

**University of New England**

**Public support for renewable energy: Do values matter?**

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## Declaration

I certify that the ideas, experimental work, results, analyses, software and conclusions reported in this thesis are entirely my own effort, except where otherwise acknowledged. I also certify that the work is original and has not been previously submitted for any other award, except where otherwise acknowledged.



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Even

After

All this time

The Sun never says to the Earth.

“You owe me.”

Look

What happens

With a love like that

It lights the whole sky.

- Hafiz, Sufi poet

For me, Hafiz’s poem speaks of just one natural resource, sunlight, that will enable us humans to tread more softly on the Earth. I hope this work offers one tiny step towards this dream.

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## Thesis Summary

The overarching aim of this thesis was to determine the extent to which policy-related price increases undermine or foster public support for the proposed 50% Renewable Energy Target (50% RET), and to identify psychological (personal values, climate change concern, and political orientation) and contextual (household income) factors that may moderate people's responses to policy-related price rises. The three main research questions were: (1) Are projected policy-related electricity price increases related to public support for the proposed 50% (RET)? (2) Do personal values interact with policy-related electricity price to shape public support for the proposed 50% (RET)? and (3) Do individual attributes (i.e., climate change concern, political orientation, and household income) interact with policy-related electricity price to shape public support for the proposed 50% (RET)? In this thesis, I present three empirical studies to address these questions.

Chapter 1 presents an overview of a range of topics that contribute to the current knowledge of energy source and policy support, with a focus on personal values. It argues that projected flow-on costs of electricity may play an important part in energy policy support, but individual attributes such as climate change concern and personal values are also important. It reviews traditional approaches to understanding personal values in this decision context and introduces a novel typology approach to understanding the relationship between personal values and policy support. Overall, this chapter advocates the need to consider interactions between individual attributes and the impacts of the policy on electricity costs, and the explanatory role of holistic values-based profiles that occur within voting citizens.

Chapter 2 presents an empirical study (Study 1; Phillips et al., 2019) that applied a multi-level perspective to investigate within-subject relationships between the projected impacts on electricity prices and public support for a proposed 50% RET. Personal values (*self-enhancement* and *self-transcendence*) were examined as between-subject moderators of this relationship. Australians ( $N = 404$ ) rated their support for a 50% RET at eight projected

flow-on increases in their quarterly electricity bills. This study indicated that: (1) support for the 50% RET fell as the projected price of electricity increased, and (2) although participants with low *self-enhancement* and high *self-transcendence* values were most supportive of the policy, these value-based differences disappeared as projected prices increased. These results indicate that personal values likely play an important role in determining support for renewable energy policies, but their relevance may diminish as the projected flow-on costs to consumers linked to such policies increase.

Chapter 3 is an empirical study (Study 2) that built upon Chapter 2 with a typology approach to personal values. Specifically, it examined climate change beliefs and energy source preferences in relation to homogenous values-based profile group membership. Australians ( $N = 633$ ) completed the Personal Values Questionnaire (Schwartz, 2017) and rated their climate change belief, climate change concern, specific energy source preferences, and support for the 50% RET. A latent profile analysis identified four distinct homogenous values-based profiles: *Free-Spirits* (12%), *Power-Achievers* (28%), *Traditionalists* (16%), and *Normatives* (44%). A multivariate analysis of variance indicated that the *Free-Spirits* group expressed significantly greater concern about climate change, stronger beliefs in the reality of anthropogenic climate change, and perceived more immediacy of its effects than the *Power-Achiever* and *Traditionalist* groups. *Free-Spirits* also expressed stronger preferences for solar energy and weaker preferences for coal than *Power-Achievers*, and greater support for the 50% RET than the *Power-Achiever* and *Traditionalist* groups. These results indicate that a values-based typology approach may be useful to determine holistic person-centred motivation profiles that link to climate change belief and concern, energy preferences, and policy support.

Chapter 4 is another empirical study (Study 3) that built upon Chapter 2. It further investigated the relationship between projected electricity prices and public support for the 50% RET by examining three personal attributes (household income, political orientation,



and climate change concern) as moderating variables. Australians ( $N = 633$ ) rated their support for the 50% RET at one of five projected flow-on increases in electricity price. Moderated regression analysis indicated that (1) support for the 50% RET fell as the projected price of electricity increased, and (2) although high household income and high climate change concern predicted higher support for the policy, the effect of projected price increases on policy support did not vary according to any of the three examined personal attributes. These results indicate that sensitivity to the projected flow-on cost of the 50% RET remains consistent regardless of income, political orientation, and climate change concern.

Chapter 5, the General Discussion, provides a summary of the key conclusions from the empirical studies. In sum, this thesis provides the first evidence that public support for a proposed renewable energy policy in Australia is associated with the projected impact of the policy on electricity prices, and this relationship remains quite consistent across a range of psychological and contextual characteristics. A typology of personal values provides the first evidence that membership of homogenous values-profile groups is associated with climate change belief and concern, preference for different energy sources, and renewable energy policy support. Implications for policy design and future research on the complex associations between individual attributes and clean energy policy support are discussed. Overall, this thesis demonstrates that policymakers need to consider the effects of proposed renewable energy policy changes on consumer's electricity prices, since Australians are not prepared to pay much more for renewable energy, irrespective of their personal values or other personal attributes.

# CHAPTER 1

## General Introduction

A global transition to clean energy generation to cut carbon emissions is urgent, and climate scientists warn of catastrophic consequences if we fail to act (IPCC, 2018, 2019; Steffen et al., 2018). This means that a rapid move towards generating energy from renewable sources, rather than thermal generation from fossil fuels, is imperative (Denis, Graham, et al., 2014; Finkel et al., 2017; IPCC, 2014, 2018; Ram et al., 2019). This transition is not a matter of technical or economic viability because renewable technologies are already capable of meeting global electricity demand more efficiently and effectively than the current system (Garnaut, 2019; Jacobson & Delucchi, 2011; Ram et al., 2019). To achieve this, a coordinated policy response that provides clear signals to potential investors is required for widespread uptake of new technologies (Finkel et al., 2017; Garnaut, 2019; IEA, 2018; Ram et al., 2019). The transition is therefore largely a matter of political will.

In Australia, political leaders' opinions differ on clean energy generation. The current centre-right Liberal government prefers a technology-agnostic approach to providing affordable and reliable electricity, including the continued use of old and new coal-fired power plants (Energy Security Board, 2018). In contrast, the centre-left Labor Party shadow ministry proposes a Renewable Energy Target (RET) that would require half of Australia's electricity to come from renewable generation (50% RET) by 2030 (Australian Labor Party, 2015). According to expert modelling, using existing technology and protecting economic prosperity, Australia could live within its carbon budget and achieve net-zero emissions by mid-century (Bloomberg New Energy Finance, 2018; Denis, Jotzo, et al., 2014), and that the 50% RET provides a credible pathway towards this goal (Denis et al., 2015). However, political discord about the scope and design of new policies has led to chaotic regulatory inaction that has undermined investment opportunities in new renewable electricity

generators (Finkel et al., 2017). The result of this is that Australia has the highest carbon intensity among the countries of the International Energy Agency, is vulnerable to network security threats due to outdated power plants, and has made little movement toward implementing alternative energy sources (IEA, 2018).

Research has shown that insufficient public support hinders sustainable energy transitions (Drews & Van den Bergh, 2016; Perlaviciute & Steg, 2014), and public support is largely determined by evaluations of the various costs and benefits of renewable energy technologies (Perlaviciute & Steg, 2014; Perlaviciute et al., 2018; Perlaviciute et al., 2016; Steg, 2016; Steg et al., 2006). To understand what determines support for clean energy systems, we need to better understand how people evaluate these costs and benefits, and which evaluations are key drivers of, and/or barriers to, support (Perlaviciute & Steg, 2014). Therefore, the overarching aim of this thesis is to increase research knowledge of the relationship between projected policy-related electricity prices and public support for the 50% RET, by determining whether personal values (Schwartz, 1992, 1994) and sociodemographic characteristics moderate this relationship. In this chapter, I introduce the context of renewable energy policy in Australia and discuss the potential roles played by projected policy-related electricity price increases, personal values, and three other individual attributes in determining levels of policy support.

### **Public Policy Support**

When developing and implementing an energy policy, it is valuable to contemplate the degree to which strategies are effective, but also the degree to which they are acceptable to the public (Perlaviciute et al., 2018; Steg, 2016). Acceptability and acceptance of an energy policy both reflect an attitude towards the policy (Schuitema et al., 2010). An attitude is a psychological tendency that is expressed by evaluating a specific object (such as an energy policy) with some degree of favour or disfavour (Eagly & Chaiken, 1993, 2007).

Policy “acceptability” reflects an attitude to a proposed policy, whereas, policy “acceptance” reflects an attitude to a policy after it has been implemented (Schuitema et al., 2010). Given that policy consequences can never be predicted with 100% accuracy, policy acceptability and policy acceptance sometimes differ (Schuitema et al., 2010). A policy that is supported by the public pre-implementation may elicit widespread protest post-implementation, once its consequences become evident. The primary focus of this research is to understand factors that relate to public “acceptability” (i.e., support) of the proposed 50% RET. The terms “policy acceptability” and “policy support” are used interchangeably in the literature (Schuitema et al., 2010; Steg, 2016; Steg et al., 2005, 2006). I elected to use “policy support” throughout this thesis because of its ready interpretation.

Public support is important for policy reform in democratic countries because politicians may not implement policies if they expect strong public backlash (Drews & Van den Bergh, 2016). To explore potential public support for a clean energy transition in the United Kingdom, Demski et al. (2015) employed mixed methods to determine attributes of an energy system that the public deemed especially important. Attributes that emerged were: (a) efficiency and waste; (b) environment and nature; (c) security and stability; (d) social justice and fairness; (e) autonomy and power; (f) process and change. Social justice and fairness, for example, refer to ideals that advocate a fair distribution of the risks and benefits of an energy system (e.g., cost, ability to make a living) between different members of the public, and that the responsibilities of managing those risks and benefits are shared (see Demski et al., 2015, p. 64 for full descriptions of all values attributes). These attributes afford valuable insights that may inform energy system design and policy decisions, however, to determine potential public support, it is also important to consider how people evaluate and weigh up the many consequences of fundamental changes to their national energy system.

Expectancy models of decision-making (e.g., Feather, 1995; Tversky & Kahneman, 1979; Von Neumann & Morgenstern, 2007) suggest that individuals weigh the costs and benefits of different alternatives to make their choices. From this perspective, the anticipated positive and negative consequences of implementing new energy policies or initiatives will drive public support or opposition towards them (Steg, 2016). In evaluating a new policy, individuals consider potential outcomes for themselves, such as impacts on their household electricity bills, and operational changes that may undermine their secure supply of electricity (Perlaviciute & Steg, 2014). In addition, they consider potential outcomes for society or the environment, such as any changes to environmental pollution levels, carbon emissions, the distribution of employment opportunity, community health outcomes, and pricing equity (Perlaviciute & Steg, 2014).

In Australia, public support for a renewable energy transition is generally positive. Polling results indicate that a majority of voters (65%) express support for the proposed 50% RET (Essential Research, 2017) and almost half (47%) of Australians believe that cutting carbon emissions should be the key energy policy priority rather than reducing household bills or decreasing the chance of power blackouts (Lowy Institute, 2019). Additionally, a large majority of Australians (84%) say that the government should focus on renewables even if infrastructure investment is needed to ensure system reliability (Lowy Institute, 2018). These results indicate that, in principle, Australians tend to place a high priority on reducing emissions even if it means a financial investment. However, in practice, their support for a new energy policy is likely to depend on the extent to which the perceived potential benefits for self, society, and environment outweigh the perceived potential costs.

### **Electricity Price**

Electricity price presents a direct and tangible cost for households and is an important contextual factor, given that people do not generally favour paying more for future increases

in renewable energy generation (McGowan & Sauter, 2005; Perlaviciute & Steg, 2014). For instance, when US participants received details of a future clean energy scenario at one of eight different price increase amounts (ranging from US\$5 to US\$155) there was a significant cost effect on their support for the scenario. While 70% of the sample expressed support at a price increase of US\$5-35, this proportion decreased to approximately 50% at US\$135-155 (Aldy et al., 2012). In a later study, at the prospect of paying even a modest US\$2-10 per month extra, 6-13 per cent of participants swung from support to opposition for electricity generated under a renewable energy policy (Stokes & Warshaw, 2017). This is concerning, given that existing and proposed carbon reduction policy instruments in the energy sector involve the public meeting costs to some degree through taxation or electricity bills (Evensen, 2017).

In 2019, Australia generated over 264,000 GWh of electricity, of which a large majority was from fossil fuels (i.e., 58% coal, 2% oil, and 20% gas) and only a small minority from renewable sources (i.e., 7% wind, 6% solar, 6% hydropower, and 1% biofuels: IEA, 2000). A transition to a higher proportion of renewable electricity generation will require Australia to decommission worn-out power stations and build expensive new energy generation and transmission infrastructure (Finkel et al., 2017). This will cost money, and households will ultimately have to pay for it through increases in tax or in the price of electricity (Wood et al., 2018). I calculated that Australian households may need to pay an additional \$396 to \$510 per year (i.e., \$99 - \$127.50 per quarter) for their electricity to achieve a 50% RET. This is based on typical Australian household electricity consumption of 6000kWh/year that costs approximately \$1600 (ABS, 2013; ACIL Allen Consulting, 2015; Denis, Graham, et al., 2014) and projected impacts on retail prices that ranged from 6.6-8.5 c/kWh (Australian Energy Market Operator, 2013, p. 35; Wright & Hearps, 2011). Arguably, this represents a significant financial cost for Australians, and it is important to ascertain

whether they will accept these shorter-term costs in order to achieve longer-term environmental benefits via a transition to cleaner electricity generation.

The price of electricity is already a primary concern for Australian households (Wood et al., 2017), especially because domestic electricity bills have increased by 80 to 90 per cent in the last decade (ACCC, 2017). This price rise is mostly due to extensive transmission network upgrades and wholesale price spikes from generation shortages that followed decommissions of out-dated coal plants (ACCC, 2017; Morton, 2017). In part, it is also due to energy retailers charging overinflated prices hidden behind overly complex tariffs (ACCC, 2017); a practice that Wood et al. (2017) assert is confusing and unfair for consumers. In this context, several media channels and politicians that favour coal-fired electricity generation have concealed the genuine reasons for rising electricity bills and blamed new renewable energy generation (Parkinson, 2017). This misinformation is a concern because it has the potential to generate long-term unfavourable judgements about the impact that new renewable energy is having on Australia's energy system.

If we are to adopt a clean energy system through greater use of renewable generation, it is vital to determine the public's willingness to accept the inevitable implementation costs. Given electricity bill concerns and partisan price blaming (Parkinson, 2017; Wood et al., 2017), it is unclear if Australian households will support or oppose a renewable energy transition. On the face of it, polling results suggest they will accept it (Essential Research, 2017; Lowy Institute, 2018, 2019). However, the results of previous research conducted in the U.S. suggest that support will diminish as policy related prices increase (Aldy et al., 2012; Stokes & Warshaw, 2017). It is therefore unlikely that Australians will support a 50% RET at any monetary cost. The current research addressed this question by examining the relationship between projected policy-related electricity price increases and support for a 50% RET policy in the Australian context.

### **Potential Moderators of the Effects of Projected Electricity Price Increases**

Given that public support is a trade-off between the expected benefits and costs of implementing the proposed 50% RET, it is important to identify how people assess and weight the potential impacts of a proposed energy system change (Perlaviciute & Steg, 2015). For instance, people may not attribute chief priority to financial costs if low electricity prices lead to unreliable electricity supply or high carbon emissions (Parkhill et al., 2013). Instead, they would likely consider the trade-off between any short-term personal cost of their household electricity bill and the long-term benefits of low carbon emissions and reliable electricity supply to society (Perlaviciute & Steg, 2015). In the next sections, I examine factors that may moderate the public's support for a clean energy transition when faced with the prospect of having to pay for it in higher electricity bills. That is, I examine factors that may present boundary conditions and explain "when" people may be willing to pay a higher price for electricity generated from renewable sources.

#### **Personal Values**

Personal values are relevant to understanding public policy support or opposition because they determine how people evaluate and weight policy-related consequences (Steg, 2016; Steg et al., 2005, 2006). When we think about our values, we think about what is important to us. According to Values Theory (Schwartz, 1992), they are guiding principles throughout the course of our lives and they transcend different situations. For example, if benevolence is a guiding principle, it tends to be relevant at school, work, social settings, and with friends, family, or wider community. In contrast, norms and attitudes are narrower concepts that tend to relate to certain objects, actions, or situations (Schwartz, 2007). Values therefore have a more enduring foundational influence than norms and attitudes.

Each value relates to a desirable goal and motivates action. So, people for whom the natural environment is important are motivated to protect it and appreciate spending time in it



(Schwartz, 2007). Values Theory (Schwartz, 1992, 2007) defines ten universal values according to the motivations that underlie them. Together the motivations expressed by these ten values encompass a wide range of motivational goals observed across cultures (Schwartz, 1992). The ten values that Schwartz (1992, 2007) identified are defined below according to their motivational goal:

- *Self-direction*; independent thought and action – choosing creating and exploring.
- *Stimulation*; excitement, novelty and challenge in life.
- *Hedonism*; pleasure or sensuous gratification for oneself.
- *Achievement*; personal success through demonstrating competence according to social standards.
- *Power*; social status and prestige, control or dominance over people and resources.
- *Security*; safety, harmony, and stability of society, of relationships, and of self.
- *Conformity*; restraint of actions, inclinations, and impulses likely to upset or harm others and violate expectations or norms.
- *Tradition*; respect, commitment, and acceptance of the customs and ideas that one's culture or religion provides.
- *Benevolence*; preserving and enhancing the welfare of those with whom one is in frequent personal contact.
- *Universalism*; understanding, appreciation, tolerance, and protection for the welfare of all people and nature.

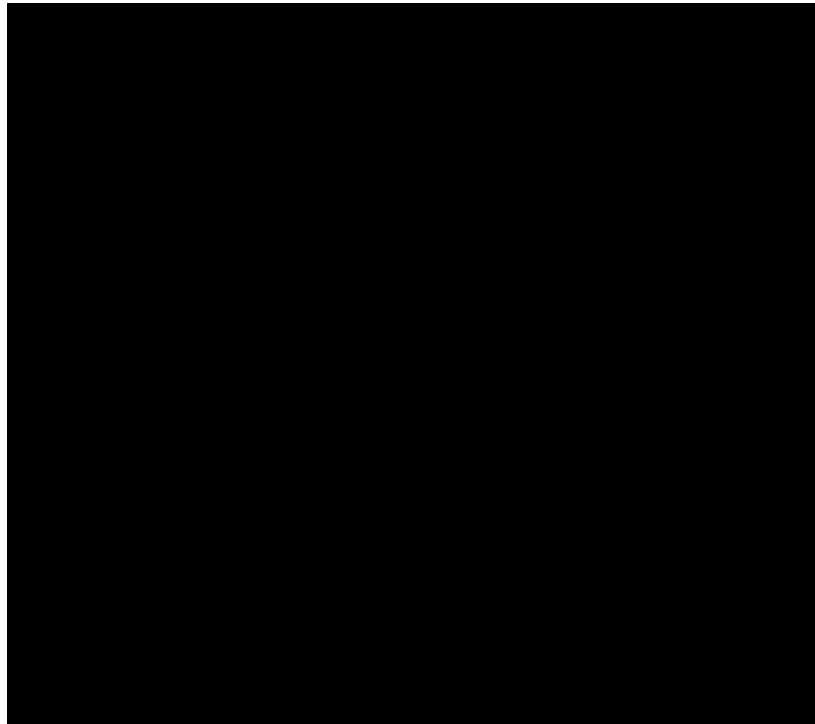
Though all values are universal, which means we hold all of them to some extent, we order them by their importance to us. That is, we prioritise each value differently and relative to one another. Hence, we each hold all values (e.g., *power*, *benevolence*, *tradition*) with varying degrees of importance, so that a particular value may be very important to one person but not so for another (Schwartz, 2007). Together our values form a hierarchical value-

priority system that distinguishes our individual character by the relative importance we place on each value within the system.

Values Theory (Schwartz, 1992, 1994) describes relations between the original ten values on a circular continuum (circumplex) that places values according to the compatibility or conflict between the motivations they express. For example, the theory posits that pursuing wealth and authority over others (*power*) is compatible with pursuing personal success (*achievement*), but it conflicts with efforts to protect the welfare and equity of others (*benevolence*). As shown in Figure 1, values that are thought to express compatible motivations stand adjacent on the circumplex (e.g., *hedonism* and *stimulation*, *power* and *achievement*, *benevolence* and *universalism*, *tradition* and *conformity*), and conflicting motivations stand opposite each other (e.g., *benevolence* and *achievement*, *security* and *stimulation*, *power* and *universalism*, *hedonism* and *conformity*). These systemic relationships have been empirically supported by Values Theory research (Bargh et al., 2001; Evans et al., 2012; Macrae & Johnston, 1998; Maio et al., 2009; Vohs et al., 2006).

**Figure 1.**

## Values Circumplex



*Note.* Theoretical model of relations between values (Schwartz et al., 2012, p. 669).

Values on the circumplex are positioned along two orthogonal dimensions that summarise the oppositions between competing values. One dimension contrasts *openness-to-change* and *conservation* values, which reflects the conflict between how much change is embraced and to what extent traditions are conserved. The other dimension contrasts *self-enhancement* and *self-transcendence* values and reflects the conflict between concerns for oneself or concerns for entities outside oneself (Schwartz, 1992, 1994; Schwartz et al., 2012). A revised Values Theory later specified 19 conceptually discrete subtypes that were ordered on the same circumplex with the same orthogonal dimensions (Schwartz & Butenko, 2014; Schwartz et al., 2012). For example, *power* was divided into two concepts: *power-dominance* and *power-resources* (see Figure 1).

Though rarely conscious, values serve as standards that guide evaluations of an object, be it an action, policy, person, or event (Feather, 1995; Schwartz, 2007). For example, Dentale et al. (2018) found that measures of conscious and pre-conscious values on an *achievement to benevolence* continuum (i.e., Self-Report and Implicit Association Test) were both significantly correlated with certain benevolence behaviours. People are generally more aware of their values when the belief or judgement they are considering has implications that conflict with their existing values. Hence, considering the prospect of increased installation of renewable energy generators may make people with *self-enhancement* priorities acutely aware of their value-based opposition to a resulting increase in electricity prices (Demski et al., 2015; Demski et al., 2017; Demski et al., 2019). Value priorities then ultimately direct attention and influence how people evaluate the different consequences of an object at stake, which could be a product, a particular action, or a proposed change to an energy system (Schuitema et al., 2010). These evaluations, in turn, underscore favourable or unfavourable judgements and ultimately one's preference and choice for the object in focus (Feather, 1995; Steg et al., 2014).

### ***Values and the Environment***

Values form the foundations of our motivational system and underlie beliefs and attitudes towards environmental problems such as climate change (Corner et al., 2014; Evans et al., 2012; Milfont et al., 2015). *Self-transcendence* and *self-enhancement* values are conceptually highly relevant to pro-environmental problems that ultimately reflect collective rather than self-interested concerns. *Self-transcendence* values reflect collective priorities that comprise five components: *universalism-concern* (equality, justice and protection of all people), *universalism-nature* (preservation of the natural environment), *universalism-tolerance* (acceptance and understanding of those who are different from oneself), *benevolence-caring* (devotion to the welfare of in-group members), and *benevolence-*

*dependability* (being reliable and trustworthy to the in-group) (Schwartz, 2017; Schwartz & Butenko, 2014; Schwartz et al., 2012). On the other hand, *self-enhancement* values reflect self-interest priorities that comprise three components: *power-dominance* (control over people), *power-resources* (control of resources) and *achievement* (success according to social standards) (Schwartz, 2017; Schwartz & Butenko, 2014; Schwartz et al., 2012).

It is therefore not surprising that researchers have found that, in general, people who uphold *self-transcendence* values tend to express more support for policies designed and employed to protect the environment than do those who uphold *self-enhancement* values (Drews & Van den Bergh, 2016). This body of research has mostly used a set of continuous variables taken from Schwartz and colleagues' (2012) circumplex model to assess distinct values. For example, in relation to climate change, studies have found that individuals who express *self-transcendence* values tend to believe that climate change is human induced and are concerned about the effects, whereas the reverse is generally true of those who express *self-enhancement* values (Corner et al., 2014; de Groot & Steg, 2008; Poortinga et al., 2019). In a meta-analysis of correlates of climate change, Hornsey et al. (2016) established that *self-transcendence* values are linked to the belief that climate change is really occurring. The study also confirmed that believing that climate change is occurring relates positively to supporting public policies designed to mitigate climate change, although the link is weaker when it comes to supporting a carbon price (a cost incurred by carbon polluters).

### ***Values and Energy Preferences***

Similarly, studies have used continuous values variables to examine the impact of human values on energy preferences and policy support (Bidwell, 2013; Corner et al., 2011; De Groot et al., 2013; Perlaviciute & Steg, 2015; Steg et al., 2006). Whether acceptance of an energy source reflects *self-transcendence* or *self-enhancing* values is contingent on the consequences that people perceive for generating electricity from that source. For instance,

nuclear energy opposes *self-transcendence* values due to its environmental threat of accidental radiation contamination (IEA, 2019b), and simultaneously appeals to *self-enhancement* values as it may offer a low-cost and reliable electricity supply (IEA, 2019b). It therefore makes sense that nuclear energy garnered stronger support among individuals who expressed high *self-enhancement* values than among individuals who expressed high *self-transcendence* values in British (Corner et al., 2011) and Dutch population samples (De Groot et al., 2013; Perlaviciute & Steg, 2015).

In contrast, Perlaviciute and Steg (2015) also found that individuals who upheld strong *self-transcendence* values expressed greater support for renewable energy sources than individuals who upheld strong *self-enhancement* values. This is congruent with the reduced CO<sub>2</sub> emissions of renewable energy generation (IEA, 2019a) that people with *self-transcendence* values may theoretically view as beneficial, and with the cost of new infrastructure and intermittent history (Energy Security Board, 2018) that may theoretically conflict with self-enhancing values. Wind farms, in particular, that afford low environmental risk and high collective benefit have gained higher support among people in a United States community sample who uphold strong *self-transcendence* values than among those who uphold strong *self-enhancement* values (Bidwell, 2013).

In sum, existing research suggests that personal values may influence cost-benefit evaluations of the likely consequences of a renewable energy policy, such as projected policy-related price increases and long-term benefits to the environment, which may determine levels of support for the policy. This research project explored this possibility by examining whether personal values interact with projected energy policy-related price increases to predict support for the 50% RET. I anticipated that stronger *self-transcendence* values (given their commitment to entities outside of themselves) would render Australians

less sensitive to policy-related price increases, and stronger *self-enhancement* values (given their self-focus) would render them more sensitive to price increases.

### ***Audience Segmentation***

Values research has generally examined the unique variance that individual values or values dimensions explain in people's decision to support or oppose a specific energy policy. A different approach is to identify a typology of values and examine the unique variance that segment membership explains in policy decisions. Individuals each have a unique set of coexisting values that they consider important or unimportant. For instance, individuals may attribute, to varying degrees, high importance to *benevolence, tradition, conformity* and *security*, and low importance to *hedonism, achievement, and power*. These priorities together comprise their values profile. Typology research identifies homogenous segments of a population sample that include individuals who possess a similar values profile. Compared to the conventional variable-centred research, this approach is person-centred because it assigns each person to a qualitatively discrete segment according to their profile of coexisting value priorities (Magun et al., 2017).

