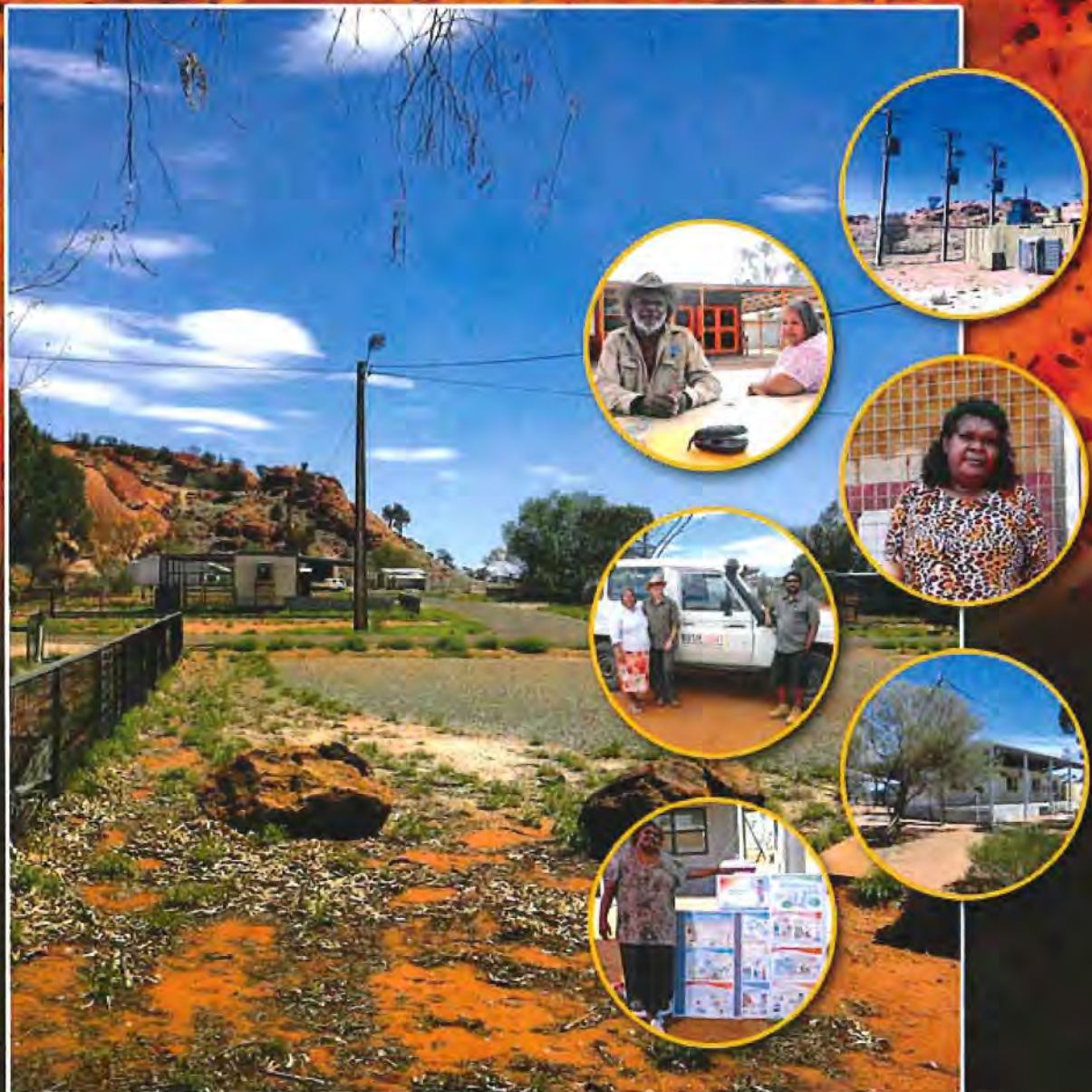





Government of South Australia
Department of the Premier and Cabinet
Aboriginal Affairs and Reconciliation Division

BUSHLIGHT
Centre for Appropriate Technology

Demand Management Community Education Program



Final Report July 2013



Bushlight is part of the Centre for Appropriate Technology (CAT); a 30-year old national Indigenous science and technology organisation. CAT was founded in Alice Springs in 1980 in response to the lack of suitable technologies for small remote communities of Indigenous people in Central Australia. CAT is controlled by an Indigenous Board.

Bushlight was established in 2002, and for the past 10 years has worked with remote Indigenous communities in the fields of demand management, community engagement & training, renewable energy system design, installation, maintenance and energy efficiency. Bushlight has developed and delivered sustainable energy projects to more than 400 individual households in 135 Indigenous communities. All Bushlight programs have respectful design and community engagement at their core.

Bushlight's head office is located in Alice Springs, along with regional offices in Broome, Darwin and Cairns. Bushlight has a staff of eighteen people, which comprises specialists in the fields of energy efficiency, renewable energy system design, engineering, community engagement, anthropology and project management.

For more information on Bushlight, see www.bushlight.org.au

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The use of images in this report

Indigenous readers please be aware that this report may contain names and images of those deceased.

All the subjects in the images and photos used in this report have given their express written permission for use, in this and the community report by Bushlight. If the permission has since changed, please contact Bushlight on (08) 8959 6165.

Acknowledgements

This program would not have been possible without the support of the Anangu people who reside in the Anangu Pitjantjatjara Yankunytjatjara lands, Maralinga Tjarutja Lands and Aboriginal Lands Trust (Yalata) who allowed us to work within their communities and took the time to have conversations about power.

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July 2013
Bushlight, Centre for Appropriate Technology

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Abbreviations and acronyms

ALT – Aboriginal Lands Trust
APY – Anangu Pitjantjatjara Yankunytjatjara
BEEbox- Bushlight Energy Efficiency Box (an in-home display device)
CAAMA – Central Australian Aboriginal Media Association
CAHREC – Central Australian Human Research Ethics Commission
CAT - Centre for Appropriate Technology
CDEP – Community Development Employment Program
CSA – Community Service Announcement
CFL – Compact Fluorescent Lamps
DCCEE - Department of Climate Change and Energy Efficiency
DCSI – Department for Communities and Social Inclusion (of which Housing SA is a business unit)
DLC – Direct Load Control
DMITRE - Department of Manufacturing, Innovation, Trade, Resources and Energy
DPC-AARD – Department of the Premier and Cabinet – Aboriginal Affairs and Reconciliation Division
DPTI - Department of Planning, Transport and Infrastructure
DSM – Demand Side Management
ESCoSA – Essential Services Commission of South Australia
ESL – English as a Second Language
ETSA – Electricity Trust of South Australia Utilities, now SA Power Networks
GBM – Government Business Manager
GSA – Government of South Australia
ICC – Indigenous Coordination Centre
ICTV – Indigenous Community Television Limited
KwH – Kilowatt hour
MTC – Maralinga Tjarutja Council
NAATI – National Accreditation Authority for Translators and Interpreters
NGO – Non-Government Organisation
NILS – No Interest Loan Scheme
NPYWC – Ngaanyatjarra Pitjantjatjara Yankunytjatjara Women’s Council
PSC – Power Support Contractor
PY Ku – Pitjantjatjara Yankunytjatjara Rural Transaction Centre
RAES – Remote Areas Energy Supply Indigenous Communities Scheme
RAS – Regional Anangu Services
RCUW – Remote Community Utility Worker
RJCP – Remote Job and Community Program
RSD – Remote Service Delivery
SA – South Australia
SAPOL – South Australian Police
YCCI – Yalata Community Council Inc.
W – Watts

Executive summary

Supplying electricity to communities in remote South Australia is expensive and logistically challenging. The South Australian government is responsible for providing electricity to Indigenous households living in these communities. Over the past few years household demand for electricity has been increasing and this trend is expected to continue. In order to better understand and manage electricity demand in remote communities, the South Australian government commissioned Bushlight to undertake a research and energy education project in a selection of remote Indigenous communities.

This report presents the findings of the Demand Management (Community Education) Program undertaken by Bushlight in late 2012 and early 2013. It provides an overview of the background issues of remote energy supply and demand, an explanation of the methodology and field work undertaken and presents a range of findings and recommendations.

The Remote Area Energy Supplies (RAES) Scheme for Indigenous communities operates in 14 major remote Indigenous communities and covers over 210,000 square kilometres in west and northwest South Australia. In 2011-2012 more than 3.75 million litres of diesel fuel was used for electricity generation in these communities. This fuel provided about 1,000 homes and community buildings with over 13 million kWh of electricity (DMITRE 2012). There is growing demand for energy in these communities and effective demand management is increasingly important to control costs.

In October 2012, Bushlight, the energy division of the Centre for Appropriate Technology, was contracted by the Government of South Australia, Department of the Premier and Cabinet – Aboriginal Affairs and Reconciliation Division (DPC-AARD), to undertake the Demand Management (Community Education) Program in the RAES region targeting public housing used by Indigenous residents (Anangu). There were two key foci in this project. Firstly, to undertake research (desktop, fieldwork, qualitative and quantitative) in order to develop a more detailed understanding of current energy use in this area and inform recommendations. Secondly, to develop and roll-out an appropriate energy education program designed to raise awareness, encourage safe and smart energy use in Indigenous homes in the RAES communities. The project was undertaken between October 2012 and July 2013.

As expected, this research indicates that electricity use in public housing in the RAES region is relatively high when compared to other homes in regional and remote South Australia. The context is one of complex social and infrastructure determinants in a harsh climate that lead to high energy use in homes.

In Indigenous homes in the RAES region, large numbers of residents and high volumes of visitors are common. Residents are almost exclusively residing in public housing and are located in regions of extreme climatic conditions. Indigenous people in these regions also tend to be low income earners and have limited access to efficient appliances.

Homes in the target communities have a small number of portable appliances that are used frequently, particularly fridges, bar heaters, and TVs. These tend to be in poor condition and inefficient. In the houses surveyed there was a predominance of hardwired (fixed) appliances which were used heavily or improperly including stoves, evaporative air conditioners and solar hot water systems with one shot boosters.

Indigenous residents in public housing are not charged for their electricity use and accordingly there is no price mechanism to mediate household consumption. In addition, there is no feedback or method for informing residents of their household electricity consumption. The absence of both a price mechanism and any consumption feedback mean that there is little incentive, financial or otherwise, for residents to reduce their power use.

The increasing costs of supplying and maintaining electricity in these remote regions poses serious challenges for funding and sustainability of supply. The introduction of 'user pays' for electricity for Indigenous residents has been raised by stakeholders and community residents throughout the planning and implementation of this project. Although no policy decision has been made by the SA government regarding user pays, there is some likelihood that it may occur in the future.

Anangu public housing is one piece of the total energy demand in the region. Implementing appropriate demand management strategies to public housing will achieve some margin of reduction. However, energy use is high in homes (Indigenous and non-Indigenous), community and government buildings across the Anangu lands. The implementation of demand management strategies that target Anangu public housing should occur in conjunction with broad-based demand management to ensure maximum impact across the region.

Recommendations in this report for demand management acknowledge the context and complexities that influence energy consumption in the region and address barriers that Indigenous residents experience in reducing energy use. These factors and some of their associated findings and recommendations are outlined below.

Behaviour, attitude and incentive

Findings

- **Day to day, residents are more home-based.** Day to day life is more home-based than work-based for a majority of Anangu households due to low levels of employment, so individuals' energy use occurs primarily at home. Patterns of occupancy have yet to be established due to the short duration of the study.
- **Differences between generations.** Older generations of Anangu residents typically use less power in comparison to younger generations who generally own and use more appliances. Demand will continue to rise with the high proportion of younger residents in the region.
- **No gain for reduced use.** There is no social or financial benefit for residents in the RAES region to use less power at home. Energy conservation behaviours occur but as a free public good, reducing power use is not a priority in the context of other issues for residents.
- **High energy use domestically within in a context of high energy use regionally.** Energy use in public housing appears relatively high however high energy use occurs across the region in Piranpa (non-Indigenous) residences, community buildings and facilities.

Recommendations

- **Power studies in schools and TAFE.** Power saving and safety programs for students are essential and are required to be established and driven by community schools and TafeSA.
- **Local employment of 'Power Mulpa'.** Implement the strategy of employment and training of local Anangu community workers as energy educators to deliver ongoing educational programs, provide residency support and tailored advice to homes (e.g. in home energy consultations or audits) to reduce power use.

