

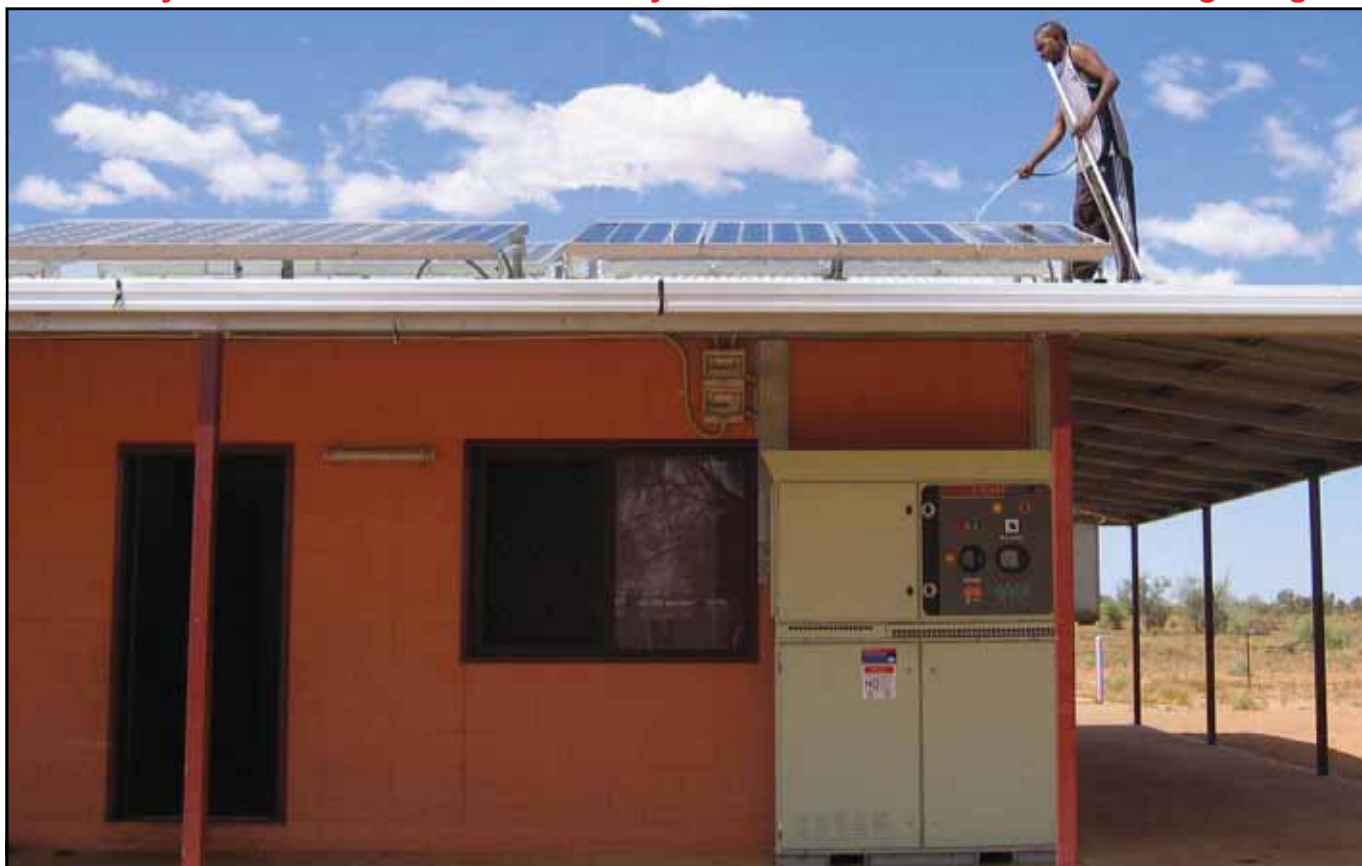
Light and Life in the Bush

BUSH LIGHT

Case Study 2

July 2005

www.bushlight.org.au



Grant Wallace cleans the solar panels at House 5 at Corkwood Bore

Corkwood Bore

Introduction

Corkwood Bore is the relocation site for the Arrernte families of Harry's Creek East Outstation. The community was relocated in early 2004 due to the building of the "Alice to Darwin" railway line. Situated some 50kms north east of Alice Springs, this community comprises seven houses and has a permanent population of approximately 30 family members with a large extended family from both Arrernte and Warlpiri language groups.