Previous segmentation research has identified homogenous segments of the public based on a wide range of variables that include environmental beliefs, behaviours, and often values (Hine et al., 2016; Hine et al., 2014; Hine et al., 2013; Morgan et al., 2015). In a review, Hine et al. (2014) found that over 25 studies had employed this methodology to explore specific audiences of climate change communications. From the pioneering *Yale Project on Climate Change Communication* (Leiserowitz et al., 2008), the *Global Warming Six Americas* emerged. These six unique segments of the US population varied from *alarmed* to *dismissive* along an attitudinal continuum that reflected their degree of concern and engagement with climate change. The same model has been replicated across countries (Leiserowitz et al., 2013; Morrison et al., 2013) and over time (Leiserowitz et al., 2012;

Leiserowitz et al., 2010). Five ‘*interpretive communities*’ emerged in Australia and varied along a similar climate change concern and engagement continuum (Hine et al., 2013). Since then, Hine et al. (2016) have demonstrated that the efficacy of specific message attributes (e.g., highlighting local impacts) to motivate climate change action varied according to which of three segments (i.e., *alarmed*, *uncommitted*, and *dismissive*) participants were members. To increase the practical utility of this approach, Poortinga and Darnton (2016) developed a short screening tool to efficiently assign segment membership in order to engage the public across different sustainability areas.

### ***Values Segmentation***

In a typology that is based on personal values, members of each segment share similar profiles of value priorities, and as such may hold similar beliefs and concerns about climate change, and similar support for a renewable energy transition. How values coexist within profiles is important when we consider the interrelationship of values that Schwartz (1992; 1994; Schwartz et al., 2012) presented on the circumplex. Values may be activated by particular events or messages (Blackmore et al., 2013) and this can influence attitudes and behaviours related to that value (Holmes et al., 2012). For example, when *benevolence* values are activated, we are more likely to offer our time to help someone (Maio et al., 2009). When a value is activated, however, it tends to ‘bleed over’ and reinforce adjacent values on the circumplex and their related attitudes and behaviours (Holmes et al., 2012). For instance, when *benevolence* and *self-direction* values are primed, we are more inclined to support pro-environmental policies than when financial success and status are primed, despite there being no reference to the “environment” (Sheldon et al., 2011). Moreover, while adjacent values are reinforced, opposite values are weakened in a “seesaw effect”; that is, when one value rises the opposite values tend to fall (Holmes et al., 2012). So, we are less likely to be kind and offer our time to help someone when *achievement* values are engaged (Maio et al., 2009).



Nevertheless, values may not guide behaviour when other factors are at play (Holmes et al., 2012). For instance, values and actions may diverge if the environment does not support value-congruent behaviour (Ajzen, 1991; Evans et al., 2012), if social normative influence is more salient (Meliema & Bassili, 1995), or if a value seems irrelevant and/or competes with another value (Maio et al., 2001). For example, Evans et al. (2012) found that the information participants received about car-sharing influenced their recycling rates. When participants received environmental information about car-sharing, recycling was higher than control, but when they received financial information, or both environmental and financial information, their recycling rates were no different than control. Thus, the environmental message offered beneficial effects when only *self-transcendence* reasons were salient but not when they were mixed with opposing self-enhancing reasons. This result shows that *self-enhancement* and *self-transcendence* values may interact to guide pro-environmental actions.

Values and their interrelations are important because everyone simultaneously holds all values and ascribes more importance to some than to others. Therefore, each value can impact an individual's behaviour and attitudes when activated at different times (Blackmore et al., 2013). Some people may even uphold opposing values on the circumplex. Innovators in renewable energy technology, for instance, are often recognised for their exceptional achievements to advance clean energy systems in their pursuit to limit global warming for the benefit of humankind (Easto, 2017). Arguably, this is an expression of both high *universalism* and high *achievement* values despite these values standing opposite on Schwartz's values circumplex (1992, 1994; 2012). Such innovation is also an expression of *openness-to-change* and determination to alter out-dated energy systems. The different value priorities that coexist within each individual form a unique profile that may underlie climate change and clean energy decisions on a foundational level, insofar as they may inform a person's beliefs and attitudes in this context. Therefore, a typology of values may enhance

the knowledge base of what determines support for clean energy sources, and therefore enhance the design of policies and targeted communications.

Previous segmentation studies have focused on human values in various domains, including social worker performance (Levin et al., 2019), organic food purchasing (Chryssohoidis & Krystallis, 2005; Krystallis et al., 2012; Yildirim & Candan, 2015), shopping tourism (Choi et al., 2015), grassroots group affiliation (Martin & Upham, 2016), and cross-culture comparison (Magun et al., 2015, 2017). Studies have tended to interpret the findings based on two broad dimensions with opposing values at each end: *self-enhancement* to *self-transcendence*, and *openness-to-change* to *conservation* (Magun et al., 2015, 2017), or based on the four higher order values: *self-enhancement*, *self-transcendence*, *openness-to-change*, and *conservation* (Martin & Upham, 2016). For instance, Magun et al. (2015, 2017) used latent class analysis to identify five segments in a European sample, based on participants' scores on Schwarz's (1992, 1994; 2012) original 10 theorised values. They found that four segments expressed values on a continuum that ranged from *self-enhancement* combined with *openness to change* to *self-transcendence* combined with *conservation*. A fifth segment that similarly expressed *openness-to-change* and *self-transcendence* values diverged from that continuum.

Martin and Upham (2016) used cluster analysis to identify three segments of a zero-waste community that were also based on Schwartz's (1992, 1994; 2012) original 10 theorised values. Two segments emerged that expressed strong *self-transcendence* values but differed in their expression of *conservation* and *openness-to-change* values. However, a third segment emerged that prioritised *self-enhancement* values, which indicates a self-focused motivation that appears incongruous with their affiliation with a pro-socially motivated zero-waste community. The apparent conflicting values in the third segment do not provide support for the value relations that Schwartz (1992; 1994; Schwartz et al., 2012) conveyed on

the circumplex. Rather it supports the possibility that opposing values may coexist within profiles of values.

The above literature review suggests that personal values may combine within individuals to form values profiles that may not always conform to Schwartz's (1992, 1994, 2012) Values Theory, and may produce unique responses to the issues of climate change and renewable energy. The current research examined this possibility by identifying values profiles and determining their associations with belief in anthropogenic climate change, climate change concern, energy preferences, and support for the 50% RET.

### **Contextual and Psychological Characteristics**

The notion that values govern our beliefs about the natural world and, in turn, how we act herein is empirically supported (van Riper & Kyle, 2104; Steg et al., 2005). However, people are less likely to act on their environmental values when behaviours are too effortful, costly or uncomfortable (Diekmann & Preisendörfer, 2003; Steg et al., 2014). It is important to identify and investigate cognitive and contextual factors that may help us understand why the most well-intentioned people sometimes fail to act consistently with their values (Fielding & Hornsey, 2016). To extend and complement my investigation of personal values in this context, I explore the extent to which household income, political affiliation, and or climate change concern may render people more or less sensitive to the impact of a proposed renewable energy policy on projected electricity price rises in Australia.

#### ***Household Income***

Household income is a tangible contextual factor when we consider the fairness of an energy policy that will potentially increase the price of household electricity. According to energy economist Metcalf (2019), the distributional effect of any rise in electricity price is generally regressive across households. This is because the increased burden per dollar of income is greater for families with low income compared to those with high income.

Moreover, low-income families tend to be larger and live in less energy-efficient homes that require more electricity to achieve comfortable living standards (Boardman, 2012). In turn, these factors further compound the distributional inequity of higher cost electricity (Metcalf, 2019). In short, if a policy-related electricity price rise is too large, low-income households are likely to struggle to pay their bill.

Given that higher electricity prices have a greater impact on lower-income households (Demski et al., 2019; Metcalf, 2019), it is reasonable to expect that lower-income households would be more sensitive to potential price rises than their higher-income counterparts and therefore less supportive of an energy policy that affects those prices. Previous research has found that higher household income is related to stronger public support for clean energy that potentially means higher bills (Aldy et al., 2012; Tranter, 2014), although this result is not consistent. Aldy et al. (2012) and Tranter (2014) found that people with higher incomes were willing to pay more for clean energy, while Tranter (2011) found those with higher income were not willing to pay more.

On balance, given the distributional inequity of higher electricity price, household income may interact with policy-related price effects to predict support for the 50% RET. People with lower income may be more susceptible to policy-related price and reduce their support for the 50% RET as projected price increases. While people with higher income may be less affected by policy-related price increases and maintain stronger support for the 50% RET irrespective of price.

### ***Climate Change Concern***

Climate change poses massive threats to human livelihoods across cultures, environments and locations (IPCC, 2019) and climate change concern is the psychological response to the perceived nature, course, and consequences of this phenomenon (Reser et al., 2012); often indicated by personal feelings of worry (Poortinga et al., 2019). Although it is

one of the most serious existential threats to life on earth, climate change is evolutionarily unique because, unlike most ecological challenges, the climatic changes are gradual and without a particular location. This is a tricky set of circumstances for people to perceive and evaluate (Weber, 2016). Yet, these attributes are critical to appreciate the subjective nature of climate change and the substantial heterogeneity in risk judgements and concern across individuals and nations (Hine et al., 2013; Lee et al., 2015; van der Linden, 2017; Whitmarsh, 2011). In Australia, United Kingdom, and Europe, climate change has been consistently regarded as a “very serious” problem (Lorenzoni & Pidgeon, 2006; Pidgeon, 2012; Reser et al., 2012) but concern has recently waned in the United States, China, and Russia (Brechin & Bhandari, 2011; Lee et al., 2015).

The degree to which people are concerned about climate change is linked to their willingness to support strategies that address the issue. In America, for instance, strong policy support for US mitigation policies—such as regulating carbon emissions, signing international treaties, and raising gasoline taxes—has been linked with greater worry about climate change (Smith & Leiserowitz, 2014). Similarly, in Sweden support for environmental policies and intentions to change travel, energy use, and food consumption increased with climate change worry (Sundblad et al., 2014), and in the United Kingdom, climate change concern has been associated with a greater willingness to take action to reduce energy consumption (Spence et al., 2011). In Australia, climate change concern has been related strongly and positively with acceptance of climate change, higher risk perception, climate change distress, climate change-specific self-efficacy, responsibility and willingness to act, and mitigation behavior (Reser et al., 2012). More generally, research has found robust support for associations between climate change risk perceptions, general intentions to change individual behavior, and/or self-reported policy support to address the issue (Brody et al., 2012; Krosnick et al., 2006; O'Connor et al., 1999).

In light of this body of literature, increased concern about the impending changes to average climate conditions may render individuals more accepting of an energy policy designed to reduce the risks. People with lower levels of concern about climate change may be more susceptible to policy-related price increases and decrease their support for the 50% RET as projected prices rise, while people with higher concern may be less susceptible to policy-related price and retain support for the 50% RET as prices rise.

### ***Political Orientation***

Political orientation and party affiliation is important for pro-environmental policy support because it affords a social identity that shapes relevant beliefs, choices, and actions (Fielding & Hornsey, 2016). Individuals who are affiliated with left-leaning political parties generally support climate change mitigation actions more than those aligned with right-leaning political parties (Fielding et al., 2012). In complex decisions such as climate mitigation, a particular stance on the issue from a political leader may even serve as a heuristic means for people to make their choice (Tranter, 2017). On both sides of the political divide, protagonists assert their viewpoints, which people often accept—not because they are based on science, but because they are consistent with their party allegiance (Kahan et al., 2012; Tranter, 2017). When information is congruent with their prevailing views, people assimilate it more easily, because the effortful process of changing their current beliefs is not required (Lewandowsky et al., 2012). This process makes people more inclined to assimilate misinformation simply because it fits with their existing ideology. Once encoded, the misleading effect of information persists in memory despite any later correction (Lewandowsky et al., 2012). Rather than inoculating this polarising effect, higher education seems to reinforce it. Higher educated Democrats (left-wing) and Republicans (right-wing) in the United States expressed an even greater divide in their belief about climate change than their lower educated counterparts (Hamilton, 2011; Kahan et al., 2012).

In Australia, the current energy policy directives of the major political parties suggest opposing worldviews and value positions. Conservative leaders are more likely than progressive leaders to be skeptical about anthropogenic climate change and less supportive of renewable energy generation (Fielding et al., 2012; Kousser & Tranter, 2018; Tranter, 2013). This pattern of support for a clean energy transition in Australia is generally consistent with levels of renewable energy support across left and right political party affiliations worldwide (Aldy et al., 2012; Leiserowitz et al., 2018; Leiserowitz et al., 2011). Given that people more easily assimilate information that is consistent with their party affiliation (Kahan, 2012; Lewandowsky et al., 2012; Tranter, 2017), it is plausible that individuals with right-wing views may be more susceptible to misinformation that blames renewable generation for electricity price rises. This could exacerbate the polarised support for renewable energy policy and ultimately leave politically right-leaning individuals more sensitive to policy-related price increases than their left-leaning counterparts.

Overall, existing research findings suggests that household income, climate change concern, and political orientation may determine how people evaluate projected energy policy-related price increases and derive their level of support for a 50% RET. This research project empirically examined these possibilities.

### **Aims of the Current Research**

A review of relevant research literature revealed that Australians tend to place a high priority on reducing carbon emissions, but the effect of their evaluations of projected policy-related price increases on policy support is largely unknown. When it comes to explicitly supporting a transition to renewable energy, their support for a new energy policy at any given cost is likely to vary according to individual attributes and contextual factors. Therefore, this thesis aimed to determine the extent to which policy-related price increases affect public support for the proposed 50% RET in Australia, and to identify potential

psychological and contextual factors that may moderate people's sensitivity to policy-related price rises. Specifically, I sought to answer three main research questions:

1. Are projected policy-related electricity price increases related to public support for the proposed 50% (RET)?
2. Do personal values interact with policy-related electricity price increases to shape public support for the proposed 50% (RET)?
3. Do individual attributes (i.e., climate change concern, political orientation, and household income) interact with policy-related electricity price increases to shape public support for the proposed 50% (RET)?

I addressed these questions in several ways. To address Question 1, I initially conducted a Multilevel Modelling (MLM) analysis of the effect of projected electricity price increases on support for the proposed 50% RET in Australia (Study 1, Chapter 2). MLM is a flexible technique for analysing nested data structures, including repeated measures designs. In addition to measuring between person differences, I presented the same proposed policy to each individual at eight different electricity price increases. Given that each participant rated their degree of policy support at eight price levels, differences in reported support could be identified both within-subjects and between-subjects. That is, one level identified changes in each participant's policy support across price levels, and a second level identified differences in participants' support based on their interpersonal differences (i.e., values and other individual attributes). Chapter 2 provides a detailed description of this approach and its use in the current research.

Study 1 (Chapter 2) also addressed Question 2, by examining whether the effect of sensitivity to projected electricity price increases on policy support may vary according to personal values priorities. This methodological approach focused on the variance in policy support explained by two composite values variables: *self-enhancement* (i.e., concerns for



oneself) and *self-transcendence* (i.e., concerns for entities outside of oneself) in accordance with traditional Values Theory (Schwarz, 1992, 1994, 2007). This was a variable-centred approach because it focused on variance explained by a set of variables (Muthén & Muthén, 2000). I also addressed Question 2 in Study 2 (Chapter 3). In this study, I conducted a latent profile analysis (LPA) to identify homogenous segments of the sample that shared similar profiles of value priorities. LPA is a person-centred approach because it assigns individuals to discrete segments of a sample according to their patterns of scores on a set of continuous variables—in this case, on variables that assessed Schwarz’s (2017) personal values. I then compared scores on anthropogenic climate change belief, climate change concern, political orientation, energy source preference, and policy support across the segments that emerged.

Lastly, I addressed Question 3 in Study 3 (Chapter 4). In this study, I investigated whether other contextual and psychological characteristics (i.e., climate change concern, household income, and political orientation) interacted with projected electricity price increases to predict people’s support for the proposed 50% RET.

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## **CHAPTER 2**

### **Study 1**

#### **How projected electricity price and personal values influence support for a 50% renewable energy target in Australia**

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### **Abstract**

This study investigated how projected electricity prices and personal values influence public support for a 50% renewable energy target (RET) in Australia. In an online experiment, 404 participants rated their support for a 50% RET across eight projected increases in their quarterly power bills. Multi-level modelling indicated that: (1) support for the 50% RET fell as the projected price of electricity increased, (2) although participants with low *self-enhancement* values and high self-transcendent values were most supportive of the 50% RET, these value-based differences disappeared as projected electricity prices increased. Implications of these findings for energy policy design are discussed.

**Key Words:** renewable energy; personal values; multilevel modelling; energy policy; policy acceptability; electricity price.

## **How Projected Electricity Price and Personal Values Influence Support for a 50% Renewable Energy Target in Australia**

Fundamental changes to our energy production and use are paramount to limit climate change and its impacts (Finkel et al., 2016; Intergovernmental Panel on Climate Change, 2014). Net zero emissions by mid-century must be met in order to limit global warming to 2°C and avoid dangerous climate change (United Nations, 2016). Achieving these goals will require a rapid shift towards generating electricity from renewable sources, such as wind, water, and solar, rather than continuing to burn carbon emitting fossil fuels (Denis, Graham, et al., 2014; Intergovernmental Panel on Climate Change, 2011). Technically and economically it is possible to meet global energy demand solely from renewable sources by 2050 (Jacobson & Delucchi, 2011). So, a clean energy transition is feasible with sufficient international will.

It is encouraging that many countries have implemented policies to hasten the transition to clean energy generation (Sawin et al., 2015). In Australia, the Renewable Energy Target (RET) promotes renewable energy generation by requiring energy companies to annually source 33,000GWh (approximately 23.5% of Australia's electricity generation) from renewable sources (Australian Government, 2015). However, this policy expires in 2020, and the current Coalition government has yet to announce a replacement. Australia is well placed to adopt clean energy technologies, yet current political leaders favour a technology agnostic approach to providing affordable and reliable electricity (Energy Security Board, 2018), which includes the continued use of coal-fired power stations (old and new). In the absence of carbon-capture and storage technologies (which are still under development), the current approach is incompatible with Australia's carbon emission obligations under the Paris Agreement (IEA, 2018; United Nations, 2016). Furthermore, the political infighting about what new policies should and should not include has undermined

investment security for building more renewable electricity generators (Finkel et al., 2017). This leaves Australia vulnerable to energy security risks and its carbon intensity is still the highest among International Energy Agency (IEA, 2018) countries. A well-planned, integrated climate and energy framework that provides clear signals to potential investors is therefore vital to ensure a secure and sustainable energy future (Finkel et al., 2017; IEA, 2018).

At the time of this study, the Labor Party proposed a RET of 50% by 2030 as a revised energy policy. It extends the current RET and ensures that half of Australia's electricity would come from renewable sources by 2030 (Australian Labor Party, 2015)<sup>1</sup>. Expert pathway modelling has demonstrated that, by using existing technology and not sacrificing economic prosperity, Australia could live within its carbon budget and achieve net zero emissions by mid-century (Bloomberg New Energy Finance, 2018; Denis, Jotzo, et al., 2014). Given that the 50% by 2030 RET provides a realistic pathway towards zero-emissions by mid-century (Denis et al., 2015), this policy represents a viable mechanism for meeting Australia's international climate obligations (United Nations, 2016).

In democratic societies, such as Australia, politicians are often reluctant to pursue new policies if they expect substantial opposition from their constituents (Steg, 2016). Given that public support is likely to play a key role in the transition to a low carbon economy (Jacobson & Delucchi, 2011), it is critically important to understand which factors drive public acceptability of energy system changes, and how to best leverage these factors in the development and implementation of renewable energy policy and projects (Sovacool, 2014; Stern et al., 2016). Insights from the social sciences can help policy makers understand public

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<sup>1</sup> The federal Labor Party recently confirmed support for an emissions intensity scheme, which could remove the need for a separate renewable energy target (See Wood, 2017).

preferences and the specific factors that drive support (and opposition) to new policy initiatives (Hackmann et al., 2014; Weaver et al., 2014).

Expectancy models of policy support suggest that public affinity and antipathy for new policy initiatives are driven by the positive and negative consequences the new policies are expected to generate (Steg, 2016). When evaluating a new policy, individuals consider possible implications for themselves, such as impacts on their household electricity bills and functionality changes that affect the reliability of their electricity supply. In addition, they consider possible implications for society or the environment, such as any impacts on carbon emission levels, environmental pollution levels, employment distribution, community health outcomes, and pricing fairness. Thus, overall support for a new policy is determined by the extent to which the expected benefits for self, society and environment outweigh the expected costs (Eagly & Chaiken, 2007; Zanna & Rempel, 2008).

To investigate public support of an energy system change in the United Kingdom, Demski et al. (2015) used mixed methods to identify aspects of the electricity sector that the public consider particularly important. These were (1) efficiency and waste, (2) environment and nature, (3) security and stability, (4) social justice and fairness, (5) autonomy and power, (6) process and change (see p. 64 of their article for full definitions). These aspects offer important insights into public decision making for the electricity sector. However, it is also important to identify how people evaluate and weigh up the many potential consequences of a system change. For example, electricity price is important as it represents a direct and tangible cost for households. But lowest price is not necessarily the highest priority if it entails high carbon emissions or insecure energy supply (Parkhill et al., 2013). More likely, people will consider the discounting trade-off between the short-term personal cost of their household electricity bill against the long-term collective benefits of low carbon pollution and secure energy supply (Perlaviciute & Steg, 2015).

Aldy et al. (2012) investigated this discounting effect on public support for a proposed national clean energy standard in the United States. As expected, they found that support for the policy declined as the projected price of household electricity increased. They also found that the strength of the relationship between price and policy support varied according to participants' socio-demographic profiles, with left-wing Democrats, whites and younger members of their sample willing to pay more for clean electricity. Similarly, in Australia, Tranter (2014) identified younger, more educated, and more left-wing members of their sample were willing to pay more for electricity generated from renewable sources.

In Australia, public support for renewable energy is generally positive. A national opinion poll identified that, overall, 65% of Australian voters approve of the proposed 50% by 2030 RET (Essential Research, 2017). This is encouraging for the renewables sector, but it does not consider how the projected financial costs of low emission electricity may impact consumers' decisions to support the policy. This is notable since Australia's electricity prices have risen 80 to 90 percent in the last decade (ACCC, 2017), which several right-leaning politicians and media outlets blamed on new renewable electricity generation (Morton, 2017). It remains unclear if this strategy will successfully diminish electorate support for renewable energy in Australia, especially if it means a further inflation of household electricity bills. The present study addresses this important gap in the literature by evaluating the impact of projected household electricity prices on public support for a specific renewable energy policy (50% RET by 2030). In addition, this study examines how personal values may interact with price signals to influence support for a clean energy policy. That is, it addresses the issue of whether people with different value priorities are equally sensitive to price signals when assessing the extent to which they support a new energy policy.

Personal values are relevant to understanding which policies members of the public support or oppose because values determine how people evaluate and weight the various

consequences that stem from implementing such policies (Steg, 2016; Steg et al., 2005, 2006). Values are desirable goals that transcend situations and generally serve as guiding principles in people's lives (Schwartz, 1992). People generally endorse all personal values to some extent, but will prioritise them differently (Schwartz, 1992). As such, these priorities direct attention and influence how people evaluate different consequences of products, ideas or actions. Evaluations then underscore attitudes that determine judgements of favourability or unfavourability and, in turn, preference and choice (Feather, 1995; Steg et al., 2014). Values have been shown to influence decisions and behaviours pertaining to issues such as climate change (Corner et al., 2014; Evans et al., 2012), asylum seekers (Beierlein et al., 2016; Greenhalgh & Watt, 2015), and clean energy (Bidwell, 2013; Butler et al., 2015; Nilsson et al., 2014; Perlaviciute & Steg, 2015; Poortinga et al., 2004).

*Self-transcendence* and *self-enhancement* values are particularly important when considering pro-environmental issues that ultimately reflect collective, as opposed to self-interested, concerns. *Self-transcendence* values prioritise positive collective outcomes, and are comprised of 5 components: *universalism-concern* (equality, justice and protection of all people), *universalism-nature* (preservation of the natural environment), *universalism-tolerance* (acceptance and understanding of those who are different from oneself), *benevolence-caring* (devotion to the welfare of ingroup members), and *benevolence-dependability* (being reliable and trustworthy to the ingroup) (Schwartz, 2017; Schwartz & Butenko, 2014; Schwartz et al., 2012). *Self-enhancement* values, on the other hand, prioritise self-interest and are comprised of three components: *power-dominance* (control over people), *power-resources* (control of resources) and *achievement* (success according to social standards) (Schwartz, 2017; Schwartz & Butenko, 2014; Schwartz et al., 2012).

People who prioritise *self-enhancement* values tend to be less supportive of policies that are designed and implemented to protect the environment, whereas those who prioritise



*self-transcendence* values tend to be more supportive (Drews & van den Bergh, 2015). Support for specific energy sources also tends to align with either *self-enhancement* or *self-transcendence* values depending on the perceived consequences for producing electricity from that source. Nuclear energy, for example, garnered stronger support among individuals with high *self-enhancement* values and weaker support among those with high *self-transcendence* values (De Groot et al., 2013; Perlaviciute & Steg, 2015). Self-enhancing people attributed higher import to personal benefits (low financial cost and reliability) of nuclear power than self-transcendent people, who attributed higher import to the environmental risks (accidents and waste) associated with nuclear power (Perlaviciute & Steg, 2015). Likewise, for wind farms - which afford low environmental risk but high collective benefits - respondents who scored higher on *self-transcendence* values expressed greater support (Bidwell, 2013).

Beliefs and feelings, often rooted in people's values and cultural worldviews, are also important to understanding divergent responses to proposed energy policies (Kahan et al., 2011). For example, people who value individualism and free markets tend to oppose policies if they restrict commerce and industry. In contrast, people who espouse communitarian worldviews may advocate industry regulation, particularly if it benefits their whole society. Beliefs and feelings about energy policy may also have an inherent political dimension; individuals may look to the publicly expressed views of political party leaders in an effort to navigate complex social and economic issues (Tranter, 2017). In other words, cultural cognitions and political party affiliation both offer heuristic means to negotiate complex issues without substantive appraisal of competing evidence and arguments. Formed heuristically, these viewpoints are likely to be systematically different to those formed in a rational decision process wherein they would appraise all possible consequences of the policy

(Kahan et al., 2011). This highlights the importance of investigating factors that underlie policy decisions.

Although beliefs and feelings are important determinants of policy opposition and support, this study focuses on personal values as they tend to be more stable and underscore beliefs and feelings (Stern, 2000; Dietz et al, 2005). Although previous research shows that personal values predict support for specific energy sources (i.e., nuclear and wind), it is unclear the extent to which values matter as projected energy prices fluctuate. For example, *self-transcendence* values may predict support for green energy policies when the costs of adopting such policies are low. But what happens when the projected costs of a green-energy transition are high? At what price point, if any, will individuals with strong *self-transcendence* values stop supporting a green energy policy in favour of a less expensive alternative? To our knowledge, the potential moderating effect of personal values on price sensitivity has yet to be investigated in the energy policy literature.