Household economics

Findings

- **Preference for cheaper and inefficient appliances.** Low income and remote location influences residents purchasing decisions for cheaper and perhaps less efficient appliances as stocked by community stores.

Recommendations

- **Address supply chain of efficient appliances.** Implement strategy for increased access to efficient appliances for low income earners from their community.
- **No Interest Loans Schemes:** Implementation of a No Interest Loans Scheme (NILS) for efficient appliances will provide the financial means for low income residents to purchase more efficient appliances, hence reducing demand for energy in homes.

Appliances – fixed/hardwired

Findings

- **High energy use fixed/hardwired appliances.** Public housing in the RAES region are fixed or hardwired with high energy use appliances e.g. electric stoves. Heavy use of appliances has been reported, this may be due to large household numbers, home based residents and few alternative appliances in homes, e.g. no kettle therefore an electric stove is used to heat water.
- **Hot water system.** Solar hot water system and one shot boosters are effectively running as inefficient electric hot water systems from frequent use of booster by residents and high household numbers.

Recommendations

- **Review Minister's Specifications and housing standards.** Review Minister's specifications and housing standards using the framework of the National Indigenous Infrastructure Guide to increase energy efficiency from design, house orientation, materials and appropriate high standards for fixed appliances.
- **Address hot water systems.** Frequent use of booster and high household numbers. Trial alternatives such as heat pumps and instantaneous gas where possible and implement regionally from an evidence base.

Appliances – portable

Findings

- **Few but very inefficient portable appliances.** Many residents have a small number of appliances with a high predominance of inefficient appliances such as electric frypans. Some households are without basic appliances such as fridge.
- **Access to efficient appliances.** Portable appliances in homes are often second, third or fourth hand or very inefficient models purchased from community store. Access to energy efficient appliances is difficult due to remote location and limited availability in community stores.

Recommendations

- **Work with stores.** Work with stores to make more efficient appliances accessible. This is of particular interest to the APY Executive Board.
- **Incentive scheme to remove inefficient appliances.** Implement incentive scheme to remove/swap out high energy use inefficient appliances from RAES region.
- **Community program to recondition (improve the efficiency) of current appliances.** Utilise existing organisation or maintenance programs to increase efficiency of large whitegoods.

Climate

Findings

- **Extreme weather in RAES region.** Anangu communities experience an extreme summer and winter; this contributes to high energy use in the region.
- **Experience of current housing stock.** Majority of houses are experienced by residents to be very cold during winter months and very hot during summer months, this contributes to heavy use of appliances for comfort.

Recommendations

- **Community development initiatives - retrofits.** Implement community initiatives through existing organisations and agencies. Initiatives to increase outside shade (structures or vegetation) orientated for summer sun and wind breaks orientated for winter for residences.

Public housing

Findings

- **Public housing in RAES region.** There is no home ownership in the remote communities of the RAES region. All public housing is inhabited by Anangu residents who are charged rent through Housing SA. As renters, residents have limited options to make energy efficient changes to homes e.g. increase roof insulation, change building materials or fixed appliances in homes.
- **Maintenance to public housing.** Ongoing issues of broken appliances.

Recommendations

- **Appropriate training for retrofits.** Provision of training to community members through existing institutions to undertake appropriate retrofits. This is also an opportunity to increase local skills.
- **Energy and water saving devices.** Region wide installation of small scale appropriate energy and water saving devices such as efficient globes, timer switches, motion sensors and water saving shower heads.
- **Community landscaping program.** Increase shade and protection for houses at an appropriate orientation for summer and winter using plant species suitable to the environment.

Consumption feedback to residents

Findings

- **No direct or indirect feedback.** Residents currently receive no form of 'feedback' on their household energy use therefore residents have no knowledge of actual consumption.
- **Payment will not solve the need for feedback.** Implementation of prepayment metering in other jurisdictions has not addressed the need for timely and accessible energy consumption feedback in homes.
- **High appliance use and high energy use.** Some residents intuitively draw links between high appliance use and high energy use; others draw inaccurate links between high use of lighting and high energy use.

Recommendations

- **Direct and indirect feedback.** Implement culturally and literacy appropriate feedback mechanism for residents. This would occur in an environment where there was an incentive for residents to reduce their power use.
- **In Home Display.** Appropriate in home display such as the Bushlight Energy Efficiency Box (BEEbox) would provide a proven mechanism for Government and provide consumers a tool to understand energy use as a dollar amount.

Technical opportunities

Findings

- **New technology and opportunities for direct load control.** Bushlight assumes that the provider is exploring new technology and opportunities to assist with direct load control.

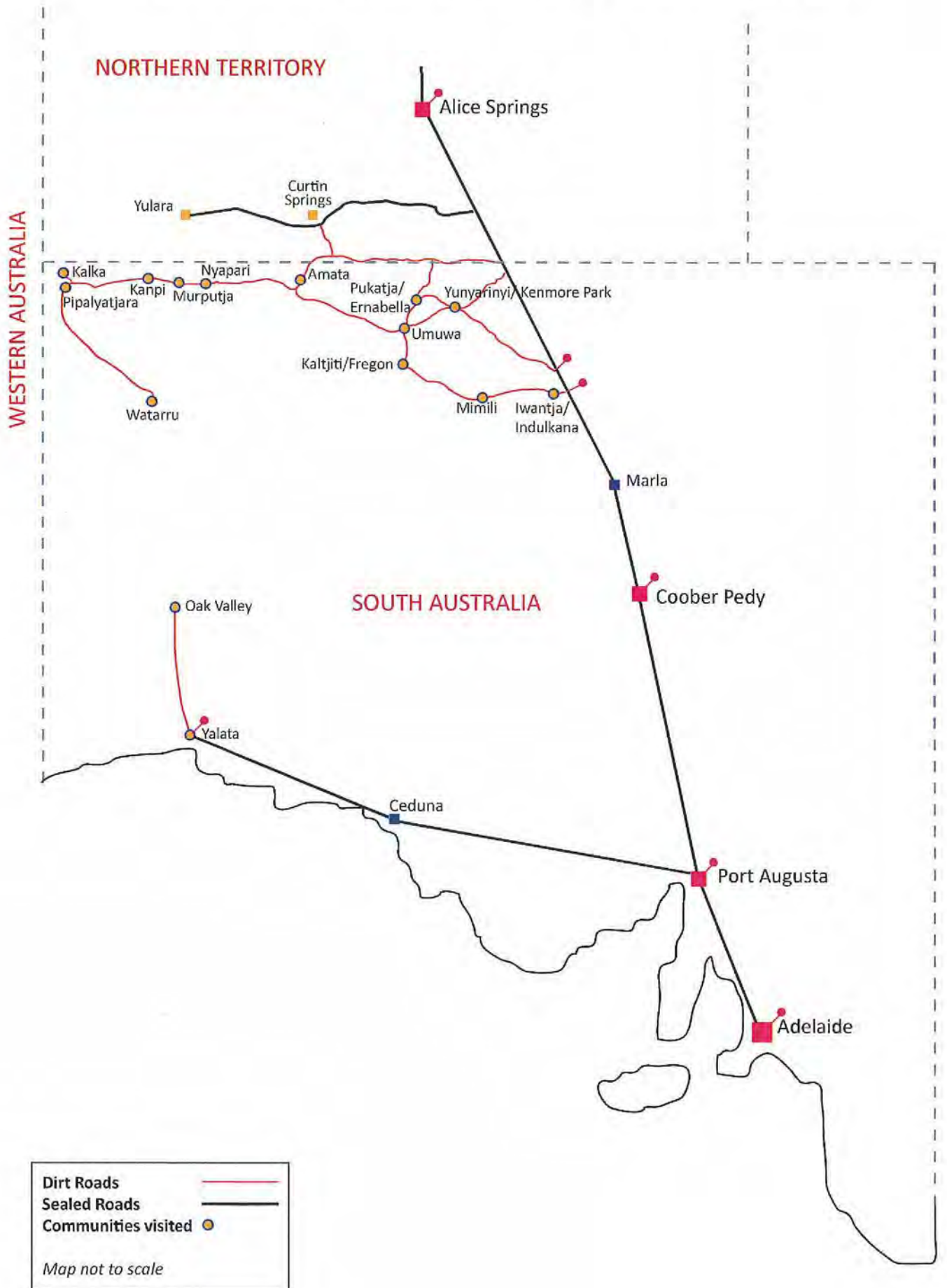
Recommendations

- **Cycling or Direct load control of fixed appliances.** DMITRE to continue to pursue opportunities for direct load control. Trial and implement cycling of fixed appliances (e.g. reverse cycle air conditioners in NGO and government residences) and explore direct load control with other fixed appliances and coordination of community facilities to off peak (i.e. community pool filtration systems).

Further recommendations

- **Further research.** Further research is required in this little known field of consumer behaviour in remote Indigenous communities.
- **Learn from others.** Energy Efficiency Programs are underway in remote Indigenous communities interstate and these programs will provide further insights and relevant strategies for demand management.

Anangu Pitjantjatjara Yankunytjatjara Communities Demand Management Community Education Program



Introduction and background

This report presents the findings and recommendations of the Demand Management (Community Education) Program undertaken by Bushlight in late 2012 and early 2013. The report is structured in several key parts; introduction and background (including methodology), summary of the community education program, findings and recommendations. The appendices contain the community report for wider public distribution as well as program activities and educational materials, communications and the body of research for the program as required by the Department of the Premier and Cabinet – Aboriginal Affairs and Reconciliation Division (DPC – AARD).

The purpose of this project was to better understand and address issues surrounding household electricity demand in the Remote Areas Energy Supply (RAES) Indigenous communities in South Australia. Little research has been undertaken on essential services in the region. Accordingly, the focus of this project was to undertake research (desktop, field-based, qualitative and quantitative) to develop a more detailed understanding of current energy use in this area and to do so in conjunction with an appropriate energy education program designed to raise awareness and encourage safe and smart energy use at home. Having conducted this research, Bushlight is in an informed position to make recommendations to address demand management in the RAES region.

The RAES scheme for Indigenous communities operates in 14 major remote Indigenous communities, covering over 210,000 square kilometres in west and northwest South Australia. The communities include Oak Valley (in the Maralinga Tjarutja Lands), Yalata (estate of the Aboriginal Lands Trust) and 13 community clusters in the Anangu Pitjantjatjara Yankunytjatjara Lands. Essential and municipal service delivery is challenging due to the physical remoteness of communities and the vast service area size (RAES 2012).

Table 1: Specified remote Indigenous communities and approximate number of public housing as supplied by DPC-AARD (2012)

INDIGENOUS LAND HOLDING AUTHORITY	REMOTE INDIGENOUS COMMUNITIES	PUBLIC HOUSING NUMBERS (APPROX.)
Anangu Pitjantjatjara Yankunytjatjara (APY) Lands	Amata	67
	Pukatja, Umuwa and Yunyarinyi	78
	Kaljiiti (Fregon)	45
	Iwantja (Indulkana)	39
	Mimili	52
	Pipalyatjara and Kaika	46
	Murputja/Nyapari/Kanpi	14
	Watarru	17
	APY Subtotal	358 (approx.)
Maralinga Tjarutja (MT) Lands	Oak Valley	19 (approx.)
Aboriginal Lands Trust (ALT) Lands	Yalata	51 (approx.)
	TOTAL	428 (approx.)

The logistical challenge of supplying electricity to these communities is a significant factor in what is an increasingly expensive undertaking. In the 2011-2012 financial year more than 3.75 million litres of diesel fuel was used for electricity generation in the RAES communities. This fuel provided about 1,000 homes and community buildings with over 13 million kWh of electricity (DMITRE 2012). In the absence of an offsetting user-pays system for residents, the South Australian Government is responsible for the entire cost of supplying power to these communities. Due to their remoteness, the cost of supplying diesel-powered electricity to these locations is three to four times that of supplying electricity to urban consumers. Rapidly increasing energy demand is also driving costs.

Recent figures provided by the South Australian Government show that electricity demand is rapidly increasing in communities supplied through the RAES scheme. The annual electricity generation and distribution costs are estimated to be increasing by 20% per annum and peak demand by 30% (DMITRE 2012). These increases are likely the result of both new infrastructure developments (housing, commercial and government facilities) and acquisition and use of new appliances by households (portable electric heaters, TVs and air conditioners) as well as other factors (DMITRE 2012a).

