Australasian Marketing Journal ■■ (2017) ■■–■■

Contents lists available at ScienceDirect

Australasian Marketing Journal

journal homepage: www.elsevier.com/locate/amj

Social marketing strategies for renewable energy transitions

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ARTICLE INFO

Article history:
Received 30 December 2016
Revised 19 April 2017
Accepted 28 April 2017
Available online

Keywords:
Social marketing
Renewable energy
Environmental attitudes
Energy transition
Energy efficiency

ABSTRACT

Transitions to more sustainable energy systems are increasingly required to address the problem of climate change. Different stakeholder groups, however, may not share the same level of acceptability for an increase in renewable energy. This paper examines energy consumers' attitudes towards energy issues, their use of renewable energy in the home and constraints to energy conservation. Respondent-completed questionnaires from 325 people reveal strong support for renewable energy and a belief in human-induced climate change. A multitude of obstacles to energy-efficient practices are revealed by the survey. The paper also explores the role of social marketing in prompting behavioural change and encouraging a transition to renewable energy. Policy makers can utilise these findings to accelerate the transition to renewable energy and build capacity among residents.

1. Introduction

Transitions to renewable energy continue to attract academic attention (see, for example, Araújo, 2014; Markard, Raven & Truffer, 2012). Energy transitions represent a shift in socio-technical systems (Geels, 2004), where this shift unfolds over a long time-span and requires far-reaching changes along different dimensions including technological, organisational, political, economic and socio-cultural (Markard et al., 2012). Although there are many ways to define the concept, an energy transition is defined in the current work as *a long term structural change of energy systems (incorporating generation, distribution and use) from a fossil-fuel-based to a renewable energy-based system*. Furthermore, consistent with government policy in many countries, renewable energy is defined as *energy that is obtained from natural resources, such as solar or wind, that are continually replenished* (Australian Renewable Energy Agency, undated). Internationally, the growth of renewable energy in 2015, at 8.3 per cent, is claimed to be the highest on record, which reflects the significant growth in capacity over the last five years (International Renewable Energy Agency, 2015).

Claims are increasingly being made that nations must transition to more sustainable, renewable energy systems. This is primarily because fossil fuel-based energy generation is deemed to have substantial negative environmental effects such as carbon emissions and associated climate change impacts (Fouquet and Pearson, 2012; Fri and Savitz, 2014; Grubler, 2012; Schultz et al., 2015). Electricity generation in Australia is claimed to account for 38 per cent of greenhouse gas emissions, due primarily to the use of fossil fuels in electricity generation (Byrnes et al., 2013). Data from the Organisation for Economic Cooperation and Development (OECD) show that Australia's per capita emissions rate remains the worst of all 34 OECD countries (Organisation for Economic Cooperation and Development (OECD, 2015). Recent government projections to 2050, however, portray a shift in energy generation in Australia with average annual growth of renewable energy expanding faster (1.5%) than traditional energy sources, such as coal (0.8%), gas (–0.1%) and oil (0.0%) (Syed, 2014). With global demand for electricity predicted to double by 2050 (Dunn et al., 2011), more research is needed to understand how nations can achieve effective energy transitions.

Residential energy conservation is cited as a way to encourage a transition to renewable energy (Abrahamse, Steg, Vlek & Rothengatter, 2005; Frederiks, Stenner & Hobman, 2015; Gray & Bean, 2015; Hards, 2013; Sweeney, Kresling, Webb, Soutar & Mazzarol, 2013; van Doren, Giezen, Driessen & Runhaar, 2016; Vine, Buys & Morris, 2013). Consumer-oriented studies of energy conservation are sparse, particularly in Australia (see Moloney et al., 2010; Mullaly, 1998) The literature on energy conservation is linked with a long-established body of work on the determinants of pro-environmental behaviour (Faiers, Cook & Neame, 2007; Jackson, 2005; Steg & Vlek, 2009; Wilson & Dowlatabadi, 2007). This has seen a wide range of theories applied to pro-environmental behaviour; however, there is no agreement on the most effective change strategies nor the

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http://dx.doi.org/10.1016/j.ausmj.2017.04.006
1441-3582/

Please cite this article in press as: Lynne Eagle, Amy Osmond, Breda McCarthy, David Low, Hayden Lesbirel, Social marketing strategies for renewable energy transitions, Australasian Marketing Journal (2017), doi: 10.1016/j.ausmj.2017.04.006

fundamental principles on which strategies can be built (Moloney et al., 2010). The complex interaction of factors influencing decisions to move towards renewable energy are not well understood and it is acknowledged that "more insight is needed into factors influencing consumers' acceptance of future energy systems" (Leijten et al., 2014, p. 973). For instance, a study by Bird et al. (2014) found that Australians' support for nuclear power reduced post the Fukushima Daiichi nuclear plant disaster in 2011 (i.e., an event can serve as a catalyst for forming or changing an opinion). Leijten et al. (2014) state "it is therefore essential to better understand how to promote the transition towards a sustainable energy system at the macro and meso (e.g., political, technological, institutional) levels and at the micro (e.g., individual, household) level" (p.973). This paper considers the micro level through the perspective of residents' attitudes towards, and acceptance of, renewable energy.

