A Review of the Alice Solar City Program

Professor Rolf Gerritsen, Dr Benxiang Zeng and Ms Rachel O'Leary

Charles Darwin University

(Alice Springs campus)

Preface

In 2011 the Alice Solar Cities and Charles Darwin University signed a Memorandum of Understanding to cooperate to advance research and implementation of solar and general energy conservation initiatives in the pursuit of reducing greenhouse gas emissions and increasing efficiency of electricity networks.

This review is in the spirit of that Memorandum. The CDU team is reviewing the operations of the Alice Solar City project with a view to assisting its stakeholders in renewable energy and sustainable livelihoods to plan for the future and to sustain what has been a very worthwhile initiative. We were requested by the ASC Consortium to examine some issues – the ASC's impact on tourism and its contribution to the profile of Alice Springs – that would not usually be part of a review such as this. Hopefully we have provided sufficient information in those two instances.

This review has been conducted iteratively with the ASC staff. Consequently they have responded/reacted to suggestions we have made during the process. So this review is a snapshot of an evolving enterprise, which may already be undertaking initiatives that we suggest here.

We should here acknowledge the assistance of the ASC staff in providing the data upon which this review rests. The ASC has a national reputation amongst its sister Solar Cities for the quality of its data processes; we have found this repute well-deserved.

The impending advent of carbon pricing makes the continuation of the work of the Alice Solar Cities project even more important than we show here it has been.

TABLE OF CONTENTS

Abbreviations used in the Review

ALEC	Arid Lands Environment Centre
ASC	Alice Solar City
ASTC	Alice Springs Town Council
CRT	Cost-reflective Tariffs (prices)
EEM	Energy Efficiency Measure
EFT	Effective Full-Time
GHG	Green House Gases
PTE models	Physical, Technical, Economic models
PV	Photovoltaic
PWC	Power & Water Corporation
SHW	Solar Hot Water

LIST OF FIGURES

EXECUTIVE SUMMARY

1.1: Introduction

Alice Solar City has officially been operating since March 2008. This review has concluded that the ASC project has been highly successful and exceeded nearly all its initial targets.

The six partners in the ASC Consortium have cooperated effectively and produced a good model of governance that has encouraged emulation elsewhere.

1.2: 2008 Proposed benefits

The ASC commenced with four aims: to increase the adoption of PV technologies; reduce electricity network loads; to trial cost-reflective electricity tariffs and to increase the adoption of energy-efficient measures. They designed a set of incentives, implemented via rebate vouchers (essentially a subsidy).

Apart from its own activities the ASC oversaw and supported other projects such as the Tangentyere Council's retro-fit of town camp houses. The so-called Iconic projects produced or saved large amounts of electricity and made a significant contribution to Greenhouse Gases (GHG) reduction. The cooperation ASC engendered was recognised by the Joint Defence Facility retro-fit of its housing.

The ASC has had a large and positive effect on the electricity system. It has had a measurable effect in reducing peak load demand on the electricity network, a substantial achievement in itself.

Participants in the ASC program have benefited by being assisted to either off-set their electricity consumption (eg through PV systems) or to reduce their electricity consumption. A large number of incentives were designed to help participating consumers to reduce their electricity demand. There is also evidence that participants have benefited in the accelerated "saleability" of their houses and possibly some capital gains.

The ASC has had a large impact on GHG reductions in Alice Springs. We estimate that facilities established with or through the ASC are now producing over 4,000 tonnes equivalent CO_2 savings each year.

1.3: Achievement against targets

The ASC has produced outcomes better than almost all its targets, often having to revise the original targets up-wards because take-up of its incentives exceeded expectations. The residential program has been a particular success.

1.4: Other outcomes

Over the past five or so years the ASC has made a substantial contribution to the Alice Springs economy. These contributions have been through direct capital inflows, value-added from the ASC's activities; indirect impacts from these factors and a positive re-distribution of resources to consumers, to the general benefit of the Alice Springs economy.

We have analysed the contribution of the ASC to the local tourism industry and concluded it had a minor but beneficial impact on tourism and hospitality enterprises.

We conclude that the impact of the ASC program has been equivalent to the injection of some $100 million into the Alice Springs economy over the past five years. This is a substantial return on the public investment in the ASC and its programs.

The ASC program has also led to some skills enhancement in the local workforce.

We present evidence that about 75% of ASC participants have reduced their energy use.

The ASC has tapped a strong cohort of customers who have become an "informed public" in favour of energy conservation and probably other forms of resource conservation.

The ASC has made a contribution to the community spirit and profile of Alice Springs. The ASC is a source of pride for many local residents.

1.5: Issues of design and implementation

We have commended the ASC's implementation systems, in particular the device of the Home Energy Audit as encouraging informed participation in energy conservation initiatives. The take-up rates from ASC incentive vouchers has been relatively good by national and international benchmarks.

1.6: The future of the ASC

We were asked to consider the future of the ASC once its Federal Government funding ceases. We considered new sources of finance (various types of loan schemes); a new agency/brokerage role for the ASC and new tactics in designing its reach.

We are optimistic that the Alice Solar City program has been such a success that the ASC Consortium partners will re-design it and enable it to continue to contribute to sustainable resource use in central Australia for many years to come.

1.1. INTRODUCTION

Alice Springs has an average of 9 hours per day, per annum, of sunlight (Grantham 2011: Table 1). Obviously this provides a significant opportunity for providing solar hot water and the photovoltaic generation of electricity, thereby reducing the community's fossil fuel-based energy consumption. However, this energy saving effect is countermanded because residential and commercial - ie office space/shops/etc - usage of electricity, such as for air conditioning to counteract the high temperatures in summer, is an important component of final electricity demand.

In any case Alice Springs has a legitimate interest in Energy Efficiency Measures (EEMs). So in 2005, when the Federal Government announced a Solar Cities Program, there was an enthusiastic response in the town. A consortium – led by the Alice Springs Town Council - was formed and prepared what turned out to be a successful business case (ASC 2006) for the town's inclusion in the program. In March 2008, with the signing of the Alice Springs Solar City Consortium Agreement the Alice Solar City officially launched operations (a project design team had been set up in the previous August).

There were originally seven consortium partners

- Alice Springs Town Council
- Northern Territory Government
- Power and Water Corporation
- Arid Lands Environment Centre
- Desert Knowledge CRC
- Tangentyere Council
- Chamber of Commerce

As the project developed the Desert Knowledge CRC (DK CRC) fell by the wayside (having reached the end of its funding cycle). But the other consortium members remained active and enthusiastic. The governance of the ASC was refined with experience. The Town Council, the PWC and the NT Government representatives organised the executive governance of the ASC and the Environment Centre, Chamber of Commerce and Tangentyere assumed an advisory role. A survey of all these organisations (except the DK CRC) indicated a uniform happiness with the governance operations of the ASC. The fact that the ASC consortium model of governance has been copied for the Alice Water Smart Program, provides evidence that the governance model was effective.

Background to this study

Historically attempts at improving energy efficiency were dominated by physical-technical-economic (PTE) models. These focused upon the relative cost/efficiency dividends of re-engineering buildings and implicitly assumed that all consumers had similar characteristics. Research following the oil crises of the 1970s revealed that – adjusted for factors such as dwelling characteristics and household composition - there was a wide variation in energy usage in the population (eg. Sonderegger 1978; Lutzenhiser et al 1992); in other words, that variation could not be satisfactorily explained by PTE models.

The ASC project has clearly moved beyond simple PTE models. It employs a mix of strategies. Some of its incentives effectively underwrite a *price* for renewable energy investment by its participants (this fits the description of most of the ASC's residential and commercial incentives) and allows the "market" to determine the quantity of up-take for renewable energy products. Other of its activities – such as the "Iconic" projects - target a *quantity* of renewable energy to be produced, in this case not by the "market" but by direct grants and investment, mostly by others (Haas et al 2004). In addition, the Household Energy Audits (HEAs) and the voluntary up-take of incentives vouchers reveal a central behavioural education element to the project. Indeed it ranks well against Californian programs widely regarded as best practice (Sullivan 2009). In effect the ASC has created a "demand-pull" program, as distinct from the "technology-push" programs resulting from PTE models (eg Taylor 2008). In this review we present some of the successes of the Alice Solar City and our explanations for these successes, which are largely in the realm of intelligent design of incentives and a capture of a (possibly partly pre-existing) propensity to energy and general conservation approaches to lifestyles.

One of the conclusions we have reached as a result of this review is that the Alice Solar City project has met all of the Commonwealth's rather elaborate selection criteria (Australian Government 2005, p.7) in the original Solar Cities Programme guidelines.

We present this review with some important caveats:

- There is an absence of the logical counter-factual; what if there had been no Alice Solar City program over the past four or so years? We may thereby presume a greater (or lesser) gain from ASC because of the absence of a comparator. So the data comes with a degree of uncertainty (Horowitz 2011). An alternative mechanism to the counter-factual – a comparison of the Alice Solar City with other Solar Cities – would be a task in itself because the six other Solar Cities are in locations and situations very different from Alice Springs and we have neither the time nor the resources to make these complicated comparisons. ASC did consider maintaining a detailed comparison with either Mt Isa or Kalgoorlie but dropped the idea because it was complicated and labour intensive.
- The outcomes of the ASC program cannot be accurately quantified in many instances. To take one example: that of replacing refrigerators with more energy efficient refrigerators. There is international evidence that, in such cases, the replacement is often larger than the original, thereby reducing the theoretical energy savings. In addition even the purely technical estimate of energy savings in this instance is

affected by other factors, such as what is the ambient temperature in which the new refrigerator is going to operate (eg Pratt & Miller 1998). So how much the new fridge owners use their airconditioner or heaters will marginally affect the efficiency of the appliance. So some of our estimates of the effects of the ASC project could be refined, though probably only at the margin. In any case domestic appliance replacement was only a very small element of the ASC program – 32 vouchers for replacement fridges and freezers of the 2,437 vouchers redeemed by February 2012 (we haven't counted energy efficient pool pumps or halogen light replacement, though similar caveats might apply to these – viz that energy savings leads to increased use, the so-called "rebound effect").

- We have made no attempt to quantify the transaction costs of the ASC project. At its crudest we could assume that this was the staffing and office costs of the ASC, about 10% of its outlays. But that does not remove the administrative component that went into the public education effects of the ASC and hence perhaps an increased up-take of its incentives program, which would thereby provide an offsetting element. The ASC's customers obtained benefit from the relationship, so any transaction costs must have been out-weighed by benefit to them. Given that a high proportion of households (about 20% of all households in Alice Springs) engaged with the ASC, transaction costs cannot have been a significant deterrent.

Ideally any estimate of the transaction costs would also include those imposed on suppliers and installers (from extra paperwork and some delay in securing payment of voucher entitlements). In interviews we asked suppliers and installers about that opportunity cost effect and almost universally it was belittled; it appeared that ASC was more prompt in payments than most of these businesses' other customers. Indeed ASC records indicate that some suppliers/installers took a considerable period to submit their rebate invoices. Since it was introduced by Coase (1960) and Demsetz (1969) the concept has continued to be difficult to quantify (McCann et al 2005), hence our reticence to estimate transaction costs here.

1.2. 2008 PROPOSED BENEFITS

The benefits we here consider were originally defined in the 2008 Consortium Commonwealth Funding Agreement (with reference to the original Detailed Business Case submission – ASC 2006) and subsequently modified in 2009.

The original – interacting - aims of the ASC Consortium were to:

- Increase the adoption of solar technologies, such as photovoltaic (PV) panels;
- Reduce electricity network loads, especially peak loads;
- Trial new cost-reflective tariffs/pricing (CRT) to encourage load-shifting (and thereby peak load reduction); and

- Increase the adoption of energy efficient measures (EEMs) and sustainable energy use behaviours.

To achieve these objectives the ASC Consortium designed a range of incentives. These incentives were implemented via vouchers given to consumers who registered with the ASC. These vouchers were issued to consumers who either proposed an EEM need, such as a Solar Hot Water (SHW) system, or had their needs identified by a Home Energy Audit carried out subsequent to their registration.

These incentives related to the aims; viz

- Solar technologies – SHW or rooftop PV systems, designed primarily to reduce base load (SHW) or summer peak loads (PV);
- Load-shifting – in particular via CRT;
- Structural EEMs – these vouchers involved incentives to improve general energy efficiency, in particular in relation to households' passive heating characteristics. This category covered items such as painting the roof with reflective paint; installation of roof insulation, window and wall shading or window tinting and double glazing[2]. Other EEMs addressed appliance energy efficiency, such as light bulb, refrigerator and pool pump replacements.
- Sustainable energy use behaviour; for example "single-shot" hot water booster systems as well as a 10:10/20:20 savings offer for electricity reductions beyond set targets.

It should be noted that the ASC was primarily funded by the Federal Government; so the rebate element was the starting point, not that we have any evidence of the Consortium partners seriously questioning whether that option was superior to a loans-based system. In any case the ASC program had a mixture: the Iconic projects were mostly funded directly by the Federal Government and part-funded by the ASC's RRPGP funding. The Tangentyere project was designed and delivered by the Tangentyere Council with rebates provided to the Council out of the ASC's RRPGP funding, while the ASC delivered the rebate alternative directly to residential and commercial customers.

Particular projects: Tangentyere, JDF base, iconic and hospital

Apart from projects that the ASC administered directly, it also brokered several other projects, for the Joint Defence Facility base, the hospital and the five "iconic projects". The hospital project, to install an energy monitoring system, was complicated by the simultaneous construction of a new emergency wing and the installation of a co-generation plant. We review the iconic projects (see Figure 1.4.2 below) under our assessment of the economic impacts of the ASC project. Here it is sufficient to say that four of the planned iconic projects have been implemented and one (Araluen) will be implemented in the near future. The Joint Defence Facility project used mainly JDF funds to provide energy retro-fits to JDF-owned

[2] A comprehensive list of the incentives available to registrant households is available at the ASC website http://www.alicesolarcity.com.au/residents/incentives

residences in Alice Springs. Amongst other things it was an indicator of good-will to the ASC project.

Tangentyere Project

The Tangentyere project implemented energy efficiency retrofits to 60 houses in Alice Springs town camps. It had a heavy emphasis on energy education. The process was tailored to the situation in the town camps, so the one-shot hot water boosters and appliance timers proved both practical and popular. There were some culturally-inspired misfits; for example the panel heaters installed were not popular, as the Aboriginal residents of the camps were accustomed to a more direct and intense personal space heating source. These lessons have been recorded (Tangentyere Project 2011) and will be useful if the ASC evolves a low-income household set of activities in the future.

The town camp project was conducted by the Tangentyere Council and evaluated by the Centre for Applied Technology. It was completed in June 2011 and the subsequent evaluation (Tangentyere Project 2011) indicated that it had been a success.

The Tangentyere and the other projects were in effect treated as singular exercises. The role of the ASC was as a broker and adviser. Perhaps this portended the future role for the ASC that we advance in Section 1.6 below).

Impact on the electricity system

Subsidies for Photovoltaic installations were introduced nationally by the Federal Government in 2000. They lowered wholesale electricity prices but have also attracted some criticism for inefficiency and inequity (for a summary of such arguments, see MacIntosh & Wilkinson 2011). The Australian National Audit Office claimed that in 2007 the cost per tonne CO_2 -equivalent of Greenhouse Gas (GH G) abatement was about $447 (ANOA 2010). The Audit Office also claimed that PV systems provided less than 0.2% of installed electricity capacity.

The ASC incentives system has provided better results than these national figures. When the ASC commenced in March 2008 it could only identify two rooftop grid-connected PV systems in Alice, while there were then about 5,500 in Australia (Key Results: Residential PV: 2). As can be seen from Figure 1.3.1 below, the actual achievement of PV installations is over twice the original ASC target. This is not entirely surprising; in the initial years the "feed-in" tariff offered to participants greatly exceeds the standard PWC tariff. (until that ends on June 30, 2013). The results were dramatic and between early 2008 and June 2010, nearly 552 tonnes of CO_2 equivalent savings were made from the installation of ASC registrants' PV units (Key Results: Residential PV: Data Summary).

Between the 1st of July 2010 and the 30th June 2011 data for the 233 ASC-sponsored residential PV systems indicates that they generated 704,898 kWh, a very high proportion of their theoretical capacity.

Figure 1.2.1 Theoretical and actual outputs of residential PV systems

Total Installed Capacity (with data available) - 445.6 kW	**Annual Output**	**Annual kWhs Generated per kW Installed**
Theoretical Optimum Annual Generation (**ORER**)	722,747 kWh/yr	1622 kWh/kW/yr
Theoretical Annual Generation with Estimated Shading Losses (ORER)	680,700 kWh/yr	1528 kWh/kW/yr
Theoretical Optimum Annual Generation (**SD**)	762,711 kWh/yr	1712 kWh/kW/yr
Theoretical Annual Generation with Estimated Shading Losses (SD)	718,526 kWh/yr	1613 kWh/kW/yr
Measured PV Generation (July 2010-June 2011) – 446kW	**704,898 kWh/yr**	**1582 kWh/kW/yr**

(Source: Key Results: Residential PV, 2011: 9)

Benefit to participants

Participants in energy efficiency activities may have non-energy motives for making improvements. One example is the rapid spread of the microwave oven; the attraction of its convenience probably outweighed its energy savings (Mills & Rosenfield 1996). These non-energy motives are just one element of several that complicate the calculation of energy efficiency and saving calculations (eg. See Reichl & Kollman 2011). One problem in securing energy savings in households is the persistence of habits (de Vries et al 2011). Another, from a Melbourne survey (Newton and Meyer 2010), is the contextual situation (eg how many people in the house, where is it located, etc).

From the evaluator's perspective the principal benefit to participants in the ASC were obviously economic. This benefit was primarily a reduction of the discount rate on their future consumption, as delivered by the rebates and, more obviously, through lower electricity bills. Secondary benefits were raised comfort levels from more energy efficient households. But the benefits were also psychological – the altruism of reducing Alice Springs' carbon footprint in the face of climate change. The full array of incentives and responses is given in Appendix 1, Section 1.2. Some, such as swimming pool blankets are mainly a water conservation measure (although they do allow for diminished use of water pumps) and attest more to a general pro-conservation ethos that we attribute here to the "informed public".

So for the "informed public" (people who are interested in energy conservation in particular and general conservation issues/behaviours), the ASC provided big benefits. The evidence shows that this informed public (as represented by registrants with the ASC) were reasonably well-informed about energy conservation issues (cf Appendix 1: Table 1.4.1). Given their socio-economic characteristics (Section 1.4 below), they were in a position to use the ASC program to implement EEMs that delivered both economic and psychological benefits such as a feeling of contributing to resource sustainability and social value.

The Capital Gain Factor

Most analysis of EEMs programs indicates that the participants in such programs assume that EEMs - in particular PV units and Solar Hot Water Systems - add capital value to their homes/properties and that this is an important determinant in participation in renewable energy programs (eg. Tonn & Berry 1986). We assumed that was true for Alice Springs but decided to test the assumption by interviewing local real estate agents. We interviewed five agents (we think this is about 15 per cent of EFT real estate agents in Alice Springs). We used the existence on a property of a PV system as the indicator of capital gains. Only two of the agents said that they added the capital value of the PV system to the house price (one quoted a $5,000 addition, the other a $10,000 addition to the house price). Significantly both these agents had installed a PV system on their own dwelling. But all the agents questioned said that the presence of visible renewable energy infrastructure on the house (especially PV systems and SHW systems) were an increasingly important factor in marketing. Almost without qualification they said that buyers were now "looking for" (ie expecting?) such features. The existence of these systems quickened house sales (which for the seller is an opportunity cost capital gain, if not an easily observable one!). The fact that new buyers are increasingly looking for renewable energy apparatus on houses may indirectly attest, at least to some degree, to the success of the ASC's educational-cum-social responsibility initiatives. That is because the new buyer is not capturing the capital gain of the EEM feature on the house they purchase.