In light of the significant and increasing cost of supplying electricity to RAES communities, the South Australian Government commissioned Bushlight to undertake this project to begin to address demand management.

Bushlight is the energy division of the Centre for Appropriate Technology, which is Australia's peak not-for-profit Indigenous science and technology organisation. Bushlight was established in 2002 and provides energy related technical advice and services to Indigenous communities throughout regional and remote Australia. Bushlight works with Indigenous people and their support agencies to deliver reliable and sustainable renewable energy systems. Bushlight also provides training and education in household energy efficiency and conservation to reduce power bills, and support livelihoods for Indigenous people. Over the past decade, Bushlight has gained extensive experience in remote household energy consumption behaviours and technologies.

In October 2012, Bushlight was commissioned to undertake community education services in the RAES region, targeting work on public housing, used by Indigenous residents (Anangu) as part of a demand management strategy. The contract was from the period 30th October 2012 to 31st of July 2013 (later extended to 30 August 2013). The contract's objective was to develop a program to address energy demand management in specified Indigenous communities in remote South Australia.

The program featured the following elements:

- An extensive, systematic and respectful approach to relationship building, community engagement and education for Anangu and Piranpa (non-Indigenous) residents in specified communities.
- Development and use of targeted, culturally appropriate educational resources to increase understanding of energy and aiming to facilitate behaviour change and energy efficiency improvements over time.
- A research component that included qualitative elements (householder attitudinal interviews on energy) with quantitative data (consumption data obtained through the installation of data loggers in a number of representative households).
- A cooperative approach that engaged DPC-AARD staff, Department of Manufacturing, Innovation, Transport, Resources and Energy (DMITRE) staff and other relevant stakeholders in all stages of the project.

Methodology

This project was designed to establish a deeper understanding of issues relating to energy consumption and conservation in Indigenous households in the specified communities.

The methodology taken in the research component of this project is in accordance with the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Guidelines for Ethical Research in Indigenous studies. The Central Australian Human Research Ethics Committee granted conditional approval for the project in early March and full approval on 3 April 2013 (refer to appendix 3.1.3 for letter of approval, pg. 134). Data collection for the project included a three stage approach: a literature review of relevant industry and academic sources, and interviews with Indigenous people living in a sample RAES community, and consumption data obtained from a selection of households. Recommendations are also drawn from Bushlight's decade of experience of working with energy demand reduction in Indigenous communities.

Literature Review and Desktop Research

A comprehensive literature review of relevant industry sources, publicly available reports and academic literature was a key part of this project, and is included in appendix 3.2 (pg. 156) The field of energy consumption behaviours and technologies in the Indigenous domain is under-researched and there are little publicly available data or reports. However, there is now burgeoning interest in energy consumption in low income and marginalised households, a body of work which has helped inform this report more generally. This evidence base provides context and lessons from other projects in related fields.

Interviews

The research involved interviews with a total of 22 households living in the sample community, with participants' full knowledge and consent. Early in the project planning it was recognised that local language interpreters would be essential to ensure a smooth entry and introduction to the communities in undertaking educational activities and successful qualitative interview outcomes.

As a social research project this report is largely based on a qualitative approach designed to capture the views of Indigenous residents living with the RAES scheme. It is not necessarily a representative sample of Indigenous electricity users in South Australia, but does include the quotes and perspectives of a range of residents. These qualitative data, when combined with desktop research and quantitative data obtained through dataloggers have helped inform the findings and recommendations of this project. Household interviews were undertaken by non-

Indigenous Bushlight researchers and local Indigenous interpreters of both genders sourced from the community. Please refer to appendix 3.1.7 for qualitative findings (pg. 143).

Quantitative data

In order to gain a firm understanding of the energy consumption and patterns of use in the target communities, 13 basic Energy dataloggers were installed in Indigenous houses. This was done with the full informed consent of the residents. This resulted in nine sets of household data and data from three community facilities (clinic, school and store) collected over a three month period. Please refer to appendix 3.1.7 (pg. 162) for a snapshot of quantitative findings. Analysis of both sets of data (interviews and quantitative data) enabled comparisons to be made between consumption levels and patterns (or lack of patterns) and the socio-cultural, behavioural and structural factors that influence the use of energy by residents.

Findings and Recommendations

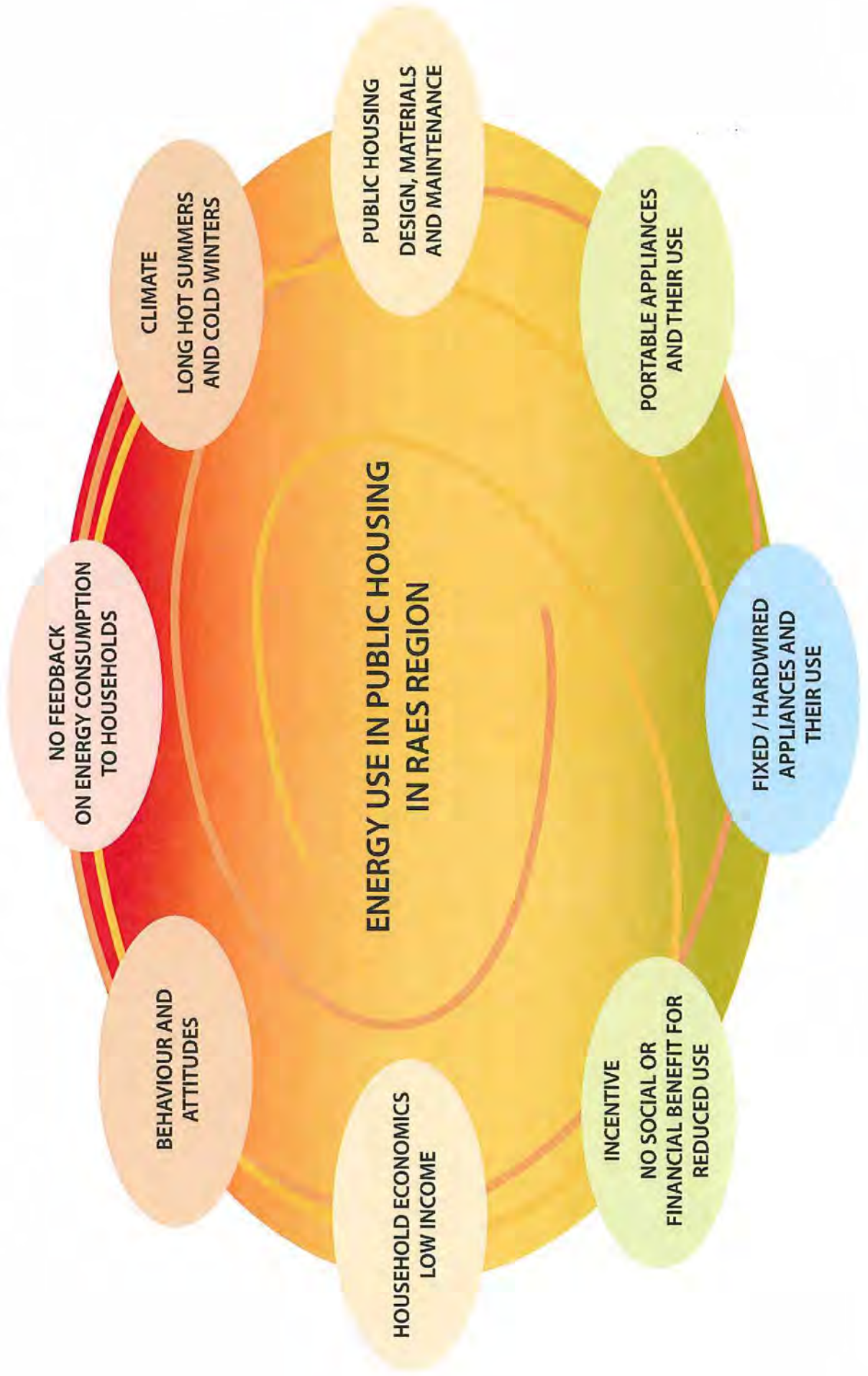
Findings and recommendations in this report are discussed systematically in the following categories:

- Behaviour
- Attitudes and incentives
- Household economics
- Appliances (fixed/hardwired)
- Appliances (portable)
- Climate
- Public housing
- Consumption feedback to residents
- Technical opportunities
- Further recommendations

Evidence gathered in this project clearly shows that electricity consumption in public housing in the RAES region is higher than comparable homes in urban areas or other regional towns. Anangu residents in public housing are not currently charged for their electricity use. Residents have never paid a tariff related to household consumption levels. In the past there was a nominal 'poll tax' charged by the State, but this was abandoned some years ago (DMITRE 2012).

In both Indigenous and non-Indigenous households in these communities, high energy consumption is prevalent. In both cases, there is little incentive or disincentive, financial or otherwise, for residents to reduce use or even be engaged with power supply issues. In the case of non-Indigenous employees (e.g. - health and education professionals) residing in these communities, electricity and other housing costs are normally included in their remuneration packages. This kind of arrangement is a commonplace in remote Indigenous communities throughout Australia. High electricity consumption in public housing occurs within a context of high use regionally.

Socio-cultural, climatic and infrastructure factors that interact to influence energy use in RAES remote Indigenous Community public housing



Socio-cultural & Economic Factors

Several socio-cultural factors were found to both contribute to high energy consumption and prevent residents from being able to reduce their power use. High populations, household overcrowding and large numbers of visitors add to the amount of power used in homes. In some cases, solar hot water systems are operating as electric systems due to the high number of residents and frequent use of electric boosters.

Given high levels of unemployment in the region, residents are primarily home-based, and therefore most consumption occurs in the home rather than in public spaces or workplaces. Low income levels also limit residents' purchasing power for appliances, and there is an understandable preference for cheap appliances. An abundance of broken or suspect appliances continue to be used by residents. There is also limited choice to purchase appliances locally, as most stocked in community stores are selected for low price rather than energy efficiency.

A significant and growing demographic of young people has implications for energy consumption, with young people appearing to own more appliances and have higher expectations for appliance use. Inefficient and/or ineffective use of heating and cooling appliances is likely to have impacts on the amount of power consumed in homes.

The absence of any price mechanism means that electricity is generally conceived of as a free public good, and there is no benefit or priority in managing or reducing use. Awareness of electricity generally relate to outages caused by weather events or maintenance events. There was also a high degree of awareness of child safety around electricity.

Infrastructure Factors

A number of infrastructure-related factors were found to explain and contribute to high energy use in the RAES region. In the RAES communities, there are no informational feedback mechanisms to inform residents of the level of household energy consumption. As such, there is no possible way for residents to monitor or potentially control their energy consumption.

Public housing in the RAES region is fixed or hardwired with high energy use appliances, for example electric stoves. There is also a related high level of use of fixed appliances by residents, due to large household numbers, home based residents and few alternative appliances in homes, and for example no kettle therefore electric stoves are used to heat water. In some cases, there may be maintenance issues (e.g. evaporative air conditioners), which need to be attended to prevent increased consumption by these devices. .

The RAES communities are located in climates of extreme hot and cold. This leads to increased heating and cooling requirements and there is a need to ensure that residential housing is designed with optimal thermal properties in mind.. Maintenance of public housing stock and fixed appliances is a key factor in energy use.

These socio-cultural, economic and infrastructure factors, among others, interact to influence overall energy consumption as recognised in the literature (Faiers et al. 2007; Abrahamse and Steg 2009). It should be recognised that energy behaviour can vary widely even in households with similar characteristics (Stephenson et al., 2010).



Image 1: Power distribution to Kanpi and Nyapari in the APY lands.

Community education program

Bushlight developed and rolled out an energy education program designed to raise awareness, and encourage safe and smart energy use in Indigenous homes in the selected communities over a short time frame.

Several strategies were used in the early stages to ensure an appropriate approach and resources. This involved early visits to Oak Valley and Yalata to discuss power stories with residents, stakeholders and employees in the communities. Draft educational resources were trialled with focus groups and interpreters and adapted from feedback.

Contact was made with stakeholders including APY, Housing SA etc. and relationships developed over the period of the project. Contact was also established with peer organisations working the Anangu lands including Nganampa Health especially the UPK environmental health program, NPY Women's Council, community researchers, etc. Educational program was designed first from Bushlight's extensive experience to the context of the Anangu lands then referenced with the consultation of interpreters Lena Taylor (Oak Valley) and Lorna Wilson (Alice Springs).