This case study looks at the seven Bushlight Household Renewable Energy (RE) Systems that were installed between November 2003 and April 2004. Household systems were installed due to the distance between houses making a centrally located community system unviable.

Bushlight's Approach

Bushlight has established a process for use with homeland communities to plan and manage their energy services.

This process is called the Community Energy Planning Model (CEPM). Bushlight regional staff sit down with community residents and take them through this process.

The process helps residents to choose and manage energy services that are best for them and that will help them achieve their aspirations.

This is in part achieved by providing residents with technical and other information so they can choose sustainable – that is, affordable, consistent 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 services options.

Corkwood Bore was the first field application of the CEPM. The initial stages of the CEPM were carried out under difficult circumstances due to residents not yet having relocated to their new houses, and therefore having limited knowledge of their future circumstances.

**Improving Livelihood Choices for Indigenous People
through Improved Access to Sustainable and Renewable Energy Services**

Energy Service Goals

Due to not having moved into their new homes the community members had not yet thought about future aspirations related to energy. However, the majority of community members did express that one of their goal was to have access to reliable 24 hour energy services.

However, since moving to the new houses many ideas and aspirations have been established. These are further discussed under *Community Outcomes*.

Existing Energy Services

Due to the community not living in their new houses discussions included what was available at the previous site, as well as what would be available at the new site.

Prior to moving to Corkwood Bore the following fuels were available to the families:

1. Firewood
2. Diesel
3. Solar

Firewood was used for winter space heating, cooking on outside fireplaces, production of craft (seed bead production and wood burning on artefacts) and some members had access to rocket woodchip water heaters. Firewood was plentiful, however families had to travel some distance to gather good quality firewood.

The main source of electrical energy was a diesel generator. Bushlight was advised by the community that the generator broke down often. The generator was the asset of the community's resource agency, Ingerkerke Outstations Resource Services who, possibly due to being under-resourced, were unable to respond quickly to these situations.

Additional barriers to regular and reliable electrical energy for the community were the financial burden of diesel costs and irregular availability of motor vehicles to transport diesel from Alice Springs to the community.

*"At Harry's Creek the community only had candles, fire, wood water heater and a solar panel for lights which didn't really work. It was a bit hard back there. **It was hard!** The generator pumped water, when that ran out we had to collect water in jerry cans. We had to drive to the generator. We bought more tin food at Harry's Creek. We had no fridges."*

*Laurel Palmer, Resident Corkwood Bore
CEP Review April 2005*

Solar electrical energy was generated by four small DC RE systems, these were designed to provide limited lighting to the shelters. During a field trip only one of these was found to be operational. It is likely that these systems could not be sustained through lack of community training and limited support.

In addition to taking into account the issues the families had to deal with at their original location, Bushlight also needed to include an assessment of the likely issues the families would face at the new location. The designs and plans for the new houses at Corkwood Bore allowed for a different mix of fuel types to used which included:

1. Firewood
2. Gas
3. Diesel
4. Solar

Firewood was intended to be used for space heating and outdoor cooking. However several households had no means of transporting wood and wood available within carrying distance of houses was cleared during the first winter. The houses had also no method for inside space heating which led to energy use problems during cold winter months, as discussed further under *Maintenance Issues*.

While all houses have fittings to connect gas bottles to stoves, many of the residents had not used gas before and felt uneasy about the safety of using gas especially with children about. Residents also had the problem of limited access to reliable transport to transport gas bottles and funds to purchase fuel for both transporting and filling gas bottles.

"Another problem has arisen that has impacted on the use of the RE system – all houses have gas connections and a gas stove. However, most of the community has been hesitant to use gas because of safety issues. The cost of gas bottles has been prohibitive as well as the issue of appropriate transport. One household has purchased a small camping gas bottle to connect to their stoves, which are easily transportable and less costly to purchase and fill. Some of the older residents have chosen to trade off some of their energy budget to run an electrical frypan and others are using outdoor fires to cook on."

*Ben Purcell, Bushlight CA Team
Technical Officer
CEP Review April 2005*

Solar energy has been used for three purposes. Firstly solar hot heat water systems were installed in each house. Secondly a solar bore pump has been installed to pump water to header tanks, which then provide enough head to supply all seven houses. The third use of solar energy has been for the supply of domestic electrical energy needs, which has been met by Bushlight through the installation of household RE systems.

Energy Services Planning

Due to Bushlight being contracted to provide household RE systems for houses that had not previously been lived in, this site was not typical of Bushlight's work.