In sum, the primary focus in this study is to understand two factors, projected energy price increases and personal values, that may contribute to support for the implementation of a proposed energy policy to provide 50% of Australia's electricity needs with renewable generation by 2030. The study investigates how (1) the projected cost of electricity generated from renewable sources, and (2) personal values may impact expressed support for a 50% by 2030 RET in a sample of Australian residents. Following Aldy et al.'s (2012) US study, we predicted that expressed support for the 50% RET in Australia would decrease as projected energy prices, linked to the policy, increased. Based on the research on personal values reviewed earlier, we predicted that respondents with stronger *self-transcendence* and weaker *self-enhancement* values would report stronger overall support for the 50% RET. Finally, we predicted that the strength of the relationship between cost and policy support would vary according to participants' value priorities. Based on the literature on human values in

renewable energy support (Bidwell, 2013; Butler et al., 2015; De Groot et al., 2013; Demski et al., 2015; Perlaviciute & Steg, 2015), we expected participants with stronger *self-transcendent* values - given their commitment to the environment and collective good - would be less sensitive to energy costs, and maintain stronger support for the 50% RET as costs increased. We also expected participants with stronger *self-enhancement* values - given their commitment to personal wealth - would be more sensitive to energy costs, and more rapidly reduce their support for the 50% RET as costs increased.

### Methods

An Australian national survey was conducted to examine public support for the 50% by 2050 RET at eight different electricity price increases. Participants completed the online survey between 2<sup>nd</sup> November and 1<sup>st</sup> December 2016. This comprised demographic items and measures to assess both political and values orientations. These were followed by a measure to assess participants' support for the 50% RET at eight cost amounts.

### Sampling

A sample of Australian participants was sourced from The Online Research Unit (ORU, 2016), an Internet panel company, with coverage across all states and territories. The sample comprised 421 Australian residents who received small (\$2.50) cash rewards for their participation. Of these, 17 gave flat-line responses across many items and were dropped from the sample prior to data analyses. The remaining 404 participants' demographics differed somewhat from the Australian population (ABS, 2017). Over half were males (55.4%), compared with 49.4% in the general population. Ages ranged from 18 to 89 years ( $M = 47.8$ ,  $SD = 16.1$ ), with median age of 46yrs, compared with 37yrs in the general population. Most participants (61.6%) had completed high school and/or tertiary or trade qualifications, compared with 69.1% in the general population. The median household income level was 60-80K per year, which is consistent with \$64,200 per year in the general

population (ABS, 2017). Participants' geographical distribution across states and territories differed from the general population,  $\chi^2(7, N = 404) = 17.02, p = .02$ , although this effect was small (Cohen's  $w = 0.21$ ). Victoria, South Australia, and Tasmania were over-represented, whereas New South Wales, Queensland, Australian Capital Territory, Western Australia, and Northern territory were under-represented.

## Measures

Demographic information was measured and used as control variables in all analyses. Single-item measures assessed participants' age (years), gender (1 = *male*, 2 = *female*), educational attainment (6-point scale, 1 = *Year 10 or less* to 6 = *Postgraduate degree*), and income level (7-point scale, 1 = *\$40k or less*, 7 = *greater than \$200k*)<sup>2</sup>.

Political orientation was assessed using the Conservatism-Liberalism Scale (CLS; Mehrabian, 1996). This was also included as a control variable in all analyses. This 7-item self-report scale measures left to right political orientation on a single dimension. Items are rated on a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Three items endorse right-wing orientations (e.g., "The major national media are too left wing (socialist) for my taste."), and four endorse left-wing orientations (e.g., "I am politically more socialist than conservative"). After left-wing items are reverse scored, mean scores across all items are calculated. Higher scores indicate right-wing orientations, whereas lower scores indicate left-wing orientations. For this study, the CLS was adapted for Australian participants. For example, the terms 'Republican and Democrat' were amended to 'Liberal and Labor', respectively.<sup>3</sup>

Values orientations were measured using the revised Portrait Values Questionnaire (PVQ-RR; Schwartz, 2017). This is an adapted version of the PVQ (Schwartz et al., 2001)

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<sup>2</sup> For data analyses, the mid-point of each income range, and \$225,000 for the highest range were used.

<sup>3</sup> In Australia, the Liberal Party is the primary right-wing party, whereas the Labor party is the primary left-wing party.

and PVQ-R (Schwartz et al., 2012) that more precisely differentiates between distinct value types. The PVQ-RR consists of 57 items that measure 19 values – three items for each value type. Items consist of brief, gender-matched, portraits of different people. Each item portrays the motivations or aspirations of a fictitious person. Participants then rate how similar they are to that person on a 6-point scale (1 = *not like me at all* to 6 = *very much like me*). For example, “It is important to her to care for nature” describes a woman who cherishes the natural environment. “It is important to him to be wealthy” describes a man who values the power of resources highly. Participants’ values are inferred from the values of those people they indicated as most like themselves.

Scores for participants’ *self-enhancement* and *self-transcendence* values were computed using, respectively, the relevant nine and fifteen items identified by Schwartz (2017); Schwartz et al. (2012). *Self-enhancement* comprised the aggregate mean scores for *achievement, power-dominance, and power-resources* items. *Self-transcendence* comprised the aggregate mean scores for *universalism-nature, universalism-tolerance, universalism-concern, benevolence-care, and benevolence-dependability* items. Both scales were highly reliable in this study (self-enhancement  $\alpha = .89$ , self-transcendence  $\alpha = .93$ ).

Support for the 50% RET was measured by adapting the methodology used by Aldy et al. (2012) to measure renewables support amongst US residents. Participants read a statement describing the 50% RET and indicated their level of support for it at eight levels increased electricity cost levels. The statement read “The Federal Government may consider an energy policy that would require all electricity suppliers to obtain 50% of their energy from renewable sources by the year 2030. Eligible sources may include solar, wind, water, and biomass.” The question read “To what degree would you support this policy if it required an additional investment in your quarterly household electricity bill, by the following amounts?” Eight different cost amounts were presented (e.g., \$5 more per quarter),

and participants rated their degree of policy support at each amount on a 6-point scale (-5 = *strongly oppose*, -3 = *moderately oppose*, -1 = *slightly oppose*, 1 = *slightly support*, 3 = *moderately support*, and 5 = *strongly support*).<sup>4</sup>

Cost amounts \$5, \$25, \$45, \$70, \$90, \$115, \$135, and \$155 were selected based on retail costs projected by electricity sector decarbonisation modelling, coupled with average household electricity consumption. The projected impacts on retail prices ranged from 6.6-8.5 c/kWh (Australian Energy Market Operator, 2013, p. 35; Wright & Hearps, 2011). Given that a typical electrical appliance only household uses 6000kWh/year that costs approximately \$1600 (ABS, 2013; ACIL Allen Consulting, 2015; Denis, Graham, et al., 2014), this equates to an additional \$396 - \$510 cost per year; that is \$99 - \$127.50 per quarter. Consistent with Aldy et al. (2012), the selected cost amounts ranged below and above the projected costs. They were also framed as quarterly increases to ensure they were personally relevant to the householder in terms of how they pay their electricity bill.

### **Statistical Method**

We used multilevel modelling (MLM) to explore and quantify the magnitude of the effects of electricity cost on policy support and to determine if personal values moderated that relationship. Multilevel modelling (MLM) is a highly flexible statistical technique for hierarchical or nested data structures, including repeated measures designs (Bickel, 2007; Hine et al., 2016; Raudenbush & Bryk, 2002). In the current study, all analyses were conducted using HLM 6 statistical software (Raudenbush et al., 2004). Given that each participant rated their degree of policy support at eight electricity prices points, variation in support judgements occurred both within-subjects (changes in each participant's support for

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<sup>4</sup> This scale is centred at zero and can be dichotomised to compute percentage distribution of 'support' responses if required.

the policy across price points, Level 1) and between-subjects (differences in participants' support, based on their values and other personal characteristics, Level 2).

***Level 1: The impact of electricity price on policy support***

Conceptually, the Level 1 analysis is similar to computing a regression equation for each participant in the sample, with policy support as the criterion and electricity price as the predictor variable, and then computing the average intercept and slope for the whole sample.

***Level 2: The impact of personal values on policy support***

The Level 2 analysis addressed two main questions:

- (1) To what extent do personal values predict participants' support for the 50% RET? This can be most usefully conceptualised in traditional multiple regression terms, as a between-subjects, main-effects analysis (Raudenbush & Bryk, 2002). See results subsection 3.2 that examines the effect of personal values on policy support.
- (2) To what extent does the relationship between electricity price and support for the 50% RET vary as a function of personal values? This is similar to a moderation (interaction) analysis in standard multiple regression. However, given that the price effect manifests at Level 1 (within-subjects), and the values/political orientation effects are at Level 2 (between subjects), these moderation tests are referred to as "cross-level interactions" (Raudenbush & Bryk, 2002).

## **Results**

Prior to analyses, all variable means, standard deviations, and inter-correlations were computed (displayed in Table 1). Stronger *self-enhancement* values correlated with younger age, higher education and higher income, whereas stronger *self-transcendence* correlated with older age, lower income, lower education, and stronger left-wing orientation. In this sample, the two value types were antagonistic, reflected in a strong negative correlation ( $r = -$

.71); respondents who scored high on *self-enhancement* tended to score lower on *self-transcendence*, and vice versa.

**Table 1**

*Descriptive statistics and inter-correlations for demographic and level 2 predictor variables.*

	<i>M</i>	<i>SD</i>	Correlation ( <i>r</i> )						
			Gender	Age	Educ.	Income	PO	SE	
Age	47.83	16.15	-.21***	1					
Education level	3.70	1.58	-.03	-.24***	1				
Household income (AUD)	76,584	50,493	-.10	-.24***	.40***	1			
Political orientation	3.01	0.76	-.10	.22***	-.14**	-.06	1		
Self-enhancement	3.24	1.00	-.12*	-.36***	.23***	.27***	.07	1	
Self-transcendence	4.56	0.84	.10*	.29***	-.10*	-.18***	-.30***	-.71***	1

*Note:* All Correlations are Pearson's *r*. Following the Schwartz et al. (2012) methodology for correlation analyses, both self-enhancement and self-transcendent value scales were centred at the sample mean score.

*N* = 404. Gender was coded 1 = male, 2 = female. High scores for political orientation reflect right-wing ideology.

\**p* < .05, \*\**p* < .01, \*\*\**p* < .001.

## Analyses

### *Unconditional model*

The first step in HLM is an unconditional model to test whether policy support varied between participants. This analysis is akin to computing a one-way analysis of variance of policy support across participants. The unconditional model identified a significant policy support effect across participants,  $t(403) = -17.46$ ,  $p < .001$ . The intra-class correlation coefficient (ICC) represents the proportion of the variance in policy support between participants ( $4.98/12.73 = 0.39$ ). Hence, 39.12% of the total variance in policy support occurred between participants. This confirmed the utility of employing a multi-level strategy and examining within-subjects and between-subjects effects for subsequent analyses.



***Level 1 model***

The Level 1 analysis revealed a strong negative effect of price on policy support ( $B = -0.03$ ,  $SE = .001$ ,  $p < .001$ ), and explained 43.1% of the within-person variance in policy support. This supported our prediction that public support for the 50% RET would fall as the projected impact of the policy on electricity prices increased. In addition, a strong negative correlation ( $r = -.74$ ) between the Level 1 intercept and slope for price indicated sensitivity to price was stronger among those participants who reported lower overall policy support and weaker for those with higher overall policy support.

***Level 2 model***

In this model, we included demographic variables (gender, age, education level, and household income) and political orientation as covariates for both main effect and cross-level interaction analyses, to control for the possibility that they shared variance with the Level 2 predictors. Table 2 presents the unstandardized coefficients for (1) intercept and main effects for Level 2 variables, and (2) intercept and cross-level interaction effects for electricity price\*Level 2 moderator variables.

**Table 2***HLM Level 2 Analysis: Socio-demographic effects on support for 50% RET*

	Coefficient	SE	t(396)	p-value
<b>Main effects</b>				
Intercept	0.62	0.16	3.88	< .001
Gender	0.60	0.33	1.85	.07
Age	-0.01	0.01	-0.43	.67
Education level	0.42	0.11	3.53	.001
Household income	0.01	0.003	3.41	.001
Political orientation	-0.91	0.22	-4.11	< .001
Self-enhancement	-0.50	0.20	-2.50	.01
Self-transcendence	0.94	0.21	4.50	< .001
<b>Cross-level interactions</b>				
Self-enhancement	0.01	0.002	3.23	.002
Self-transcendence	-0.01	0.002	-4.28	< .001

*Note:* All significance tests are based on robust standard errors. High scores on political orientation represent right-wing orientation. Cross-level interaction represents *electricity price\*variable* interaction effect and is akin to moderation in multiple regression analysis

The main effect tests reported in Table 2 indicated higher education, higher household income, left wing political ideologies, stronger *self-transcendence*, and weaker *self-enhancement* significantly predicted stronger support for the 50% RET. Age and gender were unrelated to support.

Examination of the cross-level interactions in Table 2 revealed that both *self-enhancement* and *self-transcendence* values scores moderated the effects of electricity price on policy support. This means that the effect of electricity price varied significantly according to participants' different value priorities.

### **Analysis of covariance**

To interpret the cross-level interaction effects for *self-enhancement* and *self-transcendence*, a series of ANCOVAs (analysis of covariance) were conducted to compare mean policy support between (a) high/low *self-transcendence* groups, and (b) high/low *self-*

*enhancement* groups, whilst controlling for gender, age, education level, household income amount, and political orientation (consistent with the HLM Level 2 analysis). Values scores were centred at the sample mean, consistent with the Schwartz et al. (2012) methodology for analyses of variance. Low and high *self-enhancement* groups comprised individuals whose *self-enhancement* scores were in the lowest and highest quartile ranges respectively. Similarly, low and high *self-transcendence* groups comprised individuals whose *self-transcendence* scores were in the lowest and highest quartile ranges respectively. Figures 1<sup>a</sup> and 1<sup>b</sup> convey the adjusted mean differences in policy support between high/low *self-enhancement* and high/low *self-transcendence* groups respectively. Error bars not overlapping denote significant differences ( $p < .05$ ).

**Figure 1**

Mean Differences in Policy Support between High and Low Value Groups

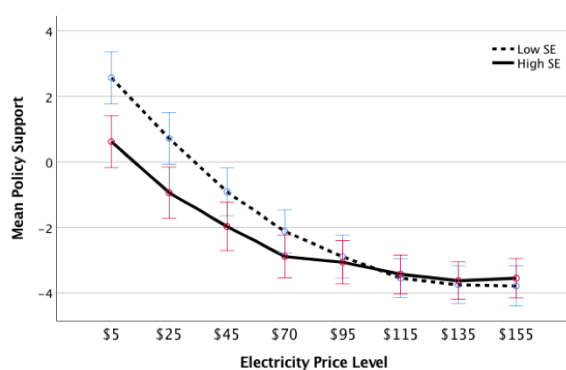


Figure 1<sup>a</sup>. Adjusted mean policy support<sup>5</sup> for high/low self-enhancement groups at each electricity price level. Note: Lines for low/high SE represent 25th and 75<sup>th</sup> percentiles respectively. Policy support: -5 = strongly oppose, +5 = strongly support). Error bars: 95% CI

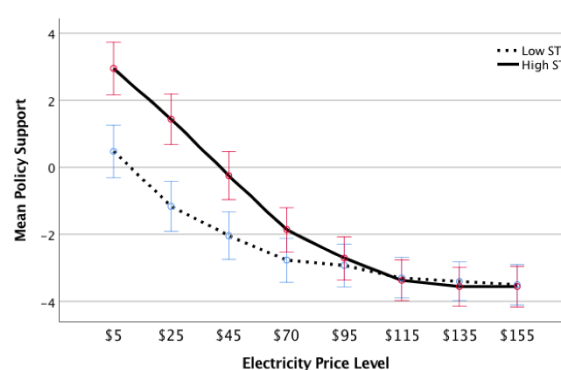


Figure 1<sup>b</sup>. Adjusted mean policy support<sup>6</sup> for high/low self-transcendence groups at each electricity price level. Note: Lines for low/high ST represent 25th and 75<sup>th</sup> percentiles respectively. Policy support: -5 = strongly oppose, +5 = strongly support). Error bars: 95% CI.

For high/low *self-enhancement* group comparisons, the ANCOVAs revealed

differences in policy support at the lowest two price levels: \$5 per quarter,  $F(1,196) = 9.46$ ,  $p$

<sup>5</sup> Covariates evaluated at the following values: Gender = 1.45, Age = 46.5, Education Level = 3.78, Household Income = 77.512, Political Orientation = -.01.

<sup>6</sup> Covariates evaluated at the following values: Gender = 1.47, Age = 46.7, Education Level = 3.80, Household Income = 77.881, Political Orientation = -.08.

= .002, partial  $\eta^2 = .046$ , and \$25 per quarter,  $F(1,196) = 6.70$ ,  $p = .009$ , partial  $\eta^2 = .034$ .

Relative to low self-enhancers, high self-enhancers were significantly less supportive of the 50% RET when projected electricity price increases were \$25 or below. For price increases above \$25, levels of support for the 50% RET did not differ between participants with high and low *self-enhancement* values.

A similar pattern was evident for the high/low *self-transcendence* group comparisons. Significant differences in policy support were found at the lowest three price levels: \$5 per quarter,  $F(1,196) = 15.52$ ,  $p < .001$ , partial  $\eta^2 = .073$ , \$25 per quarter,  $F(1,196) = 18.74$ ,  $p < .001$ , partial  $\eta^2 = .087$ , and \$45 per quarter,  $F(1,196) = 9.76$ ,  $p = .002$ , partial  $\eta^2 = .047$ .

Relative to the low *self-transcendence* group, the high *self-transcendence* group were significantly more supportive of the 50% RET when projected electricity price increases were \$45 or below. For price increases above \$45, levels of support for the 50% RET did not differ between participants with high and low *self-enhancement* values. Thus, for both values-group comparisons, the predictive power of values on support for the 50% RET disappeared as the projected impact of the policy on electricity prices increased.

## Discussion

### Summary of Main Findings

The current study investigated whether Australians' support for a proposed 50% RET would vary as a function of personal values and the projected impact of the policy on electricity prices. As predicted, and consistent with previous research by Aldy et al. (2012), public support for the proposed renewables target was closely linked to projected price impacts of the policy; the greater the projected increase in electricity prices, the greater the opposition to the proposed 50% RET.

In terms of personal values, respondents with stronger *self-transcendence* values and weaker *self-enhancement* values expressed stronger support for the 50% RET. This finding

aligns with previous research on the role of personal values in renewable energy support (Bidwell, 2013; Butler et al., 2015; De Groot et al., 2013; Demski et al., 2015; Perlaviciute & Steg, 2015), and is consistent with the more general view that *self-transcenders* (who value “bigger-than-self” outcomes) are more receptive to pro-environmental initiatives than *self-enhancers* (who value personal outcomes related to wealth and power).

The most important findings of this study stemmed from our analyses to determine whether the impact of projected electricity price increases on support for the 50% RET would vary as a function of respondents’ personal values. We predicted that individuals with strong *self-enhancement* values, given that they prioritise personal outcomes such as wealth, would be more sensitive to projected price increases than those with weaker *self-enhancement* values. This hypothesis was not supported. Although participants in the high *self-enhancement* group (relative to the low *self-enhancement* group) expressed less support for the 50% RET when electricity price increases were low, there were no differences in support between high and low self-enhancers when projected price increases were more substantial (\$45 per quarter and above).

Similarly, we predicted that a stronger commitment to the environment and collective good (prioritising *self-transcendence* values) would render people less sensitive to increased electricity prices than those with low *self-transcendence* values. This hypothesis was also not supported. Although participants in the high *self-transcendence* group (relative to the low self-transcendence group) expressed more support for the 50% RET when electricity price increases were low, there were no differences in support between high and low self-transcenders when projected price increases were greater (\$70 per quarter and above). In short, personal values predicted support for renewables when projected electricity price increases were small. But when price increases were projected to be medium and large, values no longer predicted support.

Previous studies have demonstrated the utility of using personal values to predict public support for pro-environmental policies (Bidwell, 2013; Butler et al., 2015; Perlaviciute & Steg, 2015; Steg et al., 2014; Steg et al., 2005), and priming values to increase pro-environmental behaviour (Evans et al., 2012; Nilsson et al., 2014; Verplanken & Holland, 2002). But the results of the present study highlight an important boundary condition for these values-based effects. People who value positive collective and environmental outcomes will not necessarily support an energy policy that broadly aligns with their values if they perceive the personal financial costs linked to the policies to be too high. This finding is consistent with previous research in environmental psychology which suggests that people are less likely to act on their environmental values when behaviours are too effortful, costly or uncomfortable (Diekmann & Preisendörfer, 2003; Steg et al., 2014). That is, the presence of barriers can prevent even the most well-intentioned people from acting in a manner consistent with their values.

### **Policy Implications**

In light of these findings, what can be done to encourage the public to support pro-environmental energy policies that promote renewables? As a starting point, we strongly support initiatives that actively promote pro-social and pro-environmental values (Corner et al., 2014; Steg et al., 2014; Thøgerson & Crompton, 2009; Verplanken & Holland, 2002). Given that, overall, values predict public support for pro-environmental policy (Drews & van den Bergh, 2015), this lays an important foundation for positive change. However, it is also important to address the reality that people are generally reluctant to support pro-environmental policies that they perceive will introduce a substantial personal financial burden. One possible strategy for addressing this problem is to have governments intervene to compensate low income households using revenue from industries that emit high amounts of carbon. This approach was a key component in Swoboda, Tomaras, and Payne's (2011)

Clean Energy Bill, which though politically contentious seems much more promising than attempting to convince people to adopt a longer-term view on the benefits of paying more for clean electricity. Decades of research on time discounting suggest that policy options that impose short-term costs with the promise of uncertain future benefits can be very difficult to sell (Frederick et al., 2002).

One interpretation of our results is that when anticipated costs of a policy are low, values are important determinant of policy preferences, but when the anticipated costs are high, values become less important. An intriguing alternative interpretation is that values always matter, but they direct respondents' attention to different outcomes related to *self-transcendence* depending on the magnitude of projected costs. Given that individuals with strong *self-transcendence* values are committed to prosocial outcomes such as equity and justice, they may be predisposed to perceive high electricity prices as fundamentally unfair; by imposing a disproportionate burden on low-income households or shifting costs from energy suppliers to consumers. Thus, their steep decline in support for the 50% RET at higher price points may not simply reflect their personal reluctance to pay higher prices for electricity, but rather their unwillingness to accept a new policy that they believe places unfair burdens on vulnerable segments of the population (Steg, 2016). In the first interpretation of our results, high electricity costs trump values in determining policy preferences. In the second explanation, higher costs activate concerns about fairness that lead self-transcenders to withdraw their support for the policy.

Perceived fairness in electricity pricing is a salient factor in Australia because energy suppliers often fail to fully take into account impact on consumers when setting pricing (ACCC, 2018; Mountain, 2018; Wood, 2017) and determining who should ultimately be responsible for funding grid upgrades and other changes to the energy system (Demski et al., 2017). Perceived unfairness can foster mistrust of electricity suppliers (Hobman & Frederiks,

2014), which, in turn, may undermine support for complex new policies (Hobman et al., 2016).

Fairness concerns highlight the importance of limiting the financial impact of a clean energy transition for low-income households and to address complex electricity pricing. Encouragingly, this sentiment aligns with current policy directives (ACCC, 2018; CSIRO and Energy Networks Association, 2015; Wood et al., 2016). These strategies may help limit possible conflicts between pro-environmental and fairness values.

### **Limitations and Future Research**

Several limitations should be kept in mind when interpreting the results of this study. First, we examined Australian's support for a federal 50% RET by 2030, an energy policy initially proposed by the Australian Labor Party in 2015. Our conclusion that public support for the proposed RET declines steeply in response to projected increases in electricity prices applies only to Labour's policy. Our findings may not generalise to alternative policies that have been subsequently proposed, such as the Emissions Intensity Scheme (Wood et al., 2016), Clean Energy Target (Finkel et al., 2017), and the National Energy Guarantee (Energy Security Board, 2018).

Second, participants in the current study were asked to assess their support for a 50% RET based on a single attribute: electricity price. This approach may have elicited a somewhat different preference than if participants were also provided with additional information about other possible RET impacts, such as projected reduction in carbon emissions and overall reliability of the nation's energy system (e.g., see Bessette & Arvai, 2018). Future research should investigate how members of the general public trade-off impacts related to price, carbon emissions, and energy system reliability (the "trilemma" of energy policy issues (Demski et al., 2017), when determining their policy preferences.



Third, in terms of individual difference factors, the current study focused narrowly on two types of personal values: *self-transcendence* and *self-enhancement*. There are a host of other psychographic factors, such as cultural cognition and political orientation, that have been shown to influence preferences for various energy sources and policies. Future research should explore the extent to which these other factors moderate price-sensitivity effects on public support for renewables.

Finally, our finding that individuals with *self-transcendence* values withdrew their support for the 50% RET under conditions when the policy was projected to elicit larger increases electricity prices can be interpreted in two ways: (1) values become less relevant to predicting policy support when the projected costs of the policy are high, or (2) high costs can trigger concerns about equity and fairness which lead individuals to make a values-based decision to withdrawal their support of the policy. Future research is needed to disentangle these two accounts.

## **Conclusions**

Transitioning to clean energy production is a challenging but necessary response to the current climate crisis. However, energy policy is contentious in Australia, characterized by passionate debate about the relative costs and benefits of renewable energy technologies. This was reflected in our findings that participants' values priorities determined their support for a 50% RET by 2030; an effect that varied across price points. Low *self-enhancement* and high *self-transcendence* had a positive effect on policy acceptance, but this effect disappeared as electricity prices increased. Our results indicate that personal values likely play an important role in determining public support for renewable energy policies, but their relevance may diminish as the projected flow-on costs to consumers linked to such policies increase. A second possibility is that higher projected costs may lead to perceptions of unfairness that lead some consumers to make a values-based decision to withdraw their

support for the policy, despite its environmental merits. Overall, our results suggest that widespread public support for a 50% RET is unlikely to emerge unless energy prices are deemed to be affordable and fair by consumers.

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**Higher Degree Research Thesis by Publication**  
**University of New England**

**STATEMENT OF ORIGINALITY**

(Study 1)

We, the Research Master/PhD candidate and the candidate's Principal Supervisor, certify that the following text, figures and diagrams are the candidate's original work.

All elements presented are the original work of the candidate, except for those specified in the Statement of Authors' Contribution below	Not applicable
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31 August 2020

Date



Principal Supervisor

31 August 2020

Date

**Higher Degree Research Thesis by Publication**  
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**STATEMENT OF AUTHORS' CONTRIBUTION**

(Study 1)

We, the PhD candidate and the candidate's Principal Supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the candidate's contribution as indicated in the *Statement of Originality*.

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## Research Progression to Study 2

Study 1 found that projected policy-related price increases were strongly negatively associated with support for a 50% RET in an Australian sample. Support for the policy fell sharply as the projected price of electricity increased, with the greatest drop in support observed between the two lowest price levels (\$5 and \$25 per quarter). Additionally, significant relationships between policy support and personal values supported predictions of Values Theory (Schwarz, 1992, 1994, 2012). Participants with stronger *self-transcendence* or weaker *self-enhancement* values tended to report higher overall support for the 50% RET. However, the results also revealed an important boundary condition; values only predicted stronger (*self-transcendence*) or weaker (*self-enhancement*) policy support at low price levels.

Although Study 1 found reliable associations between personal values and policy support, it did not take interrelationships between values into account. It evaluated *self-transcendence* and *self-enhancement* as independent composite continuous variables. Study 2 aimed to clarify and extend the results of Study 1 by employing an alternative strategy that identified shared patterns of ten personal values across individuals in an Australian sample ( $N = 633$ ), and to test whether the emergent values profiles interact with projected policy-related price-increase to predict policy support. This affords important insight into how values priorities coexist within similar groups of people and, in turn, reveal different patterns of climate change beliefs, concern, energy preferences and policy support when we consider human values as a sum of all their priorities.