Keeping residents of the communities informed on the demand management program and community activities has been a priority to Bushlight. Bushlight sought an interview with the Anangu Paper Tracker and contact with local radio station PY media to utilise avenues to spread the word of the program in language.

After establishing a solid approach and design, Bushlight began further work in the Anangu lands, first seeking permission and direction from community leaders and Traditional Owners to work in the communities. This occurred alongside the experienced interpreter and past employee of the APY council, Mary Anderson. Bushlight has provided easy to use information packs on the 'safe and smart power program' which outlined Bushlight's experience and approach to power education within Indigenous communities.

Notification and promotion of meetings and visits to come by Bushlight in the communities was done through imaged based plain language posters and personal engagement with residents and stakeholders within the communities. On these initial visits to the selected communities Bushlight sought local interpreters for return community visits with the assistance of Mary Anderson, local stakeholders and community leaders. Bushlight has recognised the importance of good interpretation in an educational program in the Anangu lands and that messages are more relevant to the community from a known interpreter.

After the initial visit, Bushlight then returned to communities, sought permission and built a small educational stall and hosted a community BBQ alongside an interpreter (from the advice of the APY council) where the resources were dispersed with explanation to residents. Following the community stall Bushlight continued the conversations on power by hosting community wide meetings and focus groups depending on the requirements on the community. The power story of the community was discussed with possible strategies for saving power at home with the aid of image based educational resources. Bushlight respected cultural matters and sorry business by not visiting communities at inappropriate times and by altering activities as required by the community.

Educational messages

Often messages about saving power in remote communities have been directly linked to financial saving for residents. In the context of the selected communities in the Anangu lands, there is no financial incentive to reduce the use of energy in the home. Therefore, educational messages were built on themes of safety and comfort and used analogies that are relevant to communities, such as driving cars to save diesel.

Educational resources

All resources used by Bushlight have been developed from the basis of 10 years of experience in energy training and education in remote Indigenous communities. Resources used in the demand management program can be found in the Appendix 1.7: Educational resources (pg. 81). As described above, the collection of resources were trialled in communities and feedback was sought from residents, experienced interpreters, stakeholders and employees who work directly with residents. Resources have been designed to encompass the needs of the community and timeframe limitations. The resources varied, some were visual and detailed, such as the resident guides, and some were audio and simple, such as the broadcasts for local radio. Resources include those that can be positioned in high visibility in the community for example posters and talking posters and those that can return home such as enamel camp mugs and appliance stickers. There are tools that travelled with Bushlight (banners) and those that remained in the community after the Bushlight completed the program (talking posters).

Outcomes of the community education program

Overall outcomes of the Demand Management program have included:

- Greater understanding of factors that influence energy consumption and barriers to reduce use
- Greater understanding of the complexities of working in power in the RAES Indigenous Communities
- The South Australian Government is in an improved, more informed position to address demand management through Bushlight's findings and recommendations

In particular to the education program component

- Residents of public housing were provided with access to appropriate resources and conversation has commenced on reduced power in the region.
- Education has begun and should continue over a longer time frame.
- Overall, a greater understanding of energy use in public housing in the RAES region has been reached.

Bushlight experienced two challenges in engaging with residents on energy saving. Firstly power saving is not a high priority among other issues residents experience in remote Indigenous communities and secondly the palpable atmosphere of white troopy fatigue.

Currently there is no payment for power consumption. Issues of low income have been widely acknowledged in the Anangu lands. As there no incentive or disincentive for reducing power use at home, power saving does not appear to be a priority in comparison to issues of low income, health, sorry business and other matters.

There is a palpable atmosphere of 'white troopy fatigue' from residents due to the demands of numerous programs and requests for meetings on country by internal and external organisations and government bodies. In the APY Annual Report 2011/2012 there were a total of 1339 notifications for government employee and contractors (e.g. Bushlight) seeking to visit the Anangu lands. This illustrates the large number of visitors to communities travelling for business, meetings and community programs.

This experience on the ground has directly informed robust recommendations that acknowledge and understand the context and challenges of a community education program in the Anangu lands.



Image 2: Interpreter with Bushlight's educational resources. Bushlight recommends further energy education in the RAES remote Indigenous communities.

Findings and recommendations

This demand management program has proved successful in collecting and analysing information about how energy is used in Anangu homes and issues experienced by residents in the specified group of remote South Australian communities in the RAES region. Fieldwork, research (qualitative and quantitative) and Bushlight's extensive 10 year experience of remote power in Indigenous communities have all contributed to the findings and recommendations in this report. Please refer to appendix for expanded qualitative and quantitative findings on pg.143 and pg. 162 respectively.

Summary of key findings

Energy use in public housing in the RAES region is relatively high. Across the fieldwork, research and past experience there were key findings that were common. Key qualitative and quantitative findings that emerged are as follows.

Climate, behaviour and built environment

The majority of Anangu people spend a lot of time at home and residents use homes as shelter from the climate. Residents experience inadequate thermal efficiency of houses, hot in summer and cold in winter. This leads to a corresponding increase in energy use to improve comfort. This has been both reflected in qualitative findings and the sample of energy use data. Please refer to the appendix 3.1.7, (pg. 143) of qualitative findings and pg. 162 for an analysis of the data collected.

Generational differences in energy use

There is an apparent generational difference terms of overall energy use and appliances. In many cases it appears that elders are living on the verandah with the younger generation living inside. In addition, the older generation often have fewer appliances and expressed a preference using appliances less especially electric bar heaters and evaporative air conditioners. The demographic profile of the RAES communities shows a high proportion of young people. This will contribute to increasing power consumption over time.

Appliance inefficiency increasing overall demand

Portable appliances were found mainly to be second, third or fourth hand or purchased at the community store. All appliances (fixed and portable) appeared from residents' descriptions to either be partially broken or in poor condition and/or inefficient models. With this finding so widespread, inefficiency in appliances is undoubtedly contributing to high demand.

Household occupancy patterns vary

Qualitative findings established that there was moderate mobility of residents from home and often households receive visitors both during the day and for extended periods. The data showed trends in day time energy use and trends for energy consumption that reflect climatic conditions. Households use relative high amounts of energy though individual households peak at different times and different days without a common pattern (please refer to pg. 162), this may be due to travel and increase in household populations from visitors.

Socio-cultural, economic and infrastructure factors that influence energy use have been found to include:

- Behaviour and attitude
- Household economics
- Appliances (fixed/hardwired and portable)
- Climate
- Public housing
- Consumption feedback to residents
- Technical opportunities

The following section provides themed findings, analysis and associated recommendations. The recommendations acknowledge the context and complexities that influence energy consumption in the region, including barriers specific to remote Indigenous residents.

Behaviour and attitude

What we know

Large households and many visitors.

'(We have visitors) all the time. ... stay for a couple of days' - Anangu resident interviewed by Bushlight

'Grandkids come around for the day. Sit around and then go home. Nobody camps overnight' - Anangu resident interviewed by Bushlight

Homes in RAES remote Indigenous communities have large household numbers with extended family and often experience overcrowding (Housing SA 2012). Of the twenty two households interviewed, the permanent house population was relatively high when compared to Aboriginal households for example in Alice Springs. On average there were 6.4 residents per house among interviewed Anangu Pitjantjatjara Yankunytjara (APY) households compared to 3.3 in Aboriginal households in Alice Springs (Census Quick stats 2011).

Behaviour related energy consumption in households is amplified by high resident and visitor numbers. As of 30th June 2012, there were 182 overcrowded houses in the region as defined by the Canadian Occupancy Standard used by the ABS (2007). Homes have frequent visitors during the day and for extended periods of time as illustrated by resident comments above and the qualitative findings (please refer to pg. 143). In three RAES Anangu communities there is significant overcrowding in a proportion of community housing including Iwantja/Indulkana (56%), Yalata (23%) and Pukatja/Ernabella (20%) as reported by Housing SA (2012). This is not uncommon in remote Indigenous communities as approximately one third of homes in remote or very remote communities experience severe overcrowding and significant disrepair, with a large proportion of residents being children (FaHCSIA 2012, ABS, 2008; ABS, 2010). These factors and demographics are very likely to have an influence on household energy consumption

Moderate mobility of households. Many Anangu residents visit family regularly both in and outside the region. Household patterns of occupancy vary. Of those households that Bushlight interviewed mobility to and from the community was moderate. The random nature of electrical data collected may demonstrate energy use following movement of residents and visitors at different times (appendix pg. 162). As described by Housing SA (2012), populations in RAES remote communities are highly mobile, within and between homelands and communities. There are usually significant fluctuations to community populations during school holidays, cultural business and sporting carnivals.

Day to day, residents are more home-based. Generally, day to day life is more home-based than work-based for a majority of Anangu households due to low levels of employment. The majority of adults in RAES Indigenous communities are unemployed. At the end of January 2013 there were a total of 722 job seekers in the APY region and 660 in the Ceduna region including the community of Yalata among others (DEEWR 2013b). Through discussion and research with Anangu residents, many people in the lands are home-based during the day especially during summer. This differs to Piranpa (non-Indigenous) staff that work outside of the home (please refer to appendix 3.3.3 for comparison in energy consumption between public and employee housing pg. 172). The link between employment and power use was illustrated by an Anangu resident below;

'During the day I don't stay home, I go to work... I think people in other house don't work and watch TV use more power' - Anangu resident interviewed by Bushlight

Research suggests that a higher consumption of electricity by unemployed residents might be due to more time spent at home (Urmee et al., 2012; Romero et al. 2012).

Differences between generations.

'Daughter uses the fan with the air conditioner during the day and at night. All the time. I only like using it at night when it's very hot with windows open' - Anangu resident interviewed by Bushlight

'I sleep outside but my Grandson, he uses the air conditioner day and night' - Anangu resident interviewed by Bushlight

Research and fieldwork has shown older generations of Anangu residents typically use less power in comparison to younger generations from owning fewer appliances and using appliances less. Older generations of Anangu prefer fire over appliances for cooking and warmth due to health concerns. There is also a preference by older generations to use air conditioning less often. In contrast, younger residents have a preference for greater climate control (24hr air-conditioning) and use more appliances (iPods and play stations). In some cases, older residents were living outside on the verandah while the young generation was living inside with appliances. It has been highlighted in the

literature that past experience further influences energy use behaviour, e.g. older people who avoid air conditioning because they grew up without it (Dillahunt et al., 2009; Langevin et al., 2012). This appears true of the RAES communities. This may spell an ongoing increase in demand over time for the region as 40% of people living in SA remote communities are 18 years or younger, 26% are 19-29 years old, with only 13% being 50 years or older (Housing SA 2012).

Behaviour to keep warm.

'We use combustion heater for a while to heat house'- Anangu resident interviewed by Bushlight

'No fire outside. Just sit outside in the sun behind a wind break'- Anangu resident interviewed by Bushlight

'Use the combustion heater, mostly at night we close windows and doors . . . use more when it's raining and cold'- Anangu resident interviewed by Bushlight

'Yes (there is a combustion heater) but it's broken so there is a bar heater in those other rooms'- Anangu resident interviewed by Bushlight

In the colder months in the RAES region, use of appliances (combustion heater and portable electric heaters) outweighs the prevalence of other behaviour to keep warm. There are energy saving practices to keep warm by residents such as the use of blankets, moving outside for warmth, controlling draughts to contain warmth and some householders leave the house when it is cold (for warmth of fire and sun). However, data collected confirms a significant energy increase in colder months. This may be from portable electric heaters with increased use of ovens and hot water boosters.

'Use booster in winter time. Press a lot in winter time'- Anangu resident interviewed by Bushlight

Fires and 'drum ovens' are still utilised for warmth and cooking in communities where there is an availability of wood. Access to wood is often dependent on access to a car as described by residents below. Clothing has not been described by respondents as a means to keep warm.

'(We get wood) from out in the open, only when we got a car'- Anangu resident interviewed by Bushlight

'Pick firewood when it's possible in the car'- Anangu resident interviewed by Bushlight

Behaviour to keep cool.