During this stage of the CEPM Bushlight provides information and education related to energy service options and issues. Bushlight also listens to the community to find out about base information regarding the community's current and future energy needs and issues, social structures, mobility, household members and daily activities. The families at Corkwood Bore, not having lived in their new houses, were not in a position to be able to provide such information.

One of the major factors that affects the system size is the number of permanent residents in each house. While each house had been initially designated to particular community families and/or members, the people living in them changed considerably for a number of months until the current occupants of each house had settled in.

This has resulted in Bushlight providing a significant amount of post installation support to each household to build up their knowledge of particular issues related to managing available power and maintaining their household RE systems. Some of these issues have been detailed under *Maintenance Issues*.

The end result of the Energy Service Planning process is a Community Energy Plan, a document that details the most appropriate mix/use of available types of energy. This document includes details the proposed household RE system.

System Specifications

Due to the seven houses being spread over a 5km distance it was not viable to provide a centralised RE system. Therefore seven household RE systems were proposed, one for each house. All houses were constructed the same, allowing the solar arrays to be

roof mounted and equipment and battery enclosures to be placed on the southern verandas.

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.



Bob Palmer and his family with the first Bushlight Household RE System

Costing Information

The table provided on the next page shows individual system costs and the rebates provided through the Remote Renewable Power Generation Program.

Based on the average system capacity the total diesel offset by the provision of 24 hour power to all seven houses is equivalent to 67,500 litres per annum. This equates to an annual cost saving of approximately \$90,000, and greenhouse gas abatement of 196 tonnes.

Major System Component Specifications

RE system	PV array (kWp)	Battery bank (Ah @ 24V)	Inverter (kW @ 40°C)	Charge controller (A @ 24 V DC)
House 1 (Neville)	1.65 (22 x 75W panels)	1200 (12 x 2V)	1.5	100
House 2 (Bob & Jennifer)	2.25 (30 x 75W panels)	1440 (24 x 2V)	2.2	120
House 3 (Leonie)	2.25 (30 x 75W panels)	1200 (12 x 2V)	1.5	100
House 4 (Peter)	1.80 (24 x 75W panels)	1200 (12 x 2V)	1.5	100
House 5 (Laurel)	2.10 (28 x 75W panels)	1200 (12 x 2V)	1.5	120
House 6 (Georgina)	2.25 (30 x 75W panels)	1200 (12 x 2V)	1.5	120
House 7 (Cisco)	1.35 (18 x 75W panels)	960 (12 x 2V)	1.5	60

System Costs and Rebates

Installation Site	Total Cost of System	RRPGP Sourced
Corkwood Bore House 1	\$66,713	\$32,784
Corkwood Bore House 2	\$90,698	\$38,401
Corkwood Bore House 3	\$67,328	\$36,062
Corkwood Bore House 4	\$68,006	\$33,255
Corkwood Bore House 5	\$70,853	\$36,077
Corkwood Bore House 6	\$72,151	\$36,195
Corkwood Bore House 7	\$69,789	\$36,644

prioritising of the many needs of the outstations they service, a change of senior staff and period of time without senior staff.

However, community members at Corkwood Bore have upheld their roles by maintaining the systems and using them appropriately alongside other types of energy available to them.

"On all my visits to the community I have observed very clean and tidy systems and the area around them, which would show that the residents were upholding the Community Service Agreements, reflecting good relationships and understanding and a willingness by residents to maintain their RE energy systems."

*Tony Renehan, Bushlight Project Officer
CEP Review April 2005*

Central Australian Regional Manager, Tig Armstrong advised that Ingkerreke Outstations Resource Services has the Draft Community Service Agreement for Corkwood Bore at hand. He has recently recommenced discussions regarding the CSA and User Contributions with the new Coordinator.

Community Service Agreement

The Community Service Agreement contains three separate, but related parts:

Community Service Agreement (CSA)

An agreement signed by the residents of the community, Ingkerreke Outstations Resource Services, Bushlight and the Department of Family and Community Services. In signing the CSA, the parties approve the Community Energy Plan that has been developed for the community, and their role in the implementation of the plan.

User Contributions Agreement

An agreement signed by the residents of the community, Ingkerreke Outstations Resource Services and Bushlight, and covering the implementation and administration of financial contributions by the community towards the maintenance of their household RE systems.

The Community Energy Plan

A document recording the main steps of the CEPM process, including decisions made and a pictorial version of responsibilities agreed to in the CSA.