Study 2 also addressed a potential methodological shortcoming of Study 1. In Study 1, all participants rated their support for the 50% RET at eight different price levels, which may have elicited an anchoring effect whereby participants relied heavily on the first price level (\$5) when evaluating policies at subsequent price levels. In Study 2, participants rated their policy support at only one of five price levels, following random assignment.

**CHAPTER 3**

**Study 2**

**From Free-Spirits to Traditionalists: A Values-based Typology for Understanding  
Climate Change Concern and Energy Preferences**

*Submitted for Publication*

### Abstract

People vary substantially in what they deem important in their lives. This study created a typology of participants based on their personal values and investigated whether climate change beliefs, climate change concern, energy preferences, and support for a 50% renewable energy target (RET) vary as a function of values-type. Australian residents ( $N = 633$ ) completed Schwartz's (2017) Personal Values Questionnaire (PVQ-RR) and rated their climate change beliefs, concern about climate change, energy source preferences, and 50% RET support. Latent profile analysis identified four values-based segments based on participants' PVQ-RR scores: *Free-Spirits* (12%), *Power-Achievers* (28%), *Traditionalists* (16%), and *Normatives* (44%). Multivariate analysis of variance indicated that the *Free-Spirits* group expressed stronger belief in anthropogenic climate change and greater climate change concern than the *Power-Achiever* and *Traditionalist* groups. *Free-Spirits* also expressed stronger preferences for solar energy and weaker preferences for coal than *Power-Achievers*, and greater support for the 50% RET than the *Power-Achiever* and *Traditionalist* groups. These results indicate that a values-based typology may be useful to understand the roots of climate change concern and energy preferences, as well as how to best engage with each segment within the typology.



### **From Free-Spirits to Traditionalists: A Values-based Typology for Understanding Climate Change Concern and Energy Preferences**

The need for a clean energy system to reduce carbon emissions is urgent, as climate scientists warn of the catastrophic results of inaction (IPCC, 2018, 2019; Steffen et al., 2018). Yet we live in an era of increased polarisation, wherein people's climate change attitudes and mitigation actions reflect divergent value priorities (Poortinga et al., 2019). People vary substantially in what they deem important in their lives. Some strive to accumulate wealth, comfort, and power, reflecting self-enhancement values. Others are more concerned with outcomes that extend beyond the self to the natural environment, other people, or society as a whole, which reflects self-transcendence values (Schwartz & Butenko, 2014; Schwartz et al., 2012).

These patterns of values may influence how individuals respond to environmental challenges like climate change. For example, individuals with strong self-enhancement values, who prioritise the acquisition of wealth and power, may focus on the economic costs of mitigating climate change or threats to the established social order. These priorities may lead them to downplay the need for change or even deny that climate change is happening at all. Otherwise, people with strong self-transcendent values, who prioritise the health of the natural environment and positive collective outcomes, may be more concerned about the potentially catastrophic impacts of climate change on our natural world, people, and society. This may render them more likely to believe that climate change is a significant threat requiring urgent action (Corner et al., 2014; Hornsey et al., 2016).

Personal values also have implications for energy policy, given that people are more likely to support a proposed system change when it aligns with their values (Steg et al., 2006; Steg et al., 2015). When it comes to transitioning to clean energy generation to reduce carbon emissions and potentially mitigate climate change, political leaders who focus on the

negative aspects of clean energy, such as intermittent generation and expensive installation, are less likely to advocate the transition (Fielding et al., 2012). For example, in Australia, the incumbent Coalition Government lags on climate change action (IEA, 2018), favours the continued burning of fossil fuels for electricity generation (Energy Security Board, 2018b), and claims that ambitious decarbonisation targets are not economically sensible (Liberal Party, 2019). From this self-enhancement perspective, it is plausible that policy decision-makers believe a coal-based economy meets the best interests of the people. Current opposition parties, on the other hand, focus on the positive implications of clean electricity on the environment and propose a target of net zero emissions by 2050 (Australian Labor Party, 2018)<sup>7</sup>, which aligns with climate scientist recommendations (IPCC, 2018). Their policy decisions may reflect a self-transcendence perspective, where a clean energy economy meets the best interests of the people.

Fundamentally, these opposing energy directives reflect different views about whether self-enhancement or self-transcendence value-based judgments and decisions best serve public interests. It is, therefore, imperative to ascertain the nature and predictive strength of Australians' values in the support or rejection of any proposed policy change, because political leaders are unlikely to implement policy changes if they expect ardent public backlash (Drews & Van den Bergh, 2016). This study takes a person-centred approach to understanding the impact of values on energy preferences by identifying how values coexist within individuals and combine to predict climate change beliefs and concern, as well as energy policy acceptance.

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<sup>7</sup> In Australia, the Liberal Party is the primary centre-right wing party, whereas the Labor Party is the primary centre-left wing party.

### Values Theory and Applications

Values are desirable goals that transcend situations and serve as guiding principles (Schwartz, 1992). To some extent, people espouse all personal values but attribute different priorities to them (Schwartz, 1992). Whether they are implicit or explicit, values shape our decisions on a foundational level. The import that people give to values directs their attention and determines how they evaluate different products, ideas, or actions (Steg, 2016; Steg et al., 2005, 2006). Evaluations shape attitudes that guide assessments of favourability or unfavourability, which ultimately forms preference and choice (Feather, 1995; Steg et al., 2014).

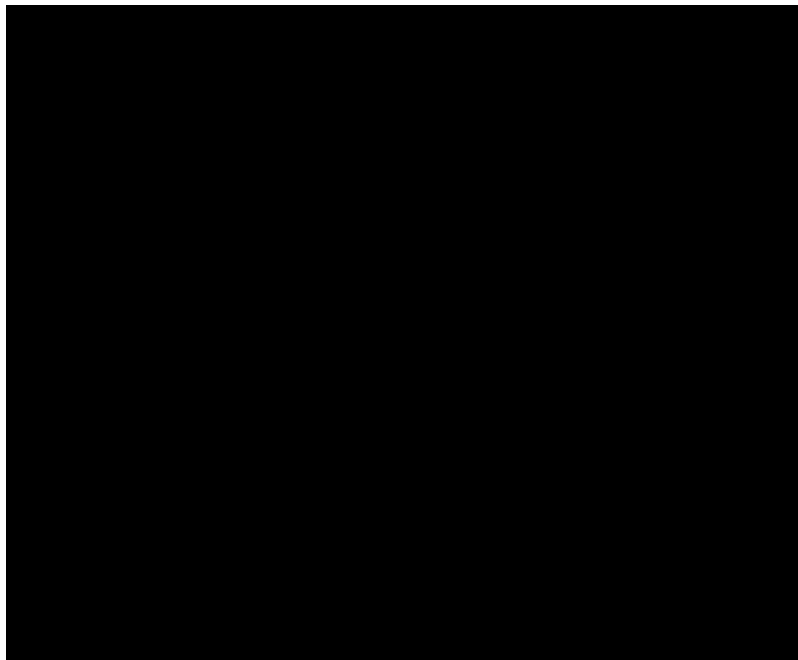
Schwartz (1992, 2007) defined ten values according to the motivational goal they express. These were (1) *self-direction* – independent thought and action, (2) *stimulation* – excitement, novelty and challenge in life, (3) *hedonism* – pleasure or sensuous gratification for oneself, (4) *achievement* – personal success through demonstrating competence according to social standards, (5) *power* – social status and prestige, control or dominance over people and resources, (6) *security* – safety, harmony, and stability of society, of relationships, and of self, (7) *conformity* – restraint of actions, inclinations, and impulses likely to upset or harm others and violate expectations or norms, (8) *tradition* – respect, commitment, and acceptance of the customs and ideas that one's culture or religion provides, (9) *benevolence* – preserving and enhancing the welfare of those with whom one is in frequent personal contact, and (10) *universalism* – understanding, appreciation, tolerance, and protection for the welfare of all people and for nature.

Schwartz's original set of values formed a circular continuum (circumplex) based on the compatible and conflicting motivations that people experience if they hold any pair of values in a single action or decision (Schwartz, 1992, 1994). Motivations on the circumplex are arranged according to two orthogonal dimensions; self-enhancement versus *self-*

*transcendence*, and *openness-to-change* versus *conservation*. In a subsequent revision, Schwartz and his colleagues revised his theory to incorporate 19 conceptually distinct subtypes that are ordered on the same circumplex (Schwartz & Butenko, 2014; Schwartz et al., 2012). See Figure 1.

### **Figure 1**

#### *Values Circumplex*



*Note.* Theoretical model of relations between values (Schwartz et al., 2012, p. 669).

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The *openness-to-change* versus *conservation* dimension reflects how much one embraces change or conserves traditions, whereas the *self-enhancement* versus *self-transcendence* dimension signifies the extent of concerns for oneself or entities outside oneself (Schwartz, 1992, 1994; Schwartz et al., 2012). Segments on the circumplex represent discrete value types, arranged according to the compatibility or conflict between the motivations they express. Conflicting values stand opposite each other, whereas compatible

values stand adjacent. Hence, adjacent *power* and *achievement* values are mutually compatible, but they conflict with opposing values of *benevolence* and *universalism*.

Experimental values theory research has empirically supported these systemic relationships (Bargh et al., 2001; Evans et al., 2012; Macrae & Johnston, 1998; Maio et al., 2009; Vohs et al., 2006).

### ***Values and the Environment***

Values occupy the root of our motivational system and underlie beliefs and attitudes towards environmental issues such as climate change (Corner et al., 2014; Evans et al., 2012; Milfont et al., 2015) and renewable energy (Bidwell, 2013; Butler et al., 2015; Nilsson et al., 2014; Perlaviciute & Steg, 2015; Phillips et al., 2019). Research into the impact of human values on climate change beliefs and concern has been primarily conducted using a set of continuous variables derived from Schwartz and colleagues' (2012) circumplex model. Studies indicate that people who uphold self-transcendence values tend to believe that climate change is human-induced and are concerned about the effects, while the reverse is generally true of self-enhancement values (Corner et al., 2014; de Groot & Steg, 2008; Poortinga et al., 2019). Moreover, a meta-analysis of correlates of climate change beliefs confirmed that holding *self-transcendence* values for the natural environment is associated with believing climate change is really occurring (Hornsey et al., 2016). In turn, believing that climate change is real relates positively with support for public policies that help mitigate climate change, though this relationship diminishes when it comes to supporting a price on carbon (Hornsey et al., 2016). In general, people who prioritise *self-transcendence* values tend to support policies designed and implemented to protect the environment more than those who prioritise *self-enhancement* values (Drews & Van den Bergh, 2016).

Whereas many studies have focused on *self-enhancement* and *self-transcendence* values, fewer have explored the role of *conservation* and *openness-to-change* values in

climate change perceptions (Poortinga et al., 2019). Some research has indicated that people with *openness-to-change* values are more likely to believe that climate change is real and human-induced (Milfont et al., 2015), whereas people with *conservation* values are less concerned about or willing to act for the environment (Stern et al., 1998). However, these relationships appear weaker for *openness-to-change* and *conservation* values than for *self-transcendence* and *self-enhancement* values (Milfont et al., 2015; Poortinga et al., 2004; Steg & De Groot, 2012). Furthermore, Poortinga et al. (2019) have shown both the direction and significance of *conservation vs openness-to-change* associations vary across countries. In a large European study ( $N = 44,387$ ), they found that *conservation vs openness-to-change* values were not significantly associated with four climate change perception dimensions (change in climate, human attribution, impacts, and concern) in most countries, whilst in some countries these associations were negative (i.e., linked with *conservation*) and in other countries they were positive (i.e., linked with *openness-to-change*). In line with Rohrschneider and Miles (2015), Poortinga and colleagues suggested that smaller effects of several values in Central and Eastern Europe may partly reflect the fact that the environment is not a major party issue in these countries, which results in less public polarisation than in Western countries.

### ***Values and Energy Preferences***

Similarly, continuous variables that assess distinct values have been used to examine the role of values in energy preferences and policy acceptability (Bidwell, 2013; De Groot et al., 2013; Perlaviciute & Steg, 2015; Phillips et al., 2019; Steg et al., 2006). Energy source acceptance tends to reflect either *self-enhancement* or *self-transcendence* values depending on the consequences that people perceive for generating electricity from that source. For example, nuclear energy gains stronger support among individuals with high *self-enhancement values* than among those with high *self-transcendence* values (Corner et al.,

2011; De Groot et al., 2013; Perlaviciute & Steg, 2015). This makes sense since nuclear energy may offer cost-effective and reliable electricity (IEA, 2019b) that appeals to *self-enhancement* values, while simultaneously opposing *self-transcendence* values by threatening the environment through accidental contamination (IEA, 2019b).

In contrast, the cost of new infrastructure and intermittent history of renewable electricity generation (Energy Security Board, 2018a) may impede its acceptance among people with strong *self-enhancement* values; however, the reduced CO<sub>2</sub> emissions it offers (IEA, 2019a) may be viewed as beneficial for those with *self-transcendence* values. Hence, Steg et al. (2015) found that people who endorsed strong *self-transcendence* values expressed greater support for renewable energy sources than people who endorsed strong *self-enhancement* values. In particular, (Bidwell, 2013) found that wind farms, which afford low environmental risk but high collective benefits, received strong support among people who uphold *self-transcendence* values. Most recently, Phillips et al. (2019) found that people with low *self-enhancement* and/or high *self-transcendence* values expressed support for a proposed renewable energy target, though only at low projected electricity price increases.

### **The Segmentation Approach**

Overall, previous research in this area has investigated the unique variance explained by individual values in people's decision to support or oppose a specific energy policy. An alternative approach is to investigate a typology of values. Each individual has a unique set of value priorities that coexist to form a profile of values they deem important or unimportant. For example, an individual may, to a varying degree, place high import on *universalism, self-direction, stimulation, hedonism, and achievement*, and low import on *benevolence, security, conformity, and traditionalism*. Together these priorities comprise their values profile. Typology research identifies homogenous groups of people within a population sample (i.e., segments of the sample) who share similar profiles. Compared to the

traditional variable-centred research, this approach is person-centred since it assigns each person to a qualitatively distinct profile grouping (Magun et al., 2017).

Previous research has identified segments of the public according to a wide range of environmental beliefs and behaviours that have often included values (Hine et al., 2016; Hine et al., 2014; Hine et al., 2013; Morgan et al., 2015). In a review, Hine et al. (2014) identified over 25 studies that employed this methodology with a particular interest in improving climate change communications. The *Global Warming Six Americas* emerged from the *Yale Project on Climate Change Communication* (Leiserowitz et al., 2008) wherein six unique segments of the US public ranged from *alarmed* to *dismissive* along an attitudinal continuum reflecting their degree of concern and engagement with climate change. This segmentation model has been replicated over time (Leiserowitz et al., 2012; Leiserowitz et al., 2010) and in multiple countries (Leiserowitz et al., 2013; Morrison et al., 2013). In Australia, Hine et al. (2013) identified five '*interpretive communities*' that were similar to the *Six Americas* insofar as they varied along a similar climate change concern and engagement continuum. Hine et al. (2016) have since demonstrated the utility of a segmentation strategy to improve climate change communications. They determined that the efficacy of specific message attributes (e.g., emphasising local impacts) to motivate climate change adaption varied according to which of three distinct climate change segments (i.e., *alarmed*, *uncommitted*, and *dismissive*) participants were members. Poortinga and Darnton (2016) further advanced the utility of this approach to engage the public across different sustainability policy areas.

### ***Values Segmentation***

In terms of a typology based on personal values, members of each segment share similar patterns of values priorities and therefore may share similar beliefs about the reality of anthropogenic climate change, levels of climate change concern, and energy preferences.

How values coexist is important when we consider the inter-relationship that Schwartz (1992;



1994; Schwartz et al., 2012) conveyed on the values circumplex. Values can be engaged by specific communications or experiences (Blackmore et al., 2013) and this tends to affect the attitudes and behaviours associated with that particular value (Holmes et al., 2012). For instance, when reminded of *benevolence* values, we are more likely to respond generously to requests for help (Maio et al., 2009). However, when one value is engaged it tends to ‘bleed over’ and strengthen neighbouring values on the circumplex as well as their associated attitudes and behaviours (Holmes et al., 2012). For example, when reminded of generosity, self-direction, and family, we are more likely to support pro-environmental policies than when we are reminded of financial success and status, even though the ‘environment’ has not been mentioned (Sheldon et al., 2011). Furthermore, whereas neighbouring values are strengthened, opposite values are suppressed in a “seesaw effect”; that is, as one value rises, opposite values tend to fall (Holmes et al., 2012). For instance, when *achievement* values are activated, we are less likely to be generous and offer our time to help someone (Maio et al., 2009).

However, values are not the sole determinants of behaviour, and actions may diverge from them when other factors are at play (Holmes et al., 2012). For instance, a value may not guide behaviour if it seems irrelevant and/or competes with another value (Maio et al., 2001), if social expectations are salient (Meliema & Bassili, 1995), or if the environment does not support value congruent behaviour (Ajzen, 1991; Evans et al., 2012). For example, Evans et al. (2012) identified that recycling rates depended on the information participants received about car-sharing. Recycling was higher than control when participants received environmental information about car sharing, but no different than control when they received financial information, or when they received both financial and environmental information. Thus, the positive effects of the environmental message occurred when *self-transcendence* reasons alone were salient, but not when combined with opposing *self-*

*enhancement* reasons. This finding suggests that *self-transcendent* and *self-enhancement* values may interact to predict pro-environmental behaviour.

Segmentation studies have focused on human values in a variety of domains that include social worker job performance (Levin et al., 2019), organic food purchasing behaviour (Chryssohoidis & Krystallis, 2005; Krystallis et al., 2012; Yıldırım & Candan, 2015), shopping behaviours of Chinese tourists (Choi et al., 2015), grassroots innovation (Martin & Upham, 2016), and cross-cultural population differences (Magun et al., 2015, 2017). The results of these studies suggest that alternative profiles may exist within some samples, or that theoretically conflicting values may coexist within some individuals. For example, Magun et al. (2015, 2017) used latent class analysis to identify five values-based segments in a European sample based on participants' scores on Schwartz's (1992, 1994; 2012) 10 theorised original values. Consistent with Schwartz's theory, four segments exhibited compatible values on a continuum that ranged from *self-transcendence* combined with *conservation* to *self-enhancement* combined with *openness to change*. However, a fifth segment diverged from that continuum, by similarly prioritising *self-transcendence* and *openness to change* values. Similarly, Martin and Upham (2016) used cluster analysis to identify three values-based segments within a pro-environmental zero-waste community. Two main segments had strong *self-transcendence* priorities but varied in their priorities for *openness-to-change* and *conservation*. However, the third segment prioritised *self-enhancement* values which suggests they have self-focused motivation, despite also displaying pro-environmental motivation in their affiliation with zero-waste proponents. Since conflicting values coexist in the third segment, it does not provide support for Schwartz's theory.

Given these inconsistent findings, it is unclear how values may coexist to influence public climate change concern or preferences for clean energy sources. It is plausible that

some individuals may even uphold competing values on the circumplex. For example, innovators in the renewable energy sector are perhaps renowned for their outstanding technological achievements in sustainable energy production for the reduction of global warming and the betterment of humankind (Easto, 2017). In this case, high *universalism* and *achievement* values are apparent even though they appear opposite on Schwartz's values circumplex. Such innovative success reflects an *openness to change* and a determination to radically alter out-dated energy systems. The informative findings of previous typology research suggest that a values typology may also enhance the knowledge base of factors that influence public climate change beliefs, climate change concern, preference for clean energy sources, and policy support, and therefore inform the development of targeted communications in this domain.

### **The Current Study**

The current study extends previous research on values and pro-environmental behaviour in four important ways. To start, it is the first values typology research to focus on the Australian public. Whereas previous Australian studies have segmented the public based on a broad range of variables including environmental values, this study focuses narrowly on Schwartz's (2007; 2012) personal values. Second, this is the first values-based typology study to use and interpret Schwartz's original 10 values (1992, 2007): *self-direction*, *stimulation*, *hedonism*, *achievement*, *power*, *security*, *conformity*, *tradition*, *benevolence*, and *universalism*, instead of interpreting findings in relation to only two broad dimensions with opposing values at each end (Magun et al., 2015, 2017; Martin & Upham, 2016). Third, it is the first to apply a values-based typology to energy policy research. Herein, it explores the possible links between different values profiles and preferences for fossil fuel and renewable energy sources, and with support for a proposed renewable energy policy (50% RET). Fourth, this is the first values-based typology study to focus on the possible links between

different values segments and either belief in anthropogenic climate change or concern about climate change.

In terms of values-based segments, we hypothesised that a latent profile analysis (LPA) of 10 values would identify segments that range on a continuum from *self-transcendence* (benevolence and universalism) combined with *conservation* (conformity, tradition, security) to *self-enhancement* (achievement, and power) combined with *openness-to-change* (self-direction, stimulation, and hedonism) values. This was based on previous values-based typology studies (Magun et al., 2015, 2017), which found similar patterns. We also hypothesised that at least one segment would express weak values relative to other profiles. This hypothesis is based on studies that identified “uncommitted” (Hine et al., 2016; Hine et al., 2013; Morgan et al., 2015), “self-reliant”, “pragmatists” (Poortinga & Darnton, 2016), “weak social focus” and “weak personal” focus values segments (Magun et al., 2015, 2017). We also acknowledged the possibility that alternative profiles (e.g., strong self-transcendence and openness-to-change) and/or profiles with theoretically conflicting values (e.g., strong *self-transcendence* and *self-enhancement*) may emerge, as suggested by previous research (Magun et al., 2015, 2017; Martin & Upham, 2016), but made no specific predictions about their structure.

In terms of energy preferences, based on previous studies (Bidwell, 2013; Butler et al., 2015; Corner et al., 2014; Corner et al., 2011; De Groot et al., 2013; Perlaviciute & Steg, 2015; Phillips et al., 2019; Steg et al., 2015), we expected that members of strong *self-transcendence* values combined with weak *self-enhancement* segments would generally prefer renewable sources and members of strong self-enhancement combined with weak *self-transcendence* segments would generally prefer fossil-fuel sources. It follows that, in terms of support for the 50% RET, we hypothesised that members of strong *self-transcendence/weak self-enhancement* segments would be willing to support the policy,

whereas strong *self-enhancement*/weak or strong *self-transcendence* segment members would not be so willing. However, considering that *self-transcendence* information no longer predicted pro-environmental attitudes when it was accompanied with *self-enhancement* information (Evans et al., 2012), we hypothesised that these preferences would depend upon levels of theoretically opposing values in a segment. As such, an alternative segment with strong *self-transcendence* and strong *self-enhancement* values would not significantly differ from the sample mean with respect to their energy source preference or support for the 50% RET.

Lastly, in terms of belief in anthropogenic climate change and climate change concern, we hypothesised that members of strong *self-transcendence*/weak *self-enhancement* segments would indicate strong beliefs and concern, whereas members of strong *self-enhancement*/weak *self-transcendence* segments would be more sceptical. Given previous inconsistent findings of studies that have assessed *openness-to-change* and *conservation* values (Poortinga et al., 2019), we made no hypothesis for different energy source preferences, policy support, climate change belief, or climate change concern for members of segments with high levels of both of these values.

## Method

### Participants

A sample of Australian participants was sourced from Qualtrics Research Services (Qualtrics, 2019), an Internet panel company, with coverage across all states and territories. The sample comprised 633 Australian residents who received small incentives such as loyalty points or gift vouchers for their participation. Overall, our sample was better educated but otherwise similar on a range of demographic variables with respect to Australian national norms (ABS, 2016). Just under half were males (49.1%), compared with 49.3% in the general population. Ages ranged from 18 to 88 years ( $M = 45.2$ ,  $SD = 17.5$ ). Distributions

across three ranges (18-34 years, 35-54 years, and 55-87 years) matched national norms,  $\chi^2(2, N = 631) = 1.54, p = .46$ . Participants' geographical distribution across states and territories also matched the general population,  $\chi^2(7, N = 633) = 4.59, p = .71$ . Most participants indicated that they had completed Year 12 (88.0%), while some indicated that they had also completed a bachelor's degree or above (34.6%). The corresponding levels from the 2016 census were 62.3% and 22% respectively. The mean household income level was \$72.2K per year, compared with \$65.3K per year in the general population (ABS, 2019).

### **Procedure and Measures**

Following human ethics approval, 413 participants completed an online survey in June 2018 (during Winter). Then, to increase statistical power, 220 participants completed the same survey in June 2019. The survey comprised demographic items and measures to assess participants' climate change concern, energy source preference, support for the 50% RET policy, and personal values.

#### ***Demographics***

Demographic information was assessed with single items for age (years), gender (1 = *male*, 2 = *female*), educational attainment (6-point scale, 1 = *Year 10 or less* to 6 = *Postgraduate degree*), and household income level (7-point scale, 1 = *\$40k or less*, to 7 = *greater than \$200k*).

#### ***Belief in Climate Change***

Drawn from Reser et al. (2012), this question asked participants to select one of six statements that best described their beliefs (1 = "*I don't think climate change is happening*", 2 = "*Climate change is happening but is entirely due to natural processes*" to 6 = "*Climate change is happening and is entirely due to human activity*"). The first statement is included so that climate deniers are not forced to indicate a false belief that climate change is happening.

### ***Climate Change Concern***

Participants responded to the question “How concerned are you about climate change, sometimes referred to as 'global warming'?” on a 5-point Likert scale (1 = *not at all concerned* to 5 = *extremely concerned*). This item is also drawn from Reser et al. (2012). It has face validity because it does not presume concern by offering a “*not at all concerned*” option.

### ***Energy Source Preference***

A single item, adapted for Australia from Poortinga et al. (2006), measured participants' preference for six energy sources. These were coal, gas, nuclear power, hydroelectric power (water), sun/solar power, wind power, and biomass. Participants responded to the question “Please rate your opinion of the following energy sources for producing electricity in Australia” on a five-point scale (1 = *extremely bad*, to 5 = *extremely good*).

### ***Support for 50% RET Policy***

To assess support for the 50% by 2030 RET, participants read a statement describing the policy and answered a single contingent choice question (Phillips et al., 2019). The statement read, “The Federal Government may consider an energy policy that would require all electricity suppliers to obtain 50% of their energy from renewable sources by the year 2030. Eligible sources may include solar, wind, water, and biomass.” The question read “To what degree would you support this policy if it were to increase your quarterly household electricity bill \$XX per quarter?” Where \$XX was one of five values: \$5, \$35, \$70, \$105, and \$150. Participants rated their degree of policy support on a 6-point scale (1 = *strongly oppose*, 2 = *moderately oppose*, 3 = *slightly oppose*, 4 = *slightly support*, 5 = *moderately support*, and 6 = *strongly support*). Participants were randomly assigned to one of five groups and presented with a price increase of \$5, \$35, \$70, \$105, or \$150 per quarter.

### *Personal Values*

To measure personal value priorities, we used the revised Portrait Values Questionnaire (PVQ-RR; Schwartz, 2017). This version is adapted from the PVQ (Schwartz et al., 2001) and PVQ-R (Schwartz et al., 2012) and differentiates between distinct value types more precisely. The PVQ-RR comprises 57 items that measure 19 values – three items for each value type. Each item is a short gender-matched statement that portrays the motivations or aspirations of a fictitious person. Participants rate how similar they are to that person on a 6-point scale (1 = *not like me at all* to 6 = *very much like me*). For example, “It is important for her to be very successful” describes a woman who highly cherishes her achievements. “It is important to him to be wealthy” describes a man who highly values the power of resources. Participants’ values are inferred from the values of those fictitious people they indicated were most like themselves. To adjust for response bias, participants’ value scores were centred around their mean response to all items (Schwartz et al., 2012).