We considered this capital gain element at some length because the ASC secured a very impressive up-take on its solar PV incentives (see Section 1.3 below). These were accompanied by an advantageous "feed-in" tariff which has been criticised by economists as being a form of regressive taxation (Nelson et al 2011). We simply note that feature of the program was the result of a Federal Government policy and not intrinsic to the design of the ASC incentives.

Another of the caveats we would attach to the benefit to participants category is that the participants - the Tangentyere project aside – are disproportionately a particular category of the population of Alice Springs. We discuss this point below.

Impact on GHG emissions

Whilst this was a background element of the ASC project, it was a spin-off and one that will become more important soon as carbon pricing begins. The main contributors to the GHG emission reductions were the iconic projects, residential PV panels and SHW systems and larger commercial energy efficiency projects, but other energy-saving EEMs also contributed.

It is not possible, with present data to calculate precisely the total GHG reductions resulting from the ASC project but Figure 1.2.2 below gives some indication of the potential from selected EEMs (cf. Appendix 1: table 1.2.2 for more detail).

Figure 1.2.2: Energy savings from selected EEMs

EEM	Est. Annual Savings	
	(kWh/year)	CO_2 equivalent (Kgs)
Paint roof white	200	138
Replace high energy lights (with energy efficient lights)	400	276
Install one-shot booster for hot water	400	276
Service evaporative air conditioner	150	103

(Source Key Results: Residential Overview 2012)

Clearly relatively simple EEMs can produce large electricity savings and consequent GHG reductions. Implementing the measures illustrated above can reduce an average household's electricity consumption by about 12 per cent. Servicing an ageing SHW system could reduce electricity consumption by a further 8%.

The ASC's own calculations estimate that, for the FY 2010/11 their residential PV program alone produced 479.331 tonnes/year of GHG reduction. Over (the data does not include solar heat pumps) seventy eight tonnes of that saving was produced by the ASC's Solar Hot Water initiative (Key Results: Residential Solar Hot Water 2012: 4).

We consider below the question of the degree of carbon dioxide emissions reduction that can be attributed to the ASC project. In Figure 1.2.3. below, we produce some estimates of the carbon dioxide savings from some of the more visible ASC programs.

Figure 1.2.3: Estimates of some carbon dioxide savings created by the ASC project

	Carbon Dioxide Savings (tonnes per annum)
Commercial Program	
(Ref. Appendix 1: Table 1.3.4)	423.9
Residential *(Ref. Key Results Reporting, 2011, passim)*	
Solar Hot Water systems (2010 data)	246.6
Residential PV systems (Feb 2012)	516.5
Cost-Reflective Trial	no data
Residential EEMs	353.7
Iconic Projects	
Crowne Plaza	420
A/S Airport	470
Uterne Solar Power Station	1,540
A/S Aquatic Centre	350
Araluen Cultural Precinct	211
TOTAL	4,320.7 tonnes pa

Some of these figures (eg SHW) are based upon data that has not been updated or needs data that has yet to be collated. Nevertheless, it seems that, even without the iconic projects, the ASC is now (notionally including Araluen, which is not completed) delivering CO_2 equivalent savings of over 4,300 tonnes per annum.

1.3. ASC ACHIEVEMENT AGAINST TARGETS

It is generally accepted (eg see Fuller 2008) that there are difficulties to be overcome in implementing solar/renewable energy initiatives. For the provider of the program these are uncertainty of savings, which can deviate from those projected and call the efficiency of the program into question. An additional problem is split incentives between property owners and lessees, which can reduce take-up rates. For the potential participants there are issues of possessing the initial investment (in the case of rebate or grant programs, though not for loan-based programs) and a lack of the information needed to make rational decisions. Transaction costs can also be a bar to participation, although usually only when the participant's intent is weak.

Generally the design of the ASC program successfully overcame these barriers, for reasons we will discuss (Section 1.5 below). Consequently the ASC met almost all of its up-graded targets, some by substantial margins. In the following section we detail these achievements below, using the benchmark of the 2008 Consortium Agreement, which was the basis for the operations of the ASC.

Figure 1.3.1: ASC Achievements Against Targets: Residential Program

Residential Program	**Original Target**	**Revised 2009**	**Cumulative Feb. 2012**
HEA	1,500	2,250	2,478
Vouchers used	850	1,750	2,877
Domestic PV (Capacity)	300kW a	360kWa	532.5kWa (277 systems)
Domestic SHW units	1,000	1,000	700
10:10/20:20 claims	1,300	350	394
Smart meter rollout	na	350	379

(Ref. Appendix 1, Section 1.3)

The commercial program was slightly less effective, in part because Alice Springs businesses generally operate air-conditioned facilities during weekday peak hours. Alice Springs is essentially a service centre and it does not have industrial scale producers. So electricity "load-shifting" to off-peak is not really a significant option. Businesses in Alice Springs generally face time pressures because of staff shortages; with electricity costs usually representing less than 2 per cent, motivation to invest in improving energy efficiency must come from either additional benefits (green marketing) or personal commitment on the part of the proprietor.

Figure 1.3.2: ASC Achievements Against Targets: Commercial program

Performance indicator	**Target**	**Actual Result**
Major energy audits	3	5
Major energy projects	8	6
Commercial PV systems	20	39
SME Audits	75	163
SME energy projects (completed)	20	34
Smart meter rollout	4	0
	(Ref Appendix 1, Section 2.3)	

Some of these targets have been defined down. For instance the major energy audits target was originally 15. This initiative has had some problems encouraging firms to invest in these energy audits. In part this reflects the branch office structure of some larger businesses/franchises (eg the large supermarkets), where investment decisions are not made in Alice Springs. In part this is because there are few locally owned and controlled businesses in town that could invest $5,000 in an energy audit and expect some return through lower electricity bills.

Photovoltaic(PV) System Installations

With the commissioning of the Uterne PV array in July 2011 the solar capacity in Alice Springs rose dramatically. The PV power penetration measure at midday on a sunny winter days is now about 8% and over a full year it will supply about 2.5% of annual load (Hancock 2011: 24). This is well above the national level, though this can be partly attributed to a significant element - about 40 % (ref. Hancock 2011: 2) - of non-ASC residential PV systems in the town.

One point to note is that, while the ASC has provided only about 60% of the residential PV systems in Alice Springs (Hancock 2011: 2), it has sponsored 89.7% (35 of 39) of the

commercial systems. This somewhat qualifies our comment about the ASC's commercial program being less successful than its residential program.

In some other parts of Australia the provision of PV inputs have been greater, but mainly because utilities have invested heavily in them. For example, in south-east Queensland PV inputs reportedly can provide over 80% of the midday demand (Nelson et al 2011: fig.4).

Solar Hot Water System Installations

In 2009, although the take-up of SHW systems was tracking below the 1,000 target, the ASC decided to maintain that target because hot water is such an important user of energy (Key Results: Residential Hot Water, 2012: 2). Since mid-2009 the number of ASC-sponsored SHW systems has risen from 183 to 620 at June 2011 (Key Results: Residential Solar Hot Water, 2012: 4). This aspect of the ASC program has also produced considerable GHG savings, cumulatively over 1,000 tonnes since Jan-June 2008 (Key Results: Residential Hot Water 2012: 4).

Summary: ASC effect on carbon dioxide emissions

The Alice Solar City project has greatly exceeded its original ambitions for reductions in electricity consumption and hence CO_2 emissions. If we compare the 2006 Business Case projections with our estimates from 2011/12 we can see a huge improvement (by a factor of over 20) over the initial estimates.

In Figure 1.2.3 above we have used a CO_2 saving per kWh/year ratio of 0.69 tonnes of CO_2 per kWh/year. The official Australian standard is 0.67 and the NT's standard is 0.68 (Australian Government 2011). We believe (and the PWC agrees) that the central Australian conversion rate should be fractionally higher than for the Territory as a whole because there are more sunny days/pa. in the centre than in the tropical north. Otherwise our estimates are conservative.

We reiterate that our estimates are just that: estimates. We did not have access to detailed survey material but used the Key Results reporting documents (Key Results Reporting 2011). In addition we have not included EEMs installed by non-participants in the ASC incentives scheme. We are aware that the ASC had a strong demonstration effect (one of the authors of this review installed a PV system through becoming aware of the ASC scheme). The PV systems element attracted new entrants into the Alice Springs market, but we have not attempted to include this in our calculations.

We have illustrated in the Appendix (Appendix 1: Figure 1.3.4. – for the ASC's commercial program -some of the factors that can effect electricity use, even after EEMs have been installed. These complicate any truly accurate calculation of the effect of the commercial program on electricity usage and hence – in the absence of detailed PWC survey of customers – we are forced to develop our own estimates. We have applied a similar reasoning to the residential program. Electricity savings after EEMs can vary according to house size, the composition and number of residents (eg houses with children or older people use more space

heating and cooling). For example, households using a SWH electric booster via switchboard can use 400 kWh/year, with conservative use, or 700 kWh/year with careless use.

Nonetheless we are confident that our estimate of 25,000 tonnes per annum of carbon dioxide savings equivalent is realistic.

1.4. OTHER OUTCOMES

Here we concentrate upon four outcomes from the ASC: its contribution to the Alice Springs economy; its impact on energy awareness; its contribution to the community spirit and profile of Alice Springs and its interaction with a broader conservation ethos within the town.

Impact on the Alice economy

Conventional microeconomics would suggest that a subsidy would increase the supply of the item subsidised. We show below that such supply increases is definitely one of the consequences of the Alice Solar City program.

Public choice economics would suggest that a subsidy might lead to the capture of the real benefit by the provider, rather than the customer. Some empirical studies bear out this point: that the installer or the retailer has captured some of the direct benefit of the subsidy (Wiser et al, 2007). We doubt that this has happened in the ASC case (the point has some importance to our recommendations for the future of the ASC, discussed in Section 1.6 below). In any case it is difficult to estimate this effect because during the period in which the ASC has operated the Australian dollar appreciated by over 25% against the US dollar and increasing economies of scale (plus the entry into the market of China) dramatically reduced the cost of solar panels. At the same time installation costs have risen, but not above the rate of the CPI.

We checked ten installation invoices from one SHW installer over a period of three years and the cost of installation increased by about 80% of the CPI over that period. That may reflect our observations elsewhere here that the volume of work created by the ASC program led to productivity rises that meant that profitability increased, thereby reducing the real (inflation-adjusted) costs of installation.

There is a caveat to be made here. We can estimate different impacts of a renewable energy program. Some of these estimates (ie direct economic impacts) can be made with a degree of confidence. Others cannot and require some assumptions, such as the application of multipliers to calculate effects.

This uncertainty is not unusual but a common feature of estimating the impact of renewable energy programs (eg Annecke 2008).

We discuss the economic impacts of the ASC under four headings:

- Direct investment from governments, consortium members, project partners and customers;
- Direct contribution to the value added to economic activities, such as tourism development;
- Indirect impacts from the direct investment and contribution; and
- Economic impacts on the re-distribution of financial resources in the region, such as money savings for energy use.

The data used here was provided by the ASC program, expect for some cited from other sources as indicated. We have differentiated the areas of direct expenditure associated with the ASC from the areas of indirect expenditure caused by expenditure on ASC-associated activities.

Direct expenditure:

There are four sources of direct expenditure: monies provided to the ASC; expenditure by users of ASC vouchers; expenditure on iconic projects and spend through that element of tourism attributable to the "Solar City" label.

1. Direct expenditure through the ASC account

The major direct economic contribution to the ASC program is the financial investment injected by the NT and Federal governments, with smaller contributions from ASC consortium members.

Since 2008, the ASC program has received around $14.584 million to date (by the end of 11/12 financial year). Some money has been spent on incentives (in total $5.861 million by 30 April 2012) through incentives for local households and businesses to apply solar and EEM technologies. Other expenditure includes on marketing and promotion events, consultancy, staff salaries, administrative expenditures and other operational expenditures.

2. Direct expenditure by customers via incentives paid by the ASC

Up to April 2012, a total of $5.861 million in financial incentives was provided to the ASC's customers including residential and business customers. The total expenditure associated with the incentives was $15.716 million (Figure 1.4.1 below). It is calculated that $9.855 million was spent by customers using the incentive vouchers.

Figure 1.4.1: ASC incentive payments and extra spending by customers associated with the Incentive Program (Date Range: 10/03/2008 to 30/04/2012 Inclusive)

Customer type	ASC Incentive Value implemented $ (V1)	Invoices Total Amount $ (V2)	V2/V1
Households	$4,432,318	$12,229,707	2.76
Businesses	$1,428,961	$3,486,142	2.44
Total	$5,861,279	$15,715,849	2.68

3. Direct funding invested through iconic project partners

There have been several iconic projects implemented under the ASC but separately funded from other sources. The total funding for iconic projects was $12.164 million, with 50% of it funded by RRPGP and the rest by the project partners (Table 1.4.2).

Figure 1.4.2: Total investment in Iconic projects

Project name	RRPGP investment ($)	Project partner's contribution ($)	Total investment ($)
Crowne Plaza	1,500,000	1,500,000	3,000,000
Illparpa (Uterne)	3,300,000	3,300,000	6,600,000
AS Airport	1,132,000	1,132,000	2,264,000
AS Aquatic Centre	150,000	150,000	300,000
All iconic projects	6,082,000	6,082,000	12,164,000

We have not included the Araluen project in this calculation as it is just beginning.

4. Direct economic contribution through tourism

Our survey of tourists revealed that the ASC program was not central to tourists' decision to visit Alice Springs, nor a substantial determinant of their length of stay or expenditure. This suggests that currently the ASC is a minimal contributor to the town's tourism economy (cf. Appendix 2). However, the ASC program has brought in some business travellers, such as conferences and events participants who visited Alice Springs to attend ASC activities. Since 2008, totally around 700 interstate visitors have visited Alice Springs to attend the ATRAA conference, the Solar Cities Forum and to participate in project launches and to

inspect ASC programs. It is estimated that they have stayed for 2,724 visitor nights in total, and consequently spent around $498,000 in Alice Springs (Figure 1.4.3).

Figure 1.4.3: Conferences and events related to the ASC program

Name of conference	Date	Number of delegates	Number of interstate delegates	Average time spent in AS (nights)	Total number of tourist nights	Total spend ($) Estimate
ATRAA Conference 2010	2010	700	630	4	2520	461,160
Solar Cities Forum 2011	2011	45	30	3	90	16,470
Annual visit by solar cities representatives	2008-2012	n/a	3	2	24	4,392
Launch of Crowne Plaza iconic project	2009	n/a	10	3	30	5,490
Launch of Uterne iconic project	2011	n/a	10	3	30	5,490
Launch of Airport iconic project	2010	n/a	10	3	30	5,490
TOTAL					2724	**498,492**

Although we cannot fully attribute the 2010 ATRAA (Appropriate Technology Retailers Association of Australia) Conference to the ASC program, it seems reasonable to say that the ASC program was critical to bringing the ATRAA conference to Alice Springs. So here we consider the economic impact of the conference as a direct economic impact of the ASC program.
The economic impact of these conferences and events would also include other spending by organizers, which has not been included in the analysis due to lack of such information.
This suggests that direct economic impact of ASC on local tourism (business tourism sector) has been estimated at a minimum of $500,000, with the possibility of a higher by 20% spend.

Indirect impacts:

The indirect economic impacts of the ASC are estimated from the direct economic contribution from governments, consortium members, project partners, customers and travellers related to ASC.

It is very difficult to calculate the total indirect economic impacts from the ASC because of a paucity of information. We decided to simply estimate indirect expenditure by applying an economic multiplier. There is no multiplier available for Alice Springs, so we applied a

multiplier derived by Stoeckl, *et al* (2007). Considering the industry structure in Alice Springs, we used a multiplier of 1.88 that was calculated by Stoeckl, *et al* (2007) for the "Retail" industry in the regional economy in Australia's Tropical Savannas. Given that Alice Springs is primarily a services centre, this choice of multiplier is appropriate. Therefore, the total indirect economic impact generated from the above direct investment and expenditure (i.e. the total direct impact is $49.265 million) is estimated $ million [$49.265 million* (1.88-1) = $43.353 million] (Figure 1.4.4. below).

Figure 1.4.4: Total economic impact of ASC in Alice Springs

Economic impacts	Value ($ million)	Notes
Direct expenditure through ASC account	14.584	
Direct expenditure by customers associated with incentives	9.855	
Direct investment in iconic projects	12.164	
Direct expenditure by ASC business travelers	0.498	
Total direct investment and expenditure	49.265	
Total indirect economic impact	43.353	Multiplier is 1.88
Total economic impact	92.618	Multiplier is 1.88

Thus, it is estimated that total economic impacts from ASC would be $92.618 million. However, as discussed below, this amount could be read as the minimum of the economic impacts of ASC on local economy, given some other economic impacts have not been included in this calculation. For instance, the Araluen iconic project alone would take the total figure to over $100 million.

Calculating the total economic impact of the ASC is complex. For instance, we conducted an informal survey of 20 of the 26 largest installers of EEMs (we excluded the large chain retailers, who mainly sold energy efficient light bulbs, pool blankets and appliances). We expected that some of them would have added staff in response to the increased demand stimulated by the ASC voucher scheme. However, the majority said that they didn't need to because, as their experience increased, their workers installed the EEMs more quickly. This increased workforce productivity was not factored into our indirect impacts of the ASC program. But the Alice Springs economy operates with skilled labour shortages, so this increased labour productivity is a valuable asset. The ASC incentives project led to a degree of specialisation (and hence higher productivity) in the economy; this effect was noteworthy and special. In that sense, of encouraging specialisation and up-grading skills, the ASC has replicated effects noticed elsewhere, such as in the United States (Friedman et al 2011).

We will digress slightly around this point because it is of some significance. The larger "markets" for ASC vouchers saw a degree of economic concentration (specialisation) among suppliers and installers. We illustrate this in Figure 1.4.5. here:

Figure 1.4.5: Degree of market concentration for selected major up-take EEMs

Service	No of major Suppliers/Installers	Their services (Number)	Total Services in category
Pool Blankets	2	200	214
Solar Hot Water	7	384	707
External Shading	2	144	152
Roof Painting	2	132	174
Service Evap. Coolers	4	257	372
Service SHW heaters	1	53	152
Totals	*16*	*1,170*	*1,771*

These figures represent a considerable commitment to the ASC voucher market by some firms in Alice Springs. We will return to this point in Section 1.6 below, because it has significance for the future of the ASC.

In addition to the productivity gains, we have not factored in direct consumer savings in electricity costs because (theoretically) this would be equalled by an income loss by the PWC. However, consumers and an electricity corporation have different utilities/expenditure patterns, so it is likely that the consumers' increased discretionary expenditure would have a positive net effect on the Alice Springs economy, outweighing the loss to the PWC.

Similarly, we did not factor in the value of all the Greenhouse Gases saved by the ASC's EEMs. That awaits the impending imposition of a market price on carbon. So the environmental gains/savings of the ASC have not been included in our calculations of indirect benefits of the project. This would be an interesting exercise. During the four years the ASC has been operating the price of PV panels and Solar Hot Water systems has declined dramatically, both for reasons of economies of scale for producers and because of the appreciation of the Australian dollar. So the ASC has allowed much greater savings of GHGs than would have occurred without its incentives interacting positively with declining costs.