'In summer the house gets very, very hot, with air conditioning the house cools down'- Anangu resident interviewed by Bushlight

'I got to my son's house. They have big shady trees. I sit in the yard under the shade and make baskets'- Anangu resident interviewed by Bushlight

Fieldwork and research shows that there is an ongoing use of evaporative air conditioners throughout the day and night during warmer months as reported by residents (please refer to appendix: 3.1.7 qualitative findings on pg. 143). Residents' responses on keeping comfortable included the use of appliances (evaporative and portable fans) and moving outside (sit in shade outside and sleep outside). Of particular interest, when residents described use of evaporative air conditioners, windows and doors were closed during use. This significantly decreases the efficiency of an evaporative air conditioner. Both heavy and improper use will drive higher energy consumption in hotter times, despite the relative efficiency of evaporative air conditioners. In the literature it is suggested that 30% of the variance in the overall heating consumption and even up to 50% in cooling consumption can be explained by behavioural factors (Langevin et al., 2012). These figures illustrate the potential for demand reduction if recommendations are adopted to address behaviour.

Broken and suspect appliances continue to be used. Generally, even if there is a safety concern, residents continue to use partially broken and suspect appliances. Energy use will increase in a household from the use of broken appliances if the damage decreases efficiency. For example, some oven doors did not shut or seal properly but were still used for baking, thereby increasing the energy use. This may be due to a lack of alternatives available to residents. Many homes had few, if any, alternative cooking appliances so the damaged stove continues to be used for cooking. Some residents were also frustrated with the condition of fixed appliances (that required replacement or repair) but there was confusion on the reporting process, of whom and how to contact the responsible body.

Residents have control over their behaviour. Residents have the most control over their behaviour but are without incentive or reason to reduce power use. What has become evident in investigating the behavioural contribution to power use is that it is often due to habitual behaviour rather than an active intention to use more. From the literature, it is estimated that 10 to 20% of the overall energy consumption can be saved just by behavioural changes, without any further equipment infrastructure or appliances needed (Langevin et al., 2012).

Development has influenced growing demand. Generally, residents' behaviour at home has not changed over time but the infrastructure and appliances have. In the 2011/2012 financial year there were a number of changes in the RAES region. There were another 38 new houses and the upgrade of 19 houses (APY 2012) and a transition of TV from analogue into a digital network (Caddie 2013). The new and upgraded houses use more power from the fixed appliances installed and are part of the increase in total demand for power. The recent availability of digital TV may influence time at home and hence energy use both directly and indirectly. There has also been an increase in the total demand for power in the RAES region from new infrastructure such as the Umuwa trade training centre. A significant rise in power consumption during and post development was also observed in the NT with the introduction of the SHIHP Building Program leading to a significant increase in demand from additional and refurbished public housing (Engineers Australia 2010).

No incentive or disincentive for reduced use. There is no social or financial benefit for residents in the RAES region to use less energy at home. Power is perceived as a free public good therefore it appears to be used without an eye to conservation in the majority of homes. It has been established in the literature that people are less likely to reduce their energy consumption if this has high behavioural costs in terms of effort, convenience and money. There is currently no price mechanism to manage demand by Anangu residents. Reduction in energy use is not a priority amongst other issues experienced by Anangu residents.

Awareness of saving power.

'Need to use bit by bit' – Anangu resident interviewed by Bushlight

'I tell my house to turn the outside lights off' – Anangu resident interviewed by Bushlight

There is an awareness of 'saving power' in the RAES region though there were minimal responses made by residents that had an energy conservation theme. Some Anangu residents are already familiar with saving power concepts from visiting family who are billed (Adelaide, Coober Pedy) or those with prepayment power card meters (remote communities and town camps in WA and NT). The majority of residents are quick to describe switching appliances off to save power though again there seems to be a little incentive to change behaviour.

Concepts of consumption.

'Maybe the other house use more as there is more people and there is only one in my house' – Anangu resident interviewed by Bushlight

'This house (uses more) from movies and the fridge is always on' – Anangu resident interviewed by Bushlight

Residents seem to have a general concept about consumption when comparing their use to their neighbours. Comparative links have been drawn between use of appliances, lighting and household population (please refer to appendix: qualitative findings, pg. 143). Examples described by residents include; the neighbour would use more as they have more people, leave lights on at night or the household uses more power than their neighbour as the neighbour always cook outside and lives alone. This is despite residents not receiving feedback on energy use either directly through a mechanism like an in-home display or indirectly from a power bill.

Power is 'Palya'. Power is working fine, ok or good. Outages occur occasionally, perceived by residents to be due to weather or be infrastructure works related. There have been no reported disconnections in the APY lands for consumers by the provider in the past 2011/2012 financial year (DMITRE 2012).

Incentive for effective energy education. Without incentive to reduce use there will continue to be low to moderate participation in energy education programs. Research shows consumers who do not pay for their energy bills usually have ambivalent feelings towards education programs as they do not have a real motivation to change their current behaviour (Langevin et al. 2012).

Valued for use rather than a valuable resource. Power is valued for its utility. Power is valued by residents as a means to use appliances including lighting. Broken appliances have been the first concern in conversations on power (please refer to appendix: qualitative findings, pg. 143). However, it appears to not be 'valued' as a finite or costly resource to produce.

Safety of children:

'Don't let kids touch power points. Always brought up not to touch power points. Power is dangerous. It kills' – Anangu resident interviewed by Bushlight

'When my family visit I tell them to look after their children and I watch them as well'- Anangu resident interviewed by Bushlight

Generally, children's safety with power is a key concern for residents. When discussing electrical safety, most residents have been worried about their children being safe. Families are active in keeping children away from harm.

High energy use domestically within a context of high use regionally. Government and non-government organisation (NGO) employees working in Indigenous communities are provided with essential services and housing as part of remuneration packages. This includes all educators, health workers and police in the Anangu lands. This is a common practice for employers in remote Australia. Therefore other areas of the demand are not restricted in accordance to price and this drives a higher total demand for the entire RAES region.

Recommendations

Energy Education Programs. Education programs can continue to address the contribution of behaviour to energy demand. Further implementation of appropriate energy education programs will be required over the long term (2 years +). The lack of user pays, and the atmosphere of 'white troopy fatigue' are key challenges to address in the design and implementation of energy education programs. Education programs should:

- Tailor community workshops for interested communities
- Use information stalls at community events
- Embed the educational content in existing programs such as living skills or tenancy programs (*see below*)
- Use educational audio in language and imaged based resources for workshops, info stalls and radio
- Include further education on the energy consumption of different appliances
- Target education on behaviour leading to high energy use in communities
- Promote 'easy' behavioural measures i.e. using additional clothing to keep warm
- Promote 'easy' adjustments in homes i.e. using compact fluorescent lights where possible
- Build upon strategies that residents are already using to reduce power use i.e. use of blankets
- Be delivered by a local community member employed as a 'Power Mulpa' energy educator (*see below*)
- Continue to develop energy education programs around themes of safety and keeping kids safe in houses.

Existing Energy Efficiency Programs. Some on-grid retailers already operate residential energy efficiency programs in SA under the 'residential energy efficiency scheme'. Components from existing programs should be adapted to the RAES region where appropriate. In addition, other opportunities include:

- DMITRE is currently undertaking a review of the South Australian Residential Energy Efficiency Scheme. This may provide further strategies and incentives for reduced demand.
- SA government has promoted FaHCSIA's Home Energy Saver Program, designed for low income earners, elements could be applied to the Anangu lands.

Power program in Community Schools and TAFE. Power saving and safety programs for students are essential, as future users of essential services in the RAES region. Programs on power should be established and driven by schools and TafeSA as part of current curriculum.

Communication campaign. Ongoing implementation of culturally appropriate power saving and safety messages in language through using current media avenues in the RAES region. In particular:

- Radio – Community Service Announcements through PY media and Radio 5NPY in RAES region
- Talking posters – Audio and image based posters that promote power saving and safety
- Indigitube - an ICTV online video streaming service, similar to YouTube, that streams educational and media videos for Indigenous Australia.
- The Anangu Paper Tracker – both press releases and Interviews; audio for radio and printed media for website.

Community programs. Implement community programs that encourage behaviours that use less power. Programs that support residents to take behaviour 'short cuts' to use less power. Two standout areas to be addressed are access to warm clothing and blankets and access to wood for combustion wood fired heaters as described below.

Warm clothing and blanket program. Increase access to alternatives for residents to use bar heaters. Implement a region wide ongoing program for residents to have increased access to purchase warm clothing and blankets in these remote communities. There is already some work by NGOs working in the region however it targets emergency relief only. Resources to implement this recommendation would be less if the government partnered an existing organisation in the region such as the NPY Women's Council or church group to deliver program.

Community wood program and long term planning of wood management in the region. Combustion heaters and outside fires including drum ovens are used extensively during cooler weather. They use no power and are preferred over portable electric heaters by most residents. The size of wood is an issue for combustion heaters. Access to cut wood of the right size is problematic and depends on fallen timber available outside the community. Timber is sparse in most RAES communities. Residents collect it either on foot or, depending on availability, with a car. There are mobility issues for elderly, the sick and young families. The wood requires cutting with chainsaws, however petrol as a components of two stroke fuel has certain restrictions in remote communities. Long term planning for wood management in the region is necessary and could be achieved in partnership with APY land management. A community wood program that addresses access for those with mobility issues and is run through existing community programs especially Remote Jobs and Community Program seems an effective, medium term solution to reducing peak demand during colder periods.

Living skills and tenancy programs. Review living skills and tenancy programs from existing organisations and government agencies then embed energy conservation skills. With an increase in new houses and upgrades in the RAES region, there is a need to review existing living skills programs to include a stronger focus on households that are overcrowded and to embed better energy management practices.

Local employment of 'Power Mulpa' community workers. Implement the ongoing, part time employment and training of local Anangu community workers as active 'energy educators' to deliver ongoing educational programs, provide residency support and tailored advice to homes (in home consultations and audits). It is clear from literature and research that tailored information and direct advice is effective in reducing energy use (Steg, 2008). In the context of these remote communities this will occur more effectively if the worker employed is known to the community and is fluent in local language. If workers are employed and managed through an existing agency or organisation such as Housing SA or Regional Anangu Services (RASAC) fewer resources are required to implement this recommendation.

Regional education and interpretation. There is an atmosphere of 'white troopy fatigue' in the RAES region from numerous meeting, programs and organisations. For greater effectiveness, establish regional system of coordination for all educational programs (by government agencies and non-government agencies) partnered with the co-ordinated employment of skilled interpreters in local communities. There may be incentives for Indigenous or government organisations or positions to manage this such as Government Business Managers. This approach would also increase the employment and income of local interpreters and cultural appropriateness of education.

Improved reporting system for broken fixed appliances in public housing. Review and implement improvements to system of reporting damaged and broken fixed appliances in public housing by residents that emphasise the responsibility of tenants. Implement an initial short-term education and community engagement program to address safety aspects and improve access to reporting systems for maintenance and repair. An improved system should aim to encourage residents' autonomy in addressing housing issues. This could occur through existing maintenance program of Housing SA.

Anangu knowledge and experience. Programs and education implemented, should as a requirement build upon existing knowledge and experience of power saving from Anangu residents.

Table 2: Summary of recommendations to address behaviour

RECOMMENDATION	OUTCOME	RESOURCES AND TIME REQUIRED
Energy Education Program	Power use reduced through behaviour change	Moderate, Mid term
Existing Energy Efficiency programs	Existing resources used for demand management	Moderate, Mid term
Power program in schools and TAFE	Power saving behaviour change in younger residents	Minimal, Ongoing
Communication campaign	Behaviour change through ongoing promotion	Minimal, Ongoing
Warm clothing and blanket program	Reduced use of electric appliances for heating	Minimal, Ongoing
Community wood program	Reduced use of electric appliances for heating	Moderate, Ongoing
Power saving and safety in living skills and tenancy programs	Increased efficiency in homes from behaviour change	Moderate, Mid term
Local employment of Power 'Mulpa' community workers	Effective education and advice to reduce power demand	High, Mid term
Coordination of educational programs and interpreter services	Effective and appropriate energy education	Moderate, Ongoing
Improve access to reporting on fixed appliances	Use of inefficient appliances decreased for a reduced demand	Moderate, Short term
As part of energy education, Anangu experiences are built upon	Reduction in demand from effective energy education	Minimal, Mid term
As part of energy education, a focus on children's safety	Reduction in demand from effective energy education	Minimal, Mid term



Image 3: Danger sign in language, Oak Valley Power station. Bushlight recommends the use of a safety theme in ongoing education programs.