Scores for the ten original values were computed using the aggregate mean scores for the relevant value items (Schwartz & Butenko, 2014; Schwartz et al., 2012). For example, “*Benevolence*” scores included *benevolence-care* and *benevolence-dependability* items. And “*Tradition*” scores included *tradition* and *humility* items thereby recapturing the original tradition value before it was split into subtypes (Schwartz & Butenko, 2014). Three “*face*” items were not included in any of the ten original values scores as they measure a separate value in the revised theory (Schwartz & Butenko, 2014). All scales for the ten original values were reliable in this study: *self-direction*  $\alpha = .86$  (6 items), *stimulation*  $\alpha = .79$  (3 items), *hedonism*  $\alpha = .84$  (3 items), *achievement*  $\alpha = .74$  (3 items), *power*  $\alpha = .86$  (6 items), *security*  $\alpha = .81$  (6 items), *conformity*  $\alpha = .73$  (6 items), *tradition*  $\alpha = .93$  (6 items), *benevolence*  $\alpha = .83$  (6 items), *universalism*  $\alpha = .88$  (9 items). Standardised scores for the ten original values were



used for the latent profile analysis to identify groups of participants who shared similar value profiles.

## Results

### Descriptive Statistics

Mean scores and intercorrelations between the 10 personal values, climate change belief and concern, and support for the 50% RET assessed in the study are presented in Table 1. Intercorrelations generally supported the inter-value relationships proposed by Schwartz's values theory (Schwartz et al., 2012). That is, adjacent values on the circumplex were positively correlated (e.g. *benevolence* with *universalism*, *power* with *achievement*, *hedonism* with *stimulation*, and *tradition* with *conformity*). Opposite values on the circumplex were negatively correlated (e.g. *power* with *universalism*, *benevolence* with *achievement*, *security* with *stimulation*, and *hedonism* with *conformity*). Relative to other values, participants in the sample generally gave higher importance to *self-direction*, *hedonism*, *security*, *benevolence*, and *universalism* values than they gave to *stimulation*, *achievement*, *power*, *conformity*, and *tradition*. Levels of values observed in the sample are similar to those observed in previous British, Australian, and European/American community samples (see Martin & Upman, 2016; Phillips et al., 2019; Schwartz et al., 2012). Several significant bivariate correlations between values and belief in anthropogenic climate change, climate change concern, and support for the 50% RET were also evident in the dataset.

**Table 1***Descriptive Statistics and Inter-correlations for the Ten Original Values, Climate Change Belief and Concern, and Policy Support*

	M	SD	Correlations											
			S-dir.	Stim.	Hed.	Ach.	Pow.	Sec.	Conf.	Trad.	Ben.	Univ.	C. Bel.	C. Cons.
Self-direction	0.60	0.62	1											
Stimulation	-0.35	0.86	.027	1										
Hedonism	0.12	0.84	.065	.437***	1									
Achievement	-0.37	0.83	-.209***	.351***	.226***	1								
Power	-1.60	0.98	-.250***	.133**	.114**	.400***	1							
Security	0.53	0.55	.053	-.450***	-.217***	-.287***	-.269***	1						
Conformity	-0.06	0.74	-.312***	-.352***	-.366***	-.278***	-.283***	.168***	1					
Tradition	-0.23	0.64	-.240***	-.237***	-.315***	-.315***	-.227***	.039	.253***	1				
Benevolence	0.61	0.56	.047	-.220***	-.178***	-.204***	-.385***	.016	-.065	.041	1	1		
Universalism	0.34	0.60	.069	-.012	-.118**	-.320***	-.479***	-.159***	-.107**	-.083*	.133**	.133**	1	
CC Belief	4.14	1.31	.015	.111**	.063	.066	-.050	-.113**	-.178***	-.143***	.021	.274***	1	
CC Concern	3.38	1.35	-.114**	.158***	.054	.057	-.093*	-.156***	-.099*	-.135**	-.088*	.439***	.561***	1
Policy Support	3.42	1.86	-.040	.050	.032	.137**	.007	-.165***	-.133**	-.138***	.052	.224***	.253***	.323***

*Note:* All correlations are Pearson's  $r$ . Following the Schwartz et al. (2012) methodology, values scores are centred at the participant mean values score.

$N = 633$ . Significance tests are: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

We conducted a repeated measures ANOVA, followed by Bonferroni-corrected pairwise comparisons to determine which of the seven energy sources evaluated in the study received the strongest (and weakest) endorsement on a scale from 1 (*extremely bad*) to 5 (*extremely good*). The repeated measures analysis indicated that support varied significantly across energy types (Wilks'  $\lambda = .35$ ,  $F(6, 627) = 190.46$ ,  $p < .001$ , partial  $\eta^2 = .65$ ). Pairwise comparisons indicated that participants generally expressed significantly stronger support for solar energy ( $M = 4.51$ ,  $SD = .83$ ) than for all other energy types, with a mean close to the top of the 5-point scale. The next strongest support was wind ( $M = 4.23$ ,  $SD = .96$ ) and hydro ( $M = 4.24$ ,  $SD = .87$ ), which received significantly greater support than biomass ( $M = 3.52$ ,  $SD = 1.01$ ) and gas, ( $M = 3.45$ ,  $SD = 1.10$ ). In turn, biomass and gas received significantly greater support than nuclear ( $M = 2.76$ ,  $SD = .132$ ) and coal ( $M = 2.73$ ,  $SD = 1.29$ ), the two least popular energy types (all pairwise comparisons significant at  $p < .001$ ).

In terms of climate change concern, on a scale from 1 (*not at all concerned*) to 5 (*extremely concerned*) participants, on average, reported moderately high levels of concern ( $M = 3.38$ ,  $SD = 1.35$ ). The majority reported that they were moderately (22%), very (25%), or extremely concerned (26%), and just over one quarter indicated that they were not at all concerned (13%) or slightly concerned (13%). For anthropogenic climate change beliefs, on average, the sample believed that climate change is partly due to human activity ( $M = 4.14$ ,  $SD = 1.31$ ) on a scale from 1 (*climate change is not happening*) to 6 (*climate change is happening and entirely due to human activity*). Just under a third (32%) attributed climate change equally to natural and human activity, and just under half attributed it mainly (32%) or entirely (12%) to human activity. Around a quarter of participants did not believe that climate change is happening (6%) or that it is either entirely (8%) or mainly (10%) due to natural processes.

### **Latent Profile Analysis of Values**

We conducted a latent profile analysis to identify homogenous groups of participants based on their scores on Schwartz's 10 original values (Schwartz, 2014; Schwartz et al., 2012).

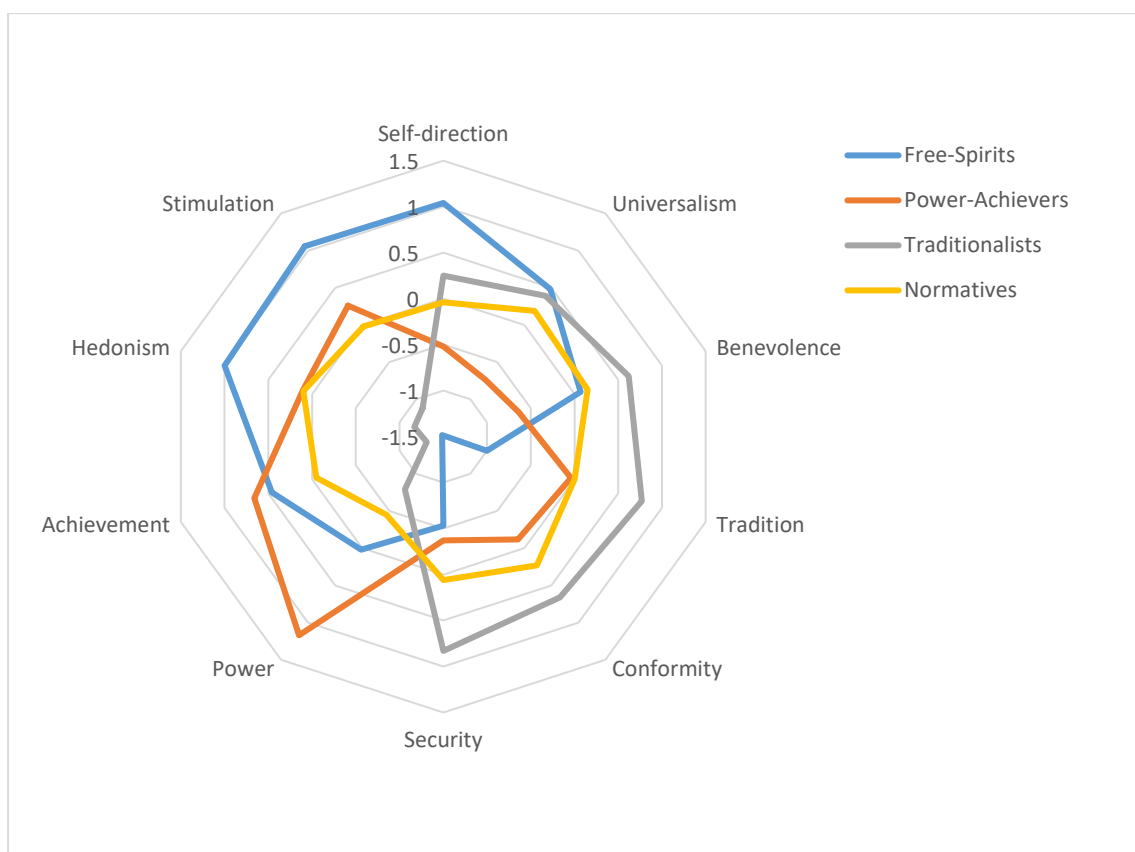
We compared the fit for 1 to 5 profile solutions using LMR ratio test, which assesses the improvement of fit between neighbouring profile models (e.g., 2 vs 1, 3 vs 2, 4 vs 3, etc.).

The 4-profile solution fit the data significantly better than the 3-profile solution (LMR 173.54,  $p < .05$ ), and the 5-profile solution did not significantly improve fit relative to 4 (LMR 124.73,  $p = .51$ ). Thus, we retained 4 profiles for interpretation and further analysis.

A graphical representation of the profile solution is presented in Figure 2.

### Figure 2.

#### *Mean Original Values Scores by Values Segments*



A MANOVA conducted in SPSS 25 (IBM Corp., 2017) revealed that the 4 segments explained over half of the variance in Schwartz's set of personal values (Wilks'  $\lambda = 0.10$ ,  $F(10, 620) = 73.28$ ,  $p < .001$ , partial  $\eta^2 = .54$ ). All univariate  $F$ s for the 10 values dependent variables were significant at  $p < .001$ . Segment means for the 10 original values, along with Tukey's post-hoc tests indicating how the segments differed on each value, are presented in Table 2.

The first values segment comprised 12% of participants, who we labeled *Free-Spirits*. Members of this group scored significantly higher than all other groups on *self-direction*, *stimulation*, and *hedonism*. They scored significantly lower than all other groups on *conformity* and *tradition*. The second segment included 28% of participants who scored significantly higher than all other groups on *power* and noticeably higher on *achievement*, and significantly lower than all other groups on *benevolence* and *universalism*. We labeled this group *Power-Achievers*. The third segment comprised 16% of participants who we labeled *Traditionalists*. This group scored significantly higher than all other groups on *traditionalism*, *conformity*, *security* and *benevolence*, and scored significantly lower than all other groups on *stimulation*, *hedonism*, *achievement*, and *power*. The final segment comprised 44% of participants who scored close to the sample mean on most values. We labeled this segment *Normatives*.

**Table 2***Mean Differences on Original Values by Values Segments*

Value Variables	Values Segment Mean Scores ( <i>M</i> )				<i>F</i> (3, 629)	$\eta^2$
	Free-Spirits <i>n</i> = 74	Power-Achievers <i>n</i> = 176	Traditionalists <i>n</i> = 104	Normatives <i>n</i> = 279		
Openness-to Change						
Self-direction	1.04 <sup>a</sup>	-0.52 <sup>b</sup>	0.25 <sup>c</sup>	-0.04 <sup>d</sup>	56.87 <sup>***</sup>	.21
Stimulation	1.06 <sup>a</sup>	0.26 <sup>b</sup>	-1.12 <sup>c</sup>	-0.02 <sup>d</sup>	116.69 <sup>***</sup>	.36
Hedonism	1.00 <sup>a</sup>	0.11 <sup>b</sup>	-1.17 <sup>c</sup>	0.10 <sup>b</sup>	112.21 <sup>***</sup>	.35
Self-Enhancement						
Achievement	0.46 <sup>a</sup>	0.66 <sup>a</sup>	-1.31 <sup>c</sup>	-0.05 <sup>d</sup>	158.34 <sup>***</sup>	.43
Power	0.02 <sup>a</sup>	1.17 <sup>b</sup>	-0.79 <sup>c</sup>	-0.45 <sup>d</sup>	276.23 <sup>***</sup>	.57
Conservation						
Security	-0.53 <sup>a</sup>	-0.37 <sup>a</sup>	0.83 <sup>b</sup>	0.06 <sup>c</sup>	47.92 <sup>***</sup>	.19
Conformity	-1.52 <sup>a</sup>	-0.12 <sup>b</sup>	0.66 <sup>c</sup>	0.23 <sup>d</sup>	122.50 <sup>***</sup>	.37
Tradition	-1.00 <sup>a</sup>	-0.04 <sup>b</sup>	0.77 <sup>c</sup>	0.00 <sup>b</sup>	57.93 <sup>***</sup>	.22
Self-Transcendence						
Benevolence	0.07 <sup>a</sup>	-0.64 <sup>b</sup>	0.62 <sup>c</sup>	0.15 <sup>a</sup>	48.04 <sup>***</sup>	.19
Universalism	0.48 <sup>a</sup>	-0.73 <sup>b</sup>	0.39 <sup>ac</sup>	0.19 <sup>c</sup>	58.39 <sup>***</sup>	.22

*Note.* All mean scores are based on standardised scores and estimated marginals. Values with different superscripts in rows differ significantly at  $p < .05$ .

*N* = 633. Significance tests are: <sup>\*\*\*</sup>  $p < .001$ .

### **Climate Change Belief and Concern, Energy Preferences, and Policy Support**

We conducted a second MANOVA to determine whether the values segments differed in terms of belief in anthropogenic climate change, climate change concern, energy preferences, and policy support. Prior to analysis we identified one multivariate outlier that did not alter the pattern of results. Therefore, we report results from the full sample.

Presentation of the five projected price increase amounts did not differ across the four segments,  $\chi^2(12, N = 633) = 6.41, p = .89$ , which supported the use of the responses to this question as a single dependent variable. The segments explained a statistically significant, but small, amount of variance in the anthropogenic belief, concern, preference, and support variables taken as a set, Wilks'  $\lambda = 0.89, F(10, 620) = 2.40, p < .001, \text{partial } \eta^2 = .04$ .

Segment means for climate change belief, concern, energy preference, and policy support variables, along with Tukey's post-hoc tests indicating how the segments differed from each other on each variable is presented in Table 3.

**Table 3**

*Mean Differences on Climate Change Belief and Concern, Energy Preference, and Policy Support Variables by Values Segments*

	Values Segment Mean Scores ( <i>M</i> )					<i>F</i> (3, 629)	$\eta^2$
	Overall	Free-Spirits	Power-Achievers	Traditionalists	Normatives		
Anthropocentric Belief	4.14	4.59 <sup>a</sup>	3.97 <sup>b</sup>	3.96 <sup>b</sup>	4.19 <sup>ab</sup>	4.79 <sup>**</sup>	.02
Climate Change Concern	3.38	3.76 <sup>a</sup>	3.23 <sup>b</sup>	3.11 <sup>b</sup>	3.48 <sup>ab</sup>	4.68 <sup>**</sup>	.02
Energy Preferences							
Support coal	2.73	2.09 <sup>a</sup>	3.02 <sup>b</sup>	2.81 <sup>b</sup>	2.67 <sup>b</sup>	9.74 <sup>***</sup>	.04
Support gas	3.45	3.12 <sup>a</sup>	3.48 <sup>ab</sup>	3.49 <sup>b</sup>	3.52 <sup>b</sup>	2.62 <sup>*</sup>	.01
Support nuclear	2.76	2.70 <sup>a</sup>	2.93 <sup>a</sup>	2.52 <sup>a</sup>	2.77 <sup>a</sup>	2.15	.01
Support hydro	4.24	4.28 <sup>a</sup>	4.13 <sup>a</sup>	4.36 <sup>a</sup>	4.27 <sup>a</sup>	1.66	.01
Support solar	4.51	4.65 <sup>a</sup>	4.34 <sup>b</sup>	4.58 <sup>ab</sup>	4.56 <sup>ab</sup>	3.99 <sup>**</sup>	.02
Support wind	4.23	4.38 <sup>a</sup>	4.15 <sup>a</sup>	4.16 <sup>a</sup>	4.26 <sup>a</sup>	1.24	.01
Support biomass	3.52	3.51 <sup>a</sup>	3.48 <sup>a</sup>	3.48 <sup>a</sup>	3.55 <sup>a</sup>	0.20	.00
Policy Support	3.42	3.89 <sup>a</sup>	3.20 <sup>bc</sup>	2.96 <sup>c</sup>	3.60 <sup>ab</sup>	5.50 <sup>***</sup>	.03

*Note.*  $N = 633$ . Values with different superscripts in rows differ significantly at  $p < .05$ .

Significance tests are: \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

Variable scales: Climate change concern, 1 = “not at all concerned” to 5 = “extremely concerned”; Climate change belief, 1 = “climate change not happening” to 6 = “climate change happening and entirely due to human activity”; Energy preference, 1 = “extremely bad” to 5 = “extremely good”.



In terms of belief in anthropogenic climate change and climate change concern, *Free-Spirits* expressed significantly stronger belief and concern than the *Power-Achievers* and *Traditionalists*, whereas the *Normatives* did not differ significantly from any other segment.

For energy preferences, *Free-Spirits* expressed significantly stronger support for solar compared to *Power-Achievers*, weaker support for gas than *Normatives* and *Traditionalists*, and weaker support for coal relative to all other segments. All four values segments expressed similarly strong support for hydro and wind energy; moderate support for biomass; and weak support for nuclear, with no segment differences approaching statistical significance.

For policy support, *Free-Spirits* expressed significantly greater support for the 50% RET than the *Power-Achievers* and *Traditionalists*, whereas the *Normatives* only scored significantly higher than the *Traditionalists*. A subsequent 4x5 factorial ANOVA found that group differences in policy support remained constant across the five projected policy-related price increases (\$5, \$35, \$70, \$105, or \$150 per quarter). The main effects of segment membership,  $F(3,613) = 5.12, p = .002$ , and price increase  $F(4,613) = 8.47, p < .001$ , were significant, but their interaction effect was not,  $F(12,613) = 1.12, p = .34$ .

## Discussion

Using latent profile analysis (LPA), we identified four Australian values-based audience segments (*Free-Spirits*, *Power-Achievers*, *Traditionalists*, and *Normatives*) that explained over half of the variance (54%) in Schwartz's set of ten personal values. A MANOVA determined that participants' segment membership explained a small (4%) but significant amount of unique variance in their overall climate change belief and concern, energy source preferences, and degree of support for the 50% RET policy. Further, a factorial ANOVA indicated that differences in policy support across segments were constant across five projected policy-related price increases. These results indicate that members of

each segment share a unique set of value priorities that affords insights into how values tend to coexist and combine to predict energy decisions, which may inform the development of future large-scale communication strategies.

To the best of our knowledge, this is the first Australian typology study that focuses narrowly on human values. In accordance with our expectations, the LPA resulted in audience segments that were comparable to those found in a large European sample (Magun et al., 2015) which supports the validity of our findings. As hypothesised, three segments varied on a continuum that ranged from *self-transcendence* combined with *conservation* to *self-enhancement* combined with *openness-to-change*. At one end, *Traditionalists* tended to express stronger *self-transcendence* and *conservation* values and lower *self-enhancement* and *openness-to-change* values than *Power-Achievers* and *Normatives*. This group aligns with the European “strong social focus” group. At the opposite end of the continuum, *Power-Achievers* tended to express stronger *self-enhancement* and *openness-to-change* values, and lower *self-transcendence* and *conservation* values than *Traditionalists* and *Normatives*. This group aligns with the European “strong personal focus” group. A third segment, placed towards the centre of the continuum, scored close to the mean on most values. These were the *Normatives* who had no strong motivations in any direction but upheld *conformity* and *self-transcendence* values slightly more than other values. This group aligns with the European “weak-social focus” group. Magun et al. (2015, 2017) identified two weak values groups. Whilst their “weak social focus” was similar to the *Normatives* group, a similar segment to their “weak personal focus” group did not emerge in the current study.

The presence of the *Normatives* segment in our sample supports our hypothesis that the LPA would identify at least one group that expressed near average priorities for all values. Considering previous climate change typology studies that focus on broader sets of attitudinal factors specific to climate change, this segment may reflect the “uncommitted”

interpretive audiences identified by Hine et al. (2013), Hine et al. (2016), and Morgan et al. (2015). It may also reflect the weak values expressed by the “pragmatists” and “self-reliant” segments that Poortinga and Darnton (2016) identified based on sustainability dimensions.

As hypothesised and in accordance with European values typologies (Magun et al., 2015, 2017), a *Free-Spirits* segment diverged from the *self-transcendence/conservation* to *self-enhancement/openness-to-change* continuum. This group expressed higher than average *openness-to-change* values and lower *conservation* values and, on that basis, is similar to the European “growth” group. However, whereas the “growth” group expressed higher *self-transcendence* and lower *self-enhancement* values, the *Free-Spirits* espoused both *self-enhancement* and *self-transcendence* values that we explore below.

### **Implications for Values Theory**

The methods used in this study provide a way of looking at the whole value system that captures how values coexist and combine in holistic profiles. We made no predictions about their structure but acknowledged the possibility that conflicting values that stand anomalous to Schwartz’s Values Theory (1992, 1994; 2012) may emerge within profiles, and they did. The *Free-spirits* group members expressed stronger than average *achievement* and *universalism* values simultaneously. According to Schwartz’s Values Theory, *achievement* and *universalism* stand opposite each other on the circumplex, are theoretically antagonistic, and should therefore be difficult to uphold simultaneously. From a practical perspective, it is plausible that values for *achievement* combined with *openness-to-change* values would bestow innovation tendencies in this group. Then, when combined with *universalism* values, it is plausible that their innovations may focus on the betterment of the natural environment and/or humankind. This group may, therefore, include the pioneers of society that develop new technologies and instigate system transformations. Further research is needed to investigate this possibility.

*Traditionalist* segment members also possess a motivational profile that contravenes Schwarz's (1992; 1994; 2012) theoretical relational patterns, insofar as members simultaneously expressed *self-direction* and *conservation* values. Again, these values are generally antagonistic, so people tend to express one value or the other, but not generally both values together (Blackmore et al., 2013; Maio et al., 2009). From a practical perspective, it is plausible that *conservation* and *self-transcendence* values together may render a genuine belief that the tried and true ways of generating electricity (i.e., coal-fired thermal generation) are the best approach to serve humanity. Then, when combined with *self-direction* values, they may be determined to make their own choices and resist pressure from media or politicians to accept new ways of generating electricity. Future research may also productively explore this possibility.

The identified inter-value relational anomalies within the values profiles flowed to associated energy preferences and climate change belief and concern. We hypothesised that members of stronger *self-transcending*/weaker *self-enhancing* segments would prefer renewable energy sources, be more willing to support the 50% RET, and indicate strong belief in anthropogenic climate change and climate change concern. However, although *Traditionalists* and *Normatives* are characterised by the hypothesised combination of relatively low self-enhancement (*achievement* and *power*) and high self-transcendence (*benevolence* and *universalism*) values, these two profiles reported stronger preferences for coal and gas than the *Free Spirits*, and *Traditionalists* also reported weaker climate change beliefs, concern, and support for the proposed 50% RET. Additionally, *Traditionalists* aligned with the stronger self-enhancing/weaker self-transcending *Power-Achievers* in their beliefs and concern, and as stronger advocates for coal fired electricity and weaker advocates for solar generated electricity. These results run counter to our prediction that stronger *self-*

*transcendence/weaker self-enhancement* would link to stronger climate change beliefs, concern, and renewable energy preferences.

Instead, our results indicate a more nuanced pattern of relationships. The strongest anthropogenic climate change beliefs, concern, pro-environmental energy preferences and policy support were consistently reported by the *Free-Spirits*' segment, whose members possess a combination of high levels of one form of self-enhancement (*achievement*) and one form of *self-transcendence (universalism)* that co-occur with high levels of all *openness to change* values and low levels of all *conservation* values. Two notable unique characteristics of this values profile are evident. *Free-Spirits* is the only segment whose members endorse both *self-transcendence* and *self-enhancement* values and report high levels of all *openness to change* values combined with low levels of all *conservation* values. All other interactions of values within individuals in our sample were associated with similar and less optimal renewable energy-related outcomes.

At first glance, the finding of an association between positive outcomes and high *self-enhancement* combined with high *self-transcendence* runs counter to a previous research finding. Evans et al. (2012) found that, compared to a control group, participants recycled more wastepaper when *self-transcendence* values alone were activated, but there was no effect when *self-transcendence* values were activated in combination with *self-enhancement* values. Yet, inspection of their methodology revealed that their *self-transcendence* condition primed *universalism* values (caring for the environment), but their *self-enhancement* condition primed *power* values (saving money) which are not featured in the *Free-Spirits* profile. A *universalism* prime may have altered their participants' profiles to resemble our *Free Spirits* (high *universalism*), and their resulting increase in recycling is consistent with the relatively greater policy support reported by *Free Spirits* in our sample. Whereas inducing *power* values may have shifted participants' profiles toward that of *Power-*

*Achievers* (high *power*) in our sample, who reported relatively weak policy support. Our results are therefore generally consistent with Evans and colleagues' findings and highlight the importance of examining specific values and their interactions, rather than broad values dimensions, when investigating their predictive effects on behaviour. Our results suggest that a similar experimental condition that induces *universalism* and *achievement* (rather than *power*) values may increase pro-environmental behaviour.

High levels of all *openness-to-change* values accompanied by low levels of all *conservation* values may also contribute to the positive outcomes associated with membership of the *Free-Spirits* segment. A plausible explanation of the observed pattern of results is that the *openness-to-change* to *conservation* dimension of values may moderate the effects of *self-transcendence* values. That is, when stronger *self-transcendence* values combine with *openness-to change* priorities, stronger climate change belief, concern and pro-environmental energy preferences emerge—a pattern we observed in the *Free-Spirits* members. Conversely, when stronger *self-transcendence* values combine with *conservation* values, then weaker climate change belief and concern emerge with higher support for incumbent coal-fire electricity generation and opposition to the 50% RET—a pattern we observed in the *Traditionalists*.

The nuanced pattern of relationships in our sample may shed some light on inconsistent effects of *conservation* and *openness-to-change* values on climate change perceptions. In their European study, Poortinga et al. (2019) examined the two values dimensions separately and found a consistent positive link between climate change perceptions and *self-transcendence* vs *self-enhancement* values but not so for the *openness-to-change* vs *conservation* dimension. In some countries climate change perceptions were linked with *openness-to-change* values yet in other countries the same perceptions were linked to *conservation* values. We find similar *openness-to change* vs *conservation*

inconsistencies between segments. For example, *Free-Spirits* and *Power-Achievers* both espoused relatively strong *stimulation* and *hedonism* (i.e., *openness-to-change*) and weak *security*, *conformity* and *traditional* (i.e., *conservation*) values, but their climate change belief and concern and energy preferences for coal and solar power differed. In the *Free-Spirits*, these values coexist with relatively strong *universalism* (i.e., *self-transcendence*) values and in this combination, they render stronger climate change belief and concern, preference for solar energy, and support of the 50% RET. In contrast, the *Power-Achievers*, exhibited relatively strong *openness-to-change* and weak *conservation* values that coexist with the weakest *self-transcendence* values of all segments. With this values profile, *Power-Achievers* expressed more moderate climate change belief and concern, stronger preference for coal-fired power, and opposition to the 50% RET.