While it has been noted that transitions towards renewable energy are necessary, acceptance of this among different stakeholders cannot be taken for granted. Public opinion is important for complex issues such as climate change (Pietsch and McAllister, 2010). Widespread support has become reified as a starting point for research on public responses to large-scale energy infrastructures (Batel & Devine-Wright, 2015). Social acceptance is a concept that significantly shapes the implementation of renewable energy technologies and achievement of targets (Moula et al, 2013). The focus of this paper is not on technology development per se, but rather the need to build social acceptance and increase uptake of renewable technologies, as these aspects are noted as having been neglected (Devine-Wright, 2007; Huijts et al., 2012; Wüstenhagen et al., 2007). Despite increased academic attention, no clear definition of social acceptance of renewable energy technologies exist; instead, it may be a concept of multiple dimensions (see Wüstenhagen et al., 2007 for a discussion).

Previous energy-related studies are limited in that there is a tendency to focus on a single energy technology and a failure to assess public attitudes within context (Stoutenborough et al., 2015). This paper attempts to address these challenges through a social sciences perspective. Social sciences are ideally situated to address human decisions – especially in relation to choice decisions for energy sources and consumption levels – and for the identification of barriers to sustained behaviour change (Sovacool, 2014). Accordingly, the objective of this study is to evaluate consumers' behaviour in relation to energy conservation and to examine the perceptions and attitudes of consumers regarding renewable energy, in an attempt to understand the degree of social acceptance among Queensland residents. Further examination of these findings will then be through the application of social marketing theory i.e.: "social marketing seeks to develop and integrate marketing concepts with other approaches to influence behaviours that benefit individuals and communities for the greater social good"[1]. Policy makers have recommended a wider application of social marketing to address environmental problems (Dahl, 2010; Menegaki, 2012). It is apparent, however, that authors in the energy sector confuse social advertising with social marketing, advocating mass media activity only or failing to move beyond vague descriptions of its potential (Chen et al., 2015; Frame and Newton, 2007). Nevertheless, the importance of this tool is evident in that "governments have to convince citizens that the problem [climate change] is so serious that they must change long-established patterns of behaviour" (Pietsch and McAllister, 2010, p. 218). Furthermore, Bird et al. (2014) found that "people will not voluntarily accept a reduction in living standards to reduce future [global] warming" (p. 652).

This research contributes to the literature in three ways. Firstly, it provides a contextualised account of energy practices by Australian consumers. Australia has a high reliance on fossil fuel-generated electricity and is recognised as one of the most carbon-intensive countries in the world (Clean Energy Council, 2015), albeit having considerable natural advantages in renewable energy. The first research question focusses on understanding Australian consumers' energy consumption behaviour. Secondly, the paper provides a focus on social acceptance of renewable energy technology options. Social acceptance has been an aspect of behaviour which is noted as largely ignored to date (Batel et al., 2013). The second research question explores consumers' attitudes and preferences towards renewable energy development. Thirdly, the research combines the concept of social acceptance with energy conservation behaviour in the home – an approach which is also rare in the literature. By delving into both social acceptance and energy conservation practices, a deeper understanding of what consumers think about energy issues can be harnessed. The third research question focusses on identifying residents' preferences for investment into renewable energy.

2. Methods

2.1. Research instrument and variable selection

A questionnaire was developed as part of a larger project on transitioning to renewable energy. Questionnaires have become a well-established and valid research instrument in the energy conservation literature (see Thøgersen and Grønhøj, 2010). Furthermore, Australian consumers are well acquainted with this approach since information about their domestic household is required by the government (e.g. the Census). Questions were based on key themes in the literature and included questions drawn from previously validated instruments. Respondents were asked about electricity usage and attitudes towards renewable energy in a variety of forms including dichotomous scales (i.e., yes or no), five-point Likert scales (e.g. 1 = not at all important to 5 = very important), ranking scale (e.g. 1 = most important to 6 = least important), and tick-the-box options (for demographic data only). The literature (e.g., Attari, DeKay, Davidson & De Bruin, 2010; New Environmental Paradigm scale by Dunlap and Van Liere, 1978) informed some questionnaire items while the authors constructed others. For this study in particular, variables relating to acceptance, consumers' energy consumption behaviour, attitudes towards climate change and government preferences were of importance and are further explained below.