Other indirect economic impacts could include the value of the "brand" of the Solar City. There has been a small but positive contribution of ASC to the brand value of Alice Springs, either as a small desert town or an attractive tourist destination. This can be seen in our comments (see below) on the contribution by the ASC to Alice Springs' profile. To further

tease this out an internet search we conducted found that, by searching google.com using "Alice Springs", about 28,100,000 results were displayed. When searching "Alice Springs solar city", about 108,000 results returned (searched on 17 May 2012). "Alice Springs 'solar city'" was searched, about 11,600 results returned. This suggested that solar city program has contributed to 0.04% (11,600 out of 28,100,000) to 0.4% (108,000 out of 28,100,000) of Alice Springs's internet exposure.

Tourism

Based on the tourist survey recently conducted by CDU (cf Appendix 2), most visitors to Alice Springs had a positive response to the ASC program and the promotion of solar technology and cleaner/greener energy lifestyle in the town. The average visitor to Alice Springs is on holidays (76%) and only in the town a short period of time (an average of 2.3 nights). While the visibility of solar energy is high (72%), awareness of the Alice Solar Cities Program is moderate (53%). Personal interest in solar technology/renewable energy is also medium to high. Visitors are generally supportive of the idea of promoting Alice Springs as a solar city. Anecdotally, there seemed to be a preference for promoting the sunny weather/number of cloud free days above the solar cities program. However, this could be read as another indirect positive impact of the ASC program on tourist recognition of solar related marketing strategy.

Based on information provided by the local business tourism sector, the Northern Territory Conventions Bureau is currently marketing Alice Springs as a potential destination for conferences to five different business sectors; desert knowledge, renewable energy, oil and gas, health care and mineral development. The Leadership in Renewable Energy fact sheet promotes the work of the Alice Springs Solar Cities program as well as the Desert Knowledge Australia Solar Centre and the Centre for Appropriate Technology's Bushlight Program (cf Appendix 2). The generally positive outside perception of the ASC project could possibly be better capitalised upon with more assertive marketing, in particular with the hospitality sector.

Generally the ASC has had a strong and positive effect on the Alice Springs economy. Apart from the (measurable) direct and (less confidently measurable) indirect benefits of the ASC it has contributed to the Alice Springs economy in two ways – increased productivity and increased diversification – that are important factors in shaping resilience to future economic/climate change/etc challenges.

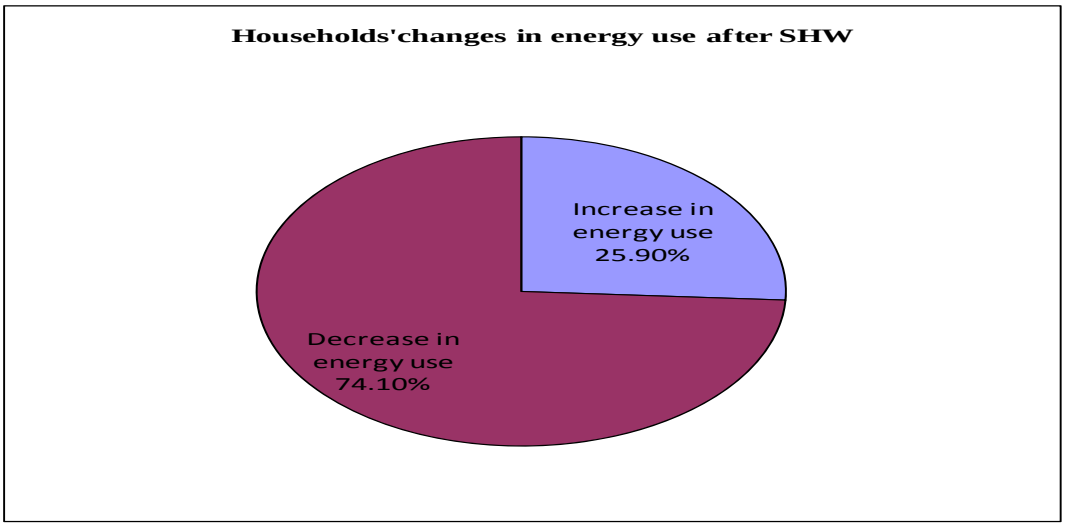
Impact on energy awareness and use

This is difficult to estimate because there are issues that are disputed, if not subject to differing analyses in this area. There has long been a dispute between the relative influences of "attitude" (ie conservation-mindedness) and "situation" - a particular spur to action, such as the existence of incentives or a particular energy "crisis" (Stern 1992).

Table 1.4.1 in Appendix 1 (taken from data from the ASC Registration Survey) reveals that ASC registrants generally had a reasonable initial knowledge of energy efficiency issues. The HEA would have improved that, so the impact on energy awareness of the ASC program would have been high, even if coming off a relatively high base.

There is data for the 700 or so households that installed Solar Hot Water systems. This is important, with about three quarters of households reducing their subsequent energy consumption, as Figure 1.4.6. indicates:

Figure 1.4.6: Energy use of post-SHW households



This figure is significant (see also Appendix 1: Tables 1.3.2 and 1.3.3 for data). One of the problems of limiting energy consumption is that increased energy use is sometimes correlated with higher incomes (Roberts 2008; Abrahamse & Steg 2008). Higher income households may have more appliances, notwithstanding that these may be energy-efficient (for a summary of this literature, see Grantham 2011).

A survey of ASC participants who signed up to Cost-Reflective-Tariffs (CRTs) showed that they substantially modified their behaviour (Key Results: Cost-Reflective Tariffs, 2012: 11).

Some of the features of this adjustment to behaviour is tabulated in Figure 1.4.7. below.

Figure 1.4.7: Reported household electricity consumption change

Moved washing machine/dryer to off-peak	11.5%
Moved other appliances to off-peak	13.9%
Turn off standby appliances	13.1%
Moved pool pump to off-peak	5.7%
Install energy efficient lighting	10.7%

(Source: Key Results: Cost-Reflective Pricing Trial, 2012: 11)

Whether or not this voluntary (self-reporting) response is an accurate indicator of behaviour, it is an indicator of intent that reveals that the ASC has had a strong impact upon the energy awareness of its participants.

ASC Participants

One of the caveats we would attach to the benefit to participants category is that the participants - the Tangentyere project aside – are a particular category of the population of Alice Springs. For a start their household incomes are higher, as indicated in Table 1.4.7 below:

Figure 1.4.8: Total household income, ASC participants versus Alice Springs LGA[3]

Annual household income	ASC %	A/S LGA
Below $50,000	12.80	30.81
Above $50,000	83.27	55.49
Above $100,000	39 (approx.)	20 (approx.)

(Source: Grantham 2011, Fig.1)

If we look at the ASC analysis of the age structure of ASC participant households, we discover a higher proportion of children and persons in the 35-64 year age groups (Grantham 2011: Figure 2). This implies family households. There is also a much higher (53%) versus 12%) of ASC participating households with someone with a tertiary education qualification than in Alice Springs households generally (which generally feeds into higher incomes in the household).

ASC participants' dwelling patterns are also different from the general population of Alice Springs, as Table 1.4.8 next indicates:

Figure 1.4.9: Household dwelling type, ASC participants versus Alice Springs LGA

Dwelling type	ASC %	A/S LGA %
Unit/flat	8.24	10.36
Detached house	83.14	69.59
Semi-detached house	2.41	19.99

(Source: Grantham 2011: Table 3)

[3] The figures used here and in the subsequent table for the Alice Springs LGA are based on the 2006 Census.

This data suggests that the median participant in the ASC program is a family of adults and children, with probably two incomes, living in a detached dwelling. The countervailing median non-ASC participating household is likely to be renting, be comprised of young adults 18-34 years old and to have lower household incomes. These phenomena are possibly a result of the rebate system applied by the ASC. All things being equal, younger persons, unencumbered by families are likely to have a lower discount rate (ie they devalue the future) than persons with families. A loan scheme (discussed below at Section 1.6) could more effectively target lower income households (though at the disadvantage of lower take-up rates than the current rebate system).

Contribution to community spirit and profile of Alice

We were asked to consider whether the ASC has contributed to the community spirit and profile of Alice Springs.

We can fairly confidently answer in the affirmative in the former case; there is little doubt that the ASC has contributed positively to the community spirit of the town. In part that is reflected in the number of households that have participated in one way or another in the ASC's programs (roughly about 20 per cent of the total number of households). It is also reflected in the contribution (discussed below) that the ASC has made in Alice Springs to an emerging informed public interested in general conservation and sustainability issues.

There is a possibility that this community spirit might be overly concentrated in a particular section of the population, but that assumes that there are no spill-overs of knowledge and a "community vision" to the broader community.

Whether the ASC has contributed to the public profile of Alice Springs is a more moot question and more difficult to determine. Here we used media mentions (dervived from data supplied by Media Monitors) of the ASC as an exemplar of its contribution to the profile of the town. It is clear from Figure 1.4.6. below that the ASC has received extensive media coverage, on average consistently on over four occasions each week for several years. The coverage has been almost unanimously positive.

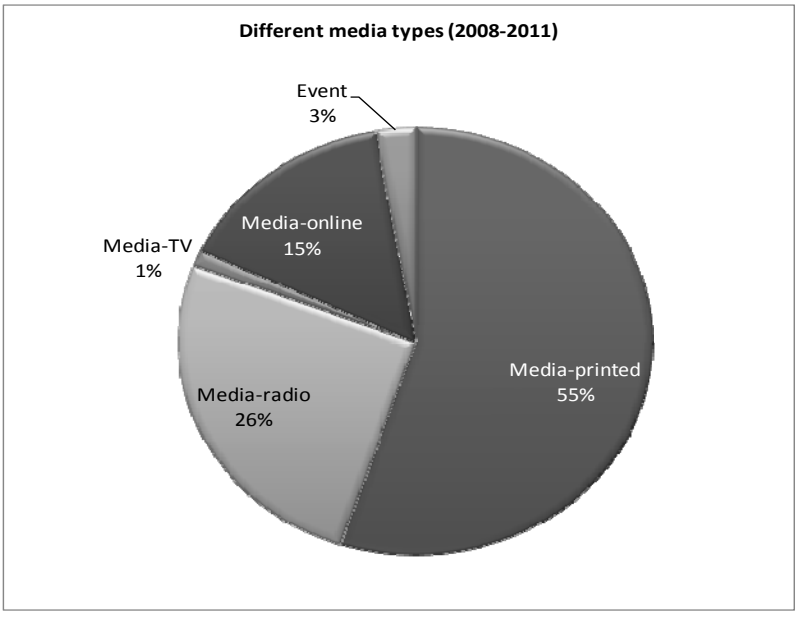
So we can assume that the ASC has contributed to the profile of Alice Springs. Nevertheless the coverage has been strongly biased towards the local and Territory media; there has been minor national coverage and international coverage has been minimal. This is reflected in our survey of tourist opinions about the ASC (see Appendix 2). From these two sources we can conclude that the ASC has strong local and Territory support, somewhat less of a profile at the national level and very little profile at the international level.

Figure 1.4.10: Media coverage associated with Alice Springs Solar City Program (Jan. 2005-Sept. 2011) by year

	2008	2009	2010	2011*	Total (2008-2011)
Total number of records	225	226	204	136	791
Local-Alice Springs/Central Australia	109	133	105	70	417
NT wide	69	54	40	31	194
Other regions in Australia	16	11	7	8	42
National	30	28	47	26	131
International	1	0	5	1	7

Our data indicates that the media coverage of the ASC has been almost entirely in the "traditional" media, mainly the print media and radio (but not TV). Internet reporting of the ASC has been minimal (see Figure 1.4.6. below). This indicates that print was the main media for communicating ASC's story. Radio was second and online interest seemed to follow after other media reports (Appendix 1: Tables 1.4.2 & 1.4.3). The overwhelming interest from the NT-based media indicates a degree of local pride in the ASC project. In that sense it testified to Alice Solar City's profile, at least within the Alice Springs region.

Figure 1.4.11.: Media coverage of the ASC by type



This is rudimentary evidence upon which to base any conclusions. Nevertheless we consider that the ASC has contributed to the repute of the town because it generates positive coverage, unlike much outside media reporting of Alice Springs.

Perhaps the seemingly low international) interest is a reflection of the ASC's mode of operation in that it has a passive website. More interest might be attracted by a blog?

In any case it may be unrealistic to expect the ASC to attract an international audience. Many countries today have renewable energy programs that excite regional or national attention but little international notice.

Nevertheless, the statistics on views of the ASC website may reveal some greater international interest. Over four years – from Jan. 2009-Dec. 2011 – the ASC website attracted 61,853 visitors, of which about one third (18,870) were repeat visitors. This latter number is far greater than the population of Alice Springs that has access to the internet. The average visit duration was 3.04 minutes; so the site was taken seriously by visitors and contributed both to the repute of the ASC and indirectly to that of Alice Springs.

Spin-off effects on other programs

It is not contended here that the ASC has caused an environmental revolution in Alice Springs. But it has contributed to raising and confirming a general community awareness of conservation issues. One of the consortium partners, the Arid Lands Environment Centre (ALEC) is the epicentre of a range of conservation activities. Since the ASC was established the Alice Springs Town Council has become more active in issues of glass recycling and waste management issues. So its sponsorship of the ASC may have influenced the Council in becoming more active in environmental issues.

Similarly the Alice Water Smart initiative, run by ALEC but with funding obtained via PWC, has copied the consortium model of the ASC. Imitation is the sincerest form of flattery; so it is obvious that the ASC governance model is considered both satisfactory by its participants and worthy of emulation.

1.5. ISSUES OF DESIGN AND IMPLEMENTATION

There is a large body of research evidence that indicates that consumers hold intuitive views about energy saving that are often not consistent with technical evidence. That is, because they are not very *au fait* with the technical issues (eg just how much energy a solar hot water system will save), they over-estimate the effects of "cutting back on energy use" or "behaviour changes" (Kempton et al, 1984; Lutzenhiser 1993). This widespread phenomenon of poorly informed consumers makes the design and implementation process of renewable energy initiatives most important.

In that sense the Alice Solar Cities has mostly got the parameters right. Its Household Energy Audits, In-House Displays and its 10:10/20:20 incentives, for example, provide positive bolsters to energy conservation awareness.

Positive elements of the ASC program's design

The ASC program is strongly supported by its Consortium partners. The ASTC's enthusiasm is evidenced by its assumption of the lead role in the project's delivery. The PWC has also been a core participant, perhaps reflecting its strong role over the years in utilising solar technology for power systems in remote locations and the benefits to be gained from trialling technologies and tariffs via the well-funded ASC program.

It should be noted that when carbon pricing is introduced it may simplify the incentives for the PWC. At present EEMs reduce the PWC's revenue without necessarily reducing (in the case of SHW and PV systems) its capital requirements to have and maintain generation capacity that can meet peak demand on overcast days when the solar systems do not reduce consumption. Carbon pricing could reduce that problem.

The Home Energy Audit

It has been long accepted that the rate of participation in home energy audits is probably correlated to the convenience and information value of the audit (Tonn & Berry 1986). In this instance, the design of the ASC process – first register with the program and then receive a home audit before getting access to incentives is a process that enhances the impact and efficiency of the audit in terms of the follow-up on audit recommendations.

The ASC Home Energy Audit process serves two useful functions:

- *Confirmational* - to confirm the need for measures the participant has identified (which serves a psychologically affirming function); and
- *Educational* - to identify other measures that may require intervention to reduce the participant householder's energy use. This usually secures some on-going commitment to the EEM objectives of the ASC and makes the program more efficient than if it were confined to measures that the householder initially nominated.

So, whilst ASC program participants are volunteers, they have been educated beyond the knowledge/inclinations that encouraged them to participate in the first instance. The ASC has also implemented a number of educational campaigns and devices (eg a solar display home) that have contributed to educating consumers.

We note that the ASC is now implementing longer term aids for participants, in particular means for participants to monitor their long-term usage of electricity. This is an attempt to prevent the "rebound" effect, much noted in the literature (cf Grantham 2011 for a summary)

On-going issues

There have been some implementation issues, mostly with minor elements of the EEMS. Such problems range from technical issues, such as the inter-operability of Current Transformer metering with IHD for some commercial customers, to the administrative, as with the complexity of the recently-implemented refrigerator disposal program. The 10:10/20:20 claims initiative has not been heavily subscribed, notwithstanding that the ASC has regularly promoted and publicised this initiative. In this case ASC registrants, probably in two job households with children, have busy lives and no spare time for concentrating on such an initiative. Also, given that the median ASC registrant has children, reducing electricity consumption dramatically is difficult. These programs are a very minor element of the ASC and don't detract from its overall success.

Take-up rates

In some instances, primarily those requiring the consumer to make a significant outlay/investment, the economic imperative is clearer. For example, the literature has long indicated that the best predictor of take-up rates for loans for conservation retrofits (eg PV panels and solar hot water) is the belief that such additions improve home value (Tonn & Berry 1986). This same conclusion probably applies to ASC's rebates for PV and solar hot water systems.

Nevertheless, there is long term international evidence that the greatest volume of environmental retrofit activity is associated with grant/rebate schemes. But despite the ASC being one of those schemes there was a significant difference between numbers of vouchers issued and vouchers redeemed, as shown in Figure 1.5.3. here:

Figure 1.5.1. :Take-up rates for ASC residential and commercial programs (to April 2012)

Residential program			
Vouchers	Issued	Redeeemed	Rate (%)
No.	6,928	2,877	41.5
Value ($)	6,684, 980	4,252,496	63.6
Commercial program			
Vouchers	Issued	Redeemed	Rate (%)
No.	111	85	76.6
Value ($)	1,820,622	1,446,235	79.4

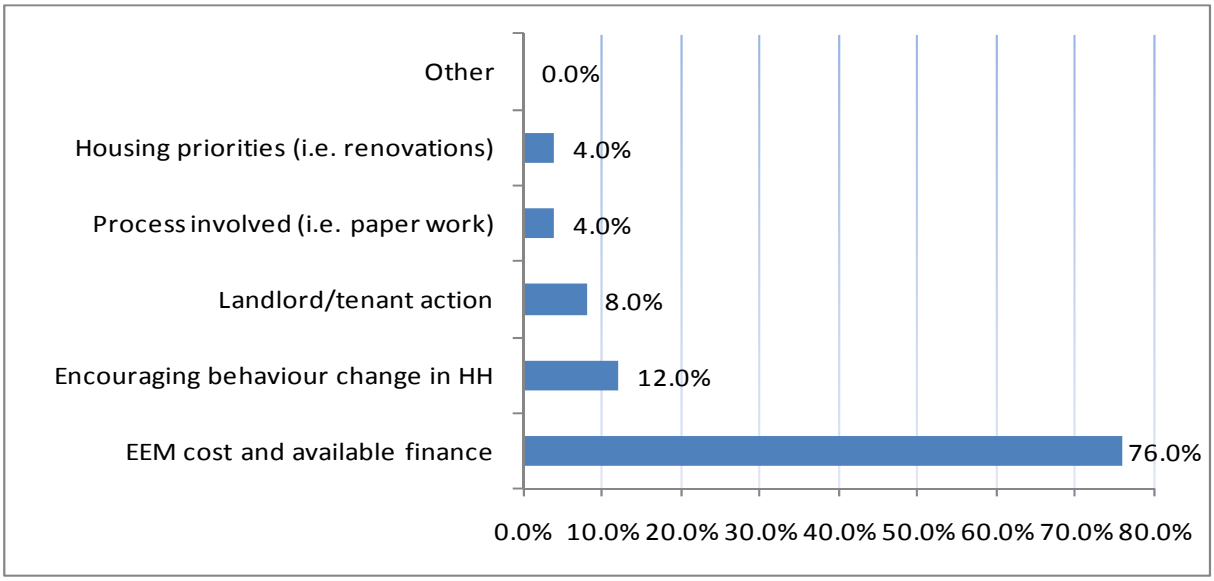
Some degree of defaulting could be expected, as is the case with other rebate-based schemes both in Australia and overseas.