Overall, this study offers an insight into the unique set of values priorities that coexist in each of the four identified segments of an Australian sample, and how each combination relates to climate change belief and concern, energy preferences, and policy support. We propose that it offers a more holistic understanding than a traditional multivariate approach. For example, the *Traditionalists* segment possesses relatively strong *self-transcendence* values, which are empirically related to climate change beliefs (Corner et al., 2014; de Groot & Steg, 2008; Poortinga et al., 2019), and support for renewable energy sources (Bidwell, 2013; Steg et al., 2015) and renewable energy policy change (Phillips et al., 2019). However, our results indicate that *Traditionalists*, despite their *self-transcendence* values, tend to believe climate change is equally due to natural and human activity and express moderate climate change concern and relatively low support for a renewable energy policy; this result runs counter to traditional multivariate findings. This typology approach examined multiple priorities that comprise each of the four values profiles and observed a different pattern of results when we considered the value priorities as the sum of all parts.

Our results indicate that support for the 50% RET fell as projected policy-related prices increased and this effect was not moderated by values segment. This indicates that all participants irrespective of segment membership are similarly sensitive to electricity price increases and decrease their support for the 50% RET as prices rise. In contrast, Phillips et al. (2019) used continuous variables to assess *self-transcendence* and *self-enhancement* values and found a significant interaction between policy-related price and values to predict support for the 50% RET. However, post-hoc tests revealed value-based differences in policy support occurred only at low projected price increases and disappeared as projected prices increased. Phillips et al. (under review) found high household income, left-wing political orientation, and high climate change concern predicted higher support for the 50% RET but they did not moderate the negative effect of electricity price increases on policy support. Consistent with our results, this indicates that all participants exhibited similar sensitivity to electricity price rises and decreased their support for the 50% RET as prices rose, regardless of their differences in individual attributes. Decision makers might consider implications of these findings for future energy policy design and communications.

### **Limitations and Future Research**

In terms of energy policy communications, future research could identify effective message frames to elicit support for a renewable energy system, and test these across values segments. Bain et al. (2012) present a promising strategy that frames climate change action as increasing benefits to future society that different audiences find appealing. For example, even climate deniers intended to act pro-environmentally if they thought that climate change action would create a society wherein people were more considerate and caring, and where there was greater economic/technical development. Taking this approach, future research could examine society benefits of a low-carbon energy future that most appeal to members of different value-based segments.



We speculate above that *achievement* combined with *openness-to-change* and *universalism* values may bestow innovation tendencies that benefit entities outside of oneself in the Free-Spirits group. Similarly, we propose that *conservative* combined with *self-transcendence* and *self-direction* values in *Traditionalists* may bestow a belief that coal fired generation is best for humanity, resulting in resistance to new ways of generating electricity. Future research may investigate whether innovators that apply technology to environmental issues are over-represented in the *Free Spirits* group, and if members of the *Traditionalist* segment are likely to resist political pressure and make their own choices about electricity.

This study had limitations that should be considered when interpreting our findings. First, although we employed a national sample, the pattern of results may not generalise to the Australian population or to other countries. Although our findings are somewhat consistent to segments found in a European sample (Magun et al., 2017), it would be beneficial to conduct further studies using similar methodology to evaluate the robustness of our values-based typology. It is also important to appreciate that the values priorities of individuals grouped together by our profile analysis are not identical. Rather, the values-based profiles we identified are based on patterns of average scores across the values variables, and differences between individuals within each segment is expected.

Second, although the study identified differences in climate change belief and concern, energy preferences, and policy support between value segments, the effect sizes were small. We suggest that readers only interpret the pattern of variance between groups until replication studies evaluate their robustness. This study skims the surface of what can be explored in this area. Further research could examine different types of behaviour intentions for a low-carbon energy transition. These may include “environmental citizenship” (i.e., signing petitions, writing to politicians, seeking information), and “private-sphere actions” (i.e., reducing energy use and purchasing green electricity; Stern et al., 1999).

### **Implications for Pro-Environmental Communications**

Considering these findings, what actions can we take to encourage the public to embrace pro-environmental energy sources along with policies that promote renewable energy? As a first step, we strongly favour strategies that foster pro-social and pro-environmental values (Corner et al., 2014; Steg et al., 2014; Thøgersen & Crompton, 2009; Verplanken & Holland, 2002). Values predict public support for pro-environmental policy, so this would build an important foundation for positive change (Drews & Van den Bergh, 2016). However, it is also important to address the reality that pro-social and pro-environmental values do not stand alone. Instead, they combine with other priorities within holistic profiles of values, where the sum of all priorities bestows a different pattern of concern and energy preferences.

One possible strategy to address this is to frame energy policy messages so they are relevant to a wide set of values priorities, not just pro-social or pro-environmental. In conceptual terms, framing involves emphasising what is at stake and why it matters in a way that is relevant to the audience. In this way, people can interpret complex debates in their own familiar terms (Nisbet & Scheufele, 2009). Climate communication studies demonstrate the pro-environmental benefit of framing messages to suit the political orientation (Hart & Nisbet, 2012; Schuldt et al., 2011) or climate change beliefs (Bain et al., 2012) of audience members. Likewise, energy policy messages that acknowledge the tremendous historic benefits afforded by coal-fired electricity may gain traction for audiences with a *Traditionalists* value profile, as well as build a foundation for them to accept that new-technology must now supersede the outdated energy system.

### **Conclusion**

People differ in terms of what they value. This study found that an Australian adult sample consists of four distinct groups based on their values profile (*Free-Spirits, Power-*

*Achievers, Traditionalists, and Normatives*). It also demonstrated that these groups vary in their climate change belief and concern, energy source preference, and renewable energy policy support. Adopting a typology approach provided an important insight into how values priorities coexist within homogenous groups of individuals and revealed that different patterns of belief, concern, preferences, and policy support emerge when we consider human values as the sum of all their priorities. These findings have implications for values theory and for energy policy communication strategies.

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**University of New England**

**STATEMENT OF ORIGINALITY**

(Study 2)

We, the Research Master/PhD candidate and the candidate's Principal Supervisor, certify that the following text, figures and diagrams are the candidate's original work.

All elements presented are the original work of the candidate, except for those specified in the Statement of Authors' Contribution below	Not applicable
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**Higher Degree Research Thesis by Publication**  
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**STATEMENT OF AUTHORS' CONTRIBUTION**

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We, the PhD candidate and the candidate's Principal Supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the candidate's contribution as indicated in the *Statement of Originality*.

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### Research Progression to Study 3

Study 2 found that personal values coexist within individuals to form values profiles, by identifying four distinct segments of an Australian sample that reported similar patterns of scores on variables that assessed Schwarz's (1992, 1994, 2012) ten original personal values. The segments differed in their belief in anthropogenic climate change, level of climate change concern, energy preferences, and extent of support for the 50% RET, which provided insight into interactions between values that may influence environmental decisions and behaviours. However, it also found that differences in policy support between the segments did not vary according to projected policy-related price increases. That finding followed the results of Study 1, in which personal values predicted policy support at low price levels only.

Study 3 aimed to extend and complement this investigation by evaluating the extent to which alternative psychological and contextual differences (i.e., household income, political orientation, and climate change concern) may render Australian participants ( $N = 633$ ) more or less sensitive to policy related electricity price increases when formulating their support for the 50% RET. This study draws on data from the same sample as Study 2.

**CHAPTER 4**

**Study 3**

**Public Support for Renewable Energy Target Declines Sharply as Projected Electricity  
Prices Rise, Irrespective of Individual Attributes**

*Submitted for Publication*

### Abstract

This study investigated whether projected electricity prices interact with household income, political orientation, and climate change concern to predict public support for a 50% renewable energy target (RET) in Australia. In an online experiment, 633 Australian participants (Age:  $M = 45.2$  yrs,  $SD = 17.5$ , Males: 49.1%) rated their support for a 50% RET at one of five projected increases in their quarterly power bills that ranged from \$5 to \$150. A moderated multiple regression analysis indicated that: (1) support for the 50% RET fell as the projected price of electricity increased, and (2) although high household income and high climate change concern predicted higher support for the policy, they did not moderate the predictive effect of projected price increase on support for the 50% RET. These results indicate that all participants, irrespective of their differences on three assessed attributes, exhibited similar sensitivity to energy price increases by decreasing their support for the 50% RET as the projected price rose. Implications of these findings for energy policy design and communication are discussed.

**Key Words:** renewable energy; energy policy; policy acceptability; electricity price; household income; political orientation; climate change concern.

**Public Support for Renewable Energy Target Declines Sharply as Projected  
Electricity Prices Rise, Irrespective of Individual Attributes**

The price of electricity is a chief concern for many Australian households (Wood et al., 2017), notably since domestic electricity bills increased 80-90% in the last decade (ACCC, 2017). This price spike is mainly due to significant transmission network upgrades and wholesale price surges from generation shortages that follow decommissions of worn-out coal plants (ACCC, 2017; Morton, 2017). The spike is also partly due to energy retailers charging overinflated prices concealed behind complicated billing schedules (ACCC, 2017), a behaviour that, according to Wood et al. (2017), is confusing and inequitable for electricity consumers.

Within this complex and confusing context, several politicians and media outlets who promulgate the benefits of coal-fired electricity generation have obscured the real reasons for rising electricity bills and blamed new renewable electricity generation (Parkinson, 2017). This is concerning since this misinformation has the potential to induce long-term harmful inferences and judgments about the effect that new renewable energy generation is having on Australia's energy system. On the face of it, however, public opinion does not reflect this. A Lowy Institute (2018) poll suggests Australians will support renewable generation even if it requires more investment in infrastructure. Nevertheless, given electricity bill concerns and partisan blaming, it remains unclear if Australians will support or oppose renewable energy generation if or when it means footing the bill for it.

A global transition to zero carbon emissions is urgent and crucial to avoid dangerous climate change (Garnaut, 2019; IPCC, 2014, 2018; Ripple et al., 2019). That requires a rapid shift towards renewable energy generation as opposed to thermal generation from fossil fuels (Denis et al., 2014; Finkel et al., 2017; IPCC, 2014, 2018; Ram et al., 2019). Existing renewable generation and storage technologies are already capable of securely meeting global

electricity demands more efficiently and effectively than the existing system (Garnaut, 2019; Jacobson & Delucchi, 2011; Ram et al., 2019). The energy transition is therefore not a question of technical feasibility or economic viability, but one of political will.

Economist Ross Garnaut (2019) asserts that Australia has exceptional opportunities for new areas of prosperity and fiscal expansion in the global zero-emissions economy. Unrivalled resources in wind and solar energy, together with abundant available land to accommodate new infrastructure, place the nation in a prime position to develop an economy based on renewables. A transition to renewable energy would create jobs in the sector, attract intensive industries to Australia, and foster export markets in zero-emission power (Beyond Zero Emissions, 2015; Garnaut, 2019). Hence, Australia has the unique advantage to emerge as an energy superpower within the global energy market and reap extensive economic benefits. However, ensuring a secure, sustainable and prosperous energy future requires a well-planned, integrated climate and energy framework to provide clear signals to potential investors (Finkel et al., 2017; Garnaut, 2019; IEA, 2018; Ram et al., 2019).

Until recently, the Renewable Energy Target (RET) promoted renewable generation in Australia by requiring energy companies to annually source 33,000GWh (approximately 23.5% of Australia's electricity generation) from renewable sources (Australian Government, 2015). The RET has now expired without a bipartisan agreement on a replacement policy (Wood, 2020). On the one hand, the incumbent (centre-right) Government favours a technology-agnostic approach to providing affordable and reliable electricity that includes ongoing coal-fired power generation (Energy Security Board, 2018). This approach is incompatible with Australia's carbon emission obligations under the Paris Agreement unless carbon capture and storage technologies become feasible (IEA, 2018; United Nations, 2016). On the other hand, the shadow (centre-left) ministry proposes 50% of electricity from renewable sources by 2030. To date, partisan squabbles about the nature and content of new

policies have resulted in chaotic regulatory inaction that undermines investment incentives to build new renewable electricity generators (Finkel et al., 2017). Australia, therefore, remains vulnerable to energy security risks with a carbon intensity still the highest among International Energy Agency (IEA, 2018) countries.

### **Public Support and Cost of Renewable Energy**

Public support is a crucial factor for policy change in democratic countries because politicians may be disinclined to implement a policy if they anticipate public backlash (Drews & Van den Bergh, 2016). Public support for renewable energy is generally positive in Australia, and a majority of voters (65%) indicate they approve of the proposed 50% by 2030 RET (Essential Research, 2017). That is encouraging for the renewable energy sector, but it does not consider how the projected financial costs of low emission electricity may impact consumers' decisions to support the policy. As noted above, another opinion poll identified that 84% of Australians say the government should focus on renewables even if it requires more infrastructure investment to ensure system reliability (Lowy Institute, 2018). Likewise, 47% of Australians think reducing carbon emissions should be the main priority for energy policy, as opposed to lower household bills or reduced risk of power blackouts (Lowy Institute, 2019). These results indicate that Australians view reducing emissions as a high priority even if meeting this aim requires a personal financial cost.

Despite these promising poll results, experimental research indicates that many people are reluctant to pay more for renewable electricity and, as such, public support for renewable energy policy declines rapidly with the prospect of paying higher electricity bills (Aldy, Kotchen, & Leiserowitz, 2012; Phillips, Hine, & Phillips, 2019; Stokes & Warshaw, 2017). In the US, a modest US\$2-10 per month utility bill rise shifts 6-13% of participants from supporting to opposing a renewable energy policy (Stokes & Warshaw, 2017). Similarly, Australian participants mostly indicated their support for the 50% RET but only up to a

modest AU\$25 quarterly rise in cost. Above that price point, they generally opposed the policy (Phillips et al., 2019). That is unfortunate since it is realistic to expect the cost of new renewable energy infrastructure to pass to consumers. Many current and proposed policy tools to mitigate carbon emissions in the energy sector require the public to foot the bill to some degree through taxes, explicit levies on utility bills, or costs passed on from energy companies (Evensen, 2017). So, if we are to transition to effective climate change mitigation through increased uptake of renewable energy, it is vital to determine factors that may ease public sensitivity to the potential costs of a new clean energy system.

### **Individual Attributes as Potential Moderators of Renewable Energy Policy Support**

Socio-demographic and other individual characteristics are known to predict decisions, attitudes, and behaviours in various life domains such as residential energy conservation (Frederiks et al., 2015; Yue et al., 2013), food consumption (Aertsens et al., 2009; Cranfield et al., 2012), and cancer screening (Euler-Chelpin et al., 2008; Mirzaei-Alavijeh et al., 2018). They are also known to predict public policy support for issues such as forestry (Eriksson et al., 2013; Schaaf & Broussard, 2006), waste management (Wan et al., 2018), and climate change mitigation (Zahran et al., 2006). To this end, we investigate the extent to which household income, political orientation, and or climate change concern may render people more or less sensitive to the impact of a proposed renewable energy policy on projected electricity price rises in Australia.

#### ***Household Income***

Household income is a tangible contextual factor when considering an energy policy that will potentially raise the cost of household electricity. Energy economist, Metcalf (2019) asserts that the distributional impact of an electricity price rise is generally regressive because the increased burden per dollar of income is more for families with low income, compared to those with high income. This inequity compounds because low-income families also tend to

be larger and live in less energy-efficient homes. In a nutshell, low-income households will struggle to pay their bill if electricity prices rise too high. Given that electricity prices become more regressive as they increase, it stands to reason that members of lower-income households would likely be more sensitive than their higher-income counterparts to potential price rises. Then, in turn, they would be less supportive of an energy policy that will increase prices.

Research indicates that higher household income predicts greater public support for a clean energy policy that will render higher bills, but not always. Aldy et al. (2012) and Tranter (2014) found that people with higher incomes were willing to pay more for clean energy, whereas Tranter (2011) found they were not. Phillips et al. (2019) found a higher income predicted higher mean policy support over a range of projected electricity price increases (i.e., \$5 - \$155 per quarter). However, their study did not reveal whether or not the negative relationship between policy support and projected electricity price varied as a function of household income level. That is, it did not signal if a higher household income would render people more or less sensitive to projected electricity prices when estimating their support for a policy than a lower household income would.

### ***Political Orientation***

Political orientation and party affiliation should be important in this context since it provides a social identity that guides pro-environmental beliefs, choices, and actions (Fielding & Hornsey, 2016). People affiliated with left-leaning political parties tend to advocate action on climate change more so than those allied with right-leaning political parties (Felding 2012). In complex pro-environmental decisions, a political stance on an issue provides a heuristic means for people to make their choice (Tranter, 2017). Protagonists on both sides of the political divide tout particular positions that people will accept, not based on scientific knowledge, but based on congruence with their allegiances



(Kahan, 2012; Tranter, 2017). Individuals assimilate information more easily when it is congruent with their prevailing views since it does not require the effortful process of changing their current beliefs (Lewandowsky et al., 2012). That inclines people to assimilate misinformation just because it aligns with their ideology. Once encoded in memory, the misleading effect of the information endures despite any subsequent correction (Lewandowsky et al., 2012). Even higher education attainment fails to inoculate but rather strengthens the polarising effect. Highly educated Democrats (left-wing) and Republicans (right-wing) in the United States were more divided in their beliefs about climate change threat than their lower educated counterparts (Hamilton, 2011; Kahan et al., 2012).

Within Australia, current energy policy preferences appear to reflect opposing worldviews and value positions. Progressive political leaders and environmentalists, on the one hand, support renewables, and conservative leaders and climate skeptics, on the other hand, support fossil fuels. That is consistent with findings for renewable energy support across left and right political party affiliations (Aldy et al., 2012; Essential Research, 2017; Leiserowitz et al., 2018; Leiserowitz et al., 2011; Tranter, 2011, 2014), and left and right political ideology (Phillips et al., 2019). Given that people accept misinformation more readily when it is ideologically congruent (Kahan, 2012; Lewandowsky et al., 2012; Tranter, 2017), people with right-wing views may be more susceptible to believe potentially misleading information that blames electricity price rises on renewable energy generation. In turn, this has the potential to maintain polarised support for renewable energy policy and may ultimately render right-wing people more sensitive to potential electricity price increases than their left-wing counterparts.

### ***Climate Change Concern***

The global threats to human livelihoods posed by climate change are extensive across locations, environments, and cultures (IPCC, 2019). Climate change concern is the

psychological response to the perceived nature, course, and implications of this threat and phenomenon (Reser et al., 2012), often indicated by personal feelings of worry (Poortinga et al., 2019). Although climate change poses one of the greatest existential threats to life on earth, it is evolutionarily unique since, unlike most ecological challenges, it is a slow and gradual modification of climate conditions without a specific location. Thus it is a difficult situation for people to perceive and evaluate (Weber, 2016). These characteristics are vital to understand the subjective nature of this threat that results in substantial heterogeneity of risk judgments and concern across individuals and nations (Hine et al., 2013; Lee et al., 2015; van der Linden, 2017; Whitmarsh, 2011). Still, climate change has been consistently viewed as a “very serious” problem in Australia, United Kingdom, and Europe (Lorenzoni & Pidgeon, 2006; Pidgeon, 2012; Reser et al., 2012) though concern traditionally wanes in the United States, China and Russia (Brechin & Bhandari, 2011; Lee et al., 2015).

The degree of concern about the effects of climate change connects with a willingness to adopt and support strategies that address the issue. For example, Smith and Leiserowitz (2014) find that worry about climate change strongly relates to increased policy support for US mitigation policies, such as regulating carbon emissions, signing international treaties, and raising gasoline taxes. Similarly, Sundblad et al. (2014) found climate change worry to be a prominent link to policy support in Sweden, and Spence et al. (2011) showed that climate change concern translates to a greater willingness to reduce energy consumption in the United Kingdom. In Australia, climate change concern correlated strongly and positively with acceptance of climate change, risk perceptions, responsibility and willingness to act, climate change-specific efficacy, climate change distress, and behaviour (Reser et al., 2012). More broadly, substantial evidence provides robust support for associations between climate change risk perceptions, general intentions to change individual behavior, and/or self-reported policy support to address the issue (Brody et al., 2012; Krosnick et al., 2006;

O'Connor et al., 1999). In light of this, it is reasonable to expect that increased concern about the impending changes to average climate conditions will render individuals more accepting of an energy policy designed to reduce the risks and more willing to tolerate associated electricity price increases.

### **Study Aims**

The primary aim of this study is to understand the predictive and moderating roles of four factors that may contribute to support for the implementation of a proposed energy policy to provide 50% of Australia's electricity with renewable generation by 2030. The study investigates how (1) the projected cost of electricity from renewable sources, (2) household income, (3) climate change concern, and (4) political orientation are linked to expressed support for a 50% by 2030 RET in a sample of Australian residents. Following previous studies (Aldy et al., 2012; Phillips et al., 2019; Stokes & Warshaw, 2017), we expected that expressed support for the 50% RET in Australia would decrease as projected energy prices attributed to the policy increased. Based on previous research (Aldy et al., 2012; Phillips et al., 2019; Smith & Leiserowitz, 2014; Sundblad et al., 2014; Tranter, 2011, 2014, 2017), we also expected that participants with higher household income, stronger climate change concern, or left-wing political orientation would report stronger overall support for the 50% RET.

In terms of moderation, we hypothesised that the strength of the relationship between projected cost and policy support would vary according to participants' household income, climate change concern, and political orientation. Based on research on household income and renewable energy support (Aldy et al., 2012; Phillips et al., 2019; Tranter, 2014), we predicted that, given the regressive nature of increased electricity prices, participants with higher household income would be less sensitive to electricity costs and maintain strong support for the 50% RET as costs increased. From the literature on climate change concern

and renewable energy support (Smith & Leiserowitz, 2014; Sundblad et al., 2014), we expected that participants with stronger expressed concern about climate change would be less sensitive to electricity prices and maintain strong support for the policy as costs increased. Lastly, from previous studies on political orientation and renewable energy support (Aldy et al., 2012; Essential Research, 2017; Leiserowitz et al., 2018; Leiserowitz et al., 2011; Phillips et al., 2019; Tranter, 2011, 2014, 2017), we predicted that participants with left-wing political orientation would be less sensitive to energy costs and maintain ardent policy support as prices increased.

## Method

### Participants

A sample of 633 Australian residents was sourced from Qualtrics Research Services (Qualtrics, 2019), an Internet panel company with coverage across all states and territories. Participants received small incentives such as loyalty points or gift vouchers for their participation. Demographic distribution was similar to the Australian population (ABS, 2016). Almost half were males (49.1%), compared with 49.7% in the general population. Ages ranged from 18 to 88 years ( $M = 45.2$ ,  $SD = 17.5$ ). Distributions across three ranges (18-34 years, 35-54 years, and 55-87 years) matched records,  $\chi^2(2, N = 631) = 1.54$ ,  $p = .46$ . Most participants indicated that they had completed Year 12 or above (88.0%), whilst some indicated that they had also completed a bachelor's degree or above (34.6%). The corresponding levels from the 2016 census were 62.3% and 22% respectively. Participants' geographical distribution across states and territories matched the general population,  $\chi^2(7, N = 633) = 4.59$ ,  $p = .71$ . The mean household income level was \$72.2K per year, compared with \$65.3K per year in the general population (ABS, 2019).

## **Procedure and Measures**

With human ethics approval, 413 participants completed an online survey in June 2018 (during Winter). A further 220 participants completed the same survey in June 2019 to increase statistical power. Participants completed an online survey in 2019. Questions comprised demographic items and measures to assess household income, political orientation, and climate change concern. Participants were randomly assigned to answer a question that measured their support for the 50% by 2030 RET at one of five cost amounts (i.e., \$5, \$35, \$70, \$105, or \$150 per quarter).

### ***Demographics***

We assessed demographic information to use as possible control variables in our analyses. Single-item measures assessed participants' age (years), gender (1 = *male*, 2 = *female*), and educational attainment (6-point scale, 1 = *Year 10 or less* to 6 = *Postgraduate degree*).

### ***Household Income***

A single item assessed participants' household income level (7-point scale, 1 = *\$40k or less*, to 7 = *greater than \$200k*). For data analyses, we used the mid-point of each income range and \$225,000 for the highest range.

### ***Political Orientation***

The Conservatism-Liberalism Scale (CLS; Mehrabian, 1996) measured political orientation on a single dimension from left to right. Participants rated seven statements on a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*). Three items endorsed right-wing (e.g., "The major national media are too left-wing (socialist) for my taste."), and four endorsed left-wing orientations (e.g., "I am politically more socialist than conservative"). We reversed left-wing items and calculated a total mean score across all items. High and low scores indicate, respectively, right and left-wing orientations. For this

study, we adapted the CLS for Australian participants. The terms Liberal and Labor, respectively, replace Republican and Democrat.<sup>8</sup> We removed one item (i.e., “Communism has been proven to be a failed political ideology) to increase scale reliability. The six remaining items rendered a highly reliable scale ( $\alpha = .82$ ).

### ***Climate Change Concern***

A single item assessed the degree to which participants were concerned about climate change. Participants responded to the question, “How concerned are you about climate change, sometimes referred to as *global warming?*” on a 5-point Likert scale (1 = *not at all concerned*, to 5 = *extremely concerned*). This item is consistent with Reser et al. (2012). It has face validity because it is transparent, meaningful and does not presume concern by offering a “*not at all concerned*” option.

### ***Support for 50% RET***

To assess support for the 50% by 2030 RET, participants read a statement describing the policy and answered a single contingent choice question. The statement read, “The Federal Government may consider an energy policy that would require all electricity suppliers to obtain 50% of their energy from renewable sources by the year 2030. Eligible sources may include solar, wind, water, and biomass.” The question read, “To what degree would you support this policy if it were to increase your quarterly household electricity bill by \$XX per quarter?” Where \$XX was one of five values: \$5, \$35, \$70, \$105, and \$150. Participants rated their degree of policy support on a 6-point scale (1 = *strongly oppose*, 2 = *moderately oppose*, 3 = *slightly oppose*, 4 = *slightly support*, 5 = *moderately support*, and 6 =

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<sup>8</sup> In Australia, the Liberal Party is the primary centre-right party, whereas the Labor party is the primary centre-left party.

*strongly support*).<sup>9</sup> We randomly assigned participants to one of five groups and presented a price increase amount according to their particular group membership.

We adapted this measure from Phillips et al. (2019). Whereas they presented eight price amounts to every participant (within-subjects design), we presented one of only five price amounts to each participant (between-subjects design). This conserved statistical power in our between-subjects study design but still tested a similar price range as the Phillips et al. (2019) study.

Phillips et al. (2019) based their price range on retail costs projected by electricity sector decarbonisation modelling, coupled with average household electricity consumption. Projected impacts on retail prices range from 6.6-8.5 c/KWh (Australian Energy Market Operator, 2013, p. 35; Wright & Hearps, 2011) and a typical household that uses only electricity (not gas) consumes 6000kWh/year that costs approximately \$1600 (ABS, 2013; ACIL Allen Consulting, 2015; Denis et al., 2014). These two statistics combine to indicate a projected additional \$396 - \$510 cost per year; that is \$99 - \$127.50 per quarter. Consistent with previous studies (Aldy et al., 2012; Phillips et al., 2019), we selected price increase amounts that ranged above and below the projected cost increases. We also presented prices as quarterly increases to ensure they were personally relevant to participants in terms of how Australian households typically pay their electricity bills.