2.1.1. Acceptance of renewable energy and energy consumption behaviour measures

Acceptance of renewable energy and alternative energy sources was captured in a 12 item scale, using a five-point Likert scale (e.g. 1 = strongly oppose and 5 = strongly support). We regarded acceptance of renewable energy as an attitude towards renewable energy, with some degree of support, or lack of support, for an increase in its supply and use. The structure of the question allowed for comparison across the different types of energy sources, including fossil fuels. The question also assessed support for technologies used to store electricity. Brief explanations of the technologies were given since the research dealt with complex issues and we wished to avoid posing questions that would confuse or frustrate respondents. Previous studies on public attitudes towards energy (Stoutenborough et al., 2015) informed this question, along with industry and government reports.

There are many ways to save electricity in the home and they differ in terms of impact and demand on individual resources (Thøgersen and Grønhøj, 2010). Adoption of renewable energy technologies by a large consumer base can significantly reduce societies' dependence on fossil fuels and greenhouse gas emissions (Claudy

[1] Definition of social marketing endorsed by the Boards of International Social Marketing Association based in the United States of America, the European Social Marketing Association, and the Australian Association of Social Marketing in 2013.

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et al., 2013). Hence, respondents were asked if they had roof-top solar and a battery storage system at home and if they were likely to get both systems in the next two years. Phrased as a dichotomous scale (i.e., yes or no), this question was included to capture purchasing behaviour. One question – comprising eight literature-informed statements and an 'other' option – was also developed to measure the factors preventing energy conservation. Personal comfort (Bond, 2011) plays an important role in preventing energy saving as well as lack of knowledge of how to effectively manage electricity consumption (Press and Arnould, 2009). The time and effort demanded to reduce energy usage (Tan et al., 2016) is also a behavioural constraint. A two item-scale "I have already done all I can to save electricity" and "I am too busy to be concerned about saving electricity" (adapted from McClaren, 2015) was included to capture the effort devoted to conservation.

2.1.2. Attitudes towards climate change measures

Eleven statements were utilised to measure respondents' attitudes towards climate change and perceived impacts. Environmental concern was measured using an abbreviated version of the new environmental paradigm (NEP) scale (Dunlap and Van Liere, 1978). Several other items were developed by the authors to capture energy-related issues of particular relevance to Queensland. These attitudes were captured on a five-point Likert scale with anchor points 1 = strongly disagree to 5 = strongly agree.

2.1.3. Government preference measures

Government preferences were assessed in two ways for the current study: (1) belief about investment priorities and (2) support for political party. Firstly, respondents were asked to rank six factors in order of importance in deciding which methods of electricity production the Queensland government should utilise in the future. The six factors considered effects on humans versus effects on the environment, and have been used in previous studies (see Poortinga et al., 2006). Secondly, as overseas studies have indicated that social acceptance of renewable energy is associated with political affiliations (Karlstrøm and Ryghaug, 2014), respondents were asked to indicate what political party they generally supported, with three major Australian parties specified as well as 'other' and 'prefer not to stay' options.

2.2. Data

Data were collected August to October 2016 through field sampling and online distribution. Field collection was conducted primarily in the regional city of Townsville, Queensland, Australia. A regional focus was important since coal mining tends to co-exist with large-scale renewable energy projects in regional economies, thus the survey enabled attitudes to be assessed within context. Furthermore, fieldwork helped us reach those markets that are difficult to access (e.g., low income, younger age groups, minority groups, defence personnel) and make the research results more substantial and reliable. A non-probability, convenience sampling method was adopted where respondents were recruited at food markets, festivals and shopping centres in the city and at selected suburbs. Online collection was facilitated through Qualtrics software with email distribution through selected regional organisations' databases. This approach was intended as a supplement to the field collection out of recognition that 86 per cent of Australian households are online (Australian Bureau of Statistics, 2016).

In total, 363 questionnaires were collected with 325 included for further analysis (89.5% completion rate). Data cleaning processes involved the removal of questionnaires with less than 50 per cent completion and the coding of missing data. More females (54.5%) than males participated in the questionnaire. Respondents came from different age groups with the majority falling into three brackets: 20–29 years (22.1%), 30–39 years (22.7%), and 40–49 years (22.1%). Half the sample (50.8%) was in full-time employment. Respondents' level of educational attainment varied with 26.8 per cent having a bachelor's degree. One-fifth of the sample reported $65,000 to $99,000 household income with respondents dispersed across the other income brackets. Most respondents (40%) lived in rental housing. The survey represents a reasonable cross-section of a regional population.