If we accept that the median ASC registrant was a family with children, then its good intentions (registering with the ASC) could be beset with expenses associated with those children and so short of the discretionary cash to spend on a SHW or PV system. Similarly the income figures of ASC households suggest a high proportion of families with both partners working and hence, perhaps, with insufficient time to take advantage of ASC vouchers. Like the rest of the NT, Alice Springs has a high degree of population "churn". Short term residence (or expected short term residence) might inhibit some households from long term investments such as SHW systems and PV panels.

As would be expected commercial registrants with the ASC were more realistic about which incentives to take up as worthwhile. Hence their much higher redemption rates, although this may in part reflect a longer and more intensive consultation phase with the ASC energy auditors..

Given that the ASC program used rebate incentives, we would assume that a shortage of the discretionary income to invest in a PV system or SHW would be the major impediment to take-up of the available voucher. This is borne out in Figure 1.5.2. next:

Figure 1.5.2: Impediments to take-up of ASC vouchers



(This data is presented more fully in Appendix 1: Table 1.5.2)

The implications of PV installation

Analysts of private PV subsidy regimes have been highly critical of the pricing of the inputs to the distribution system. Thus the extra costs to the distribution system are not borne by the PV owners but by the system/the utility as a whole, with regressive effects. Similarly the high payback tariff has regressive effects, as all consumers effectively cross-subsidise those with

PV systems feeding into the grid. In a sense this design feature was driven by the Federal Government and was not intrinsic to the ASC scheme; so it is not here a criticism. In any case, preferential tariffs for PV input to the system will be phased out in 2013 and probably not influence consumers if PV systems are offered in future iterations of the ASC.

The structure of the incentives

There is some point in considering a change the mix of incentives. For example, low income households will probably not have the up-front capital to purchase a PV or solar hot water system, even with a rebate. But they may subscribe to a loan – with the interest costs either subsidised or paid for by ASC – which would improve equity of access to ASC's programs.

It can be assumed that the ASC is reaching a point with some of its programs (PV, solar hot water?) where there would be a slowing of up-take rates for its rebates, it having attracted most (?) households with discretionary capital and no split incentives. So subsidising loans for retrofits by low income householders may unlock another population segment or "market". This would be advantageous on both environmental and equity grounds.

That is not to say that this transition in program approach would be simple. Research shows that take-up rates for loan programs are lower than for grants and rebates. So possibly a mixture of incentives would continue to be needed. One alternative, being used in California, is for EEM suppliers to lease back the electricity provided to the grid from PV panels they install.

Marketing

Research in America showed that – all things being equal –strong incentives in renewable energy programs made marketing even more important (Stern et al 1986, 176). The high registration rates for the ASC indicate that it has been successful in its marketing, especially to the informed public.

The ASC has pursued an aggressive marketing and community engagement campaign, in particular associated with its 10:10/20:20 project to encourage "energy champions".

One measure of marketing success has been the rise in energy awareness from the demonstration ASC Sustainable Living House (cf Figure 1.5.3 below):

Figure 1.5.3: Educational awareness from Sustainable Living House visits

Question 1: *By visiting the ASC Open House, please indicate if <u>your understanding</u> of the following measures has improved:*

%	By visiting the ASC sustainable house, please indicate if your useful level of knowledge has improved about (valid % of total response, i.e. all SLH):				
	No	Unsure	Yes	Did Not Look	Total
Rooftop PV Systems	16.5	11.4	68.4	3.8	100.0
Smart Meters	13.0	6.5	77.9	2.6	100.0
In-house Displays	6.4	11.5	76.9	5.1	100.0
One-shot Boosters	10.7	12.0	73.3	4.0	100.0
Paint Roof White	17.5	6.3	71.3	5.0	100.0
Thermal Skins	8.4	9.6	79.5	2.4	100.0
Vertical Shading	16.0	9.9	69.1	4.9	100.0
Energy Efficient Lighting	15.2	7.6	68.4	8.9	100.0
Appliance Star Rating	18.8	11.3	62.5	7.5	100.0
Indoor Water Measures	15.2	13.9	64.6	6.3	100.0
Garden Design	6.2	3.7	85.2	4.9	100.0
Solar Air Heating	3.8	9.6	82.7	3.8	100.0

Building coalitions

Consumers who become conscious of conserving energy usage for "cultural/ethical" reasons (eg preventing waste) may also be more easily persuaded to conserve water and better manage solid waste, even if there is uncertain economic gain to themselves (Wilhelm & Iams 1984). This suggests that organisations that press for solar energy, water conservation and waste management have a common interest in altruistic values within their communities.

The ASC has been a part of the coalition building between these interests. Interest in any one of these areas by citizens has a high probability of spill-overs into interest in the others. So pursuing this broader conservation ethos has been a sensible activity of the ASC.

Creating an income stream

This issue leads to our discussion below of the future of the ASC. While the details of future carbon credit trading under the Federal Government's Climate Change policy remain unclear at present, it does present a potential to develop an income stream for a renewed ASC project. This would require negotiation with the PWC (and the NT Government?) over who receives the Renewable Energy Certificate, but an income stream could result. In the medium term that income flow would be low because the global financial crisis has depressed the price of tradeable carbon credits down to about $10.oo; but in the longer term this could result in a significant income for a renewable energy program.

As was noted previously, when carbon pricing is introduced it will simplify the incentives for the PWC. At present EEMs reduce the PWC's revenue while not reducing (in the case of SHW and PV systems) to the same degree its capital requirements to have and maintain generation capacity that can meet peak demand on overcast days, when the solar systems do not reduce consumption. Carbon pricing could reduce that problem.

The NT Government has approved price increases to cover the impending carbon pricing regime. PWC operates within a regime of tariff equalisation between regions. So a renewed Solar City initiative could assist it in lowering costs of electricity supply to Alice Springs, as well as deferring network expenditure.

1.6. THE FUTURE OF THE ASC

Our review process has made it clear that the ASC and its staff have accumulated a great deal of expertise and knowledge over the past five years. This should be retained. Given that the current Federal Government funding for Solar Cities is coming to an end, it is incumbent upon the ASC to develop a future direction that secures its survival. International evidence indicates that a fall-off in government support for renewable energy technologies/initiatives can lead to a decline in their application (as for wind power generation – cf. Wiser, Bollinger & Barbose 2007). So the challenge for the ASC is great.

Although it is not a central part of our brief, we have given some thought to the shape of ASC's future.

Here we discuss the three elements of a renewed Alice Solar Cities program that we believe have to be decided upon:

- New sources of finance;
- a new agency role for the ASC; and
- new tactics in expanding and modifying its reach.

In the next section we have made tentative suggestions, not hard and fast recommendations.

A new source of finance

It seems unlikely that ASC will receive any more large grants, either from the Federal or (even less likely) the NT Governments. So the ASC must look at different means for furthering its objectives, the most obvious source of finance being some type of loans-based program.

The literature (eg. Brown and Conover 2009) suggests four types of loan schemes:

Private sector loans with public capital.

In this model the Treasury (presumably the NT Treasury?) would loan the ASC money, which it can then re-lend to customers for EEM retrofits or installations on new construction. Repayments are made to the Treasury. International experience suggests that, properly supervised, the default rate on these loans is very low.

Local government fee-based financing.

Here the local government (eg the Alice Springs Town Council) loans money to ratepayers to retrofit their properties and recovers the loan via an extra impost upon the ratepayers rates.

On-Bill utility loans.

This is a variant of the local government loan in that PWC would provide the loan for the EEMs, which would be repaid via the customer's power bill.

Home mortgage-based financing

In this model the ASC would form a partnership with a financial institution – eg one of the banks or another institution (eg the "local" People's Choice Credit Union) – which would provide the loan for the assumption of a mortgage, with an appropriate EEMs retrofit to the property to be purchased. The purchaser then pays for the retrofit as part of their mortgage repayments.

Logically a combination of any or all of these approaches could be applied.

Shifting to a loans-based operation is not a far-fetched scenario for the ASC. The evolving context of energy policy - particularly the impending pricing of carbon - makes such a move more feasible. When carbon pricing is introduced two sets of incentives change:

The incentive for PWC to reduce power consumption increases. The introduction of a price for carbon relatively increases the PWC's incentive to reduce power generation costs. Secondly, pricing carbon will increase the incentives for households/consumers to reduce consumption. So the relative price of EEMs will decrease (an important factor that could drive the success of a loans- based ASC).

Converting to a loans-based scheme may not disadvantage the ASC. Studies in India have interpreted it as superior to subsidy regimes (Srinivasan 2009), presumably because of the disincentive of the need for an up-front payment. We have interpreted the failure of ASC registrants to take up all the vouchers issued as a result of their HEA as being a shortage of discretionary income for the up-front capital costs for expensive items such as SHW and PV systems (and even energy-efficient refrigerators?). So these people might actually find a loans-based scheme more readily allows them to participate in EEMs.

A new role: the ASC as an agent

If the ASC is going to continue into the future it may have to change its role to one we describe as agency. In other words the ASC could become an agent that would broker loans for EEMs and then oversee the installation of those EEMs. We showed (Figure 1.4.5 above) that there was a degree of specialisation in the "market" for delivering the ASC's EEM vouchers. These firms might be induced to offer installation/supply discounts to future bearers of ASC-brokered loan vouchers. This would increase supply and make the loan commitment even more attractive to consumers.

In reality our proposed brokerage role would be merely a change in emphasis from the ASC's current role. It would administer other entities' money, rather than dispensing its own.

New tactics: targeting markets

In its new iteration the ASC would have to develop new tactics. It would need to target markets, rather than relying on volunteers to register with ASC. It should consider targeting low income households and rental properties. The former could be done in partnership with PWC, if the latter obtains a grant from the Federal Government's Low Income Energy Efficiency Program. Because of the problem of split incentives, the rental market might need some innovative approaches. For example, we suspect that – apart from split incentives - one constraint upon landlords installing EEMs in their rental properties is that it may increase maintenance costs. So ASC might trial a voucher that covers maintenance costs for a period?

Secondly the ASC may need to "trade" on its reputation and expertise and target particular products to keep it in the public consciousness. Home Energy Audits are one activity that serves a broad public interest. These could stimulate replacement of energy inefficient appliances. Follow up surveys (recently begun by ASC) could prevent any energy backsliding by former customers of energy saving retrofits. The recent provision to ASC customers of an on-line means of tracking their energy usage is also a useful innovation in preventing any consumption "re-bound".

The "re-bound" effect is much noted in the literature (Berkhout et al 2000, Greening et al 2000 – for a discussion see Grantham 2011: 21-23). It fits the economists' notion of "moral hazard". That is, when a good is purchased that may produce a particular result, the consumer

may respond in a manner that obviates the benefit of the previous good. For example, the installation of energy efficient lighting might make consumers more careless about their use of lighting and so negate or diminish the theoretical/potential gains in reduced energy usage. It is not clear whether this effect has occurred in Alice Springs. The ASC is preparing data and allowing its registrants on-line access to their energy usage to actively monitor (PWC bills do provide a comparison with the same period the previous year) and address this effect (if it exists). This is an extremely worthwhile activity and the ASC should be encouraged (subsidised by the PWC?) to continue to provide this service.

1.7. CONCLUSIONS

Energy programs generally have four foci: increased energy efficiency; increased energy self-sufficiency; reducing greenhouse gases and energy diversification. The Alice Solar City has succeeded on all four fronts, as well as in its community engagement strategy. Success is insufficient, however, because the ASC project operated with funding from a fixed six year term program.

Generally, without its base Federal grant, the ASC has to become more nimble and adaptive to survive into the future. Yet we are optimistic for it both as an organisation and as a set of objectives. That is because the times (ie the policy climate) suits it. The imposition of a carbon tax shifts the balance of incentives towards energy efficiency. So the task of persuading consumers to engage with EEMs will be easier. And it appears that the Federal Government is moving towards a National Energy Savings Initiative (Australian Government 2011), which may provide opportunities for the ASC to move to a new iteration.

References

Abrahamse, W. & Steg, L. 2009, "How do socio-demographic and psychological factors relate to households' direct and indirect energy use and savings?", *Journal of Economic Psychology*, 30: 711-720.

Annecke, W. 2008, "Monitoring and evaluation of energy for development: The good, the bad and the questionable in M&E practice", *Energy Policy*, 36: 2839-2845.

Australian Government 2005, Solar Cities Programme Guidelines. Canberra: Australian Government, Department of the Environment and Heritage, Australian Greenhouse Office.

Australian Government 2011, National Greenhouse Accounts Factors, July 2011. Canberra: Australian Government, Department of Climate Change and Energy Efficiency.

ASC 2006, Solarcities detailed business case: Alice Springs, Australia's Solar Centre. Alice Springs: Alice Springs Town Council.

Australian Government 2011, *Issues Paper, National Energy Savings Initiative*. Canberra: Dept. of Climate Change and Energy Efficiency/Department of Resources, Energy & Tourism.

Australian National Audit Office 2010, Administration of Climate Change Programs: Department of the Environment, Water, Heritage and the Arts, Department of Climate Change and Energy Efficiency, and Department of Resources, Energy and Tourism. Canberra: Commonwealth of Australia.

Berkhout, P.; Muskens, J. & Velthuijsen, J. 2000, "Defining the rebound effect", *Energy Policy*, 28: 425-432.

Brown, M. & Conover, B. 2009, *Recent Innovations in Financing for Clean Energy*. Boulder Co.: Southwest Energy Efficiency Project.

Coase, R. 1960, "The problem of social cost", *Journal of Law and Economics*, 3: 1-44.

Demsetz, H. 1969, "The cost of transacting", *Quarterly Journal of Economics*, 82: 33-53.

de Vries, P.; Aarts, H. & Midden, C. 2011, "Changing simple energy-related consumer behaviors: How the enactment of intentions is thwarted by acting and non-acting habits", *Environment and Behavior*, 43: 612-633.

Federal Government 2011, *Issues Paper, National Energy Savings Initiative*. Canberra: Dept. of Climate Change and Energy Efficiency/Department of Resources, Energy & Tourism.

Friedman, B.; Jordan, P.& Carrese, J. 2011, Solar Installation Labor Market Analysis. Golden, Colorado: National Renewable Energy Laboratory: Technical Report, NREL/TP-6A20-49339.

Fuller, M. 2008, *Enabling Investments in Energy Efficiency*. Oakland, CA: California Institute for Energy and Environment Report.

Grantham, S. 2011, *Literature Review: Household energy consumption, conservation and efficiency*. Alice Springs: Alice Springs Solar City.

Greening, L.; Greene, D. & Difiglio, C. 2000, Energy efficiency and consumption – the rebound effect – a survey, *Energy Policy*, 28: 389-401.

Haas, R.; Eichhammer, W.; Huber, C.; et al 2004, "How to promote renewable energy systems successfully and effectively", *Energy Policy*, 32: 833-839.

Hancock, M. 2011, *Alice Springs: A Case Study of Increasing Levels of PV Penetration in an Electricity Supply System.* Sydney: Centre for Energy & Environmental Markets, University of NSW.

Horowitz, M. 2011, "Measuring the savings from energy efficiency policies: a step beyond program evaluation", *Energy Efficiency*, 4: 43-56.

Kempton, W.; Harris, C. et al, 1984, "Do consumers know 'what works' in energy conservation?" In J. Harris & C. Blumstein (eds.) *What Works: Documenting Energy Conservation in Buildings*. Washington DC: ACEEE Press.

Key Results 2011, ASC-DCEE Key Results Reporting 2011:

- Residential Solar Hot Water – Interim Report Feb 2012
- Cost Reflective Pricing Trial – Interim Report Feb 2012
- Residential PV Systems Interim Report – Feb 2012
- Alice Solar City Residential Overview Interim Report – February 2012
- Residential Energy Efficiency- Interim Report – Feb. 2012

Lutzenhiser, L. 1993, "Social and Behavioral Aspects of Energy Use", *Annual Review of Energy and Environment*, 18: 247-289.

Lutzenhiser, L.; Hackett, B. & Schultz, H. 1987, Social Variation and Electricity Consumption in San Diego California: Exploratory Data Analysis and the California Energy Commission's Demand Forecasting Model. Berkeley, Calif.: University of California Energy Research Group, UER 196.

Macintosh, A. & Wilkinson, D. 2011, "Searching for public benefits in solar subsidies: A case study on the Australian government's residential photovoltaic rebate program", *Energy Policy*, 39: 3199-3209.

McCann, L.; Colby, B. et al 2005, "Transaction cost measurement for evaluating environmental policies", *Ecological Economics*, 52: 527-542.

Mills, E. & Rosenfeld, A. 1996, "Consumer non-energy benefits as a motivation for making energy-efficiency improvements", *Energy*, 21: 707-720.

Nelson, T.: Simshauser, P & Kelley, S. 2011, Australian Residential Feed-in Tariffs: industry stimulus or regressive form of taxation. Sydney: AGL Applied Economic and Policy Research, *Working Paper No 25*.

Newton, P. & Meyer, D. 2010, "The determinants of urban resource consumption", *Environment and Behavior*, 20: 1-29.

Pratt, R. & Miller, J. 1998, The New York Power Authority's Energy-Efficient Refrigerator Program for the New York City Housing Authority – 1997 Savings Evaluation. Richland Washington: Pacific Northwest National Laboratory.

Roberts, S. 2008, "Demographics, energy and our homes", *Energy Policy*, 36: 4630-4633.

Sonderegger, R. 1978, "Movers and stayers: The resident's contribution to variation across houses in energy consumption for space heating", *Energy Building*, 1: 313-334.

Srinivasan, S. 2009, "Subsidy policy and the enlargement of choice", *Renewable and Sustainable Energy Reviews*, 13: 2728-2733.

Stern, P.;Aronson, E.; Darley, J.; Hill, D. et al 1986, "The effectiveness of incentives for residential energy-conservation", *Evaluation Review*, 10: 147-76.

Stern, P. 1992, "What psychology knows about energy conservation", *American Psychology*, 47: 1224-1232.

Stoeckl, N., Stanley, O., Brown, V. and Stoeckl, W. (2007). Regional Economic Multipliers in Australia's Tropical Savannas. Report for the Tropical Savannas CRC, May 2007. Available online: *http://savanna.cdu.edu.au/savanna_web/publications/downloads/Regional-Economic-Multipliers-in-the-Tropical-Savannas.pdf*. (Accessed on 2 May 2012).

Sullivan, M. 2009, Behavioral Assumptions Underlying Energy Efficiency Programs for Business. Oakland, CA: California Institute for Energy and Environment.

Tangentyere Project 2011, Tangentyere Thermal Efficiency Project, Community Research Report. Alice Springs: Tangentyere Council/Bushlight, Centre for Appropriate Technology.

Taylor, M. 2008, “Beyond technology-push and demand-pull: Lessons from California’s solar policy”, Energy Economics, 30: 2829-2854.

Tonn, B. & Berry, L. 1986, “Determinants of participation in home energy audit/loan programs: Discrete choice model results”, *Energy*, 11: 785-795.

Wilhelm, M. & Iams, D. 1984, Attitudes and energy conservation behaviors of desert and non-desert residents of Arizona. In B. Morrison & W. Kempton (eds.), *Families and Energy: Coping with Uncertainty*. East Lansing, Mich.: Michigan University Press.

Wiser, R.; Bollinger, M. et al, 2007, Analysing historical cost trends in California’ market for customer-sized photovoltaics, *Progress in Photovoltaic Research and Applications*, 69-85.

Wiser, R.; Bollinger M. & Barbose, G. 2007, “Using the federal production tax credit to build a durable market for wind power in the United States”, *Electricity Journal*, 20: 77-88.