In the broadest terms, the purpose of these three documents is to describe how the new energy services can be sustained at the community in the most cost effective manner.

At this stage the CSA has not been signed by Ingkerreke Outstations Resource Services due to a range of factors. This has included the dissolution of their CDEP organisation (i.e. Arrernte Council),

Post Installation Community Training



Ben Purcell of Bushlight shares RE knowledge with Bob and Jennifer Palmer of Corkwood Bore

Community Training was delivered to Corkwood Bore residents with the aid of a pictorial based User Manual and their solar 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.



Ben Purcell of Bushlight provides training in the use of Bushlight RE Household System to Bob Palmer at Corkwood Bore

At Corkwood Bore training was delivered over several months, to accommodate residents as they moved into their new homes. Initially ten adult members of the community received Bushlight training. Additional training was provided in response to needs arising from new residents occupying houses and matters relating to problems arising from day to day use of the system, including how to manage energy use and the community's changing energy needs.

"The children and young people of Corkwood Bore need to understand these systems and solar power as well so they understand how to use the power. They are growing up fast and need this education as well, so the power services are successful into the future."

*Leonie Palmer, Resident Corkwood Bore
Site Visit June 2005*

Training has been successful with Corkwood Bore residents who have received it and is reflected both in the community's use of the systems and observations made during the CEP Review.

"Solar power is different to town power – you have to think about what you have to turn off."

*Grant Wallace, Resident Corkwood Bore
CEP Review April 2005*

"Bob and Jennifer have a very good understanding of how the system works. Bob was very helpful in supporting training of other residents at Georgina's House, showing that he was well versed and regularly engaging with, the operation of his system and its function."

*Tony Renehan, Project Officer Bushlight
CEP Review April 2005*

There are still some members of Corkwood Bore who were not available for training. They were not available at previous training sessions or have since moved to the community. The community has advised Bushlight staff that they would like further training of these community members and the children of the community.

"Laurel is the manager of the System, though her husband does 'push the buttons'. Laurel told us she understands how the system works. This is backed up by data information and the continuing success of her household's power supply."

*Susan Graham, Shared Services Bushlight
CEP Review April 2005*



"Shirley and Bernadette had left all the lights on when we visited. We explained why this wasn't a good idea. When I asked if they wanted to learn more about the solar system they gave a resounding YES! Their enthusiasm was contagious."

*Susan Graham, Shared Services Bushlight
Site Visit June 2005*

Maintenance Issues

In view of the changing people at Corkwood Bore and the difficult circumstances under which the CEPM was carried out, more issues than normally expected arose in the first six months after the systems were installed.

When Corkwood Bore residents encountered problems they were not directly able to assess and/or resolve they displayed confidence in seeking support from Bushlight. The relatively short distance between the community and Alice Springs enabled Bushlight to accommodate and respond to the increased need for support.

The following is an extract from the Bushlight Database, and clearly shows the responsiveness of Bushlight staff.

18/5/04 - Phone call from Laurel to Bushlight

Laurel reported faults for the BL systems operating at both her house (H5) and Leonie's house (H3). Laurel reported she was sometimes losing power when they were watching TV at night. She also reported that Leonie was losing discretionary loads on a frequent basis.

19/5/04 - Site visit to complete community training & assess faults reported 18/05/04

Shading at Laurel's house was reassessed and eliminated as a source of any fault. Laurel and Leonie's household left for town before BL staff could complete training with Laurel or discuss the faults with them. We were unable to find any fault with the system at Laurel's house. Troubleshooting revealed that one sub array was not providing any charge at Leonie's house.

21/5/04 - Follow up site visit to complete L1 training and allow further assessment of reported faults

Training was completed and faults assessed. It appeared that that regulator 2 at Leonie's house is malfunctioned and will require replacement. A replacement regulator is being organised ahead of delivery of the spare parts kits.

Training was completed with Laurel and Davy. Georgina's household is still unoccupied - training could therefore not be completed. Discussions with Laurel revealed that the faults she was reporting was the need to press the circuit timer button for the power circuit after it had lapsed. We communicated that this was normal operation and that the circuit timers were adjustable if a longer time period was required. Data was downloaded from both PLA and SE22 at Laurel and Leonie's houses.