Household economics

What we know

Low income earners. Research shows income seems to be the most influential factor of all socio-demographic variables in the energy use of households (Cayla et al., 2011). The majority of Anangu Households are low income earners with high levels of unemployment, and pensioners residing in most homes. Anangu residents are primarily dependent on Commonwealth Income support payments and may be considered 'low income'. Generally, incomes are lower by 12% in remote locations (ABS 2002). In the 2006 Census the median Indigenous individual income was \$212 per week (FaHCSIA 2010). Higher income households have the buying power to purchase energy efficient equipment, a measure which reduces their energy consumption and which is not available to low income households (Cayla et al 2011).

Preference for cheap appliances. The low income of the majority of Anangu households in the RAES region may increase the purchase of cheap but inefficient appliances (e.g. radiant bar heaters) and the use of damaged, inefficient and broken appliances e.g. old fridges. Research shows low income households have less opportunity to adopt energy saving measures (Abrahamse and Steg 2009). Therefore behaviour based opportunities need to be fully utilised to reduce energy use.

Remote locations. The issues relating to low household incomes are compounded by the higher costs of living found in remote locations. All the RAES discrete Indigenous communities are in remote to very remote locations. This means that access to a range of goods and services including quality housing, health and education services are limited (ABS 2008). It is well understood that community store prices are much higher than in towns.

Recommendations

Address supply chain of efficient appliances: Implement strategy for increased access to efficient appliances for low income earners. Commence by addressing appliances stocked by stores by promoting energy efficiency guidelines for stores or providing financial or other incentives for stores to only stock efficient appliances. Develop simple labelling system to identify efficient appliances to residents (i.e. simple thumbs up power symbol) rather than current reworked star ratings system. Continue by delivering education for consumers as to the benefits of efficient appliances. Implement incentives for residents to purchase efficient appliances.

No Interest Loans Schemes: Once the appliance supply chain is addressed, implementation of a no interest loans scheme (NILS) will provide the financial means or 'buying power' for low income residents to purchase more efficient appliances, hence reducing demand for energy in homes. NILS is designed for people on welfare benefits and can be used to buy whitegoods like fridges and washing machines (ASIC 2013).

Contextual demand management strategies. As identified in the literature, low income households tend to prefer changing their behaviour rather than implementing new technologies which usually involve high initial costs (Poortinga et al., 2003). Thereby demand management strategies should be concerned with behaviour rather than require financial costs from residents to implement.

Table 3: Summary of recommendations to address household economics

RECOMMENDATION	DESIRED OUTCOME	RESOURCES AND TIME REQUIRED
Address supply chain of efficient appliances	Reduced demand from increase in efficient appliances	Minimal, Ongoing
Implement No Interest Loans Scheme for efficient appliances	Reduced demand from increase in efficient appliances	Moderate, Ongoing
Contextual demand management strategies	Effective demand management strategies	NA, Ongoing

Appliances - fixed/hardwired

What we know

High energy use hardwired/fixed appliances. RAES public housing is hardwired with high energy use appliances e.g. electric stoves, some of which are installed with a timer. A high rate of hardwired appliances in public housing that use high amounts of energy occurs in other remote Indigenous communities and town camps (McKenzie 2012). From the literature, it is often that fixed appliances such as inefficient electric hot water systems or electric stoves are factors that lead to a high energy consumption in low income residences (NIIG 2010).

Heavy use of fixed appliances by residents. A heavy use of fixed appliances has been reported, this may be due to large household numbers, home-based residents during the day and few alternative appliances in homes, and e.g. no kettle therefore electric stove is used. Many stoves are either broken or have a broken component and continue to be used by residents even if they are suspect. Housing SA reports there is a 6-12 month turnover of stoves from heavy use and tough conditions. There has been some reporting of stoves being used as heaters in homes by residents outside qualitative interviews as described by residents below. It occurs but to what extent it is still unsure.

'I don't use the stove as a heater. I use blankets to cover myself. It is dangerous. I get frightened to use it as a heater. I do it proper way with a heater from the store' – Anangu resident interviewed by Bushlight

'I don't do that with the stove but I've seen other people do it. They camp around the stove' – Anangu resident interviewed by Bushlight

Inefficiency with evaporative air conditioners.

'Both daytime and night time, push the button at whatever setting it is at ... all the windows are closed' – Anangu resident interviewed by Bushlight

'When air con is on, open the windows so that air comes on people and then it comes out. So motor does not blow up' – Anangu resident interviewed by Bushlight

Evaporative air conditioners appear to be working effectively for residents but behaviour is creating inefficiency and wear on the appliance. Many residents prevent ventilation (by closing doors and windows) when using evaporative air conditioning. Residents are generally concerned about security and privacy and therefore windows have been painted black in some cases and windows and doors remain closed. From the literature, cooling was identified as a major part of energy consumption and in the context of the RAES public housing, there are no other low energy use cooling appliances such as ceiling fans installed.

Hot water systems.

'(You get) hot water from the booster, press the button and wait a little while' – Anangu resident interviewed by Bushlight

Solar hot water systems with one shot boosters are effectively running as inefficient electric hot water systems because of frequent use of booster by residents due to large household numbers. Reported booster use is heavy and sometimes boosters are permanently taped or jammed on effectively acting as an electric hot water system. Solar hot water systems can have some issues as they calcify due to the 'hard' water; they are maintained annually.

Recommendations

Further research into fixed appliances. Research and trial appropriate low energy use appliances and technologies that are suitable for conditions (i.e. heavy use, high functionality, withstand tough environments). From an evidence base, install appliances or technology region wide. Consider and trial and use of ceiling fans as they are used throughout public housing in remote communities and are a low energy option. Fans combined with evaporative cooling in arid regions can reduce the number of days when evaporative cooling is used in mid-season periods (NIIG 2009). The Department of Communities and Social Inclusion (Asset Services – Aboriginal and remote housing) has been planning a project on investigating Heating and Cooling in remote housing. This project may inform decisions around heating and cooling appliances for the future.

Review of Ministers Specifications and Housing Standards for Indigenous houses. Housing design, materials and appliances installed are guided by the Ministers' Specifications for Indigenous Houses. Please refer to appendix 3.4: appropriate public housing and energy efficiency, for further discussion on the Ministers specifications. Review these using the framework provided in the National Indigenous Housing Guide via Housing SA's Standards Committee and increase energy efficiency with design, house orientation, materials and appropriate high standards for efficiency of fixed appliances. Though durable, public housing could be improved for energy efficiency. Refurbishment and any upgrades should focus on function and energy efficiency with the retrofit of efficient appliances and insulation materials for roofs and walls. Generally, the refurbishment and new houses should avoid the installation of high energy use appliances (reverse cycle air conditioners) and the removal of lower energy use appliances (evaporative air conditioners).

Table 4: Design considerations from the National Indigenous Housing Guide (NIHG) (2009) that may be applicable to the RAES region

<ul style="list-style-type: none"> • House is sited so that in winter, as much of the yard as possible is exposed to the northern sun and neighbouring houses do not shade the yard • Eastern and western walls well shaded and have small and well shaded glazing • Extensive area of wall and glazing that is facing north, and depth of eaves means walls and glazing are shaded from the summer sun but exposed to winter sun • Houses with increased mass in walls to contain winter heating. • Vents between rooms to allow for transfers of warmth between heated and non-heated rooms
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Occupancy study and tenancy audit. Housing SA has undertaken an occupancy study and a recent tenancy audit. Recommendations should be considered from an energy efficiency perspective before implementation.

Maintenance regimes and access to the system of reporting. Review maintenance regimes including ease of reporting by residents. Implement adjustments as necessary (please refer to pg. 16).

Fixed ventilation for evaporative air conditioners. In conjunction with community education, design, trial and retrofit current residences so that ventilation for evaporative air conditioners is inbuilt.

Increase functionality of current fixed appliances. Increase functionality and efficiency of current appliances through retrofits. For example, install insulation on hot water pipes throughout residences.

Small efficient cooking appliances. Incentivise efficient alternative appliances for hot drinks other than electric stoves, for example small kettles rather than heating water on an electric cook top.

Address hot water system. Trial alternatives such as heat pumps and instantaneous gas where possible and implement region wide from an evidence base. Department of Housing in Arnhem Land, NT, has installed heat pumps as a different technology after experiencing similar difficulties of overcrowding and high use of solar hot water with one shot boosters. Though the difficulties of gas are acknowledged it may be possible for some communities e.g. Indulkana or Yalata with close access to a sealed road could possibly trial the use of instantaneous gas hot water systems.

Table 5: Summary of recommendations to address fixed or hardwired appliances

RECOMMENDATION	OUTCOME	RESOURCES AND TIME REQUIRED
Further research into fixed appliances	Reduced demand from low use fixed appliances	Moderate-Major, Mid term
Review of Ministers Specifications and Housing standards for Indigenous houses	Housing standards implemented that reduce demand in new houses	Minimal, Short term
Occupancy study and tenancy audit	Functionality in public housing reduces energy demand	Moderate, Ongoing
Maintenance regimes and improve access to reporting on fixed appliances	Use of inefficient appliances decreased for a reduced demand	Moderate, Short term
Fixed ventilation for evaporative air conditioners	Improved efficiency of evaporative air conditioners reducing demand	Moderate-Major, Short term
Increase functionality of current fixed appliances	Improved efficiency of fixed appliances with demand reduced	Minimal-Moderate, Short term
Small efficient cooking appliances	Use of electric stove is reduced	Minimal, Short term
Address hot water system	Improved efficiency of hot water system reduces demand	Moderate, Mid term



Image 4: Drum oven in Watarru. Bushlight recommends the implementation of a community wood program to encourage the use of combustion heaters and drum ovens instead of electric stoves and portable electric heaters.

Appliances - portable

What we know

Few but very inefficient portable appliances.

'An old one, used to belong to other person in the community' - Anangu resident describing her fridge, interviewed by Bushlight

'Been asking for a fridge freezer (from family). Consider later a second hand one' - Anangu resident interviewed by Bushlight

Many residents have a small number of appliances though there is a high predominance of inefficient high use appliances such as electric frypans and portable radiant bar heaters. Some households are without basic appliances such as fridge and/or TV. Findings from the qualitative research (please refer to appendix, pg. 143) show low rates of portable appliances (including absence of fridges and TV) have also been seen in other remote communities and town camps (McKenzie 2013).

Poor condition of appliances.

'I have a toaster, an electric kettle but it is broken now' - Anangu resident interviewed by Bushlight

It appears it is the norm for portable appliances (as with fixed) to be broken, or in an old or damaged condition. Broken and second, third or fourth hand fridges are the norm in homes and more inefficient than newer models in working order (i.e. with intact seals). Appliances had often originated from the community store or through a welfare organisation such as the Red Cross.

Access to efficient appliances. Access to energy efficient appliances is fraught due to the remote location and limited availability in community stores.

Residents have more control over portable appliances than other factors. After behavioural factors, residents have the most control over energy use from the portable appliances sourced and used in homes.

Recommendations

Address supply chains for efficient appliances. Work with stores to make more efficient appliances accessible is of particular interest to the APY Executive and No Interest Loans Scheme (NILS) are a pathways towards efficient appliances (please refer to pg. 20).

Incentive scheme to remove inefficient and unsafe appliances. Implement incentive scheme to remove high use inefficient appliances from RAES region (e.g. 'cash for clunkers' scheme).

Community program to increase efficiency of appliances. Community program to recondition appliances. Utilise existing organisation (i.e. Regional Anangu Services) or maintenance program to increase efficiency of large whitegoods like the Phoenix Fridge program (Brotherhood of St Lawrence 2013) which reconditions and recycles old fridges (e.g. cleaning coils and repair/replace damaged door seals etc.) then sells on the fridge at a reduced price in disadvantaged areas.

Increase use of combustion heaters. Use of combustion heaters may be encouraged though access to a community wood program and may decrease use of portable electric heaters (please refer to pg. 16).