Appendix 1: Supplementary Data Tables

Section 1.5: Issues of design and implementation

Section 1.2: Proposed Benefits

Table 1.2.1.: Alice Solar City Incentive Summary Report

(Date Range: 10/03/2008 to 30/04/2012 Inclusive)

Incentive Name	EOI at registration	Audit Recom.		Vouchers Issued	Vouchers Cancelled/expired	Incentives Data for incentivised EEMs Implemented				Vouchers valid but Unclaimed	Difference between Audit recommendations and initial consumers' opinions		Difference between voucher issue and audit recommendations		Percentage change in issued vouchers and initial consumers' EOI	% of claimed vouchers	% of cancelled or expired vouchers	% of uncla but v vouch
	A	high priority /voucher (P1)	low priority /no voucher	B	C	D	ASC Incentive Value $ (V1)	Invoices Total Amount $ (V2)	V2/V1	E	P1-A	%=(P1-A)/A	B-P1	%=(B-P1)/P1	%= (B-A)/A	%=D/B	%=C/B	%=E/
Replace your old refrigerator with a new, energy efficient model	38	80	49	65	19	32	$12,800	$70,532	5.51	14	42	110.5%	-15	-18.8%	71.1%	49.2%	29.2%	21.5%
Replace your old freezer with a new, energy efficient model	4	7	13	6	2	3	$872	$3,238	3.71	1	3	75.0%	-1	-14.3%	50.0%	50.0%	33.3%	16.7%

Surrender your old refrigerator or freezer	11	45	27	37	4	29	$2,900	$2,900	1.00	4	34	309.1%	-8	-17.8%	236.4%	78.4%	10.8%	10.8%
Collection, disposal and de-gas of replaced Refrigerator at ASTC Tip	19	40	0	35	1	30	$2,500	$2,500	1.00	4	21	110.5%	-5	-12.5%	84.2%	85.7%	2.9%	11.4%
Collection, disposal and de-gas of replaced freezer at ASTC tip	1	4	0	2	0	2	$169	$169	1.00	0	3	300.0%	-2	-50.0%	100.0%	100.0%	0.0%	0.0%
Collection, disposal and de-gas of surrendered fridge or freezer at ASTC tip	11	41	3	40	5	32	$2,910	$2,910	1.00	3	30	272.7%	-1	-2.4%	263.6%	80.0%	12.5%	7.5%
In-house Display for non CRT customers	0	4	1	0	0	0	$0	$0		0	4		-4	-100.0%				
Install a Solar Hot Water System	0	0	1	0	0	0	$0	$0		0	0		0					
Install Solahart 302JOTP Electric Boost Solar Hot Water System	1028	1022	264	1036	315	680	$1,269,269	$3,922,103	3.09	36	-6	-0.6%	14	1.4%	0.8%	65.6%	30.4%	3.5%

Install Edson Evacuated Tube Solar Hot Water system 315 GLES (30 tubes)	0	2	0	1	0	0	$0	$0		1	2		-1	-50.0%		0.0%	0.0%	100.0
Install Solahart 302JOTP Gas In-Line Boost Solar Hot Water System	27	24	28	26	19	7	$14,276	$56,476	3.96	0	-3	-11.1%	2	8.3%	-3.7%	26.9%	73.1%	0.0%
Install Solahart 181JOTP Electric Boost Solar Hot Water System	66	75	59	72	41	29	$40,412	$134,003	3.32	3	9	13.6%	-3	-4.0%	9.1%	40.3%	56.9%	4.2%
Install Solahart 181JOTP Gas In-Line Boost Solar Hot water system	4	2	1	2	2	0	$0	$0		0	-2	-50.0%	0	0.0%	-50.0%	0.0%	100.0%	0.0%
Install Solahart Streamline 272DJV electric boost split solar hot water system	5	11	4	10	5	5	$10,000	$33,489	3.35	0	6	120.0%	-1	-9.1%	100.0%	50.0%	50.0%	0.0%
Install Solahart Streamline DJV272 integrated gas boost split solar hot water	3	2	3	2	0	2	$4,200	$13,859	3.30	0	-1	-33.3%	0	0.0%	-33.3%	100.0%	0.0%	0.0%

system																		
Install Solahart Streamline DJV272g gas in-line boost split solar hot water system	0	1	1	1	0	0	$0	$0		1	1		0	0.0%		0.0%	0.0%	100.0
Install Heat Pump Hot Water System	7	13	30	13	4	7	$7,000	$34,559	4.94	2	6	85.7%	0	0.0%	85.7%	53.8%	30.8%	15.4%
Installation of "One-Shot" Relay for solar hot water systems	297	277	153	275	171	92	$10,015	$30,804	3.08	10	-20	-6.7%	-2	-0.7%	-7.4%	33.5%	62.2%	3.6%
Service of Solar Hot Water system	422	366	161	369	191	157	$28,481	$96,118	3.37	18	-56	-13.3%	3	0.8%	-12.6%	42.5%	51.8%	4.9%
Service of evaporative A/C	577	687	425	695	308	376	$36,189	$138,898	3.84	12	110	19.1%	8	1.2%	20.5%	54.1%	44.3%	1.7%
Paint roof white	589	665	635	663	476	176	$93,701	$277,776	2.96	13	76	12.9%	-2	-0.3%	12.6%	26.5%	71.8%	2.0%
Replace old roof with new white roof sheeting	87	84	34	87	53	27	$50,343	$178,972	3.56	7	-3	-3.4%	3	3.6%	0.0%	31.0%	60.9%	8.0%
Install roof ventilation device	311	217	142	211	154	54	$10,356	$30,286	2.92	3	-94	-30.2%	-6	-2.8%	-32.2%	25.6%	73.0%	1.4%

Install ceiling insulation - Batts	228	225	248	224	189	31	$21,395	$67,960	3.18	5	-3	-1.3%	-1	-0.4%	-1.8%	13.8%	84.4%	2.2%
Install ceiling insulation - loose fibre	10	5	4	5	3	2	$2,541	$7,260	2.86	0	-5	-50.0%	0	0.0%	-50.0%	40.0%	60.0%	0.0%
Replace Ceiling Insulation - batts	57	32	19	33	27	4	$2,655	$8,192	3.09	2	-25	-43.9%	1	3.1%	-42.1%	12.1%	81.8%	6.1%
Replace ceiling insulation - loose fibre	2	0	0	0	0	0	$0	$0		0	-2	-100.0%	0		-100.0%			
Retrofit Insulation into walls	51	7	21	7	6	1	$1,478	$4,224	2.86	0	-44	-86.3%	0	0.0%	-86.3%	14.3%	85.7%	0.0%
Install thermal "skin" over external walls	15	17	123	12	10	2	$2,000	$8,333	4.17	0	2	13.3%	-5	-29.4%	-20.0%	16.7%	83.3%	0.0%
Install external shading on walls/windows	284	413	442	377	202	160	$120,607	$429,460	3.56	15	129	45.4%	-36	-8.7%	32.7%	42.4%	53.6%	4.0%
Tint windows	279	120	91	120	60	59	$22,740	$67,985	2.99	1	-159	-57.0%	0	0.0%	-57.0%	49.2%	50.0%	0.8%
Install double-glazed windows (IGU's)	108	22	30	23	13	9	$20,440	$68,564	3.35	1	-86	-79.6%	1	4.5%	-78.7%	39.1%	56.5%	4.3%
Replace high energy usage lighting with energy efficient	518	1157	203	1122	875	187	$9,669	$31,037	3.21	57	639	123.4%	-35	-3.0%	116.6%	16.7%	78.0%	5.1%

lighting																		
Replace 12V Halogen downlight system with low energy option	370	410	324	404	285	95	$20,660	$74,343	3.60	20	40	10.8%	-6	-1.5%	9.2%	23.5%	70.5%	5.0%
Install motion sensors on external lighting	137	54	27	54	44	9	$605	$1,765	2.92	1	-83	-60.6%	0	0.0%	-60.6%	16.7%	81.5%	1.9%
Purchase swimming pool cover roller	28	51	34	52	12	22	$3,842	$11,319	2.95	17	23	82.1%	1	2.0%	85.7%	42.3%	23.1%	32.7%
Purchase swimming pool cover	245	410	80	404	172	233	$62,200	$204,688	3.29	0	165	67.3%	-6	-1.5%	64.9%	57.7%	42.6%	0.0%
Supply and install variable speed pool pump	30	70	81	55	10	24	$8,550	$30,873	3.61	19	40	133.3%	-15	-21.4%	83.3%	43.6%	18.2%	34.5%
Replacement of perished fridge/freezer seals.	138	94	25	90	68	21	$1,512	$4,673	3.09	1	-44	-31.9%	-4	-4.3%	-34.8%	23.3%	75.6%	1.1%
10:10/20:20	1320	1563	709	0	0	394	$29,990	$0	0.00	0	243	18.4%	-1563	-100.0%	-100.0%			
In-house Display Unit for Cost Reflective Tariff Package	70	335	3	2	0	336	$475	$475	1.00	0	265	378.6%	-333	-99.4%	-97.1%	16800.0%	0.0%	0.0%

Initiate Cost Reflective Tariffs package	486	479	196	2	0	379	$178,600	$178,600	1.00	0	-7	-1.4%	-477	-99.6%	-99.6%	18950.0 %	0.0%	0.0%
Install bulk floor insulation	0	1	6	1	1	0	$0	$0		0	1		0	0.0%		0.0%	100.0%	0.0%
Install BP Energiser 1000 PV system	15	17	0	15	2	14	$90,464	$199,744	2.21	0	2	13.3%	-2	-11.8%	0.0%	93.3%	13.3%	0.0%
Install BP Energiser 1500 PV system	8	11	0	9	1	9	$78,154	$178,510	2.28	0	3	37.5%	-2	-18.2%	12.5%	100.0%	11.1%	0.0%
Install BP Energiser 2000 PV system	235	273	1	270	20	254	$2,157,348	$5,622,114	2.61	0	38	16.2%	-3	-1.1%	14.9%	94.1%	7.4%	0.0%
TOTAL for RESIDENTIAL	8141	9435	4701	6929	3767	3985	$4,432,318	$12,229,707	2.76	271	1294	15.9%	-2506	-26.6%	-14.9%	57.5%	54.4%	3.9%

Table 1.2.2: Energy Efficiency Measures (Source Key Results: Residential Overview 2012.

Energy Efficiency Measure	Estimated Annual Savings kWh/year	Assumptions used in Calculation of Estimated Annual Savings	Roundings
Paint roof white	**200**	1. Summer cooling 1950 kWh/yr – 35% gain through roof/ceiling: 1950x0.35 ≈ 700 kWh/yr	Round to 200 kWh/yr, as about half houses have ceiling insulation, and

		2. Paint roof white reduces heat gain by 30-35%: 700x0.32 ≈ 224 kWh/yr	to allow for extra winter heating.
Replace old roof with new white roof sheeting	**200**	Same as painting roof white	
Install roof ventilation device	**20**	Minimal effect during AS summer – estimate as 20 kWh/yr savings	
Install ceiling insulation - batts	**350**	1. Summer and winter effect -35% of total annual load: 3400x0.35 ≈ 1200 kWh/yr 2. Ceiling insulation produces a 30% energy saving: 1200x0.3 ≈ 357 kWh/yr	Round to 350 kWh/yr
Install ceiling insulation – loose fibre	**350**	Same as for batts	
Replace ceiling insulation - batts	**230**	1. Assume existing insulation is old and approximately one third effective 2. Replacement has two thirds the savings effect of new insulation: 350x0.67 = 235 kWh/yr	Round to 230 to allow for more effective old insulation
Replace ceiling insulation – loose fibre	**230**	Same as for batts	
Install bulk floor insulation	**150**	1. Only if suspended floor – rare in AS 2. Summer and winter effect -15% of total annual load for suspended floor: 3400x0.15 ≈ 500 kWh/yr 2. Floor insulation produces a 30% energy saving: 555x0.3 ≈ 150 kWh/yr	
Retrofit insulation into wall cavities	**200**	1. Summer and winter effect -20% of total annual load: 3400x0.2 ≈ 680 kWh/yr 2. Wall cavity insulation produces a 30% energy saving: 555x0.3 ≈ 200 kWh/yr	

Install double glazed windows	**200**	1. Winter energy loss 20%: 1450x0.2 = 390 kWh/yr 2. Summer energy gain 35%: 1950x0.35 = 700 kWh/yr 3. Double glazing reduces energy flows by 30% in winter and 10% in summer: 390x0.3 + 700x0.1 = 187 kWh/yr	Round to 200
Tint windows	**140**	1. Summer energy gain 35%: 1950x0.35 = 700 kWh/yr 2. Tinting reduces gain for sun-exposed windows by approx 40%: 700x0.4 = 280 kWh/yr	Reduce to 140 as assume half widows sun exposed
Install external shading on windows/wall	**300**	1. Summer cooling on sun-exposed windows/walls 2. Window/wall average 30% of summer heat gain: 1950x0.3 = 585 kWh/yr 3. Estimate 50% exposure to allow for high summer impact over limited area, for selected high impact households: 585x0.5 = 293 kWh/yr	Round to 300 as variable area
Install thermal skin over external wall	**350**	1. Summer cooling for sun-exposed masonry walls – if sun exposed walls, increase heat gain through walls to 30%. 1950X0.3 = 600 kWh/yr. 2. Assume 60% of this gain from sun exposed walls = 600x0.6 = 360 kWh/yr	Round to 350
Replace 12v halogen downlights with low energy option	**400**	1. Replace average of 6 x 60W halogens running 4hrs/day: 6x60x4x347: Use = 500 kWh/yr 2. Replacement lighting uses one sixth energy of halogens: 500/6 ≈ 83 kWh/yr 3. Annual savings = 500 – 83 = 417 kWh/yr	Round down to 400 kWh/yr to allow for lower use, fewer lights
Replace high energy use lighting with energy efficient lighting	**400**	1. Average lighting use estimated at 6% of 8700 = 522 kWh/yr	Round to 400 kWh/yr

		2. Low energy globes save 75%: 522x0.75 = 391 kWh/yr	
Install motion sensors on external lighting	**25**	1. Assume 150W ext lighting for 1 hour/day average without sensor: 150x365 = 55kWh/yr 2. Use of sensors reduces time period by about 45%: 55x0.45 = 25kWh/yr	
Service solar hot water system	**900**	1. Generally if SHW in need of service, then likely to be running on booster and/or there is water leakage. However it may also be routine maintenance for efficient operation and extended life. 2. Therefore savings highly variable depending on prior condition: savings can vary from 0 to around 2600 kWh/yr if running continuously on booster 3. Auditor experience indicates many units in need of service are faulty – estimated average savings judged conservatively to be 900 kWh/yr (one third of maximum)	
Install one-shot relay on existing solar hot water system	**400**	1. Assume SHW working as average system – standard electric boost will use between 400 kWh/yr (for attentive householders -half) to 700 kWh/yr (inattentive a quarter) and 1400 kWh/yr (excessive-a quarter), : take average of 700 kWh/yr 2. Use of one shot instead of standard electric boost; 65 days, 2 hours per day using 2.4kW: 130x2.4 = 312 kWh/yr. Round to 300 kWh/yr 3. Savings 700-300 = 400 kWh/yr	One shot use estimate rounded down to 300
Install heat pump hot water system	**1500**	1. Assume replaces standard electric storage hot water system, using 2600 kWh/yr 2. Heat pump system reduces consumption by around 60%: 2600x0.60 = 1560 kWh/yr	Round to 1500, as E storage use may be less
Service evaporative air	**150**	1. Assume evap air con uses on average 1500 kWh/yr	

conditioning unit		2. Service improves efficiency by 10%: savings 1500x0.1 = 150 kWh/yr	
Replace perished refrigerator/freezer seals	**100**	1. Older refrigerator uses on average 700 kWh/yr 2. Replacing perished door seal improves efficiency by 15%: 700x0.15 = 105 kWh/yr	Round to 100
Replace old style refrigerator/freezer with new energy efficient model	**300**	Old unit uses 700 kWh/yr. New unit uses 400 kWh/yr. Savings = 300 kWh/yr	
Purchase swimming pool cover	**600**	1. Assume standard pump (1.1 kW) use without pool cover as follows: Summer 8 hrs/day for 180 days: 1.1x8x180 = 1584 kWh/yr Winter 4 hrs/day for 180 days: 1.1x4x180 = 792 kWh/yr Total annual consumption without pool cover = 2400 kWh/yr 2. With cover reduces summer pump hours by a half and winter pump hours by a quarter Summer savings = 800 kWh/yr and winter savings = 200 kWh/yr 3. Estimated annual savings with consistent proper use 800+200 = 1000 kWh/yr 4. Assume 60% effective use across pools. Average savings = 1000x0.6 = 600	Round to 1600 (summer) and 800 (winter)
Replace pool pump with variable speed model	**1200**	1. Standard pump (1.1 kW) without pool cover consumes 2400 kWh/yr (as above) 2. Variable speed pump reduces average consumption by 50%: 2400x0.5 = 1200 kWh/yr	

Section 1.3: ASC achievements against targets

Table 1.3.1: Number and range of ASC services 2008-2011

Install Ceiling Insulation -Batts	28
Install Double Glazed Windows (IGU's)	8
Install External Shading on Walls/Windows	152
Install Heat Pump Hot Water System	7
Install Roof Ventilation Device	52
Install Solahart 181-JOTP Electric Boost Solar Hot Water System	29
Install Solahart 302JO Electric Boost Solar Hot Water System	666
Install Solahart 302JOPT Gas In-Line Boost Solar Hot Water System	7
Install Solahart Streamline 272DJV Electric boost Split Solar Hot Water System	5

Install Solahart Streamline DJV 272g Integrated Gas Boost Split Solar Hot Water System	1
Install thermal "Skin" Over External Walls	2
Installation of "One - Shot" Relay for Solar Hot Water Systems	92
Paint Roof White	174
Purchase Swimming Pool Cover	236
Purchase Swimming Pool Cover Roller	21
Replace 12V Halogen Downlight System with Low Energy Option	92
Replace High Energy Usage Lighting with Energy Efficient Lighting	181
Replace Old Roof with New White Roof Sheeting	25
Replace your Old Freezer with a New Energy Efficient Model	2
Replace your Old Refrigerator with a New Energy Efficient Model	30
Replacement of perished Fridge/Freezer Seals	21
Service of Evaporative A/C	372

Service of Hot Water System	162
Supply and Install Variable Speed Pool Pump	24
Tint Windows	58
Grand Total	2437

Table 1.3.2: Distribution of households in different ranges of change in energy use

	Total				Number f households in this range (n)	Mean			
Range of changes	BP1_Total	AP1_Total	kWh Change	% Change		BP1_Mean	AP1_Mean	kWh Change-Mean	% Change
>100%	8583.5	33292.9	24709.4	287.87%	4	2145.9	8323.2	6177.4	287.87%
90~100%	12599.2	24621	12021.8	95.42%	2	6299.6	12310.5	6010.9	95.42%
80~90%				0.00%	0				0.00%
70~80%	8112.4	14230.2	6117.8	75.41%	2	4056.2	7115.1	3058.9	75.41%
60~70%				0.00%	0				0.00%
50~60%	34792.3	54270.7	19478.4	55.98%	4	8698.1	13567.7	4869.6	55.98%

