on the community.

Robert and Margaret also requested more copies of the CEP newsletters so that they can show people, currently the NL1 is displayed on their living room wall. Robert has told members of the Bushlight Regional team that he is going to put all of the laminated newsletters up on the walls inside the house, particularly those that show what's good to use on solar, and what should be used on the generator. This type of proactive action by the community validates proper system use and makes available RE resources to family and visitors, without having to be told. It is not always culturally appropriate for family members to direct or tell other people what to do. However taking this action allows training to be carried out by the community to other people in a practical and acceptable fashion.

In mid May 2005 Bushlight delivered its Level II Training at RHRAC to six staff. 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. This is part of Bushlight strategy to improve regional capacity. (see Service and Maintenance comments)

Service and Maintenance

At the time of the CEP Review there had been only one user related problem that caused power outage, this was caused by the use of a kettle which turned off the related circuit breaker. Residents were able to work through the problem themselves and reinstate power.

Robert's step son James helps him look after the system. James cleans the panels using a hose to wash them down. Robert is aware of the insect problems that affect the Bushlight enclosure and asked for Naphthalene and was given one box and shown where to apply. During the 12 month visit James helped Bushlight staff to clean the batteries and apply 'antsand' to the enclosure.

The community has demonstrated commitment to the maintenance of their system and solar array and show a good understanding of system use and operation.

All other problems have required Bushlight staff and or qualified personnel to rectify so residents could do nothing more than turn the system off and call Ramingining for help. Residents said that RHRCAC always comes out quickly, within 24hrs after a phone call

In May 05 the system was down due to both regulators and the PLA not functioning. There was evidence of insect intrusion into cabinet, but no holes in seals around doors. The components were replaced at the time of inspection. The community was without power for 1 month during this time, however the resident were not on the community at this time.

In August 05 there was no power available to the house. This was caused by a Bus Bar and was the result of a commissioning defect. This was rectified by Bushlight staff, the system was recharged and found to be functioning well. However, the fault light was ON constantly. This was classed as a minor fault. The system was operating and in September 05 the fault relay was replaced to rectify the fault light defect.

RHRCAC staff have helped Bushlight diagnose faults at Galawdjapin by relaying relevant system information and checks the system when they visit Galawdjapin. They also fill in the Log book regularly.

RHRCAC staff expressed dissatisfaction by saying that the system faults have taken a while to sort out, "it took 10mths basically". When asked if there was anything Bushlight could do to reduce this timeframe Tony said "Bushlight should have their own bloke to fix the problems". Although Bushlight had responded quickly in getting to the community

RHRCAC staff commented that in order to provide adequate maintenance for Galawdjapin and other RHRCAC RE power systems the organisation will need assistance with management and will require qualified tradesman to carry out the work. To date RHRCAC have found it difficult and near impossible to get qualified personnel to come out for this work. The existing RE systems have been and continue to be poorly maintained for this reason. (Refer page 4 Community Service Agreement and new funding

arrangements for Maintenance of Bushlight systems)

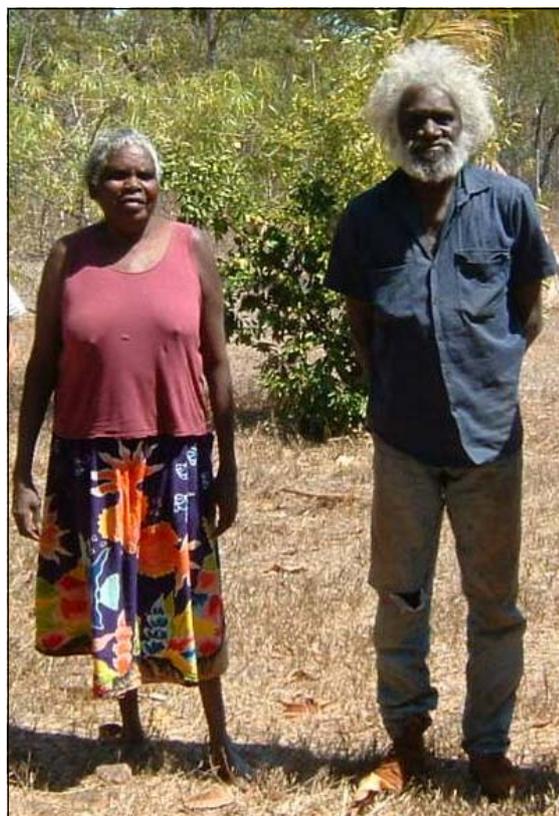
Community Outcomes

Robert was happy to say it is a 6 star unit and "it works well"

CEP Review
September '05

The community are very happy with their system and have had many enquiries from other families regarding their system and its operation and the availability of Bushlight services to other communities. The permanent resident's power needs are modest and the system meets their power requirements. However, the system has been unable to cope with the influx of visitors. This may reflect training requirements for these family members. (see Training)

Reliable power has ensured that the community is able to freeze fish and other food items ensuring a regular food supply. It has also contributed to visiting youth and children to have access to entertainment appliances such as TV, DVD and play station.



Robert and Margaret

There have been considerable savings for the community with reduced generator and diesel use. The community has shown that they understand the

need to use the generator for 'greedy' appliances and on days of low photovoltaic input. The Bushlight system generator meter shows that over 6 months (July 05 – Nov 05) the generator has been run for 180 hours which would have used approximately 190L of diesel. Prior to the new RE system, the community was using 1,575L every 6 months.

One of the community's goals is to have more people living on the outstation. Due to ceremonial business Galawdjapin was unoccupied from February till June 2005. The Bushlight CEP Review was carried out in September '05 and it is not possible to assess whether reliable power will be a contributing factor in achieving this goal due to the short time the community has actually spent living with their new RE system. However, Robert did comment that sometimes more people were coming out since the RE system was installed. The biggest factor influencing number of residents is more due to the lack of reliable and regular transport and communications on the outstation. The community has had continuing transport difficulties. However, RHCAC staff told Bushlight weekends and school holidays have continued to see an influx of visitors and there was a 'big mob' of people over the dry season.

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