## Results

Prior to analyses, we confirmed no data were missing and that there were no extreme outliers on the study variables. The household income variable had severe positive skewness of 1.10 ( $SE = .10$ ),  $p < .001$ , and the climate change concern variable had mild negative skewness of -0.41 ( $SE = .10$ ),  $p < .001$ . Table 1 displays all variable means, standard

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<sup>9</sup> This scale was also dichotomised to compute percentage distribution of ‘support’ versus “oppose” for several analyses.

deviations, and inter-correlations. Younger participants with higher education levels generally reported higher household income levels. Participants that leaned to the political right tended to be older. Young, higher educated, and politically left-leaning females tended to report higher levels of climate change concern. Policy support correlated with left-wing orientation, higher household income, and climate change concern. Policy support was also linked with younger age and higher education levels, which we included as covariates in the moderated regression analysis.

**Table 1**

*Descriptive Statistics and Inter-correlations of the Study Variables.*

	<i>M</i>	<i>SD</i>	Correlation ( <i>r</i> )					
			Gender	Age	Educ.	Inc.	PO	CCc.
Age	45.25	17.47	-.11**	1.00				
Education level	3.53	1.62	-.14**	-.07	1.00			
Household income	72.2k	52.6k	-.04	-.19***	.25***	1.00		
Pol. orientation	2.90	0.83	-.05	.24***	-.07	-.01	1.00	
CC concern	3.38	1.35	.11**	-.16***	.13**	.02	-.46***	1.00
Policy support	3.42	1.86	.04	-.10*	.11**	.14***	-.20***	.32***

*N* = 633. Gender was coded 1 = male, 2 = female. High scores for political orientation reflect right-wing ideology.

\**p* < .05, \*\**p* < .01, \*\*\**p* < .001.

Descriptive statistics and percentage distribution of policy support for the pooled sample and price groups are displayed in Table 2. In the pooled sample and all except for the lowest price group (\$5/quarter), the mean policy support was below “slightly support”; and just over half (53.9%) of the participants indicated they would support rather than oppose the policy. Median support responses and the percentage of support versus opposition responses were more optimistic. Both indicated that a majority of participants (albeit mostly small) support the 50% RET to some degree in the pooled sample and the three lower price groups



(\$5, \$35, and \$70/quarter). In the higher two price groups (\$105 and \$150/quarter), the majority of participants opposed the 50% RET.

**Table 2**

*Descriptive Statistics and Percentage Distribution of Policy Support, Pooled and by Price Groups.*

	Projected Electricity Price Increase (AUD/quarter)					
	Pooled (N= 633)	\$5 (n = 126)	\$35 (n = 128)	\$70 (n = 127)	\$105 (n = 126)	\$150 (n = 126)
Mean*	3.42	4.34 <sup>a</sup>	3.40 <sup>b</sup>	3.38 <sup>b</sup>	3.02 <sup>b</sup>	2.94 <sup>b</sup>
SD	1.86	1.68	1.82	1.83	1.93	1.72
Median	4	5	4	4	3	3
Percentage "support"***	53.9	76.2 <sup>a</sup>	53.9 <sup>b</sup>	54.3 <sup>b</sup>	45.2 <sup>b</sup>	39.7 <sup>b</sup>

*Note:* Policy support was measured on the 6-point scale, 1 = strongly oppose, 2 = moderately oppose, 3 = slightly oppose, 4 = slightly support, 5 = moderately support, and 6 = strongly support.

\* A one-way ANOVA identified significant group difference,  $F(4, 628) = 12.04, p < .001, \eta^2 = .07$ .

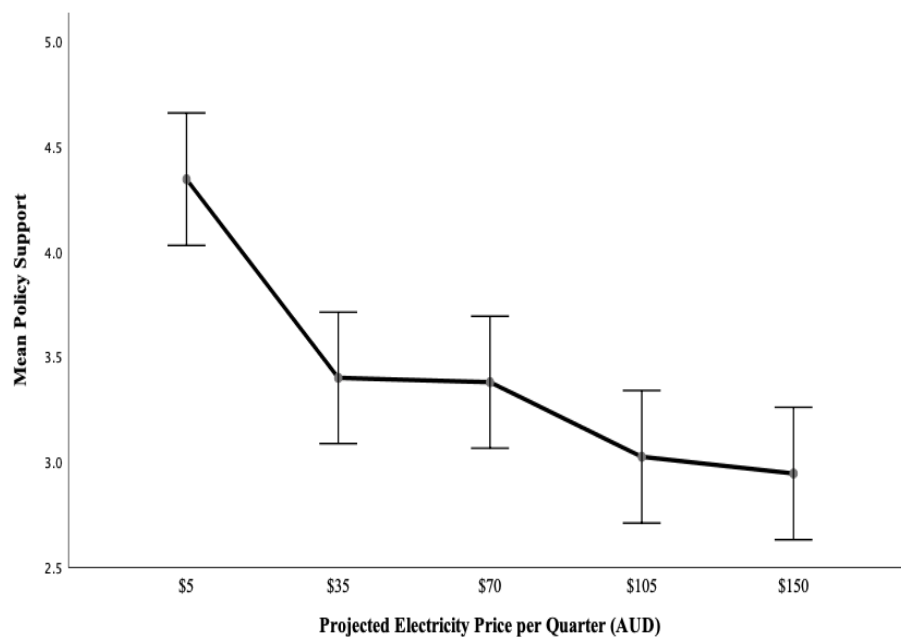
Superscripts denote Tukey's HSD post hoc group differences,  $p < .05$ .

\*\*A Chi square analysis identified significant group difference percentage support,  $\chi^2(4) = 39.26, p < .001$ , Superscripts denote standardized residual group differences,  $p < .05$ .

A one-way ANOVA identified a significant difference in mean policy support between price groups,  $F(4, 628) = 12.04, p < .001, \eta^2 = .07$ . A post hoc analysis with Tukey's HSD revealed a significantly higher level of policy support in the lowest price group (\$5/ quarter) than all other groups,  $p < .001$ , conveyed in Figure 1. Similarly, a chi-square analysis revealed significant differences between percentages of participants in the projected electricity price groups who support the policy,  $\chi^2(4) = 39.26, p < .001, \eta^2 = .06$ . Post hoc examination of the standardised residuals from the chi-square analysis (Field, 2009) revealed that participants in the lowest price group (\$5/ quarter) were significantly more likely to support the policy than those in all other price groups.

**Figure 1**

Mean support for 50% RET at each Projected Electricity Price Level



Note: Estimated marginal means reported. Error bars: 95% CI

## Analyses

### *Price Effect on Policy Support*

To assess the predictive and moderating roles of four factors on public support for the 50% by 2030 RET, we conducted a moderated multiple regression analysis (MRA) in SPSS (IBM Corp., 2017). Before interpreting the results, we tested relevant assumptions for MRA. All regression residuals were normally distributed, notwithstanding the skewness found in the household income and climate change concern variables. Mahalanobis distance indicated twelve multivariate outliers. To check the influence of these cases, we ran the regression with and without them and found no difference in the general pattern of results. We therefore retained the full sample. The data met all other assumptions of multiple regression.

In the first step, we included four predictor variables (electricity price increase, household income, political orientation, and climate change concern) and two covariates (age and education). These variables together accounted for a significant amount of variance in policy support,  $R^2 = .189$ ,  $F(6, 626) = 24.27$ ,  $p < .001$ . In the second step, we included three two-way interaction terms (price\*household income, price\*political orientation, and price\*climate change concern). To avoid potential multicollinearity problems, we centred all variables before calculating the interaction terms. This step did not explain significant additional variance in policy support for the 50% RET,  $\Delta R^2 = .004$ ,  $\Delta F(3, 623) = 1.09$ ,  $p = .35$ . Coefficients for all three interaction terms indicated non-significant very small effects ( $sr^2 < 0.004$ ). However, after controlling for all other variables in the model, the negative main effect of price increases, and the positive main effects of climate change concern and household income, remained significant. Overall, the model explained 19.3% of the variance in policy support, adjusted  $R^2 = .181$ ,  $F(9, 623) = 16.55$ ,  $p < .001$ , which indicated a medium to large combined effect size ( $f^2 = .24$ ). Unstandardised ( $B$ ) and standardised ( $\beta$ ) regression

coefficients and squared semi-partial correlations ( $sr^2$ ) for each predictor in the model (Step 2) are displayed in Table 3.

We also conducted post-hoc tests to investigate the unexpected non-significant predictive effect of political orientation in the regression model. We ran two multiple regressions in which we excluded either climate change concern or household income, and their respective interaction terms from the model. The results indicated that political orientation significantly predicted policy support only when climate change concern and its interaction with price were removed from the model,  $\beta = -.18$ ,  $p < .001$ ,  $sr^2 = .03$ ,  $F(7, 625) = 11.60$ ,  $p < .001$ . The interaction between political orientation and price remained non-significant in these models.

**Table 3***Moderated Multiple Regression analysis: Interaction Effects on Public Support for 50% RET*

	<i>B</i>	<i>SE</i>	$\beta$	<i>p</i> -value	<i>sr</i> <sup>2</sup>
Step 1					
Intercept	2.60	.46		<.001	
Age	-0.002	.004	-.023	.539	<.001
Education Level	0.027	.043	.024	.528	<.001
Electricity Price Increase	-0.009	.001	-.252	<.001	.063
Household Income	0.004	.001	.123	.001	.014
Political Orientation <sup>a</sup>	-0.089	.092	-.040	.338	.001
Climate Change Concern	0.429	.057	.311	<.001	.075
Step 2					
Intercept	2.602	.460		<.001	
Age	-0.002	.004	-.020	.592	<.001
Education Level	0.022	.043	.019	.613	<.001
Electricity Price Increase	-0.009	.001	-.256	<.001	.064
Household Income	0.004	.001	.120	.002	.013
Political Orientation <sup>a</sup>	-0.085	.093	-.038	.360	.001
Climate Change Concern	0.432	.057	.314	<.001	.076
Household Income*	< 0.001	< .001		.976	<.001
Political Orientation*	-0.003	.002		.129	.003
Climate Change Concern*	-0.002	.001		.115	.003

*Note:* Steps 1 and 2 of the model are reported. All significance tests are based on robust standard errors. Model 1  $R^2 = .189$ ,  $p < .001$ , Model 2  $R^2 = .193$ ,  $F$  change  $p = .352$

<sup>a</sup> High scores on political orientation represent right-wing orientation.

\*Interaction terms: *variable\*electricity price increase*.

## Discussion

### Summary of Main Findings

The current study investigated whether Australians' support for a proposed 50% RET is related to the projected impact of the policy on electricity prices, household income, political orientation, and climate change concern. Importantly, it also assessed whether the effect of a projected price increase on policy support would vary as a function of household

income, political orientation, and climate change concern. As predicted, and consistent with previous research (Aldy et al., 2012; Phillips et al., 2019; Stokes & Warshaw, 2017), public support for the proposed renewables target was closely linked to the projected price impacts of the policy. The more the electricity price increased, so too did the opposition for the 50% RET.

### ***Household Income***

Our results indicate that participants with higher household income generally expressed stronger support for the 50% RET, but the effect was modest in magnitude. That aligns with our prediction and previous links between income and public policy support for clean energy (Aldy et al., 2012; Phillips et al., 2019; Tranter, 2014). However, we expected that low household income would render participants more sensitive to projected electricity price rises. Therefore, we expected the strength of the link between support for the 50% RET and the projected financial impacts of the policy would vary according to different income levels. The moderated regression analysis did not support that prediction since the interaction term between household income and electricity price increase explained a very small and non-significant amount of variance in policy support. This finding suggests that sensitivity to the projected impacts of the policy on electricity prices is somewhat consistent regardless of household income levels. This finding is surprising, given that electricity prices become more regressive as they rise and impose a disproportional burden per dollar on low-income families (Metcalf, 2019).

Ultimately none of the income groups supported the 50% RET much above the lowest policy-related price increase. It may be that lower income participants were unable to afford the higher projected price increases, but also that higher income participants were simply unwilling to pay them even though they could afford to. Research suggests that opposition to cost may have just as much to do with system fairness as it does with affordability (Demski,

Evensen, et al., 2017; Sütterlin & Siegrist, 2017; Vaze & Hewett, 2012). For example, Evensen et al, (2018) found participants in the UK were willing to accept higher costs for a low-carbon energy transition, not on the basis of their affordability, but on their perception that energy companies and government are fully committed to the transition and contribute financially. However, most people believed that energy companies are only profit driven and politicians are too close to the industry to effectively regulate it. Thus, public perceptions of procedural and distributive unfairness were detrimental to their support for the energy transition. This may explain our results that indicate price sensitivity across all household income levels, but this possibility requires further research.

### ***Political Orientation***

We predicted that left-wing participants would support the policy more than their right-wing counterparts. The regression analysis, however, indicates that political orientation did not explain significant variance in support for the 50% RET when controlling for the other variables in the model. However, the negative bivariate correlation between political orientation and policy support ( $r = -.20, p < .001$ ) suggests that policy support decreases as right-wing ideology increases (see Table 2). That is confirmed by post hoc tests, which revealed that political orientation shares the same variance as climate change concern. When regressed together, the dominant effect of climate change concern remained significant, and the weaker political orientation effect became non-significant (i.e., political orientation was significant only when the model did not include climate change concern). This suggests that high levels of climate change concern among left-leaning individuals may explain the beneficial effect of left-wing orientation on policy support. Similarly, low levels of climate change concern may explain the more detrimental effect of right-wing orientation on individual levels of support for the 50% RET.

We also predicted that a right-wing ideology would render participants more sensitive to the projected impacts of the policy on electricity price. However, the moderated regression analysis indicated that the magnitude of the link between projected electricity price and support for the 50% RET did not vary according to respondent's political orientation. The interaction effect between political orientation and price was near zero and non-significant, even though the sample provided ample statistical power to find small to medium effects if they existed. These findings indicate that participants' sensitivity to projected electricity price rises is similar regardless of their political ideology, be it oriented towards the left or the right.

### *Climate Change Concern*

Our results indicate that participants with higher levels of climate change concern expressed stronger support for the 50% RET. This finding aligns with our hypothesis and previous research (Reser et al., 2012; Smith & Leiserowitz, 2014; Spence et al., 2011; Sundblad et al., 2014). Climate change concern accounted for 7.8% of the variance in support for the 50% RET. This small to medium effect is the largest in the model and comparable to that explained by electricity price increase (6.4%).

We predicted that higher concern about climate change would render people less sensitive to increased electricity prices than those with lower concern about climate change. This hypothesis was not supported. The strength of the link between electricity price and support for the 50% RET did not vary according to the degree of climate change concern. The interaction term between climate change concern and price was not significant and yielded a very small effect size. This means that participants were equally sensitive to the impact of the policy on electricity prices irrespective of how much concern they expressed about climate change impacts.

### **Policy Implications**



The most important and unexpected finding is that sensitivity to projected price increases did not vary according to the three examined individual attributes. That is, policy support fell as projected electricity prices increased regardless of participants' income level, political orientation, and climate change concern. In light of these findings, what can strategists do to encourage support for pro-environmental energy policies in Australia even though it is inevitable that increased electricity costs will flow on to consumers? As a starting point, it would be advantageous if policymakers adopt the most efficient policy mechanisms to deliver low emission electricity at the lowest possible cost. The Business Council of Australia (2020) and economists (Mitchell, 2019) agree that putting a price on carbon is the best way to meet this objective. A carbon price provides an overall emissions constraint and then lets economic activities find the lowest-cost solutions. A key advantage is that it would provide market certainty for investors to fund new generation projects for future electricity supply and ultimately keep future electricity prices down, a key prospect for the public to support the policy.

Secondly, policymakers could address the public reluctance to support low carbon energy policies that they perceive will present a considerable financial burden. One possible strategy is for governments to provide rebates to households to compensate for increased electricity costs. The rebates could be funded by revenue collected from industries that emit high amounts of carbon. This approach was a key component of Australia's Clean Energy Bill (Swoboda, et al., 2011) that compensated only low-income households to reduce the disproportionate burden placed on them. Alternatively, Holden and Dixon (2019) proposed a "Climate Dividend for Australians" plan for a carbon tax that provides compensation to all Australians. Under this scheme, households with an average income could benefit by \$585 per year, after paying increased flow-on prices from electricity generators (Holden & Dixon, 2019). Dividends would also be progressive so that the lowest-income households would be

substantially better off relative to their current income and expenditures. Though politically contentious, a carbon tax offers a market-based incentive for energy providers to reduce carbon emissions (Wood, 2020). Our results indicate that household income level does not moderate Australians' sensitivity to flow-on price increases. Therefore, a carbon price mechanism coupled with equitable rebates for *all* Australians may offer a favorable solution that gains broad public support to the climate change mitigation and energy affordability trade-off.

Thirdly, politicians may need to stop promising lower electricity prices and be honest with the public, even though this may appear to run counter to the current findings. As Australia closes old power stations and moves to a low-carbon electricity system, it will have to build an expensive new generation and transmission infrastructure. That will cost money, and ultimately consumers will have to pay more for their energy regardless of whether production is from renewables or fossil fuels (Wood et al., 2018). Our results indicate a steep drop in support for the 50% RET as the projected increase in household electricity bills rose from \$5 to \$35 per quarter. Given that \$35 is a relatively small amount to pay, representing only 6.9% of the average Australian quarterly household energy bill (ABS, 2013), this finding indicates that Australians may not be ready to meet the cost of low-carbon electricity in their household bills. Wood et al. (2018) suggest that unfulfilled promises from politicians for lower electricity prices undermine public willingness to invest more money for low-carbon electricity. They propose an alternative approach is to provide a compelling and transparent account of the urgent need for a new clean energy system, and a durable pathway to achieve it. Australians may accept, albeit reluctantly, a more honest and realistic approach to the ensuing financial impacts of the inevitable energy transition the country must achieve to mitigate the forecasted dire effects of climate change (IPCC, 2018).

### **Limitations and Future Research**

Several limitations should be noted when interpreting the results of this study. First, we investigated Australian's support for a federal 50% RET by 2030, an energy policy that the Australian Labor Party initially proposed in 2015. It is important to note that our finding that public support for the 50% RET fell rapidly in response to projected flow-on electricity price increases applies only to the policy we examined. Our results may not generalise to alternative strategies that policy experts have subsequently proposed, such as the Clean Energy Target (Finkel et al., 2017), and the National Energy Guarantee (Energy Security Board, 2018).

Second, the current experimental study only manipulated a single attribute of the proposed 50% RET: 5 levels of projected electricity price increase. However, other attributes may be salient in this decision context. Manipulating additional information about other possible impacts, such as the projected reduction in carbon emissions and overall reliability of the nation's energy system, may have elicited somewhat different preferences (Bessette & Arvai, 2018). The "trilemma" of energy policy issues includes carbon emission reduction, system reliability, and energy affordability (Demski et al., 2017). Therefore, future research could investigate how members of the general public trade-off the impacts related to price, carbon emissions, and energy system reliability when determining their policy preferences.

Third, in terms of policy difference factors, the current study focussed narrowly on a 50% RET which is a regulatory policy. However, a host of different climate policy types exist, such as market-based and voluntary policies, that may elicit different support preferences (Rhodes et al., 2017). Future research could investigate levels of support for different policy types among the public. Furthermore, if communications were to stress the efficiency of a climate policy, it may encourage more support for its implementation (Dreyer & Walker, 2013). Future experimental research could, therefore, investigate the merits of highlighting the efficiency of a proposed policy in order to garner public support for it. In

particular, research could focus on highlighting the efficiency of a carbon price, since business and industry leaders agree this offers the most promising pathway to low carbon energy at the lowest cost in Australia (Business Council of Australia, 2020; Mitchell, 2019). According to prospect theory, potential losses loom larger than potential gains (Tversky & Kahneman, 1979). One approach, therefore, may be to highlight the relative loss should countries not adopt a carbon price.

### **Conclusions**

Many Australians feel that the transition to low carbon electricity is a challenging but necessary response to the current climate emergency (Lowy Institute, 2018, 2019). However, energy policy is contentious in Australia, exemplified by heated debates about the relative costs and benefits of renewable energy technologies (Wood, 2020). This was reflected in our findings that participants' socio-demographic differences determined their support for a proposed 50% RET. Higher income, climate change concern and left-wing political ideology were positively related to stronger support for the policy, although political ideology was not associated with policy support when evaluated alongside climate change concern. However, support for the policy fell steeply as the projected price of electricity increased, and this effect remained consistent across all three assessed individual attributes. Australians are already concerned about the price of electricity (Wood et al., 2017). These findings highlight their sensitivity to further projected price increases. Overall, our results suggest that widespread public support for sustainable energy policies may be challenging to attain unless energy prices are considered acceptable by consumers.

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**STATEMENT OF ORIGINALITY**

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We, the Research Master/PhD candidate and the candidate's Principal Supervisor, certify that the following text, figures and diagrams are the candidate's original work.

All elements presented are the original work of the candidate, except for those specified in the Statement of Authors' Contribution below	Not applicable
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**STATEMENT OF AUTHORS' CONTRIBUTION**

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We, the PhD candidate and the candidate's Principal Supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the candidate's contribution as indicated in the *Statement of Originality*.

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## CHAPTER 5

### General Discussion

Climate change may have catastrophic consequences if we do not transition to clean energy generation (IPCC, 2018, 2019; Steffen et al., 2018). Public support for energy policies plays a significant role in sustainable energy transitions (Drews & Van den Bergh, 2016; Steg et al., 2005, 2006), so it is crucial to understand how people decide which policy to support (Perlaviciute & Steg, 2014). Past research has identified a range of factors that relate to evaluations of energy alternatives (Perlaviciute & Steg, 2014, 2015; Perlaviciute et al., 2018; Perlaviciute et al., 2016; Steg, 2016; Steg et al., 2006). Of these factors, electricity price represents a direct and tangible consideration for householders. Although Australians tend to give high import to reducing carbon emissions (Essential Research, 2017; Lowy Institute, 2019), they are also concerned about their domestic electricity bills (Wood et al., 2017) in light of substantial price increases over the past decade (ACCC, 2017). Given this concern, and findings that electricity prices are negatively linked with policy support in the U.S. (Aldy et al., 2012; Stokes & Warshaw, 2017), I anticipated that projected flow-on electricity price increases may lower policy support in Australia.

Consequently, this thesis investigated whether projected policy-related electricity price increases are associated with public support for the Australian Labor Party's proposal that half of Australia's electricity should come from renewable generation by 2030 (50% RET) (Australian Labor Party, 2015). It also examined whether the effect of projected electricity price increases on the 50% RET varies according to personal values, political orientation, climate change concern, and household income. In the following sections, I present the main findings of three empirical studies that comprise this thesis and discuss answers to three research questions:

1. Are projected policy-related electricity prices related to public support for the proposed 50% (RET) in Australia?
2. Do personal values interact with policy-related electricity price to shape public support for the proposed 50% (RET)?
3. Do individual attributes (i.e., climate change concern, political orientation, and household income) interact with policy-related electricity price to shape public support for the proposed 50% (RET)?

I then discuss the theoretical and practical implications of the research as well as the strengths, limitations and directions for future research. Lastly, I present the main conclusions.

### **Summary of Main Findings**

First, in respect of the aims stated above, this thesis explored the extent to which support for the 50% RET reported by an Australian sample is shaped by policy-related electricity price increases. Second, it investigated if personal values (Schwartz, 1992, 1994, 2007) moderate this relationship by initially using two continuous variables (i.e., *self-enhancement* and *self-transcendence*) and then by examining a typology of values profiles based on Schwartz's 10 values. Lastly, I investigated if other contextual (household income) and psychological (climate change concern and political orientation) factors would moderate the effect of price increases on policy support among Australians. In this section, I address the findings of this research in accordance with the main research questions.

### **Projected Electricity Price and Energy Policy Support**

To address the first research question of whether policy-related price increases shape public support for the 50% RET, I initially conducted a Multilevel Modelling analysis (Study 1, Chapter 2). Each participant rated their degree of policy support at eight price levels (\$5, \$35, \$70, \$105, or \$155) so that the variance in expressed support could be identified both

within-subjects and between-subjects. One level identified changes in each participants' policy support across price levels, while a second level identified changes in participants' policy support according to their interpersonal differences. The first level analysis revealed a strong negative policy-related price effect on participants' expressed support for the 50% RET. This indicates that, in general, support for the 50% RET is closely linked to the projected price impact of the policy in Australia. As the projected price of electricity increased the support for the renewable energy target dropped. This result is consistent with the results of previous research conducted in the U.S. (Aldy et al., 2012; Stokes & Warshaw, 2017). In addition, the level-one analysis revealed that policy-related price accounted for 43 percent of the variance in policy support within each participant, which arguably is a sizable proportion.

Study 3 (Chapter 4) also addressed the first research question with a between-subjects design that assigned participants to one of five groups. Participants were presented with the proposed 50% RET at one of five price increase levels (\$5, \$35, \$70, \$105, or \$155) and rated the policy at the given price increase. A one-way analysis of variance identified a small to medium negative price effect. In addition, a post hoc test of group differences revealed that the largest difference in policy support occurred between the lowest two price points (\$5 and \$35). Policy support fell sharply between the lower price intervals and levelled off at higher price intervals (see Figure 1, Study 3). Inspection of levels of policy support plotted against projected electricity price levels shows a similar negative price effect in Studies 1 and 3 (see also Figures 1<sup>a</sup> and 1<sup>b</sup>, Study 1). In sum, together these studies confirm my expectation that Australians would be more opposed to the 50% RET as projected policy-related electricity prices rise.

### Values and Energy Policy Support

One of the most informative findings in this thesis stemmed from the analyses to determine whether the impact of projected policy-related price increases would vary as a function of participants' personal values (Question 2). Personal values are pertinent to understanding public policy acceptance because they shape how people evaluate the costs and benefits of different aspects of a policy (Steg, 2016; Steg et al., 2005, 2006).

I first addressed this question in Study 1 (Chapter 2), which focused on the variance in policy support explained by two composite values variables: *self-transcendence* (concerns for entities outside of oneself) and *self-enhancement* (concerns for oneself). The MLM level-two analysis in this study identified changes in participants' policy support according to their interpersonal differences, including differences in personal values. Based on prior research (Bidwell, 2013; Butler et al., 2015; Demski et al., 2015; Perlaviciute & Steg, 2015), I expected that stronger *self-transcendence* values (with their inherent pro-environmental commitments) would be associated with less sensitivity to policy-related price rises, but this was not supported. Strong *self-transcendence* linked to higher policy support when policy-related prices were low, but there was no difference in policy support between high and low self-transcenders when more substantial price rises were projected (i.e., above \$70). Similarly, I expected that stronger *self-enhancement* values (with their inherent self-interest commitments) would be associated with greater sensitivity to electricity price rises, but this too was not supported. Strong *self-enhancement* linked to lower policy support when prices were low, but again there was no difference in policy support between high and low self-enhancers when larger price rises were projected (i.e., above \$45 per quarter). This pattern of results is displayed in Figures 1<sup>a</sup> and 1<sup>b</sup>, Study 1.

Secondly, I addressed Question 2 in Study 2 (Chapter 3) in which I conducted a latent profile analysis to identify segments of the population that share similar values-based

profiles. Participants were classified into homogenous segments according to their patterns of scores across variables that assessed Schwartz's (2012) 10 original values. The analysis found four values-based segments of the Australian sample. First, the *Free-Spirits* (12%) segment scored higher than all other groups on *self-direction*, *stimulation*, and *hedonism* and lowest on *conformity* and *tradition*. They also expressed relatively high *universalism* and *achievement* values. Second, the *Power-Achievers* (28%) scored higher than all other groups on *power* and *achievement* and lowest on *benevolence* and *universalism*. Third, the *Traditionalists* (16%) scored higher on *tradition*, *conformity*, *security*, and *benevolence* and lowest on *stimulation*, *hedonism*, *achievement*, and *power* than all other groups. Lastly, the *Normatives* (44%) segment was the largest and comprised participants who scored close to the mean on most values. To the best of my knowledge, this is the first typology study in Australia to focus narrowly on personal values, and the segments that emerged were generally consistent with values-based profiles observed in European samples (Magun et al., 2015, 2017).