Table 6: Summary of recommendations to address portable heaters

RECOMMENDATION	OUTCOME	RESOURCES AND TIME REQUIRED
Address supply chains for efficient appliances	Reduced demand from increase in efficient appliances	Minimal - Moderate, Ongoing
Incentive scheme to remove inefficient appliances	Reduce demand from reduction in inefficient appliances	Moderate, Short term
Community program to increase efficiency of appliances	Reduced demand from increase in efficient appliances	Moderate, Midterm - Ongoing
Community wood program	Reduced use of electric appliances for heating	Moderate, Ongoing

Climate

What we know

Extreme weather. Remote communities in the RAES region experience extreme summer and winter temperatures as described below in Table 8. In a year, temperatures can range from 46C to -5C (BOM 2013). Climatic conditions contribute to high energy use in the region.

Table 7: Climatic features of the hot arid climate present in the RAES region as described by the National Indigenous Housing Guide (NIHG) 2009

- Low rainfall all year round and high variation between day and night temperatures
- Very hot summers with hot, dry winds, average maximum temperature exceeding human comfort levels, and average humidity within human comfort levels
- Cold dry winters with cold winds and average mean temperature below the range of human comfort particularly at nights

Houses as shelter. For many residents, homes are a shelter from the extremes in temperature. Generally speaking, houses are utilised by Anangu as shelter in the extremes of summer with air conditioning and in winter with use of fires outside, wind breaks and sunlight during the day and combustion heaters, blankets, bar heaters and to a lesser extent stoves for heating during the day and night.

Outside shade and windbreaks. Preference by some residents for outside shade and outside sun for heating and cooling. Both use no power. Outside shade and shelter from wind is limited in some communities from development and the building sites of new houses.

Experience of current housing stock.

‘Have been there when it was cold, really cold’ Anangu resident interviewed by Bushlight

The majority of houses are experienced by residents as being very cold during winter months and warm only conditionally with the use of an appliance. This is true for summer too, where the householders experience their house as hot, or only cool with the use of air conditioning.

Recommendations

Community development initiatives - retrofits. Implement community initiatives through existing organisations and agencies to increase outside shelter around homes to catch winter sun, provide summer shade and protect homes from prevailing winds year round. These initiatives could occur through current organisations and programs such as Nganampa Health’s UPK environmental health program and Regional Anangu Services with the Remote Jobs and Communities Program (RJCP).

Climate appropriate refurbishments and new houses. Review Minister’s specifications through Housing SA’s Standards Committee; especially for energy efficiency of homes through orientation, design and materials (please refer to pg. 21 and appendix 3.4 appropriate public housing and energy efficiency). Some houses in the RAES region have light coloured roofs which would assist with reflecting heat during summer and a minority of houses have a small shade shelter.

Table 8: Design strategies described by the NIHG (2009) suitable for the hot arid environment of the RAES region

- Use passive solar design with insulated thermal mass that is fully shaded in summer
- Use convective cooling (venting of high level hot air to draw in cooler air from lower levels) to maximise night time cooling in summer
- Provide protection from prevailing winds in summer and winter
- Position the living areas and glazing to capture the northern sun in winter

Table 9: Summary of recommendations to address climate

RECOMMENDATION	OUTCOME	RESOURCES AND TIME REQUIRED
Community development initiatives - retrofits.	Reduction in demand due to climatic conditions	Moderate, Short-Mid term
Climate appropriate refurbishments and new houses. Review of housing Standards	Reduction in demand due to climatic conditions	Minimal, Short term

Public housing

What we know

Public housing. There is no home ownership for Anangu or Piranpa in the RAES region. All public housing in the RAES communities are resided in by Anangu and rent paid contributes to maintenance services. In a recent example of an energy efficient retrofit scheme to Indigenous public housing, Alice Springs Indigenous public housing town camps have historically been thermally inefficient and overcrowded (Alice Springs Solar City 2013). Evaluation has shown general satisfaction with energy efficiency upgrades and thermal comfort was improved. However, reduction in demand was difficult to measure as upgrades included installation of low use appliances, such as evaporative air conditioners when there were no appliances beforehand (Tangentyere Council Research Hub and Bushlight, 2011).

Maintenance of public housing

The stove is broken a whole lot' Anangu resident interviewed by Bushlight

Regular or scheduled maintenance to housing infrastructure is minimal (annually for evaporative air conditioners). Research shows that generally in remote communities, there is a high rate of disrepair reported in Indigenous Housing Organisation homes, with 33% either requiring major repairs or replacements, which often has a negative impact on thermal efficiency of the home (ABS 2008). Implementing increased servicing to decalcify air conditioners and solar hot water systems would appear beneficial.

No control to change the house. As 'renters', residents have limited options to make energy efficient changes to homes such as to change building materials, increase roof insulation or alter fixed appliances in homes. A major finding of the literature was that the lack of control over interior conditions in public housing is a key constraint for energy savings (Langevin et al. 2012). However small changes to interiors are often done with incentive. Households that pay for or contribute to their energy bills are generally more willing to adapt the interior conditions, such as changing the lighting, change clothes or adjust settings of fans, air conditioning or heaters, in order to save energy and money (Langevin et al., 2012).

Recommendations

Review of Minister for Housing Specifications. Review and Implement changes to policy setting to encourage greater energy efficiency in homes, please refer to pg. 21 of this report.

Occupancy study and housing tenancy audits Housing SA has undertaken study, please refer to pg. 21 of this report.

Community landscaping program. From development in many communities there is little or no natural shade from trees. In households where there are large trees, residents prefer to sit in shade beneath them than under the verandah. Implement landscaping program to provide shade to western orientation of house with species suitable to the climate.

Retrofits as community development initiatives and emerging employment: Major and minor retrofits are possible to increase thermal energy efficiency in current housing stock. Utilise the existing capacity of community undertake a retrofit program in collaboration with Housing SA i.e. Remote Jobs and Communities Program (RJCP) or Wiltja, a local building business based in Fregon. Providers for RJCP include Regional Anangu Services Corporation, TAFE SA and Yalata Community Inc. as subcontractors (DEEWR 2013b). Please refer to Table 10 and 11 for possible retrofits.

Table 10: Retrofits recently undertaken to town camps in Alice Springs to improve energy efficiency in public housing that may be appropriate to Anangu lands (Alice Solar City 2013)

- Canvas Sheet curtains: Installation of robust internal curtains to reflect sunlight and assist in heat retention
- Ceiling/roof insulation: Increase in bulk insulation.
- Insulated cladding to external walls: Walls receiving significant sunlight during summer were retrofitted with a corrugated iron cladding to catch and disperse solar energy, preventing it from heating up the home's block work.
- External door seals: Fitting effective seals on external doors
- Air-conditioning irrigation system: Using evaporative air conditioning run off to irrigate trees on the property
- Windows and seals: Replacement of aluminium sliding glass windows with fully sealed vertical sliding polycarbonate windows

Table 11: Further possible retrofits that could be undertaken in public housing to increase efficiency

<ul style="list-style-type: none"> • Install bulk insulation or heat reflective foil in roof spaces and retrofit insulation in walls • Paint roofing white • Ventilate the building's ceiling space • Apply solar tint to un-shaded windows • Install double glazing • Install lightweight structure or verandah to shade western and eastern sides of houses • Hot water system located closer to shower 	<ul style="list-style-type: none"> • Upgrade fluorescent lighting • Fit occupancy sensors on lighting • Fit daylight sensors/timers on lighting • Modify lighting switches and controls to enable switching off of unnecessary lighting • Install skylights • Hot water supply pipes are 'lagged' (insulated) • Increase insulation of hot water storage tank
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Training for appropriate retrofits. Provision of training to community members through existing institution to undertake appropriate retrofits. Training opportunities could exist through organisations such as Bungala, Regional Anangu Services and Nganampa Health UPK environmental health program to train workers in 'retrofit' skills in homes to support energy efficiency (e.g. increase outside shelter, increase insulation etc.).

Energy and water saving devices. Region wide installation of small scale appropriate energy and water saving devices such as efficient globes/tubes and water saving shower heads.

Community maintenance program. Increase maintenance in public housing aimed to reduce demand for energy. Incentives for non trade minor repairs and works in public housing by residents or nominated community workers. A solid program would empower residents to undertake possible maintenance at home and encourage care for homes.

Table 12: Summary of recommendations to address public housing

RECOMMENDATION	DESIRED OUTCOME	RESOURCES AND TIME REQUIRED
Review of Minister's specifications and Housing standards	Reduction in demand due to public housing	Minimal, Short term
Occupancy study and tenancy audits	Functionality in public housing reduces energy demand	Moderate, Ongoing
Community development initiatives – retrofits	Reduction in demand due to public housing	Moderate, Short-Mid term
Appropriate training for retrofits	Skills community to undertake retrofits reducing demand	Moderate, Short – Mid term
Energy and water saving devices		Minimal, Short term
Community landscaping program	Reduction in demand due to climatic conditions	Minimal-Moderate, Short-Mid term
Community maintenance program	Empowers residents to undertake non trade maintenance in homes for a reduction in demand	Moderate, Ongoing



Image 5: Residents outside one of the new houses in Fregon. Development has cleared the block of natural shade. Verandah provides shade for this residence. Bushlight recommends addressing limited shade for dwellings through retrofits and landscaping

Consumption feedback to residents

What we know

No direct or indirect feedback. Residents currently receive no form of information 'feedback' on their household energy consumption. Accordingly, Anangu residents have no accurate knowledge of household energy consumption. It has been highlighted in the literature that appropriate feedback mechanisms are necessary for residents to undertake energy saving measures in their home (Steg 2008). However, in a town camp study, there were degrees of ambivalence about the importance of feedback for residents, 'few residents have ever received bills (therefore feedback) and that they had limited awareness that energy efficiency measures could assist in reducing energy costs' (McKenzie 2013). This illustrates that any feedback mechanism will need to be partnered with community engagement and education.

Prepayment metering in other communities has not addressed the need for feedback. Even with the use of prepayment meters in other jurisdictions, the lack of information on consumption may have weakened incentives for consumers to be more efficient (ACG 2009). Unless consumers themselves are tracking their use of cards, there is no feedback mechanism in current prepayment meter power cards.

High appliance use and high energy use. Some residents intuitively draw links between high appliance use and high energy use; others draw links between high use of lighting and high energy use. Please refer to appendix 3.1.7 qualitative findings (pg. 143).

Recommendations

Implement direct feedback by installing an in home display. Implement culturally and literacy appropriate feedback mechanism for residents. This would occur in an environment where there was an incentive for residents to reduce their power use with community engagement and education to ensure mechanism is effective. Appropriate in home display such as the Bushlight Energy Efficiency Box (BEEbox) would provide a proven mechanism for government and provide consumers a tool to understand energy use as a dollar amount. Please refer to conceptual image of the BEEbox below.



Image 6: Conceptual image of in home display Bushlight Energy Efficiency Box - BEEbox

Education and community engagement. Ongoing education and community engagement utilising consumption information with the householder by community workers like ‘Power Mulpa’ as previously recommended. Power Mulpa to work with residents for strategies to reduce use.

‘Fair use’ communication campaign. With the implementation of a feedback mechanism and incentive to reduce use; promote a typical or ‘fair use’ concept of energy use for different household sizes. Promote what fair use would be so residents are able to make comparison between their own use and a realistic bench mark to motivate high use residents reducing use.

Table 13: Summary of recommendations to address consumption feedback to residents

RECOMMENDATION	OUTCOME	RESOURCES AND TIME REQUIRED
Direct and indirect feedback In Home Display	Empower consumers for reduced use Reduction in demand from residents using appropriate tool	Moderate, Ongoing Moderate, Short term-Ongoing
Education and community engagement	Reduction in demand from effective education	Moderate, Mid-term-Long term
‘Fair use’ communication campaign	Reduction in demand from communication campaign	Minimal, Mid-term-Ongoing



Image 7: Power generation at Murputja in the APY lands.

Technical opportunities

What we know

New technology and opportunities for direct load control. Bushlight assumes that the provider would already be exploring new technology and opportunities for Direct Load Control (DLC) where cost-effective.

Interest from homelands for renewable energy. At least one homeland has expressed desire to be moved from the grid to an independent power supply, if there is capital to fund it. Many homelands on the eastern side of the APY lands are connected to the central powerhouse grid.

Little to no research. There is so far little research on the way energy is used by residents in the RAES region, or indeed consumer practices in remote Indigenous communities generally. Occupancy patterns of communities and households appear to require further research.

The Central Power House. Centralisation of power on the eastern side of the APY region is relatively new and has influenced perceptions on power supply by some residents. Power generation has changed from Community power stations in some communities to the central powerhouse. Some people prefer the new way, other people prefer the old way when it was in the community.