40~50%	30440	44109	13669	44.90%	6	5073.3	7351.5	2278.2	44.90%
30~40%	97728.3	131051	33322.7	34.10%	12	8144.0	10920.9	2776.9	34.10%
20~30%	75362	92816.8	17454.8	23.16%	8	9420.3	11602.1	2181.9	23.16%
10~20%	244544	279225.9	34681.9	14.18%	26	9405.5	10739.5	1333.9	14.18%
0~10%	368214.5	386349.8	18135.3	4.93%	37	9951.7	10441.9	490.1	4.93%
-10%~0'	714655.4	678979.7	-35675.7	-4.99%	77	9281.2	8817.9	-463.3	-4.99%
-10~-20%	863936.1	738703.3	-125232.8	-14.50%	87	9930.3	8490.8	-1439.5	-14.50%
-20~-30%	706881.2	533397.2	-173484	-24.54%	67	10550.5	7961.2	-2589.3	-24.54%
-30~-40%	365130	240548.9	-124581.1	-34.12%	38	9608.7	6330.2	-3278.5	-34.12%
-40~-50%	118075.3	64255.1	-53820.2	-45.58%	15	7871.7	4283.7	-3588.0	-45.58%
-50~-60%	8129.3	3746.1	-4383.2	-53.92%	2	4064.7	1873.1	-2191.6	-53.92%
-60~-70%	15686.4	5383.6	-10302.8	-65.68%	1	15686.4	5383.6	-10302.8	-65.68%
-70~-80%	19822.1	5547.9	-14274.2	-72.01%	2	9911.1	2774.0	-7137.1	-72.01%
Total	3692692	3330529.1	-362162.9	-9.81%	390	9468.4	8539.8	-928.6	-9.81%

Figure 1.3.3: Representation of scale of energy use change after SHW

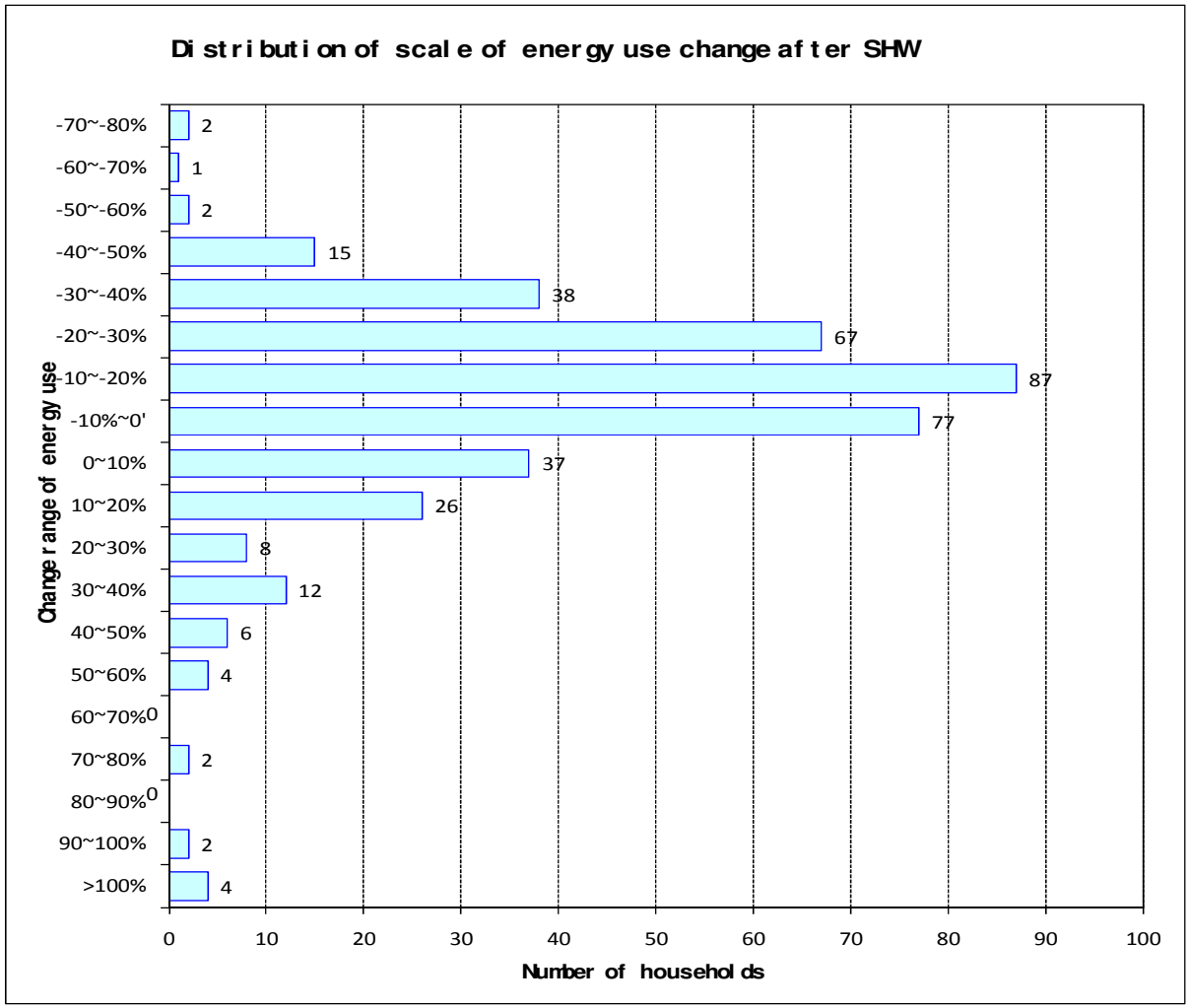


Table 1.3.4: Commercial Incentive Saving Estimates

Org Type	REG ID	historical consump kWh / p.a.	PV Capacity (kW)	# Panels	Panel Capacity (W) each	Inverter(s)	PV rebate Actual amount	Total cost GST ex	estimated output kWh p.a.
Local Govt.		0	3.3	20	165	SB3800	$ 16,776	$ 45,965	5353
Accommodation	1100	150,000	12.2	72	170	3 x SB3800	$ 49,632	$ 109,190	19853
Business	911	9,000	3.0	18	165	SB2500	$ 14,324	$ 28,648	4817
Light Industry	1192	60,700	20.2	96	210	3 x SMC 8000TL	$ 95,000	$ 190,000	32700
Mechanic	1298	7,900	5.0	30	165	SMC6000	$ 19,880	$ 43,736	8029
Aboriginal	920	13,200	3.0	18	165	SB2500	$ 14,324	$ 28,648	4817
Tourism	1079	46,700	11.4	60	190	2 * SMC6000A	$ 38,000	$ 76,000	18491
Light Industry	1699	77400	5.0	30	165	SMC6000	$ 19,880	$ 39,760	8029
Office	1143	250,000	17.1	76	225	3 x SMC6000A	$ 45,000	$ 100,300	27736
Office Trade	1362	**12,000**	6.8	36	190	3 x SB2500	$ 33,000	$ 66,000	11094
Office Trade	1271	13,100	3.0	18	165	SB2500	$	$	4817

							12,750	25,500	
Office Trade	1330	4,012	2.3	12	190	SB2500	$ 7,250	$ 14,500	3365
Mechanic	1595	40,102	11.4	60	190	3 x SMC4000TL-20	$ 39,191	$ 78,382	18491
Tourism / Aviation	2010	11,000	5.0	30	165	SMC6000	$ 20,180	$ 43,736	8029
Office Landlord	2018	298,000	11.4	60	190	2 * SMC6000A	$ 35,000	$ 70,000	18491
Accommodation	2033	600,000	10.3	54	190	SMC 11000TL	$ 34,000	$ 68,000	16642
Tourism	735	20,080	5.0	30	165	SMC6000	$ 19,880	$ 39,796	8029
Accommodation	1502	97,000	5.0	30	165	SMC6000	$ 19,880	$ 39,759	8029
Real estate	543	78,000	3.0	18	165	SB2500	$ 14,324	$ 33,759	4817
Accommodation	2239	14,600	10.5	60	175	2 * SMC6000A	$ 25,000	$ 59,545	17031
Tourism	738	24,000	5.3	28	190	SMC6000	$ 21,000	$ 41,000	8629
Light Industry	1272	41,000	10.5	60	175	2 * SMC6000A	$ 29,772	$ 59,545	17031

Vet	993	N/A	15.8	90	175	3 x SMC6000A	$ 44,000	$ 88,000	25547
Tourism / Education	2397	14,500	10.5	60	175	2 * SMC6000A	$ 30,000	$ 60,455	17031
Tourism	1304	22,400	5.25	30	175	1 * SMC6000A	$ 17,200	$ 34,454	8516
Aboriginal	2709	497,000	10.5	60	175	2 * SMC6000A	$ 24,295	$ 48,590	17031
Wholesale	2811	45,000	15.8	90	175	3 * SMC6000A	$ 40,485	$ 80,970	25547
Aboriginal	!!!	???	10.5	60	175	2 * SMC6000A	$ 28,009	$ 56,018	17031
	2781	556,699	16.4	80	205	3 * SMC6000A	$ 42,000	$ 89,597	26601
Recreation	444	150,451	10.6	56	190	2 * SMC6000A	$ 34,650	$ 63,000	17258
Recreation		10,000	6.5	36	180	1 * SMC6000A		$ 34,000	10511
Retail trade		211,000	10.1	56	180	1 * SMC10000TL	$ 27,340	$ 54,681	16350
Local Government		449,000	19.4	108	180	3 * SMC6000A	$ 40,000	$ 85,500	31532
Local Government		90,000	44.8	249	180	3 * SMC10000TL + 3 * SMC6000A	$ 60,000	$ 180,330	72698

Arts	3002	24,000	3.96	22	180	1 * SMC6000A	$ 10,773	$ 21,545	6423
Utility		???	21.6	120	180	3 * SMC8000TL	$ 42,000	$ 106,957	35035
Construction		???	15	60	250	SMA 15000TL	$ 18,382	$ 49,091	24330
Storage		???	10.3	54	190	SMA STP 12000TL	$10,000	$ 43,605	16642
Retail trade		???	15.0	80			$10,000	$ 48,350	24330
TOTAL			**411.3**	**2227**			**$ 1,103,177**	**$ 2,446,913**	**666,731**

Section 1.4: Other outcomes

Table 1.4.1: Responses to Q3, Q4, Q7 and Q10 of Customer Registration survey

(Dataset 1: Registration survey after July 2010; Dataset 2: Survey with existing customers before July 2010)

3. Please indicate your **assessment** of each of the following statements about household energy:	Definitely False	Probably False	Probably True	Definitely True			
	1	2	3	4	N	Mean	Std. Deviation

a. Insulation creates a barrier to heat/cold transfer between the outside and the inside of a house	Dataset 1 (Registration survey since July 2010)	0.0	0.0	8.7	91.3	150	3.91	0.282
	Dataset 2 (Existing customers-registered before July 2010)	0.0	0.2	9.2	90.6	478	3.9	0.302
b. In cold weather, large areas of uncovered (bare) glass windows help prevent heat loss from a house	Dataset 1 (Registration survey since July 2010)	73.5	10.6	6.0	9.9	151	1.52	0.985
	Dataset 2 (Existing customers-registered before July 2010)	79.0	9.2	4.0	7.8	477	1.4	0.887
c. To produce the same amount of inside light, halogen downlights use less electricity than either fluorescent or compact fluorescent lighting	Dataset 1 (Registration survey since July 2010)	33.1	28.3	27.6	11.0	145	2.17	1.014
	Dataset 2 (Existing customers-registered before July 2010)	39.3	25.4	20.8	14.5	476	2.11	1.083
d. An uninsulated ceiling is the part of the house through which the largest heat gain (in summer) or heat loss (in winter) usually occurs	Dataset 1 (Registration survey since July 2010)	2.0	3.3	38.4	56.3	151	3.49	0.662
	Dataset 2 (Existing customers-registered before July 2010)	2.9	2.5	36.8	57.7	478	3.49	0.691
e. Without shading on windows, sunlight entering a house will create heat that can be trapped in the house, (especially with ceiling insulation)	Dataset 1 (Registration survey since July 2010)	1.3	0.0	37.7	60.9	151	3.58	0.57
	Dataset 2 (Existing customers-registered before July 2010)	2.5	2.1	21.9	73.5	479	3.66	0.645
f. If the booster is needed with a solar hot water system during sunny periods, using it early in the morning will	Dataset 1 (Registration survey							
		34.2	43.2	19.2	3.4	146	1.92	0.818

generally use less electricity than at other times	since July 2010)							
	Dataset 2 (Existing customers-registered before July 2010)	28.6	36.1	20.8	14.5	476	2.21	1.015
g. Appliances/entertainment devices that are on stand-by don't consume any electricity	Dataset 1 (Registration survey since July 2010)	83.9	9.4	3.4	3.4	149	1.26	0.682
	Dataset 2 (Existing customers-registered before July 2010)	87.5	6.3	2.1	4.2	479	1.23	0.686
h. When a closed room is not occupied, leaving a fan on will cool the room	Dataset 1 (Registration survey since July 2010)	47.0	30.2	16.1	6.7	149	1.83	0.935
	Dataset 2 (Existing customers-registered before July 2010)	45.7	30.0	18.7	5.7	477	1.84	0.92
i. In helping to keep a house cool in summer, an unpainted (silver) metal roof is more effective than a roof painted in white gloss	Dataset 1 (Registration survey since July 2010)	67.1	26.8	4.7	1.3	149	1.4	0.646
	Dataset 2 (Existing customers-registered before July 2010)	74.9	18.4	5.1	1.7	474	1.34	0.653
j. Ceiling fans are much cheaper to operate than air conditioning (of any type)	Dataset 1 (Registration survey since July 2010)	4.0	7.4	35.6	53.0	149	3.38	0.793
	Dataset 2 (Existing customers-registered before July 2010)	3.6	6.3	27.7	62.5	477	3.49	0.769

4. Please indicate your level of **agreement** with the following statements:		Strongly Agree	Agree	Neither	Disagree	Strongly Disagree			
		1	2	3	4	5	N	Mean	Std. Deviation
a. I think people who are important to our household (e.g. family or friends) want us to reduce electricity consumption	Dataset 1 (Registration survey since July 2010)	18.7	59.3	20.7	0.7	0.7	150	2.05	0.711
	Dataset 2 (Existing customers-registered before July 2010)	30.6	45.9	20.8	2.7	0.0	477	1.96	0.797
b. I am confident our household can reduce its electricity consumption if we want to	Dataset 1 (Registration survey since July 2010)	37.1	59.6	1.3	2.0	0.0	151	1.68	0.604
	Dataset 2 (Existing customers-registered before July 2010)	34.9	56.8	7.1	1.3	0.0	479	1.75	0.638
c. Residents of Alice Springs make positive efforts to reduce electricity consumption	Dataset 1 (Registration survey since July 2010)	10.7	43.6	34.2	10.7	0.7	149	2.47	0.891
	Dataset 2 (Existing customers-registered before July 2010)	8.7	52.3	28.2	10.2	0.6	472	2.42	0.857
d. I am uncertain that electricity consumption is actually related to the environmental issues of carbon emissions and global warming	Dataset 1 (Registration survey since July 2010)	6.0	15.3	16.7	31.3	30.7	150	3.65	1.263
	Dataset 2 (Existing customers-registered before July 2010)	5.3	16.9	14.8	34.3	28.6	472	3.64	1.278
e. Reducing household electricity consumption to minimise carbon emissions is not really relevant	Dataset 1 (Registration survey	2.7	4.7	14.8	40.9	36.9	150	4.02	1.0

to my household at present, as any likely problems will occur in the future, and not in this locality	since July 2010)								74
	Dataset 2 (Existing customers-registered before July 2010)	2.7	6.7	10.3	38.4	41.8	476	4.10	1.061
f. A disincentive to my efforts to help reduce carbon emissions enough to make a noticeable change is that there is a very large number of other households in the community who would also need to reduce their electricity consumption, and I cannot be sure how many other households are making such efforts	Dataset 1 (Registration survey since July 2010)	5.4	16.9	22.3	33.8	21.6	149	3.47	1.251
	Dataset 2 (Existing customers-registered before July 2010)	7.0	24.8	19.1	26.1	23.1	472	3.33	1.319

7. Compared to the Alice Springs **residential average**, I think our annual household electricity consumption is :	Well above average	Above average	Average	Below average	Well below average	Not Sure			
	1	2	3	4	5	0	N	Mean	Std. Deviation
Dataset 1 (Registration survey since July 2010)	9.7	24.3	33.3	22.9	4.9	4.9	144	2.74	1.199
Dataset 2 (Existing customers-registered before July 2010)	5.9	15.5	26.4	30.8	20.1	1.5	478	3.39	1.225

10. Please **rate** your household for the following, during the past 6-12 months:		Never	Rarely	Some times	Almost Always	Always			
		1	2	3	4	5	N	Mean	Std. Deviation
a. Recycling/reusing hard waste (glass, plastic, metal, paper)	Dataset 1 (Registration survey since July 2010)	23.8	17.2	29.8	19.9	9.3	151	2.74	1.279
	Dataset 2 (Existing customers-registered before July 2010)	12.8	15.1	32	25.5	14.6	478	3.14	1.219
b. Recycling/composting organic waste from kitchen, garden	Dataset 1 (Registration survey since July 2010)	27.2	21.9	13.9	16.6	20.5	151	2.81	1.507
	Dataset 2 (Existing customers-registered before July 2010)	21.8	13.8	14.6	20.9	28.9	478	3.21	1.527
c. Conserving water - using devices (eg low flow fittings) and/or conscious behaviours	Dataset 1 (Registration survey since								
		6.6	13.2	33.8	36.4	9.9	151	3.3	1.038

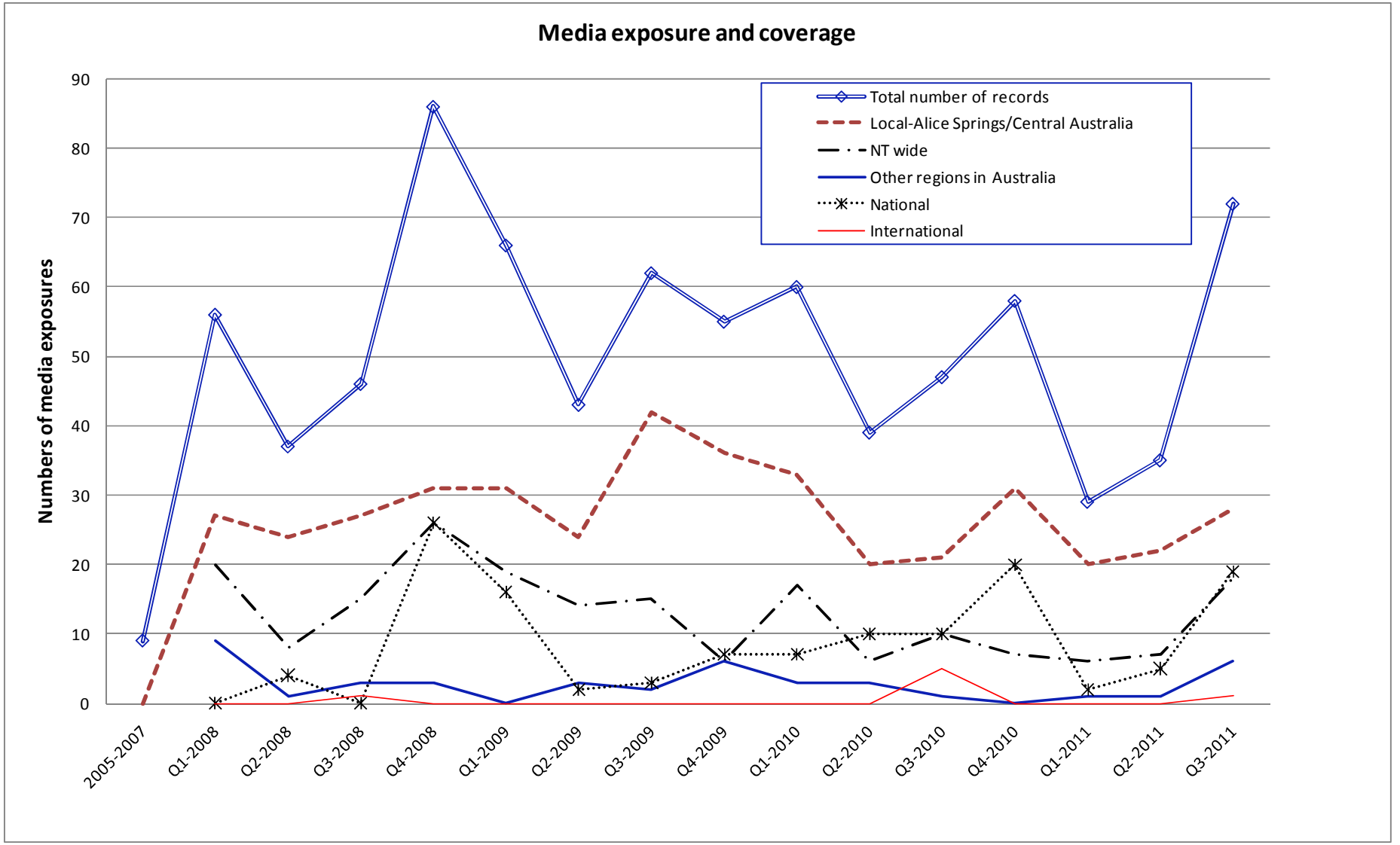
	July 2010)								
	Dataset 2 (Existing customers-registered before July 2010)	5.5	7.6	29	38	20	476	3.59	1.059
d. Conserving electricity - using devices and/or conscious behaviours	Dataset 1 (Registration survey since July 2010)	3.3	4.6	42.4	41.7	7.9	151	3.46	0.839
	Dataset 2 (Existing customers-registered before July 2010)	1.3	5	25.2	48	20.5	477	3.82	0.86
e. Purchasing Green electricity from the PWC	Dataset 1 (Registration survey since July 2010)	83.3	6.8	5.3	1.5	3	132	1.34	0.89
	Dataset 2 (Existing customers-registered before July	73.4	5.2	5.6	5.6	10.2	463	1.74	1.365