Table 1
Acceptance of energy technologies.

Energy	Mean	n
Solar (i.e., producing energy from the sun)	4.70	322
Wind (i.e., producing energy from the wind)	4.62	323
Marine power (i.e., generated from the movement of tides, waves or ocean)	4.37	319
Hydroelectric power (i.e., energy generated from flowing water)	4.27	319
Battery storage (i.e., a storage device connected to any source of energy, including solar and hydro)	4.07	324
Biomass (i.e., energy produced from sugar cane, landfill gas, wood, or sorghum crops specifically grown for energy)	4.01	322
Geothermal (i.e., generated from energy stored in the Earth, such as hot, dry rock)	3.81	323
Fuel cell technology (i.e., generated from hydrogen)	3.61	320
Natural gas (i.e., drilling wells into the ground to reach the gas, including coal seam and shale gas)	2.98	322
Oil (i.e., producing energy from oil reserves)	2.72	314
Coal (i.e., coal-fired power stations)	2.63	323
Nuclear (i.e., generated from nuclear fission)	2.55	320

2.2.1. Analysis

Data were analysed using SPSS 22.0. Cross tabulations and frequency distributions were performed since the study was a descriptive one and they are the simplest and most frequently used ways of analysing survey data (Field, 2005); sample size for respective tests are reported as appropriate.

3. Results

3.1. Acceptance of renewable energy and energy consumption behaviour of Australian consumers

Table 1 shows the level of support for each energy source. It indicates a high level of support for renewable energy, with solar and wind energy receiving the highest mean scores. Nuclear energy was by far the least favoured technology. Battery storage enjoyed strong support from the sample, along with hydroelectric and marine power. The public clearly preferred renewable energy over fossil fuels (which received a neutral score).

As a baseline measure, questionnaire participants were asked if they currently have, or are planning to install, power-saving systems. Table 2 outlines the proportion who have systems compared to those who do not. The majority of respondents indicated that they do not have power-saving system installed at home, nor are they likely to invest in them over the next two years. Roof-top solar, however, was

Table 2
Summary statistics for power-saving system installation.

Installation behaviour	Yes %(n)	No %(n)
I currently have roof-top solar (photovoltaic) at home	24.3 (76)	75.7 (237)
I am likely to install roof-top (photovoltaic) in next 2 years	17.6 (51)	82.4 (239)
I currently have a battery energy storage system at home	5.0 (15)	95.0 (286)
I am likely to install a battery energy storage system in next 2 years	12.8 (38)	87.2 (260)

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Table 3
Constraints to energy conservation.

Prevention reasons	Yes % (n)	No % (n)
Nothing. I have already done all I can to save electricity	39.8 (125)	60.2 (189)
I am worried about the prices of energy-efficient devices	23.9 (75)	76.1 (239)
I am not willing to sacrifice some personal comforts in order to save electricity	20.4 (64)	79.6 (250)
I do not have enough information on how to save electricity	17.8 (56)	82.2 (258)
Nothing. I am not concerned about saving electricity	10.2 (32)	89.8 (282)
I am too busy to be concerned about saving electricity	9.6 (30)	90.4 (284)
It is pointless trying to save electricity because utilities just then charge more for the electricity that is used	8.6 (27)	91.4 (287)
Reducing my electricity usage is not worth the trouble	4.8 (15)	95.2 (299)

the preferred power-saving system with almost one-quarter of respondents stating current installation and one-fifth suggesting likely investment.

Respondents were also asked what prevents them from saving electricity at home. Table 3 displays the degree of constraint faced by households. Almost half of the sample (39.8%) stated that they were doing all they could to save electricity and did not perceive any barriers to action. Concern about the price of energy-efficient devices and the need to sacrifice some personal comfort in order to save electricity were cited as barriers by one-fifth of the sample.

Table 4
Climate change and energy-related environmental beliefs.