To assist in monitoring system performance and maintenance issues household RE systems have been designed to allow detailed data downloads. Data downloads taken from the start of 2005 show:

1. House 1 was not reaching float during the first 3 months of the year. This was attributed to the increase of household occupancy. The occupant was to be a single male, however a family has moved into the house. Their power needs are greater than the house's system was designed for and this has resulted in an increased load and a regular loss of power. This has been highlighted to relevant parties and discussions are currently underway as to the most appropriate solution.
2. House 2 has had no data downloaded to date, although the house has been unoccupied on and off over the year.
3. House 5 had lost discretionary circuits over an extended cloudy period.

4. Systems at Houses 3, 4, 5, 6, and 7 have achieved float regularly for the period logged, indicating that the systems are not being over used and that the batteries are being well maintained.
5. All households on some days were drawing more power than the system design daily load. This is due to the systems being designed to deliver the design load in 20 years, hence their capacity in the earlier years is notably larger than the design load.

A detailed analysis of this data is scheduled and will allow Bushlight to assess its' design assumptions and processes to further improve and modify them. While there have been a variety of minor issues which Bushlight has tended to, the occupants of House 3 have had some specific issues.

In May 2004 House 3 reported to Bushlight they were regularly losing discretionary power at night. Although the CEPM process had captured a best estimate for daily energy requirements, the actual requirements were found to be significantly higher. Several factors were affecting the daily load. These included:

1. The number of people who were occupying the house was higher than initially indicated.
2. The use of lights was significantly increased due to: The bedroom blinds not being easily opened; lighting being required at night due to health problems; children required a bedroom light at night until they got used to their new home; veranda lights were being used all night for security and there were no timers installed on the toilet or bathroom lights.
3. Due to there being no space heating provided for in the house design the occupants had tried to use an electric heater, although this kept tripping out the low amp rated circuit breakers.
4. The only washing machine on the community was situated in this house, the number of washes per week was therefore much higher than previously anticipated.

"Bushlight responded quickly to the problems and issues arising from technical aspects and gave extra training for the use of the systems at our House. The Bushlight's staff have been friendly and helpful."

*Leonie Palmer, Resident Corkwood Bore
CEP Review April 2005*

Bushlight addressed these issues with further training, the installation of timers and regular visits to support the family during this period of settling in. Bushlight reviewed the household's energy budget and responded by increasing the number of PV arrays to increase the amount of power available through the system. While this solution was being implemented a petrol genset was provided to offset the additional energy requirements. These problems were addressed over a period of 3 months and Bushlight has not been

called out since and the system has been well maintained and used, without loss of power.

Community Outcomes



Leonie Palmer and grandchildren Devon, Jaydon and Richard

"We couldn't live permanently at Harry's Creek East. We didn't have proper houses or power. Now we have proper houses and power we can look to the future. For our children, grand children, great grand children....."

*Leonie Palmer, Resident Corkwood Bore
Site Visit June 2005*

Corkwood Bore Community has demonstrated that their energy service goal of reliable 24 hour energy service is one of primary services that contribute to the process of creating a viable homeland community and contribute towards livelihoods and the community's future. Primarily, 24 hour power allows the Corkwood Bore community to be permanently occupied, with less need to leave the community as often as had been experienced at Harry's Creek East.

"Now we notice the differences – we now we have more money from not buying diesel. This means we can buy more food. Now we can eat more fresh meat and vegetables. We can keep them in the fridge. We shop fortnightly now and so don't go to town so often. We had no washing machine before. Now we have one and I only run that at lunch time, as I was advised by Bushlight to help the system run well."

*Laurel Palmer, Resident Corkwood Bore
CEP Review April 2005*

Families no longer leave their homelands for the purpose of accessing energy services that were unavailable on the community before Bushlight. For example: washing clothes, storing perishable and fresh foods, entertainment, cooling in the hot weather and a comfortable place for visiting families to stay.

Leonie Palmer is an elder and senior female member of Corkwood Bore. She has been working many years with other Arrernte homelands families through an incorporated body Ngkarte Mikwekenhe Community Inc. Leonie outlined to Bushlight staff the plans for the community and Arrernte families.

"Our families need healing. We are developing our well-being and healing centre at Ngarte Mikwekenhe in town and at Corkwood Bore. We will bring families out here as part of the healing process. We have applied for funding for a school and clinic. These will service all the outstations and Arrernte families around the area. We are working together with all the families. My son and I met with a state government minister. We know what we need and what we want to do. We just need support.