In terms of support for the 50% RET, *Free-Spirits* reported the highest levels of support, *Power-Achievers* scored lower than *Free-Spirits*, and *Traditionalists* scored lower than *Free-Spirits* and *Normatives*. I addressed Question 2 by investigating segment members' sensitivity to policy-related price. A factorial analysis of variance in policy support between the four values-based segments and five policy-related price levels (\$5, \$35, \$70, \$105, or \$155) indicated significant main effects for segment membership and price level, but the interaction term between segment and price was not significant. This means that although participants' policy support varied between segments and across price levels, their sensitivity to policy-related price increases did not vary according to their segment membership. In other words, participants were equally sensitive to electricity price rises when evaluating the

50% RET, irrespective of their alliance with *Free-Spirits*, *Power-Achievers*, *Normatives*, or *Traditionalists*.

In summary, the results of Studies 1 and 2 indicate that personal values have a limited moderating influence on the relationship between projected policy-related price increase and policy support. Individual *self-transcendence* and *self-enhancement* values may influence the effect of price on policy support at low projected price increases only; and systems (profiles) of personal values may not influence this relationship at any price level.

### **Individual Attributes and Energy Policy Support**

To extend and complement my investigation of personal differences in this context, I explored the extent to which alternative psychological and contextual differences (i.e., household income, political orientation, and climate change concern) may render people more or less sensitive to policy-related electricity prices in formulating their support for the 50% RET. I addressed this Question 3 in Study 3 (Chapter 4) with a moderated multiple regression analysis that explored possible interaction effects on policy support between projected policy related price increase and the three examined individual attributes. I present the results of these in turn.

#### ***Household income***

Results of the moderated multiple regression analysis revealed a significant main effect for participants' level of household income on policy support. Higher income level was linked to higher policy support, which aligns with previous studies that have found similar links between income and clean energy support (Aldy et al., 2012; Tranter, 2014). I also expected that higher income participants would exhibit less sensitivity to electricity price and report greater support for the 50% RET as prices rose than their lower income counterparts. However, the interaction term between price and household income explained only a small amount of variance in policy support that was not significant. This means that,

contrary to my expectation, when deciding whether to support the policy, participants' sensitivity to policy-related electricity prices did not vary according to their level of income. Given that electricity price rises impose a disproportional burden on low income families (Metcalf, 2019a), this finding is surprising.

### ***Climate Change Concern***

The moderated multiple regression analysis also revealed a significant main effect for participants' reported level of climate change concern on their policy support. Higher levels of climate change concern were linked to higher support for the 50% RET, a result that is congruent with previous studies of climate change concern (Reser et al., 2012; Smith & Leiserowitz, 2014; Spence et al., 2011; Sundblad et al., 2014). However, contrary to my expectation, participants who reported higher climate change concern were just as sensitive to policy related electricity price rises on their policy support as those who reported lower concern about climate change. The interaction term between climate change concern and electricity price was not significant and produced a very small effect size. This means that sensitivity to policy-related electricity price, in relation to policy support, was generally consistent across varying levels of climate change concern expressed by participants in the sample.

### ***Political Orientation***

Similarly, the moderated multiple regression analysis found a significant main effect for participants' political orientation on support for the 50%. The direction of the relationship indicated that participants who were more politically left-leaning expressed higher support for the renewables target, as is consistent with relevant previous research (Aldy et al., 2012; Essential Research, 2017; Leiserowitz et al., 2018; Leiserowitz et al., 2011; Tranter, 2011, 2014). That said, when regressed together with climate change concern, the weaker predictive effect of political orientation became non-significant, while the

dominant predictive effect of climate change concern remained significant. Given that political orientation and climate change concern shared the same variance, this suggests that higher (lower) levels of climate change concern among left-leaning (right-leaning) individuals may explain the positive (negative) predictive effect of left-wing (right wing) orientation on policy support.

In respect of an interaction between political orientation and electricity price, I expected left-wing orientation would leave participants less sensitive to policy-related electricity prices. However, the regression model revealed that an interaction effect between policy-related price and political orientation was near-zero and non-significant, despite the sample size providing ample power to detect small to medium effects should they exist. This means that when evaluating the policy, sensitivity to price did not change according to whichever political ideology participants aligned with, be it left, right or centre.

### **Theoretical Implications**

These results have implications for Schwartz's (1992, 1994, 2012) Values Theory and for how his proposed system of values relates to pro-environmental issues like renewable energy. Values define what is important to us and what motivates our goals and actions (Schwartz, 2007). Values Theory (Schwartz, 1992, 1994, 2007) defines ten universal values based on the motivations that underlie them (i.e., *self-direction*, *stimulation*, *hedonism*, *achievement*, *power*, *security*, *conformity*, *tradition*, *benevolence*, *universalism*), and positions them on a circular continuum (circumplex) according to the compatible or conflicting motivations they express. For example, opposing *self-enhancement* and *self-transcendence* values are posited to reflect the conflict between concerns for oneself versus concerns for entities outside oneself, and *openness-to-change* and *conservation* values reflect conflict between how much change is embraced and to what extent traditions are conserved.



In line with Values Theory (Schwarz, 1992, 1994, 2012) and previous research findings (Bidwell, 2013; Perlaviciute & Steg, 2015; Steg et al., 2015), Study 1 found that self-transcendence values were positively associated with levels of policy support and self-enhancement values were negatively associated with policy support. However, significant interactions indicated that these competing values exerted their theorised predictive relationships only at lower projected policy-related price increases.

A straightforward interpretation of the results of Study 1 is that values provide an important link with policy preferences when the projected policy-related costs are low, but values become less important when the projected costs are high. An arguably more intriguing interpretation is that values always shape preferences, but they direct attention to different policy aspects based on the magnitude of the projected price rise. For instance, individuals with strong *self-transcendence* values, with their inherent dedication to social justice and equity, may perceive that high electricity prices impose an unfair and disproportionate burden on low-income households. So, their steep decline in support of the 50% RET at higher price points may not reflect a reluctance to pay higher prices for renewable electricity, but rather that they are concerned that higher prices related to the policy may impose financial hardship for underprivileged sections of society. The first interpretation suggests high electricity price outstrips values in shaping policy preferences, while the second suggests that higher prices induce equity concerns that steer *self-transcenders* to retract their support for the policy. Determining which interpretation is more accurate requires further study that separately examines the distinct values (e.g., *universalism-nature*, *universalism-concern*, etc.) that comprise broad *self-transcendence* values (see Figure 1, Introduction).

While the results of Study 1 (Chapter 2) are generally consistent with Schwartz's (1992, 1994, 2012) Values Theory, the findings of Study 2 (Chapter 3) illuminate a more

nuanced relationship between values and support for the 50% RET. In line with previous research (Martin & Upham, 2016), the current study identified combinations of values in an Australian sample that are not consistent with Values Theory (Schwartz, 1992, 1994; 2012). The four values profiles that emerged provide evidence that values positioned opposite on the circumplex can coexist within individuals, despite the antagonistic motivations they are theorised to reflect. For example, the *Free-Spirits* group simultaneously expressed stronger than average *achievement* and *universalism* values, and *Traditionalist* segment members simultaneously expressed *self-direction* and *conservation* values. The coexistence of these conflicting values is not consistent with Values Theory or with negative correlations that have been consistently observed between them (Blackmore et al., 2013; Evans et al., 2012; Macrae & Johnston, 1998; Maio et al., 2009; Sheldon et al., 2011; Vohs et al., 2006).

Furthermore, the current results indicate that combinations of values combine to explain unique variance in pro-environmental beliefs and behaviour, in ways that are not always consistent with Values Theory. For example, when taking a variable-centred approach in Study 1 (Chapter 2), *self-transcendence* values were positively linked to support for the 50% RET as seen in previous renewable energy research (Bidwell, 2013; Perlaviciute & Steg, 2015; Steg et al., 2015). However, Study 2's typology approach indicated that *Traditionalists*, despite reporting the strongest *self-transcendence* values, generally expressed relatively low levels of climate change concern, belief in anthropogenic climate change, and support for the 50% RET. In contrast, *Free-Spirits*, who reported weaker *self-transcendence* values, reported greater belief in anthropogenic climate change, higher levels of concern, and stronger support for renewable energy. These results run counter to the findings of variable-centred analyses that have consistently identified positive associations between *self-transcendence* values and climate change beliefs (Corner et al., 2014; de Groot & Steg, 2008;

Poortinga et al., 2019) and renewable energy support (Bidwell, 2013; Perlaviciute & Steg, 2015; Steg et al., 2015).

The overall pattern of results found in Study 2 suggest that value priorities may interact with others that coexist within the same profile. For instance, other values priorities that coexist with *self-transcendence* within the *Traditionalists* profile, such as *security*, *conformity*, and *tradition*, may interact with *self-transcendence* priorities (that generally link to pro-environmental beliefs and actions) to inhibit pro-environmental outcomes. In contrast, members of the *Free-Spirits* segment – who consistently expressed the strongest anthropogenic climate change beliefs, concern, pro-environmental energy preferences, and policy support – expressed a combination of high levels of one form of self-enhancement (*achievement*) and one form of self-transcendence (*universalism*) that co-occur with high levels of all *openness to change* values and low levels of all *conservation* values. Thus, the current results suggest that *self-transcendence* may interact with the *openness-to-change to conservation* values dimension to predict pro-environmental beliefs and policy support.

From a practical perspective, the current results suggest that a combination of strong *achievement*, *openness-to-change*, and *universalism* may bestow prosocial innovation tendencies. Further research may investigate the possibility that the *Free-Spirits* values profile may characterise innovators who develop new technologies and initiate energy system changes. It is also plausible that a combination of *self-transcendence*, *conservation*, and *self-direction* may predispose people to believe that traditional ways of generating electricity (i.e., coal-fired) are optimal for humanity, and resist pressure to support new ways of generating electricity. This may be evident by *Traditionalists* expressing the highest preference for coal and lowest support for solar generated electricity, in addition to the lowest support for the 50% RET of all groups. Future research may further explore this profile of value priorities in relation to pro-environmental attitudes and energy preferences.

On the face of it, the pro-environmental endorsements of the *Free Spirits* profile run counter to the interaction between *self-transcendence* and *self-enhancement* evident in the Evans et al. (2012) study, who found that an environmental message shaped pro-environmental action when *self-transcendence* reasons were made salient but not when they were combined with *self-enhancement* reasons. However, close examination of their methodology revealed that their *self-transcendence* condition primed *universalism* values (protecting the environment), but their *self-enhancement* information primed *power* values (saving money), which are not expressed in the Free-Spirits profile. The profile of values expressed by *Free-Spirits* suggests that a similar experimental condition that activates *universalism* and *achievement* (rather than *power*) values may foster more pro-environmental outcomes and endorse the utility of examining specific values (and values systems) in addition to broader values dimensions.

The current findings therefore highlight the need to consider patterns of values that coexist within individuals and suggest that a typology approach to values research may offer a more holistic insight than analyses that evaluate the predictive relational patterns of individual values variables. In relation to values, these results suggest that future researchers may benefit from carefully considering which approach (variable- or person-centred) best suits their specific research purpose.

### **Implications for Policy Design and Communication**

Climate change mitigation on the scale needed to avoid catastrophic consequences entails a rapid shift to renewable energy generation (Steffen et al., 2018). This requires proactive policies and incentives to instigate widespread uptake of new energy technologies (Garnaut, 2019; Ram et al., 2019), and public support is essential to implement these policies (Drews & Van den Bergh, 2016; Rayner, 2010). In principle, Australians tend to support the transition to renewable electricity generation (Essential Research, 2017; Lowy Institute,

2018, 2019). However, in accordance with previous research in the US (Aldy et al., 2012; Stokes & Warshaw, 2017), current research results (Study 1 and Study 3) suggest that support for renewable energy policies declines as explicit electricity prices increase. This indicates that public aversion to accepting increased costs associated with new renewable energy generation extends beyond the US to an Australian sample. This is unsurprising since both nations' governments in recent years have steered policies away from, rather than towards, climate mitigation action (Kousser & Tranter, 2018).

A notable finding of the current research is that participants' scores on variables that assessed Schwartz's (1992, 1994, 2012) theorised values (Study 1 and 2), climate change concern, political orientation, or household income (study 3) did not moderate the negative effect of policy related price on their level of support for the 50% RET. This is important given that any shift towards clean energy production in Australia will require substantial new generation and transmission infrastructure (Finkel et al., 2017), which will cost money (Wood et al., 2018). In addition, it is inevitable that Australians will have to meet those costs as existing policy directives generally require the public to pay in some way through taxation or electricity bills (Evensen, 2017) – a scenario the current research suggests is unacceptable if the cost is too high.

With this in mind, what can governments do to garner support for the policies needed to move Australia towards low-carbon electricity production? One approach is for governments to propose a policy that will efficiently deliver low emission electricity in line with carbon reduction goals at the lowest cost. There is consensus among business groups (Business Council of Australia, 2020) and economists (Metcalf, 2019b; Mitchell, 2019) that a price on carbon is the most effective mechanism to achieve this. Putting a price on carbon is a market-based strategy where businesses pay directly for their carbon emissions. This encourages all actors to find the lowest cost solutions (Business Council of Australia, 2020).

One of the major benefits of this approach is that it would ensure market certainty for investors to build more new renewable generation infrastructure, which would ultimately keep electricity prices down – a beneficial outcome for electricity consumers.

Secondly, it is important to address the public's reluctance to support a clean energy policy that may pose a financial cost. One approach is for governments to compensate households for increased electricity costs with revenue collected from carbon pricing. Swoboda, Tomaras, and Payne (2011) took this approach in their Clean Energy Bill that compensated low-income households for their higher electricity bills. However, given that the results of Study 3 indicate that income level does not moderate the public's sensitivity to projected price increases, a strategy that compensates everyone, irrespective of their income level, may garner higher support. This is a key aspect of Holden and Dixon's (2019) proposed "Climate Dividend for Australians" – a carbon pricing scheme that compensates *all* Australians. Households with high and average income will be better off under this scheme, but dividends aimed to support underprivileged members of society will ensure that low-income households will be substantially better off compared to their current financial bottom line (Holden & Dixon, 2019). On the face of it, such a carbon mitigation mechanism, coupled with fair compensation for all Australians, may attract broad-based support among electorates.

Though it may run counter to the current research results, politicians may need to be honest with the public and stop promising lower electricity prices. According to Wood et al. (2018) unfulfilled promises from politicians for lower electricity prices have undermined public willingness for financial investment in low-carbon electricity. The reality is that Australia needs to replace their out-dated generation and transmission infrastructure. This is expensive, regardless of whether Australia maintains generation based on fossil-fuels or transitions to renewable sources. The current research shows that Australians may not be

ready to meet the cost of low-carbon electricity. Study 3 revealed a steep drop in support for the 50% RET when the projected policy related electricity price rose from \$5 to \$35 per quarter. This is disappointing because — representing only 6.9% of the average Australian quarterly household energy bill (ABS, 2013) — \$35 is, arguably, a relatively small amount to pay. A transparent account of the need to transition to a new energy system and a sound economic way to achieve it may encourage Australians to accept the ensuing financial impacts, albeit reluctantly.

In addition to the price of electricity, perceived fairness is a salient aspect of energy policy design (Demski, Evensen, et al., 2017). Distrust arises when energy companies neglect to consider the impact prices impose on consumers (ACCC, 2018; Mountain, 2018; Wood, 2017), or neglect to consider who is ultimately responsible for funding changes to the energy system (Demski, Evensen, et al., 2017). Research has shown that perceived unfairness may foster mistrust in electricity suppliers (Hobman & Frederiks, 2014), which may undermine public support for new policies (Hobman et al., 2016) and/or willingness to fund policies even among individuals who can afford it (Vaze & Hewett, 2012). Policies that address perceptions of unfairness within the energy system will therefore help to curtail individual conflicts between pro-environment and fairness values.

Rather than focus on electricity price when describing policies, it is important to emphasise the positive aspects of an energy change (Evensen, 2017). This may encourage individuals to counter the weight of potential financial cost with the benefits of renewable energy for themselves or for society (Perlaviciute & Steg, 2014; Steg et al., 2006; Steg et al., 2015). In the US, Stokes and Warshaw (2017) found that, compared to a no information control group, providing information about electricity price impacts decreased support for a proposed renewable policy. In contrast, providing information about potential improvements in air quality and increased job opportunities increased support. Financial cost had a

downward effect on policy support while air quality and job benefits bolstered support. To emphasise fairness in system change is also important.

Research suggests that opposition to cost may have just as much to do with system fairness as it does with affordability. Beliefs about the fairness of processes used to make decisions about the energy system, and that energy companies and government treat people with openness, honesty, and respect (i.e., procedural justice), are linked to public acceptance of the related costs (Demski, Evensen, et al., 2017; Sütterlin & Siegrist, 2017; Vaze & Hewett, 2012). Similarly, beliefs about the importance of fair cost sharing between the general public and industry (i.e., distributive justice) is also salient for public cost acceptance (Demski et al., 2019; Evenson et al., 2018). Therefore, policy communications that convince the public to deem the change to have procedural and distributive fairness may help to mitigate their reluctance to pay for it.

Communications that foster pro-social and pro-environmental values can lay an important foundation for constructive change (Corner et al., 2014; Steg et al., 2014; Thøgersen & Crompton, 2009; Verplanken & Holland, 2002). However, the patterns of values that coexist within values profiles identified in Study 2 indicate that pro-social and pro-environmental values do not exist in isolation. Rather they coexist with other values and present a different motivational pattern that links to beliefs and preferences. To enhance broad-based policy support, communications could frame energy policies so that they appeal to a wide range of value priorities, not just pro-social or pro-environmental. Conceptually, framing involves highlighting what is at risk and why it matters in a manner that is relevant to the audience. Individuals can then understand complex issues from their own familiar perspective (Nisbet & Scheufele, 2009). Climate communication studies support the pro-environmental benefits of framing messages according to the climate change beliefs (Bain et



al., 2012), or political orientation (Hart & Nisbet, 2012; Schuldt et al., 2011) of audience members.

The *Traditionalists* and *Free-Spirits* segments that emerged in the typology of values (Study 2) may provide specific insight into the framing of relevant energy policy messages. For example, *Traditionalists* expressed high *conservation* and *self-transcendence* values. Therefore, a message that acknowledges the enormous historical value that coal-fired electricity (*conservation*) has bestowed upon our society (*self-transcendence*) may gain the attention of people with a *Traditionalists* value profile, and perhaps open the way for them to accept that new cleaner technologies must now replace Australia's out-dated energy system.

Further, the results of Study 2 suggest that message frames that induce *achievement*, *universalism*, and all *openness to change* values may be useful to gain support for renewable energy policies. Members of the *Free-Spirits* segment possessed all of these values in combination and consistently reported the strongest anthropogenic climate change beliefs, concern, pro-environmental energy preferences and policy support. Everyone holds all values to some extent to varying degrees of importance (Schwartz, 2007). However, specific communications or experiences can activate particular values (Blackmore et al., 2013; Evans et al., 2012; Maio et al., 2009) in a way that can alter attitudes and behaviours that are linked to them (Holmes et al., 2012). For instance, inducing *benevolence* values renders people to respond more generously to help (Maio et al., 2009). Therefore, carefully crafted messages with a potential to activate *achievement*, *universalism*, and all *openness to change* values together, as expressed by members of the *Free-Spirits* segment, could alter attitudes and preferences in a positive way to gain public support for renewable energy policies.

This research project focussed on the effects of projected policy-related price increases and personal values on policy support, but it is also important to note that Study 3 found that household income and climate change concern were also significantly positively

associated with policy support, even after controlling for the relative effects of price, age, education, and political orientation. While household income did not moderate the relationship between price increase and policy support, it is possible that the abovementioned proposals to provide financial compensation to households for higher electricity charges (Holden & Dixon, 2019) may have an indirect effect on policy acceptance by increasing household income.

Similarly, strategies that increase concern about climate change may indirectly increase policy support. Focussing on recent extreme weather events is one possible approach, given that experiencing these events has been associated with increased climate change concern and mitigation behaviour. For example, Spence et al. (2011) found, in a UK national sample ( $N = 1,822$ ), participants who reported experience of flooding expressed more concern about climate change, regard it as less uncertain, and felt their mitigation actions were effective. They also found that these perceptual differences linked to more willingness to save energy to mitigate climate change. Similarly, in the US, Zanocco et al. (2019) found that self-reported personal harm from extreme weather events (e.g., tornados, floods, wildfires, and hurricane) linked to higher support for climate change mitigation policies. Given these findings, it is reasonable to expect that Australia's catastrophic 2020 bush fire events (Bureau of Meteorology, 2020) will raise levels of climate change concern among its people, and indirectly bolster their support for a renewable energy transition. Policymakers could harness this potential wave of concern by developing communications that focus on the possibility of reducing similar weather events occurring in the future.

### **Limitations and Future Research**

The current research has several limitations to consider when interpreting the results. First, although the empirical studies employed national samples, the patterns of results may not generalise to the wider populations of Australia or other countries. In addition, although

the four segments that emerged in the values-based typology were consistent with those found in a large European sample (Magun et al., 2017), it would be prudent to examine further typologies in other population samples to validate the consistency of the value-based segments. It is also worth noting that individuals classified together into a values profile are similar but not identical. The segments within the typology of values are based on average scores across the values variable and individual differences within each segment is expected.

Second, the empirical studies in this research investigated public support for a specific energy policy (50% RET) that the Australian Labor Party first proposed in 2015. Therefore, the sensitivity to policy-related price increases observed in the Australian population samples applies only to the examined policy, and the results may not generalise to alternative policies that energy experts have subsequently proposed, such as the Clean Energy Target (Finkel et al., 2017), and the National Energy Guarantee (Energy Security Board, 2018). Although a carbon tax is an alternative policy that is popular among economists (Metcalf, 2019b; Mitchell, 2019) and business groups (Business Council of Australia, 2020), it is politically controversial in Australia, and major parties are unlikely to propose it in the short term (Wood, 2020). Further research may therefore profitably focus on examining public support for the National Energy Guarantee, which both major political parties have considered a plausible future policy option for Australia's energy sector (Wood, 2020).

Third, the current research only manipulated and presented a single aspect of a proposed energy policy, though others may be prominent in this decision context. Providing additional information about other potential attributes of renewable energy generation such as air quality, job creation, carbon emission, system reliability and system fairness (e.g., see Bessette & Arvai, 2018; Demski, Evensen, et al., 2017; Stokes & Warshaw, 2017), may have generated a different level of support for the 50% RET. Future research could explore how members of the general public trade-off the cost and benefits of various attributes of an

energy system change when presented together. A conjoint analysis model would potentially identify the most appealing set of system attributes because a distinguishing feature of this modelling is that it determines the implicit relative importance of each attribute (Louviere & Hout, 1988). This means that individuals are unlikely to be aware of what is being measured when determining their preferences.

Fourth, Study 1's finding that individuals with high *self-transcendence* values support the 50% RET at lower price increases but withdraw their support at higher price increases can be interpreted in two main ways. That is: (1) values have less sway on policy support as price increases grow, or (2) higher prices activate concerns about electricity pricing fairness so individuals withdraw their support based on a prosocial value judgement. Further research is needed to determine which interpretation is closer to the truth by examining values based on Schwartz's (2012) nineteen revised values (e.g., *universalism-nature*, *universalism-concern*, and *universalism-tolerance*) as opposed to examining composite value variables (e.g., *self-transcendence*). It may be that the different motivations of the three universal values may be more or less active at different price levels.

Finally, the three empirical studies in this thesis employed cross-sectional correlational designs that preclude the drawing of strong causal inferences. However, it is important to acknowledge that relatively high external validity may have offset this limitation. That is, responding to possible consequences of an energy policy that is currently under debate in Australia may be more representative of a decision encountered in "real life" than a manipulation used in a laboratory experiment.

In terms of energy policy messaging, future experimental research could examine effective frames to prompt stronger support for a renewable energy transition, and compare this across different values-based segments of a population sample. Bain et al. (2012) identified a promising approach that frames climate change action in terms of future society

benefits that appeal to a wide audience. Even climate change sceptics were willing to act if they anticipated that climate change action would bring about a society that was more caring and considerate, or if they believed that technical and/or economic development was strong. Demski, Spence, et al. (2017) found providing exemplar scenarios of future energy systems influences patterns of energy preferences. Engagement with a scenario building tool strengthened existing renewable energy preference and willingness to take positive action. Future research could investigate if, similar to Bain et al.'s findings, different values-based segments of the population may respond more or less positively to different future energy scenarios.

### **Conclusion**

The transition to clean energy generation is a challenging but vital response to the global climate change crisis. However, energy policy is contentious in Australia amid passionate debate about the relative costs and benefits of renewable energy technologies. This thesis examined the level of support for the proposed 50% RET in Australian population samples at different levels of policy-related price increases. The results indicate that Australians are generally willing to support a 50% RET but not at any monetary cost. Their support declined as policy-related costs increased, with the most rapid decline occurring between the lowest price levels (i.e., \$5 - \$35). This highlights that Australian are very sensitive to paying more for future renewable energy generation, and without explicit policy-related costs presented in the decision context, expressed support for an energy policy “in principle” may be higher than it is “in practice”.

Existing research suggests that personal values may shape cost-benefit evaluation of aspects of a renewable energy policy, such as longer-term emissions reduction and short-term financial costs, which may shape policy support. This thesis explored this possibility by examining whether personal values moderate the impact of policy-related price increases on

Australians' support for the 50% RET. Results indicated that strong *self-transcendence* related to higher policy support and strong *self-enhancement* related to lower policy support. However, counter to my expectation, there were no values-based differences when projected price rises were more substantial. This implies that personal values likely play a role in shaping support for the 50% RET when policy-related price increases are low, but their relevance diminishes when their projected flow-on financial cost to households increases.

A latent profile analysis in Study 2 found four values-based segments of the Australian sample based on their patterns of value priorities across Schwartz's (2012) 10 original values. To the best of my knowledge, this is the first typology study in Australia to focus narrowly on personal values. The segments that emerged – *Free-Spirits* (12%), *Power-Achievers* (28%), *Traditionalists* (16%), and *Normatives* (44%) – were generally consistent with values-based profiles observed in European samples (Magun et al., 2015, 2017). These segments varied in their climate change belief, climate change concern, energy preferences, and support of the 50% RET, however, participants' sensitivity to policy-related price increases when evaluating the policy did not vary according to their segment membership. This means that Australians in the sample were equally sensitive to electricity price rises irrespective of their values-based profile.

I also explored the extent to which climate change concern, household income, and political orientation may leave people more or less sensitive to flow-on financial costs when formulating their support for the 50% RET. Though high household income and stronger climate change concern related to higher policy support, participants' levels of the three examined attributes did not moderate their sensitivity to policy-related price increases in relation to their support for the 50% RET.

In summary, the three empirical studies in the current research indicate that projected policy-related price increases have a significant and consistent negative effect on support for

the 50% RET. Personal values may have a limited moderating influence on the relationship between projected policy-related price increase and support for the 50% RET. Individual *self-transcendence* and *self-enhancement* values may relate to the association between price sensitivity and policy support at low projected price increases only, and systems (profiles) of personal values, climate change concern, household income, and political orientation may not relate to this relationship at any price level. These results have implications for policy design and communications, as it is vital to address the public's apparent reluctance to pay for Australia's crucial clean energy transition.

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