Environmental and climate change statements	*n*	*Mean*
It is our responsibility to develop renewable energy for future generations	323	4.45
Queensland's renewable energy sources (e.g. solar, wind) should be fully exploited	323	4.33
High levels of energy use will impact future generations' standard of living	322	4.27
Human-induced climate change is occurring at some level	323	4.19
Queensland is rich in renewable energy sources (e.g. solar, wind)	320	4.10
Investment in renewable energy is a means of stimulating economic growth	318	3.95
We are using up supplies of fossil fuels (i.e. coal, oil, gas) too fast	321	3.89
Solar photovoltaic (PV) is the cheapest form of electricity	318	3.36
Fossil fuels (i.e. coal, gas, oil) should *not* be avoided because they support the economy	322	2.74
The environmental impacts associated with coal-fired power stations are often overstated	323	2.69
There is no link between electricity used in the home and climate change	321	2.43

Furthermore, a small number of respondents indicated that saving electricity is not worth the trouble.

3.2. Attitudes and preferences towards renewable energy development

The second objective of the study sought to explore consumers' attitudes towards renewable energy. In particular, the focus was to determine whether attitudes towards renewable energy development changed depending upon different groups of energy consumers.

3.2.1. Environmental and climate change attitudes

Table 4 displays the level of agreement (scale: 1 = strongly disagree; 5 = strongly agree) for different environment and climate change statements. As shown in Table 4, respondents acknowledged climate change, the existence of an energy problem and the need to develop renewable energy resources. Interestingly, while there was strong agreement that climate change is occurring partly due to human activities ($\mu = 4.19$), household energy consumption was not viewed as a major contributing factor ($\mu = 2.43$).

Further exploration of consumers' attitudes towards renewable energy was achieved by analysing respondents' use of renewable energy in the home. Firstly, chi-square analyses were performed between respondents' environmental beliefs (see Table 4) and their usage of power saving systems at home (see Table 2). For these analyses, environmental belief scores were recoded into 'agree' (score of 4 or 5), 'neutral' (score of 3), and 'disagree' (score of 1 or 2). Respondents were also re-categorised into 'current power savers' and 'future power savers' groups. Current power-savers was based on respondents' answer to 'I currently have roof-top solar at home' and 'I currently have a battery energy storage system at home'. That is, a 'no' response to both options represented the 'non-power savers' group whereas a 'yes' response to roof-top solar and/or battery energy storage resembled the 'current power savers' group. 'Future power savers' was constructed in the same manner using the variables 'I am likely to install roof-top solar at home in the next two years' and 'I am likely to get a battery energy storage system at home in the next two years' to devise 'future power savers' and 'non-likely power savers'. Tables 5 and 6 report the findings from the chi-square analysis for current power savers and future power savers respectively, and will be considered together.

In terms of current installation, respondents with power-saving systems did not significantly differ in their environmental beliefs to those who had no systems. Two exceptions were, however, recorded (see Table 5). Firstly, power-saving consumers agreed more strongly in that solar photovoltaic is the cheapest form of electricity (χ^2 [2, 294] = 8.11, $p < .017$; Cramer's $v = .166$, $p < .017$). Secondly,

Table 5
Attitudes towards renewable energy by current power saving consumers.

Environmental and climate change statements	Current power savers			Non-power savers			Chi-square
	Agree	*Neutral*	*Disagree*	*Agree*	*Neutral*	*Disagree*	
There is no link between electricity used in the home and climate change	28.4	26.9	44.8	15.2	21.6	63.2	$\chi^2 = 8.605$, $p < .014$[a]
Solar photovoltaic (PV) is the cheapest form of electricity	51.5	33.3	15.2	33.8	52.2	14.0	$\chi^2 = 8.109$, $p < .017$[a]
Investment in renewable energy is a means of stimulating economic growth	77.6	10.4	11.9	75.0	18.4	6.6	$\chi^2 = 3.938$, $p < .140$[a]
It is our responsibility to develop renewable energy for future generations	92.5	3.0[b]	4.5[b]	93.6	4.3	2.1	$\chi^2 = 1.289$, $p < .525$
High levels of energy use will impact future generations' standard of living	86.6	7.5	6.0[b]	85.3	11.2	3.4	$\chi^2 = 1.536$, $p < .464$
The environmental impacts associated with coal-fired power stations are often overstated	29.9	23.9	46.3	25.0	28.9	46.1	$\chi^2 = .937$, $p < .626$[a]
Fossil fuels (i.e. coal, gas, oil) should not be avoided because they support the economy	20.9	31.3	47.8	27.3	31.6	41.1	$\chi^2 = 1.355$, $p < .508$[a]
We are using up supplies of fossil fuels (i.e. coal, oil, gas) too fast	68.7	26.9	4.5	66.1	25.7	8.3	$\chi^2 = 1.083$, $p < .582$[a]
Queensland is rich in renewable energy sources (e.g. solar, wind)	79.1	9.0	11.9[b]	78.3	16.1	5.7	$\chi^2 = 4.729$, $p < .094$
Queensland's renewable energy sources (e.g. solar, wind) should be fully exploited	88.1	7.5	4.5[b]	84.5	9.9	5.6	$\chi^2 = .517$, $p < .772$
Human-induced climate change is occurring at some level	83.6	14.9	1.5[b]	83.2	12.5	4.3	$\chi^2 = 1.357$, $p < .507$

[a] 0 cells have expected count less than 5.
[b] This cell has expected count less than 5.