	2010)								

Table 1.4.2: Media coverage associated with Alice Springs Solar City Program (Jan. 2005-Sept. 2011)

	2005-2007	Q1-2008	Q2-2008	Q3-2008	Q4-2008	Q1-2009	Q2-2009	Q3-2009	Q4-2009	Q1-2010	Q2-2010	Q3-2010	Q4-2010	Q1-2011	Q2-2011	Q3-2011
Total number of records	9	56	37	46	86	66	43	62	55	60	39	47	58	29	35	72
Local-Alice Springs/Central Australia		27	24	27	31	31	24	42	36	33	20	21	31	20	22	28
NT wide		20	8	15	26	19	14	15	6	17	6	10	7	6	7	18
Other regions in Australia		9	1	3	3	0	3	2	6	3	3	1	0	1	1	6
National		0	4	0	26	16	2	3	7	7	10	10	20	2	5	19
International		0	0	1	0	0	0	0	0	0	0	5	0	0	0	1

Figure 1.4.3: Graph of media exposure and coverage


Media exposure and coverage
Numbers of media exposures
90
80
70
60
50
40
30
20
10
0
Total number of records
Local-Alice Springs/Central Australia
NT wide
Other regions in Australia
National
International
2005-2007
Q1-2008
Q2-2008
Q3-2008
Q4-2008
Q1-2009
Q2-2009
Q3-2009
Q4-2009
Q1-2010
Q2-2010
Q3-2010
Q4-2010
Q1-2011
Q2-2011
Q3-2011

Section 1.5: Issues of Design and Implementation

Table 1.5.1: Questionnaire for Home Energy Audits of Solar City Program

Questions	Answers	
Q1: How well did the HEA meet your expectations?	Mean	4.53
	Valid Response	53
	No Response	12
Q2: In relation to your expectations, please evaluate the following aspects of your HEA:		
a. The quality of discussion/verbal information	Mean	4.66
	Valid Response	64
	No Response	1
b. The amount of information presented	Mean	4.59
	Valid Response	64
	No Response	1
c. The energy/appliance related knowledge of auditor	Mean	4.7
	Valid Response	64

	No Response	1
d. The conduct of the ASC auditor	Mean	4.86
	Valid Response	64
	No Response	1
e. The printed report provided upon completion	Mean	4.49
	Valid Response	63
	No Response	2
f. The suitability of the recommended EEMs	Mean	4.44
	Valid Response	64
	No Response	1
Q3: My level of confidence in using the vouchers we receive to undertake EEMs is:	Mean	4.28
	Valid Response	64
	No Response	1
Q4: My level of confidence in carrying out the behavioural change recommended is:	Mean	4.08
	Valid Response	65
	No Response	0
Q5: To what extent do you believe you will be able to	Mean	3.82

reduce HH EC as a result of undertaking the recommendations discussed at HEA?	Valid Response	65
	No Response	0
Q6: Do you foresee any barriers that may hinder you from proceeding with the recommended EEMs?	Yes	25
	No	40
	No Response	0
Q7: My intention/motivation to carry out the recommendations from the audit is:	Mean	4.22
	Valid Response	64
	No Response	1

Question	**Answers**	**Count**	**Percentage**
Q6: Do you foresee any barriers that may hinder you from proceeding with the recommended EEMs?	Yes	25	38.5%
	No	40	61.5%
	No Response	0	0.0%

Q6: Do you foresee any barriers that may hinder you from proceeding with the recommended EEMs?	**Count**	**Percentage**

If Yes, please specify: (valid response=25; Respondents may describe more than one barrier)	EEM cost and available finance	19	76.0%
	Encouraging behaviour change in HH	3	12.0%
	Landlord/tenant action	2	8.0%
	Process involved (i.e. paper work)	1	4.0%
	Housing priorities (i.e. renovations)	1	4.0%
	Other	0	0.0%

Table 1.5.2: Indication of continuing motivation to invest in EEMs

Question 2: *As a result of your visit to the ASC Sustainable Living House, how much has <u>your motivation increased</u> to implement the following measures at your home:*

%	By visiting the ASC sustainable house, please indicate if your motivation has increased to implement (valid % of total response, i.e. all dates included):				
	No	Unsure	Yes	Installed	Total
Rooftop PV Systems	8.9	14.3	50.0	26.8	100.0
Smart Meters	13.0	13.0	50.0	24.1	100.0

In-house Displays	12.5	10.4	62.5	14.6	100.0
One-shot Boosters	15.7	3.9	49.0	31.4	100.0
Paint Roof White	13.0	7.4	55.6	24.1	100.0
Thermal Skins	16.7	20.4	57.4	5.6	100.0
Vertical Shading	11.3	17.0	47.2	24.5	100.0
Energy Efficient Lighting	3.8	3.8	49.1	43.4	100.0
Appliance Star Rating	7.7	7.7	38.5	46.2	100.0
Indoor Water Measures	9.3	18.5	42.6	29.6	100.0
Garden Design	7.1	8.9	55.4	28.6	100.0
Solar Air Heating	16.1	32.3	51.6	0.0	100.0

Total number					
N	U	Y	AI	NR	*T*
5	8	28	15	19	*75*
7	7	27	13	21	*75*
6	5	30	7	27	*75*
8	2	25	16	24	*75*
7	4	30	13	21	*75*

9	11	31	3	21	*75*
6	9	25	13	22	*75*
2	2	26	23	22	*75*
4	4	20	24	23	*75*
5	10	23	16	21	*75*
4	5	31	16	19	*75*
5	10	16	0	13	*44*

N= No

U= Unsure

Y= Yes

DNL= Did not look

AI= Already Installed

NR= No Response

T= Total

(Source: Alice Springs Solar House: survey of visitors)

Appendix 2: Visitor awareness of the Alice Solar Cities Program

Aim:

The aim of the Alice Springs Visitor Survey was to quantify the impact of the Alice Solar City program on visitors to Alice Springs. This information will be used to help estimate the direct and indirect economic benefits of the Alice Solar Cities Program to the tourism sector of Alice Springs.

Method:

Visitor Survey

A total of 200 visitors were interviewed over a one-month period during March and April 2012. Surveys were conducted at two locations; Alice Springs Airport and the Todd Street Mall. Survey participants were approached at random, with the main criteria that they were not residents of Alice Springs, i.e. visiting Alice Springs for either pleasure or business. The interviews were conducted face-to-face using a short semi-formal survey, which is detailed in Attachment A.

Review of tourism operator's websites

A short review of 27 local accommodation and tourism operators' websites was also conducted, looking for references to the Alice Solar Cities program. In addition, approximately 10 site visits were made to see what signage was available on site.

Analysis of conference data

Analysis of conference data and visits made as a direct result of the Alice Solar Cities program was also conducted, in order to quantify the benefits of business related visitors. Data was collected from Alice Solar Cities and conference organisers to determine the number of conferences, number of interstate delegates and average length of time spent in region. This was converted into an estimated visitor expenditure.

Results of Visitor Survey:

Timing

Of the 200 survey participants, the majority (75.5%) were at the end of their trip. This allowed for the most complete responses to all questions in the survey. The high proportion of 'end of trip' visitors was due to the fact that 80% of surveys were conducted in and around the departure lounge of Alice Springs Airport. The remaining tourists were either at the start of their trip (15%) or mid-way through their trip (9.5%).

Length of stay

The average length of stay for all visitors was 4.1 nights, with a minimum stay of 0 nights (just visiting for the day) and a maximum stay of 90 nights (a business visitor). The average

for business visitors was 12 nights; holidaymakers 2.3 nights and those visiting family and friends 5.2 nights. *Table 1* outlines the averages, minimums and maximums for each group.

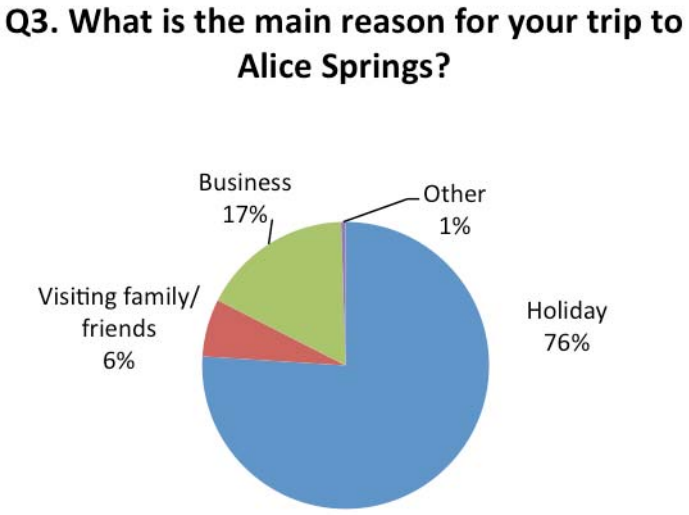
Table 1: Length of stay (number of nights) for each visitor type

Type of stay	**Average stay (nights)**	**Minimum (nights)**	**Maximum (nights)**
Business	11.8	0	90
Holiday	2.3	0	8
Visiting family/friends	5.2	1	16
All visitors	4.1	0	90

This result is similar to the average length of stay (nights) of 4.9 nights for Alice Springs-MacDonnell Region from 2008/09 – 2010/11[1].

Reason for trip

The main reason for people's visit to Alice Springs was predominantly holiday (76%), followed by business (17%), visiting family and friends (6%) and other (1%). None of the survey participants came directly or indirectly because of the Alice Solar Cities program.

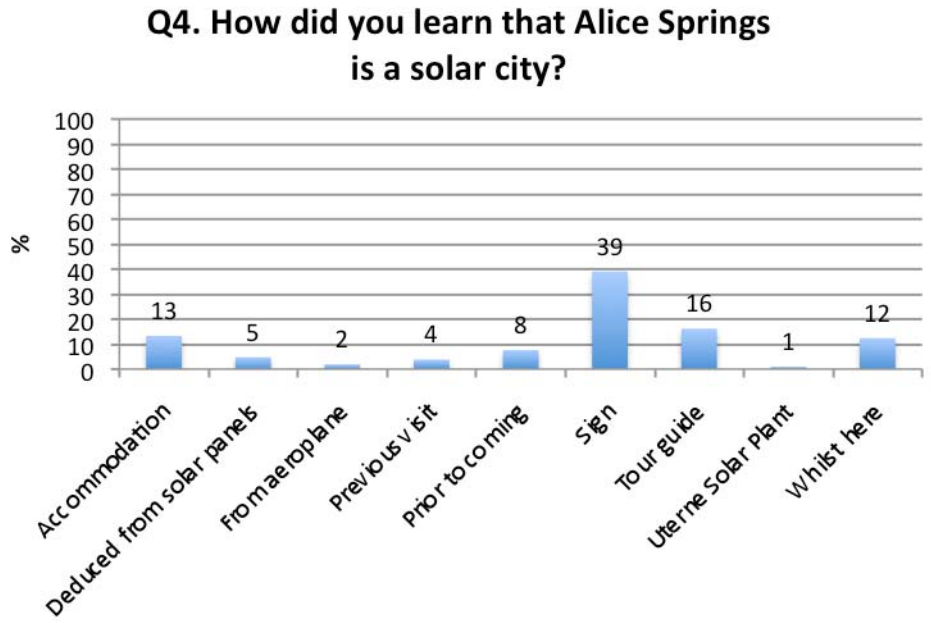


[1] Tourism NT (2012) http://www.tourismnt.com.au/Portals/3/docs/research/ALICE%20MAC%20Jun%2011.pdf Cited 9/5/12

Awareness of the ASC Program

A total of 52.5% of the survey participants answered positively that they were aware of the Alice Solar Cities program. The remaining 47.5% had not heard of the program.

Of the tourists who were aware of the Alice Solar Cities program, the following graph outlines where they learnt about the program.

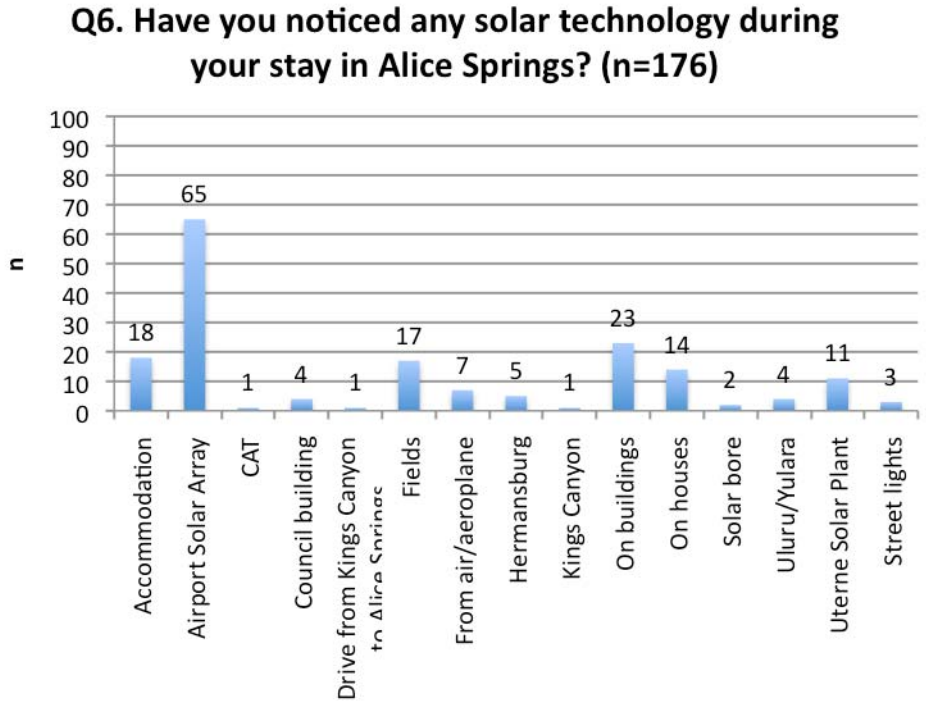


The most common way visitors learnt about the Alice Solar Cities program was by reading a sign (39%). People commented particularly on the signage on the Stuart Highway (entering and leaving the town) and at the Airport Solar Array. The second most likely way to learn that Alice Springs is a solar city was from the holiday tour guides (16%). APT Kings, Clogus, Airport Shuttle, Alice Wanderer, and Intrepid were all tour companies referred to by survey participants. A total of 13% (n=14) of tourists referred to their accommodation as the portal of information on the solar cities program. Of the 14 survey participants who nominated accommodation as their primary source of information, 12 of these stayed at the Crowne Plaza Hotel, one at Lassetters Casino and one at B&B Pathdorf. A further 12% nominated that they found out whilst they were here through word of mouth/reading brochures. Interestingly, 8% found out before they arrived in Alice Springs, through the internet, newspaper articles and word of mouth.

Awareness of Solar Technology installations once in Alice Springs

A total of 72% of visitors to Alice Springs answered positively that they had noticed solar technology/renewable energy installations during their stay in Alice Springs. The remaining 25.5% had not noticed any installations and 2.5% did not respond to this question.

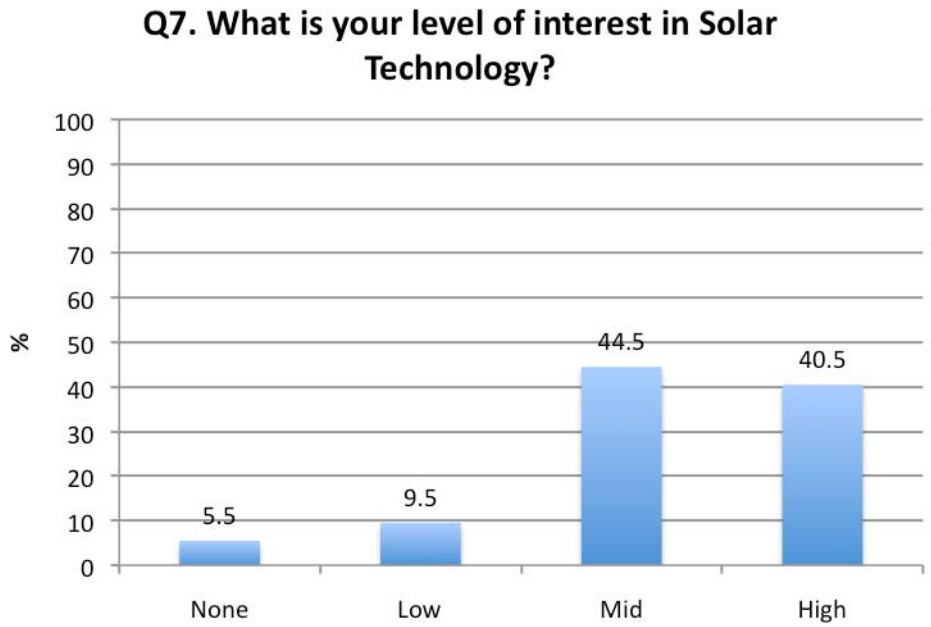
Of the 72% of visitors that did notice solar technologies, the following graph outlines where these installations were spotted.



The most noticeable renewable energy installation to visitors was the Airport Solar Array, with 65 respondents nominating this as an example. Other popular installations included generic 'on buildings' (n=23), at their accommodation (n=18), 'fields' (n=17) (which would most probably be referring to either the Airport Solar Array or Uterne Power Station) and the Uterne Solar Plant (n=11).

Level of personal interest in Solar Technology

The visitors were also queried about their level of interest in solar technology.