Demand management across the region is required. High use occurs across the board including Piranpa customers and community buildings and facilities. Demand management strategies that targets public housing should occur in conjunction with strategies to address other pieces of the total demand. For example, Ergon recently undertook a series of trials of Demand Management strategies (Ergon 2012) including an automated demand response trial, where customers reduced demand during peak load times with minimal or no impact on customer perceptions of comfort.

Recommendations

More data collection, research and analysis. Continued and expanded data collection and analysis to develop greater understanding of patterns of use and corresponding loads (daily/seasonally) may inform network technical decisions and as verification for demand management strategies implemented

Cycling or direct load control of fixed appliances. DMITRE to continue to pursue opportunities for direct load control. Trial and implement for example, a trial of cycling of reverse cycle air conditioners was done with success through the Perth Solar Cities program in residences with reverse cycle air conditioners. In RAES Indigenous communities these are primarily NGO and government housing. DLC of reverse cycle air conditioners has achieved a reduction of 20% at peak time in the first year (Perth Solar City 2011). DLC of air conditioners was also trialled by ETSA (2008) with reduction in peak demand and no noticeable difference in thermal comfort to residents. This option would have value if any transmission lines in the mini-grid have peak load constraints.

Reduce overall peak demand from coordination of community facilities. Coordination of use of high energy demand community appliances and facilities i.e. bore pumps (connected to grid); community pools pumps, and filtration systems (Pipalyatjara, Ernabella and Yalata) and desalination plant (Yalata) to operate at times outside of peak demand. This could include power factor correction for industrial scale appliances in the RAES region.

Trial and implement potential smarts and technology on the network to investigate impacts of peak loads on network investment, as directed by DMITRE

Table 14: Summary of recommendations to address technical opportunities

RECOMMENDATION	DESIRED OUTCOME	RESOURCES AND TIME REQUIRED
More data collection research and analysis	Effective monitoring of demand management strategies	Minimal, Ongoing
Trial and implement cycling of fixed appliances – reverse cycle air conditioners	Reduction of energy use by fixed appliance	Moderate, Mid term
Explore, trial and implement direct load control of other fixed appliances	Reduction of peak load by moving hot water heaters to off peak	Moderate, Mid term
Reduce overall peak demand from coordination of community facilities use	High energy community appliances moved off peak, reduced peak load	Minimal, Short term
Trial and implement smarts and technology on the network	Increased efficiency in distribution	Moderate-Major, Mid term

Policy and the RAES region

What we know

RAES situation is unusual. The provision of power without charge is not the norm for remote Indigenous communities in other jurisdictions (WA, QLD, NT), with limited exceptions, (for example, communities paying for community power from mining royalties). Payment is usually made through prepayment metering with power cards. Many Anangu travel to visit family or have lived in town camps and communities of NT or WA where there are prepayment meters and to Adelaide with conventional billing.

Wide expanse of region. The Anangu Pitjantjatjara Yankunytjatjara lands alone occupy 103,000 square kilometres in the North West corner of South Australia. (APY 2012), not including the Maralinga Tjarutja lands and estate of the Aboriginal Lands trust (Yalata). In 13 of the 15 major communities there is an approximate population of 2089 (Housing SA) in a 2012 tenancy audit from a population of 1900 in 2008. This is clearly a small population spread over a wide expanse. This will continue to be a challenge for demand management and provision of power.

Already 'paying' for power.

'(I) thought all along that we were paying for power when we were paying for rent' – Anangu resident interviewed by Bushlight

As described by the resident above, some Anangu residents believe they are still contributing to power through a past 'poll tax' scheme. This is not correct and rent payments that are made offset Housing SA maintenance and management costs.

Concerns around possible policy change. Indigenous stakeholders have voiced concerns about the possible introduction of charging for electricity. Councils and residents in the region assume that payment may be introduced at some point, however they are concerned about how it would be implemented especially if it were to occur suddenly. Many people in communities feel that it is important for everyone to be involved when talking about power and talking about homes. As stated below:

'Anangu continue to be confronted with the challenge of how to fully participate in the direction of the APY lands and how communities can be informed so that decisions made on their behalf by governments and the Executive are fulfilling the needs of their communities, their families and their culture and country'
Bernard Singer, Chairperson (APY 2012)

Recommendations

Any changes in policy (i.e. charging for use) would require region wide coordination of services and programs. Many organisations and government departments operate in similar fields; there is an overlap in the objectives of Regional Anangu Services, Nganampa Health's UPK Environmental Health program and Housing SA as well as external organisations and agencies working in the RAES region. There are opportunities for organisations to coordinate activities to improve energy efficiency in homes and work towards demand management with residents; this could be led by Housing SA for the actual house and interior in coordination with Nganampa Health, UKP environmental health program for house exteriors with the support of Regional Anangu Services.

Coordination of development and refurbishment of infrastructure. Implement communication on energy efficient development guidelines in the RAES region and a mechanism of reporting planning decisions to DMITRE for government and other organisations.

Table 15: Summary of recommendations to address policy and the RAES region

RECOMMENDATION	OUTCOME	RESOURCES AND TIME REQUIRED
Region wide coordination of services and programs	Education programs would be more effective	Minimal, Ongoing
Coordination of development and refurbishment of infrastructure.	Manage and reduction of RAES overall demand	Minimal, Ongoing

Further recommendations

Further research. Further research is required into the little understood field of consumer behaviour and essential services in remote Indigenous communities. Further study would deepen the understanding of energy use in the RAES region.

Ongoing data collection. Ongoing data collection (quantitative and qualitative) and analysis over time is necessary to effectively monitor demand management strategies. Collection of electrical consumption data at a household, community and regional level will continue to inform patterns of use when partnered with socio-cultural factors such as household population.

Demand management requires best practice in community engagement. For effective demand management best practice in community consultation and engagement relevant to the RAES region is necessary (i.e. culturally appropriate educational material, use of skilled interpreters, employing local people). Effective community engagement leads to:

- Cost effective service delivery
- Appropriate expectation management
- Informed decision making
- Accurate data collection
- Community ownership & 'buy in'

Community engagement is cost effective in partnership with demand management as:

- Residents have a genuine sense of ownership over the infrastructure and the risk of neglect and vandalism is greatly reduced
- A thorough engagement process ensures the strategy meets the needs of communities
- The engagement process includes discovering things about the community that will lead to a more effective implementation of programs, e.g. local interpreters etc.
- Community engagement builds sound relationships that can make it easier to identify and address issues and problems before they escalate
- Reduces the risk of unsatisfactory outcomes for communities and bad publicity for the government

Community driven strategies for demand management. Anangu residents have their own strategies for using less power including those mentioned above. Processes which seek, develop and implement Anangu solutions will increase participation in energy programs and strategies that lead to effective demand management within the communities.

Local interpreters' service. Working with interpreters local to RAES communities has proven to be a necessary and valuable investment in the community engagement and education program. The recent expansion of the Northern Territory Aboriginal Interpreter Service into the APY Lands will provide necessary extra interpreting services to assist in both service delivery and community engagement.

Other energy efficiency programs interstate in remote Indigenous Communities. Other energy efficiency programs are underway in remote Indigenous communities interstate. These programs will provide further insight and strategies for demand management in the RAES region and include:

Northern Territory

East Arnhem Low Income Energy Efficiency Program (LIEEP) is underway and will inform other remote Indigenous communities with strategies for energy efficiency and demand management in a low income context over the next three years (DRET 2013).

Queensland

Powersavvy is an Ergon Energy program helping business, government and residential customers to use less power and lower their electricity bills in Queensland's isolated communities. There has been effective implementation of energy educators working directly with Indigenous households to lower power use (Ergon 2013)

Western Australia

Horizon Power continues ongoing community engagement and energy efficiency activities with isolated mini-grid communities in Northern Western Australia (Horizon 2013)

Local employment of Indigenous workers in remote communities. The employment of local Indigenous workers in remote communities is an effective component of a wider demand management strategy. It lends to building on local knowledge of the community and provides an identifiable contact person for residents. Horizon Power, Western Australian currently employs 10 Remote Community Utility Workers (RCUW) in the Pilbara and Kimberley region and 12 field service workers, local Indigenous employees whose role includes meter readings in the community (Oakley 2013). Furthermore, in Ergon Energy's Powersavvy Program the local employment of field officers with home consultations have been pivotal to the success of Ergon's Powersavvy Program in both community engagement and energy saving (Howlett 2010). It was found that local field officers were the single most effective communication tool in terms of engaging the community (Howlett 2010).

Table 16: Summary of other recommendations

RECOMMENDATION	DESIRED OUTCOME	RESOURCES AND TIME REQUIRED
Further research	Greater evidence base for policy and infrastructure decisions	Minimal, Short term – mid term
Ongoing data collection	Effective monitoring of demand management strategies	Minimal, Ongoing
Best practice community engagement for effective demand management	Increased engagement and participation in demand management	Moderate, Ongoing
Community driven strategies for demand management	Increased engagement and participation in demand management	Minimal, Ongoing
Local interpreter service	Effective and appropriate engagement in programs from easier access to interpreters	Moderate, Ongoing
Other energy efficiency programs interstate in remote indigenous communities	Applicable measures from the success and learning of other programs	Minimal, Ongoing
Local Employment of Indigenous Workers in Remote Communities	Effective demand management programs from identified contact and local knowledge	Moderate, Mid-term-Ongoing



Image 8: A resident of Fregon outside her home.

Conclusion

'Power is good. The Anangu, we are still hearing stories and learning about power. We hear stories about saving power but my wife and I are basically living outside with the kids living inside' – Anangu resident interviewed by Bushlight

Electricity use in public housing in the RAES region is relatively high when compared to other homes in regional and remote South Australia. While a variety of socio-cultural and infrastructure-related factors contribute to high consumption levels in these homes, the absence of a pricing signal for electricity was found to be a critical factor when combined with a lack of energy consumption feedback to residents. As highlighted by the resident above, education and appropriate community engagement that recognises the cultural context will also have an ongoing role in contributing to effective demand management.

Energy use in Anangu public housing is but one piece of the total energy demand in the region. Implementing demand management strategies to public housing alone should result in a reduction in energy use. However, total energy use is likely to remain high in homes (Indigenous and non-Indigenous), community and government buildings across the APY lands. Community energy uses such as water pumping was not examined in this study, but may offer demand management opportunities. Implementing demand management strategies that target Anangu public housing should occur in conjunction with demand management aimed at other users across the region.

Implementing a comprehensive demand management program is a complex social policy issue, with further technical, cultural and coordination complexities. There are no obvious quick fixes or simple solutions. Additionally, managing expectations, different agendas and maintaining acceptable levels of accountability will be an ongoing challenge.

Accordingly, the implementation roadmap that Bushlight has put forward includes:

- A whole of government, cross agency, multi-disciplinary approach.
A true understanding of demand management and how to address it requires the perspective of multiple organisations and stakeholders. The package of measures identified in this report as a possible solution will require the involvement, commitment and coordination of multiple organisations and stakeholders to be delivered effectively.
- A sustained strategy and a long-term-focus
Successfully addressing demand management involves a range of coordinated and interrelated responses that require sustained effort and resources to make headway. Adopting innovative approaches may result in the occasional failure or need for policy change or adjustment in the light of experience about what works and what doesn't.
- An understanding of behavioural change
Behavioural change is central to demand management and influencing human behaviour can be very complex. Attempts to impose behavioural change are rarely successful. For example, the traditional policy tools such as legislation, penalties, regulations, taxes and subsidies that generally form a core part of strategies to achieve widespread, sustainable behavioural change may not be necessarily relevant in this context. Behaviours are more conducive to change if issues are widely understood, discussed and owned by the people whose behaviour is being targeted for change, and, importantly, there is a reason to change.
- Behavioural change can be facilitated or hindered by technology.
The uncertainty about the future of power card (debit) meters is a significant barrier to user pays proceeding successfully. Changes in behaviour to reduce power use will be minimal if residents are charged for power some months after the event. Pre-payment technology is a key enabler of behaviour change when used in conjunction with an In-Home Display providing real time feedback on consumption through an In-Home Display.

In pursuing a comprehensive demand management strategy, Bushlight is confident that adoption of the recommendations in this report, within the structure of an integrated implementation plan, will offer longer-term benefits to Government and residents of the RAES Indigenous communities.

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