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Table 6
Attitudes towards renewable energy by future power saving consumers.

Environmental and climate change statements	Future power savers			Non-likely power savers			Chi-square
	Agree	*Neutral*	*Disagree*	*Agree*	*Neutral*	*Disagree*	
There is no link between electricity used in the home and climate change	21.1	22.8	56.1	16.0	23.1	60.9	$\chi^2 = .855$, $p < .652$[a]
Solar photovoltaic (PV) is the cheapest form of electricity	57.1	33.9	8.9	32.9	51.8	15.3	$\chi^2 = 11.232$, $p < .004$[a]
Investment in renewable energy is a means of stimulating economic growth	71.9	14.0	14.0[b]	75.7	18.5	5.9	$\chi^2 = 4.624$, $p < .099$
It is our responsibility to develop renewable energy for future generations	98.2	1.8[b]	0.0[b]	91.6	4.8	3.5	$\chi^2 = 3.254$, $p < .197$
High levels of energy use will impact future generations' standard of living	87.7	8.8	3.5[b]	85.0	11.0	4.0	$\chi^2 = .280$, $p < .869$
The environmental impacts associated with coal-fired power stations are often overstated	33.3	24.6	42.1	23.5	29.2	47.3	$\chi^2 = 2.364$, $p < .307$
Fossil fuels (i.e. coal, gas, oil) should not be avoided because they support the economy	26.8	28.6	44.6	25.7	32.7	41.6	$\chi^2 = .366$, $p < .833$[a]
We are using up supplies of fossil fuels (i.e. coal, oil, gas) too fast	70.2	22.8	7.0[b]	67.0	26.3	6.7	$\chi^2 = .297$, $p < .862$
Queensland is rich in renewable energy sources (e.g. solar, wind)	89.3	7.1	3.6[b]	76.9	16.9	6.2	$\chi^2 = 4.271$, $p < .118$
Queensland's renewable energy sources (e.g. solar, wind) should be fully exploited	86.0	8.8	5.3[b]	85.5	9.7	4.8	$\chi^2 = .058$, $p < .971$
Human-induced climate change is occurring at some level	87.7	8.8	3.5[b]	82.3	14.2	3.5	$\chi^2 = 1.171$, $p < .557$

[a] 0 cells have expected count less than 5.
[b] This cell has expected count less than 5.

and more interestingly, non-power saving consumers showed stronger belief in that household energy consumption contributes to climate change (63.2% disagreement with 'there is no link between electricity used in the home and climate change' compared to 44.8%; Cramer's $v = .170$, $p < .014$). Only one significant difference was identified between those who intend to install power saving systems in the future versus those who do not (see Table 6). Future power savers showed stronger agreement with solar photovoltaic being the cheapest form of electricity (χ^2 [2, 278] = 11.23, $p < .004$; Cramer's $v = .201$, $p < .004$). This belief might offer one explanation for the level of current and intended adoption of this technology system in the home.

3.2.2. *Preferences for government investment*

Finally, the third research objective harnessed insight into what consumers think could be done to encourage a transition to renewable energy. This was explored through two avenues. Firstly, respondents were asked to rank six different factors per level of importance in deciding which methods of electricity production should be used. This question was representative of investment priorities for the Queensland Government. Table 7 displays the proportion of ranked priority for the six investment factors.

Respondents' preferences for investment priorities varied greatly. Effects on the natural environment were perceived as more important than other investment areas with 117 respondents ranking this in their top two preferences. Then, helping to prevent climate change and effects on human health and safety were of second-most importance; these factors had relatively equal proportions of respondents across the top four preferences. Level of pollution was of medium importance whereas the cost of electricity to consumers and effects on the economy were the lowest ranked investment priority areas. Alternatively, questionnaire participants were provided the option to not rank the six investment priorities based on four reasons. 'I think the factors have equal importance' was the highest no-rank reason (57 or 80.3% of non-ranking respondents), followed by 'I do not care/prefer not to rank (9 or 12.7%), 'I do not know' (3 or 4.2%), and 'other' (2 or 2.8%).