*We have received funding for the school. We only have to chose a place at Corkwood Bore for it. There are people at the outstations who are trained teachers and teachers aides. This will give them work close to their homelands. Our young men are setting up a riding course for young boys from Santa Teresa, town and outstations. This will all be part of the process. We also want to provide training to young mothers and young families. If our people stay in town they might be lost. Now we have proper houses and power we will be able to work further with this. At Harry's Creek East we could not get very far as no one was able to live there permanently with no power and no proper houses. **It would have been too hard!**"*

*Leonie Palmer, Resident Corkwood Bore
Site Visit June 2005*

Power has allowed Leonie to further develop her vision into plans and reality. She believes that reliable power is one the of the building blocks for viable homelands and allows homelands to be permanently occupied.



The beginnings of the horse course at Corkwood Bore - post and rail for storing saddles, water and transport

Leonie Palmer also undertakes carer respite for children and children with disabilities. Having reliable power means she can now undertake this role at Corkwood Bore. Leonie told us that the benefits of caring for these children on homelands are: removal of safety and traffic risks, more space for play, not worrying about unsafe and inappropriate rented town housing, greater security, on traditional country for story telling, peace and quiet, fresh air and family support from other Corkwood Bore community members.

She is comfortable to leave young families with children at Corkwood as they have reliable power, ensured of a food supply that will keep for 1-2 weeks, will be entertained and relieves them of the problems of town or larger community living.

Peter Palmer's made the followings comments in regard to household RE systems and power.

Peter said he is happy with his system and commented that from his knowledge of other solar RE systems in Central Australia, Bushlight Systems were better.

Peter uses extra power when the sun is shining and the batteries are full to run some basic power tools to make artefacts which he sells.

Peter Palmer, Resident Corkwood Bore CEP Review April 2005



Clapping stick in production at Corkwood Bore

Peter and his wife Julie are both artists. Power has directly helped them generate an income from their homelands. Julie told us:

"We can paint at night with our lights on. I enjoy doing this at that time of day, when the children are asleep and I can relax with my art."

Julie Leitchleitner, Resident Corkwood Bore Site Visit June 2005



Julie Leitchleitner with a painting in progress

Gregory and Cisco Palmer are elders and senior men of Corkwood Bore. Being semi retired they are able to devote time to being mentors and supporters of a group young men that stay at their houses. They also enjoy the company of their grandchildren, for whom they can provide entertainment due to having power.



The future of Corkwood Bore watch a DVD at their grandfather's house.

Other comments from younger residents reflect the community's feelings and the outcomes of training.

- "Solar power is '*mwarre anthurre*' - very good"
- "Generators are noisy, solar is quiet"
- "We do not have to buy diesel"
- "We have no electricity bills - more bills in town with town power"
- "Different to town power - you have to think about what you have to turn off. Town you don't think about it"
- "When visitors come we explain we have to save energy for the evening"

*Samantha Palmer and Grant Wallace,
Residents Corkwood Bore
CEP Review April 2005*

The Bushlight CEPM and RE services are supporting and enabling family members through successful training and understanding and use of technical solutions. This has aided the community's control of their power supply and ongoing community maintenance responsibilities. RE will become part of the community's contemporary culture. This is reflected both in the community's care of their systems and the humorous context that the single men at House 6 have developed.

They call House 7 (Cisco's House) "the office, because it has power".

*Tony Renehan, Bushlight Project Officer
CEP Review April 2005*

However, further training and support in RE technology would be beneficial. It is difficult to capture the whole population whilst the community is establishing itself. This access to education is part of the community's aspiration.

Not only have reliable energy services had a direct impact on the Corkwood Bore Community, they also have an important role in reducing the vulnerability factors of indigenous homelands communities. The Corkwood Bore experience has shown that reliable energy services helps free the community of the financial and physical burden of diesel power generation; provides the tools for better health outcomes; lessens the burden of care for elders by ensuring their youth have household comforts; assists the community to turnaround its' own confidence in homelands and social viability, and lessens the uncertainty of the future through access to basic services.

At Corkwood Bore, RE has lessened the burden of care for family members with special needs; time-consuming

domestic chores for older community members and removed the tension that may result for individuals who have to carry the financial and technical responsibilities of generator power.

The household RE systems will be an important component of the essential service infrastructure that plays a part in achieving the long term objectives of the families of Corkwood Bore. As a stand alone service it has already energised the community into making aspirations reality, made an immediate financial impact by removing unreliable and costly generator power; played a part in the community's day to day progress in developing livelihoods and has assisted in ensuring a happy and safe indigenous homelands community.



Laurel Palmer and her mother and some of the children who stay at Corkwood Bore