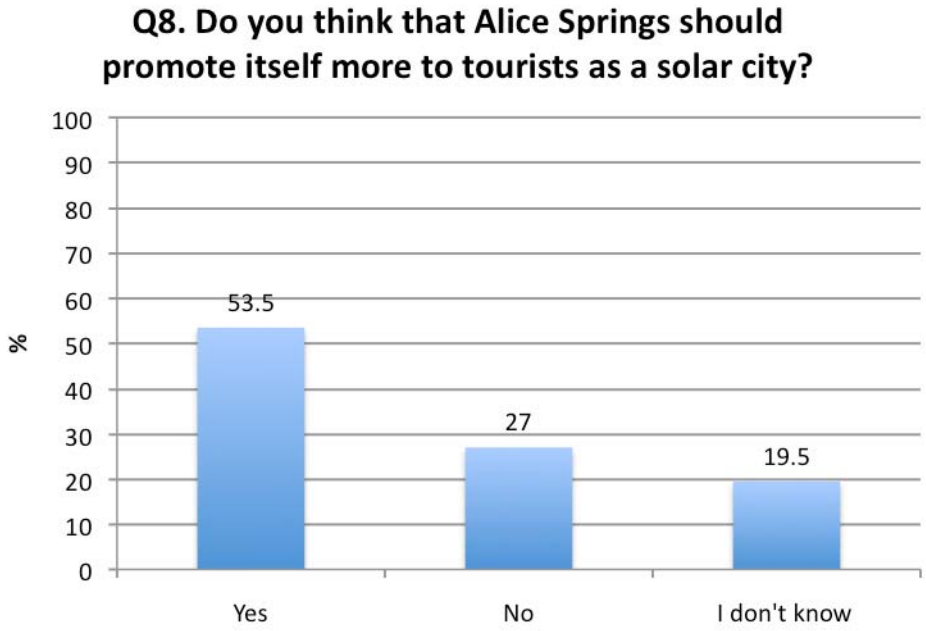
Personal interest in Solar Technology/Renewable Energy was high, with 40.5% reporting a high level of interest and a further 44.5% of respondents reporting medium interest (85% in total). In addition to the survey question, 5.5% of survey participants (n=11) self-reported that they had PV at home and 2% (n=4) reported solar hot water systems (SHWS). The actual level of PV/ SHWS would be higher as this question was not directly asked in the survey; it just came up in conversation with people of mid-high level of interest.

Promotion of Alice Solar Cities to tourist sector

Just over half of respondents (53.5%) were positive about Alice Springs promoting itself more to tourists as a solar city. They thought that it was a good idea to promote Alice Springs' sunny weather, "the sun is a drawcard" and that Alice Springs was "the best place for it". They thought it would interest some people and that it was a positive story that "people should be made aware of". One visitor suggested promoting the number of cloud-free days per year.

The people that responded negatively to the idea that Alice Springs should promote itself more to tourists as a solar city (27%) were the most vocal. They cited lack of interest/importance, "I am more interested in Aboriginal culture and the desert", that it was not a big attraction, that it would not bring more tourists and in some cases "it might put people off". People explained that they were too busy and did not have enough time "it is not on our radar, we are here for Uluru". Another explained, "It is not high on my list, but I value that it is important to locals".

Finally, 19.5% of respondents were unsure, stating indifference, lack of time and lack of interest to tourists.



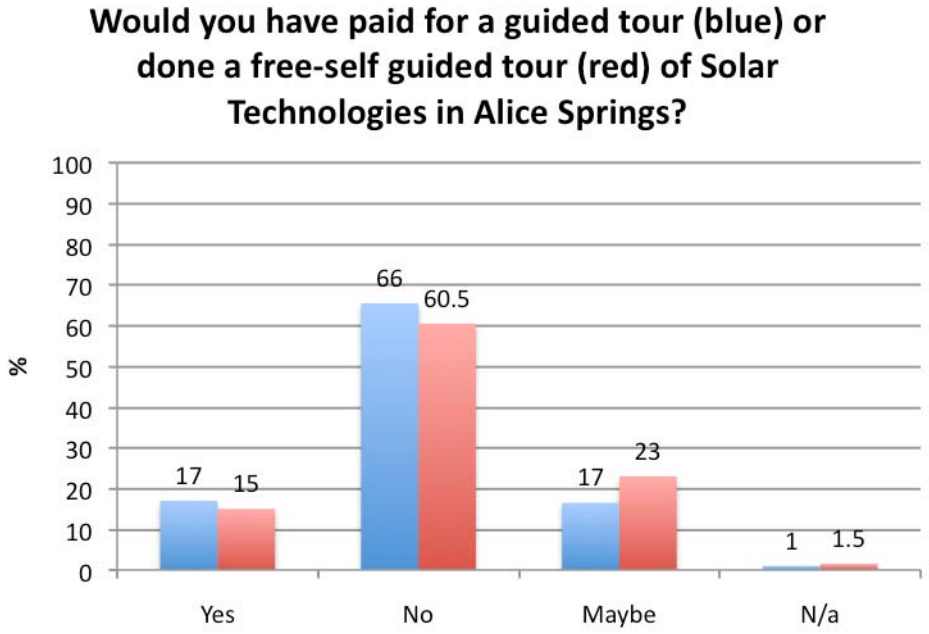
Survey participants were asked whether they had any ideas as to how Alice Springs could promote itself more as a Solar City. Of the 107 who responded positively, approximately 70 had a suggestion. These included:

- More signage or improvement to existing signs. For example, the installation of a live billboard at the Airport Solar Array, more signage at Todd Mall and Araluen, 'make signs more interesting', 'bigger billboards' (n=19)
- Promotion on existing or new tours (n=15)
- Message on the aeroplane (either from steward/stewardess at touch down or in informational DVD on Alice Springs on plane), "Welcome to Alice Springs, the premier Solar City of Australia) (n=12)
- Travel brochures (n=4)
- Tourist Information Centre (n=4)
- Internet (n=4)
- Accommodation (n=4)
- TV ads e.g. Imparja (n=3)
- Media to promote good news stories (n=2)
- Other (e.g. Museum/education centre for children, conferences) (n=2)_
- Promotion interstate (n=1)

Value of a guided tour of Solar Technologies

Survey participants were asked whether they would have paid for a guided tour of solar technologies or done a free self-guided tour with the Alice Solar Cities map.

The results to this question were a little ambiguous, as some people responded thinking of their current itinerary and others responded as if they were coming back to Alice Springs on a future visit.



The majority of survey participants did not want to pay for a guided tour of solar technologies (66%) or do a free self-guided tour (60.5%). The main reasons given were lack of time, followed by a lack of interest in comparison to all of the other tourist attractions they wanted to see. Some felt like they had this opportunity at home (mainly Europeans) or that they were already well informed. Some were happy that they had seen some of the technologies on their existing tours and suggested the inclusion of solar technologies in existing tours as opposed to a separate tour. Those who responded to the free self-guided tour also had concerns about mobility, either concerns about walking or did not have access to a vehicle and would not have hired one specifically. Some people also stated a preference for information from a tour guide.

A total of 17% of survey respondents answered 'maybe' to a paid tour and 23% answered 'maybe' to a free self-guided tour. Again the idea to incorporate this information into existing tours was suggested and a walking tour would be of interest to some.

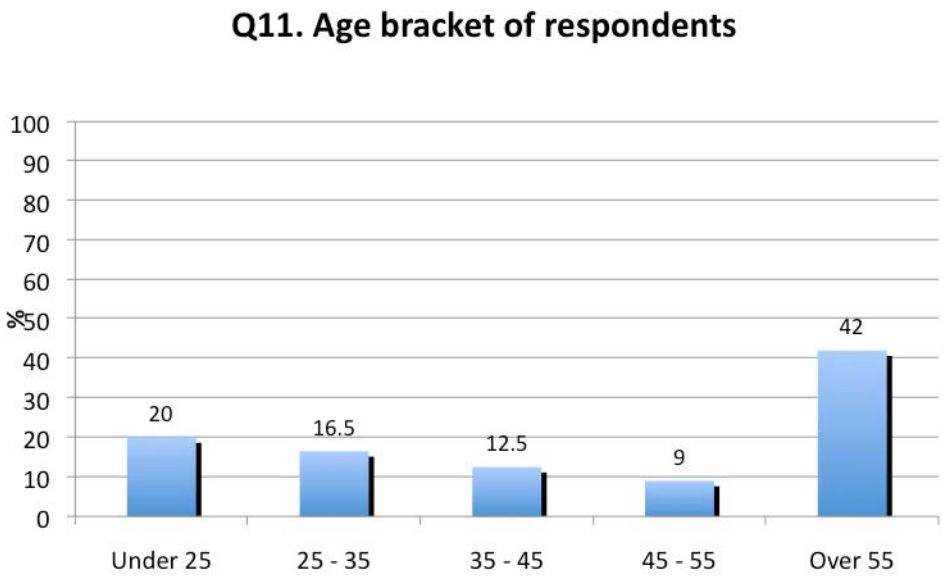
Finally, 17% of survey respondents would have been happy to pay for a guided tour and 15% would have been happy to do a free self-guided tour (had they been aware of this). These people often had a personal interest in solar energy (for example, they were engineers) or knew nothing about it and wanted to learn. Some people still flagged that they would only do the tour if there was enough time. Some commented that they would only participate if the

tour was reasonably priced ($5-$10) and as long as the solar installations were interesting/large enough. One noteworthy suggestion included designing a school tour.

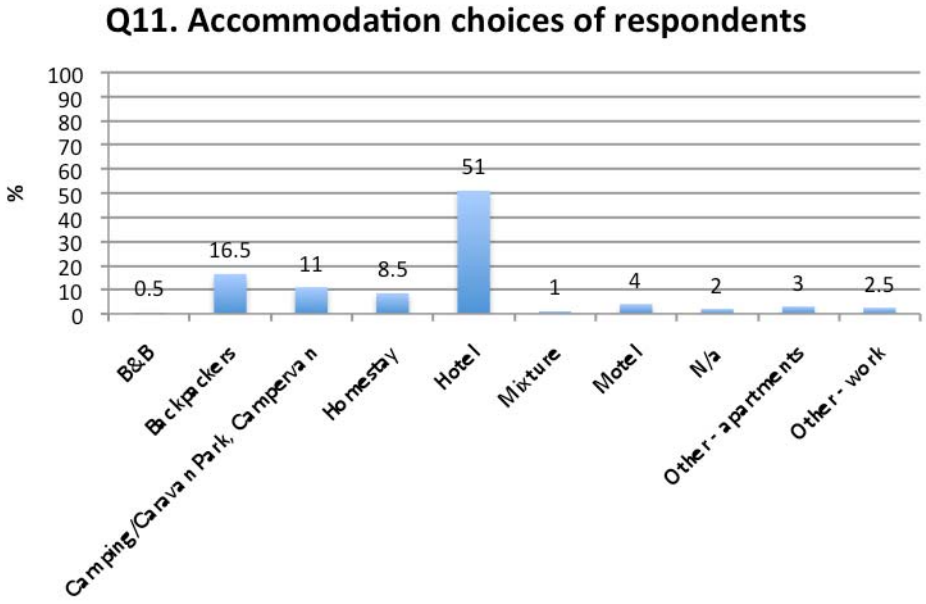
Finally, it was observed that the walking tour maps were not available at the Visitor Information Centre. If Solar Cities was to become a member of the Visitor Information Centre they would happily promote this map and any other relevant material.

Demographic summary

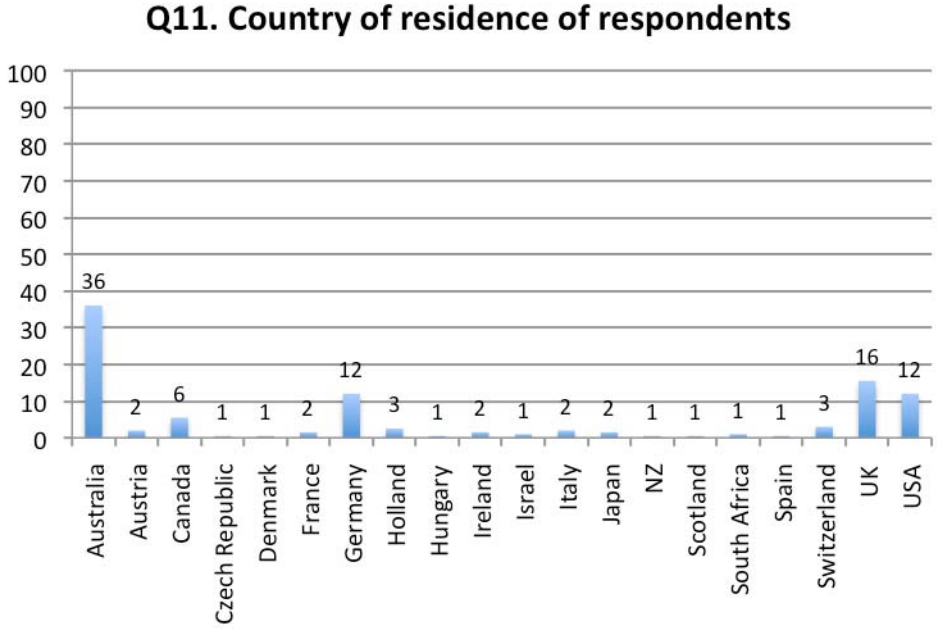
Of the 200 survey respondents, 37.5% were male and 62.5% were female. The age brackets, accommodation choices and country of residence of survey participants are all outlined in the graphs below.



The most predominant age bracket was the ‘Over 55 years’, with 42% of respondents falling in this category. The next most common age bracket was the ‘Under 25 years’ (20%), followed by ’25 – 35 years’ (16.5%).



The most common type of accommodation survey respondents stayed in was hotel (51%), followed by backpackers (16.5%), camping (11%) and homestay (8.5%).



Finally, the four most common countries of residence for survey respondents were Australia (36%), UK (16%), USA (12%) and Germany (12%).

Results from review of tourism operator's websites:

A short review of 27 local accommodation and tourism operators' websites was also conducted, looking for references to the Alice Solar Cities program. It found that most websites did not have any reference to the Alice Solar Cities program, despite many of them having received incentives, having installed solar technologies and being showcased on the actual Alice Solar Cities website.

Organisations with excellent websites that showcased their involvement with the Alice Solar Cities program included Alice Motor Inn[2], Alice Springs Town Council[3], Desert Knowledge Australia[4] and Alice Springs Airport [5]. For example, the Alice Motor Inn's website promotes their "Solar Plant" which reports CO_2 avoided, energy produced and money saved. It also graphs kWh yield for the motor inn and a breakdown of the time of day vs. yield.

There is great opportunity to promote their case studies and photographs of their installations on their own websites. Opportunities for accommodation and tourism providers to increase the profile of the Alice Solar Cities program at their venues also exist. The Crowne Plaza has an excellent environmental display and is an example of best practice. Other venues have the " This business runs on solar energy" signs, but could promote the amount of energy and greenhouse gas they are offsetting more visibly.

Results from analysis of conference data:

To date, the Alice Solar Cities Program has attracted almost 700 interstate visitors to the region since it's commencement in March 2008 through the following conferences/events:

- ATRAA Conference 2010, which had a total of 700 delegates, with approximately 90% or 630 of these coming from interstate
- Solar Cities Forum 2011, which welcomed approximately 30 visitors
- Launch of iconic projects such as the Crowne Plaza, Uterne Solar Power Station and the Alice Springs Airport solar array project as well as annual visits from Federal government bureaucrats, which attracted a further 33 interstate dignitaries.

It is estimated that the 693 interstate visitors stayed a total of 2724 visitor nights. The average spend of a domestic visitor to the Alice Springs / MacDonnell Shire region is $183/visitor

[2] www.alicemotorinn.com.au

[3] www.alicesprings.nt.gov.au/

[4] www.dkasolarcentre.com.au/

[5] www.alicespringsairport.com.au/

night[6]. This totals an estimated spend of $498,492 from visitors directly related to the Alice Solar Cities program during the four years of the project.

The Northern Territory Conventions Bureau is currently marketing Alice Springs as a potential destination for conferences to five different business sectors; desert knowledge, renewable energy, oil and gas, health care and mineral development.[7] The Leadership in Renewable Energy factsheet promotes the work of the Alice Springs Solar Cities program as well as the Desert Knowledge Australia Solar Centre and the Bushlight Program.[8]

Summary & Recommendations:

The Alice Solar Cities program contributes positively to the overall experience of visitors to Alice Springs and the overall "brand" or image of Alice Springs. This is reflected in visitor awareness of the program (53%) and sightings of solar technology in Alice Springs (72%).

Visitors generally accepted the idea of promoting Alice Springs as a solar city. Anecdotally, there seemed to be more support for promoting the sunny weather/number of cloud free days over the solar cities program. According to the Bureau of Meteorology, Alice Springs averages 9.6 hours of sunshine per day and over the last 56 years, has averaged only 63 cloudy days per year[9].

The fact that the Northern Territory Conventions Bureau is promoting the region's renewable energy installations to potential conference holders in Alice Springs also indicates that the work of Alice Solar Cities program is held in high regard.

To continue to promote the positive work of the Alice Solar Cities program to visitors in Alice Springs, the following recommendations can be made from the results of this study:

- Continue to build on the strength of likely places where tourists would become aware of the Alice Solar Cities program. Work with accommodation providers/tourist operators who have installed PV to promote their installations visibly at their buildings and also on their websites. Best practice example for this is Crowne Plaza with its display and Alice Motor Inn with its internet promotion (www.alicemotorinn.com.au).

- Make signs more visible and fun. A site visit to the Airport Solar Array also highlighted that vegetation is obscuring the sign at this location. Consider a sign in the Alice Springs Mall.

- Work with airlines to promote the Alice Solar Cities program as tourists land, either as part of the steward's welcome upon landing or as part of the Alice Springs promotional DVD that is played on the flight.

---

[6] http://www.tourismnt.com.au/Portals/3/docs/research/Regional%20snapshot%20YE%202010-11.pdf Cited 23/5/12

[7] http://www.ntconventions.com.au/WhytheNT/NTStrengths.aspx Cited 24/5/12

[8] http://www.ntconventions.com.au/LinkClick.aspx?fileticket=mzhH70GRHew%3d&tabid=185 Cited 24/5/12

[9] http://www.nata.com.au/nata-enews/421 Cited 21/5/12.

- Hold an information night for tour guides to provide information for them to share with passengers on their tours.
- Investigate Alice Solar City becoming a member of the Tourist Information Centre in order to promote the free self-guided tour map to tourists.
- Run a story on the free self-guided tour to locals who can then promote it with friends and family that come to stay.
- Do a media promotion of good news solar story to interstate papers/magazines to improve the image of Alice Springs. One good example of a media story was run in NATA news[9.]

Below we have attached the survey form

ATTACHMENT A: ALICE SOLAR CITY TOURISM SURVEY

1. Have you…?
    i. just arrived in Alice Springs
    ii. mid-way through trip
    iii. end of trip

2. What is the length of your stay? (number of nights) _____

3. What is the main reason for your trip?
    i. Holiday
    ii. Visiting family / friends
    iii. Business
    iv. Other purposes _____

4. Are you aware that Alice Springs is one of seven Solar Cities in Australia?

    Yes / No

a. If YES, how did you find out?_____

b. If NO, skip to Q 6.

5. Was the Solar Cities Project an influencing factor for your trip?

    Yes / No

    a. If YES, what were you planning to visit? _____

6. Have you noticed any solar technology / renewable energy during your stay in Alice Springs?

    Yes / No

a. If YES, what? _____

7. What is your level of interest in Solar Technology / Renewable Energy?

   None / Low / Mid / High

8. Do you think that Alice Springs should promote itself more to tourists as a solar city?

   Yes / No / I don't know

   a. If YES, any ideas? _____

9. In your itinerary, would you pay / have paid for a guided tour of solar technologies in Alice Springs?

   Yes / No / Maybe

10. In your itinerary, would you consider / have considered a free self-guided solar tour in Alice Springs?

    Yes / No / Maybe

11. Additional demographic information:

    Gender? Male / Female

    What is your age range?
    - Under 25
    - 25 – 35
    - 35 – 45
    - 45 – 55
    - Over 55 years

    What is/was the main type of accommodation you are staying/stayed in?
    i. Hotel
    ii. Motel
    iii. B&B
    iv. Backpacker
    v. Home stay
    vi. Other _____

    What is your nationality? _____