Secondly, consumers indicated their political party preference. These preferences were as follows: Australian Labor Party (ALP) – 62 (19.4%), Liberal National Party (LNP) – 54 (16.9%), Minority Parties – 39 (12.2%), and Australian Greens (Greens) – 33 (10.3%). The majority of the respondents, however, did not wish to specify preference (132 or 41.3%).

To determine respondents' attitude towards a transition to renewable energy, a chi-square analysis was conducted on political preference versus investment priority. Only the first-rank investment priority variable was selected to explore whether investment priorities change according to the political party that respondents support. Table 8 provides a breakdown of the proportion of political supporters by the most important government investment priority. A statistically significant difference (with weak correlation) was evident between political preference and most important investment priority area (χ^2 [20, 205] = 37.21, $p < .011$, Cramer's $v = .213$).

4. Discussion and practical implications of findings

The purpose of this study was to examine energy consumption behaviour in the home and householders' attitudes towards renewable energy and climate change. Overall, this study found that consumers are strongly supportive of renewable energy which confirms previous findings (see Devine-Wright, 2007; Dockerty, Appleton & Lovett, 2012; Stoutenborough et al., 2015; Warren, Lumsden, O'Dowd & Birnie, 2005). The reasons for this positive attitude towards renewable energy are altruistic and economic, with people agreeing that we have a responsibility to develop renewable energy for future generations and that this investment would stimulate the economy. Wind energy received high support in this study. Research consistently finds a disconnect between general support for wind and opposition to construction of wind farms at local level

Table 7
Consumers' attitudes towards government investment priorities.

Investment areas	1 *%(n)*	2 *%(n)*	3 *%(n)*	4 *%(n)*	5 *%(n)*	6 *%(n)*
Natural environment	29.0 (61)	26.7 (56)	17.6 (37)	13.8 (29)	9.5 (20)	3.3 (7)
Climate change	27.6 (58)	13.3 (28)	15.7 (33)	14.3 (30)	12.4 (26)	16.7 (35)
Human health and safety	19.5 (41)	20.0 (42)	23.8 (50)	21.9 (46)	9.5 (20)	5.2 (11)
Cost of electricity	11.4 (24)	5.2 (11)	12.3 (26)	7.1 (15)	25.7 (54)	38.1 (80)
Pollution	9.5 (20)	27.6 (58)	22.8 (48)	24.3 (51)	9.0 (19)	7.6 (16)
Economy	2.8 (6)	7.1 (15)	8.6 (18)	18.6 (39)	33.8 (71)	29 (61)

Note. 1 = ranked as first preference to 6 = ranked as last preference for government investment.

Please cite this article in press as: Lynne Eagle, Amy Osmond, Breda McCarthy, David Low, Hayden Lesbirel, Social marketing strategies for renewable energy transitions, Australasian Marketing Journal (2017), doi: 10.1016/j.ausmj.2017.04.006

Table 8
Relationship between political preference and government investment priorities.

	Greens	ALP	LNP	Minority	Prefer not to say
Climate change	40.0	38.1	23.7	10.7	26.9
Human health and safety	10.0	14.3	26.3	14.3	23.9
Economy	0.0[a]	2.4[a]	7.9[a]	0.0[a]	1.5[a]
Natural environment	46.7	28.6	23.7	28.6	26.9
Pollution	3.3[a]	2.4[a]	10.5[a]	17.9[a]	10.4
Cost of electricity	0.0[a]	14.3[a]	7.9[a]	28.6[a]	10.4

[a] This cell has expected count less than 5.

(Warren et al., 2005), but that is often due to how the decision is made and opposition is often confined to a vocal minority. Hence, policy makers need to consider factors at the micro (i.e., household) level when promoting a transition to renewable energy (Leijten et al., 2014). Furthermore, the survey revealed a belief in human-induced climate change, which is consistent with research by Pietsch and McAllister (2010), who found that concern about climate change was widespread and there was majority support for an Emissions Trading Scheme (ETS). There is by no means consensus in the literature with regard to how the Australian public responds to climate change. Studies (Fleming & Vanclay, 2011; Morrison, Duncan & Parton, 2013) have reported more pessimistic findings, with the latter study describing support for climate policy as "polarised and declining".

This study also explored residents' perception of government priorities when decisions have to be made about which methods of electricity production should be used. Approximately one quarter of the sample ranked effects on the natural environment and helping to prevent climate change as a top priority. Although this survey did not examine the variety of beliefs that people may hold about the effects of energy on the natural environment (e.g., aesthetics, waste management, impacts on habitats, greenhouse gas emissions), it suggests that attitudes towards renewable energy are strong and consistent. Furthermore, this study found that there was a relationship between political affiliation and the ranking of investment priorities. Further research is needed to test the relationship between political ideology and attitudes towards renewable energy policies. Studies have found that social acceptance is linked to political and environmental ideology (e.g., 'greens' purchasing green power or driving more efficient vehicles) (Brounen, Kok & Quigley, 2013; Karlstrøm and Ryghaug, 2014).

This study has practical implications for utilities and the findings may aid policy makers in overcoming obstacles to energy transitions. There is a diversity of social marketing approaches (Anda and Temmen, 2014; Dahl et al., 2015) that could be used to achieve residential energy efficiencies. Social marketing principles, in general, are acknowledged to lead to more persuasive messages and provide a framework for designing behaviour change programs. Several recommendations are proposed below, which are derived from the National Social Marketing Centre's (undated) Benchmark Criteria. For instance, the behaviour change criterion aims to change people's actual behaviour through set behavioural goals and not simply by focussing on knowledge and beliefs.

4.1. Overcoming constraints to energy conservation

Energy consumers indicated that saving electricity requires too much effort, one in which they do not have the time, inclination, or even knowledge to achieve. This confirms Pietsch and McAllister's (2010) idea that time and monetary resources, knowledge base, issues of practicality and competing priorities, act as barriers to translating positive attitudes into actual behaviour. Concern about the price of energy-efficient devices and the need to sacrifice some personal comfort in order to save electricity were cited as barriers, which is in line with the literature (Gossling et al, 2005; Moloney et al., 2010; Samuelson & Biek, 1991; Sütterlin, Brunner & Siegrist, 2011; Sweeney et al, 2013). The behaviourial constraints to saving electricity, identified in this survey, could inform effective energy reduction strategies. Respondents supported battery storage and solar energy, yet made various statements about the high cost of adopting these energy-efficient devices in the home. Specifically, more consumers expressed a desire to invest in battery storage and rooftop solar photovoltaic than those who currently have it. In terms of current installation, respondents with power-saving systems did not significantly differ in their environmental beliefs from those who had no systems. The 'future power savers' segment, however, showed strong belief that solar photovoltaic was the cheapest form of electricity. Invention strategies thus may need to consider incentive/reward schemes to assist with 'cost–benefit' trade-offs that might deter purchasing behaviour. Communicating ways of reducing energy consumption and costs, while maintaining personal comfort, might influence householders to engage in energy-efficient behaviours. Furthermore, education programs based on household newsletters, the internet and interactive technologies such as Apps (which communicate energy consumption data in real-time) could perhaps overcome the information deficit identified by some respondents. Finally, invention strategies need to be guided by segmentation based on attitudes. For example, respondents indicated strong agreement that 'high levels of energy use will impact future generations' standard of living' and that 'it is our responsibility to develop renewable energy for future generations', which suggests a desire to do more. Effective marketing communications might provide opportunities to promote energy-efficient behaviours, for example by using future-oriented appeals and slogans such as 'I am saving electricity for our children's future'.

5. Conclusion

In conclusion, despite the importance of energy to society, very little is known about public perceptions of energy in Australia. The goals of this research were to explore attitudes towards renewable energy, examine energy conservation behaviour in the home and gain an insight into consumers' perceptions of government priorities and what could be done to encourage an energy transition. Findings reveal that attitudes towards renewable energy were overwhelmingly positive and the reasons for this positive attitude were economic and altruistic. There was support for energy policies that are designed to achieve positive environmental outcomes, with effects on the economy and on electricity prices receiving the lower priority. This research is valuable since it shows that the government could accelerate the transition to renewable energy. Climate change means that reducing electricity consumption in the home is more important than ever, along with investment in renewable energy infrastructure. There is a diversity of social marketing approaches that could stimulate energy-efficient behaviours in households and further research is needed to identify interventions that will have a meaningful and significant effect on energy consumption.

Funding

This research received a grant from James Cook University, Internal Research Infrastructure Block Grant Number: 2200.93991.0270.

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Please cite this article in press as: Lynne Eagle, Amy Osmond, Breda McCarthy, David Low, Hayden Lesbirel, Social marketing strategies for renewable energy transitions, Australasian Marketing Journal (2017), doi: 10.1016/j.ausmj.2017.04.006

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Please cite this article in press as: Lynne Eagle, Amy Osmond, Breda McCarthy, David Low, Hayden Lesbirel, Social marketing strategies for renewable energy transitions, Australasian Marketing Journal (2017), doi: 10.1016/j.ausmj.2017.04.006