Energy transitions, intermediaries and home battery storage in Australia

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Abstract

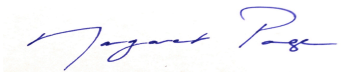
A transition to a cleaner energy future that embraces renewable energy technology such as home battery storage has never been so compelling. With high solar Photovoltaic (PV) penetration and expensive electricity rates, the likely adoption of battery storage technologies has positioned Australia to become the number one market for home battery storage in the world. To date however, there has been little research that explores the governance of such energy transitions in the Australian context. Against this backdrop, this research project explores the role of intermediary actors through a case study of home battery storage in Canberra– one of the first such projects in Australia which is rolling out energy storage to more than 5000 homes and businesses between 2016 – 2020. The research focuses on the role of key industry proponents in the scheme and identifies the existence of an intermediary landscape that comprises multiple layers – both visible and invisible. The project finds that the multifaceted role for these proponents has important implications for the role of the state and responsibility for enabling future energy transitions.

Candidate statement

This thesis is my own work and contains no material published elsewhere or written by another person, except where due reference and attribution is made in the text.

The content of this thesis is a result of work that has been carried out since the official commencement date of the approved research program. This thesis has not been submitted in whole or in part for the award of any other degree or diploma at any tertiary institution.

All research reported in this thesis received the approval of the Macquarie University Human Research Ethics Committee. Protocol number: 5201600511 (R)

Signature: 

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1 Introduction

The reality of climate change was brought into sharp focus at the 2015 Paris Climate Change Conference where negotiations with the world's heads of state resolved to achieve a legally binding and universal agreement on climate to contain global temperatures below 2°C (UNFCCC, 2015). Against this backdrop, the topic of energy transitions has become an unmistakable part of today's public discourse. Whether shaped by rising costs of electricity from fossil fuel supplies, environment and security concerns, or through climate policies, the realization that a shift to renewable energy sources and technology is necessary to contain global warming to the agreed limit. With record heat waves and super-charged storms linked to climate change, a transition to a cleaner energy future in Australia that embraces renewable energy technology such as home battery storage has never been so compelling (Mackenzie, 2016, Stefan, 2016b).

In Australia, energy storage systems are emerging as one significant pathway for this energy transition (Stock, 2015, Drew, 2015). With high solar Photovoltaic (PV) penetration and expensive electricity rates, the likely adoption of battery storage technologies has positioned Australia to become the number one market for home battery storage in the world (Stock, 2015). For consumers, the emergence of home battery storage to store solar rooftop generated electricity is becoming a reality. Home battery storage stores excess electricity generated from solar panels during the day so it can be used at night and the battery can also connect to the grid this being considered as an important adjunct to the electricity network (Stock, 2015). Together with rooftop solar systems, home battery storage presents a huge opportunity for Australian homes to use a larger percentage of the solar power they generate at home to minimise the need to purchase expensive electricity from the grid. Compared to fossil fuel, it provides emissions free energy and importantly, provides a potential solution to global climate warming (Stock, 2015).

As this energy transition unfolds in Australia there are many interests that have a stake. As part of the shift towards renewable energy in the Australian context, anecdotal evidence suggests that industry actors are playing a crucial role at the forefront of the development of home battery storage while government has lagged behind. For example, the federal government has progressed emissions reductions strategies reluctantly and inadequately and has yet to fully embrace the positive economic impacts from global decarbonisation (Stefan, 2016a, Thornton, 2017, Wood, 2016). This suggests that an exploration of industry actors

could be significant in terms of understanding how and why home battery storage is emerging in Australia and the governance of energy transitions in Australia more broadly.

One means of exploring the governance arrangements of energy transitions is through the concept of intermediary actors. Research undertaken in the UK and Europe suggests that intermediary organisations play an important role in this context by creating a means through which energy transitions can be constituted, articulated and enacted (Backhaus, 2010a). This includes formal and informal government and semi-government energy agencies, NGOs, agencies and organisations sponsored by utilities, energy services companies and providers (ESCOs) (Backhaus, 2010a, Hodson, 2013, van Lente, 2003), local communities, grassroots and networking platforms (Hodson, 2013), research and technology organisations, chambers of commerce, innovation centres, and industry associations and partnerships (Hargreaves, 2013). Defined by the relational work that they perform and their positioning between other actors, or 'in-between' actors, they are not only distinguished by their organisational form but also in terms of their function – for example, mediating, informing, connecting and coordinating, etc., (Backhaus, 2010a, Hodson, 2013, Parag Y., 2014).

However, to date, there has been little research looking at the governance of energy transitions in the Australian context, the roles of different actors and the process of intermediation. This research explores these concepts in relation to the emergence of home battery storage technology and thus provides a unique opportunity to contribute new knowledge – both empirical and theoretical – to this field.

1.1 Research aim and questions

The overall aim of this research is to understand the process of intermediation in the context of energy transitions in Australia, with specific reference to the emergence of home battery storage. In so doing, it addresses the following questions:

1. How, and by who, is home battery storage being developed and implemented?
2. How and why are industry actors acting as intermediaries in this context?
3. What is the impact of intermediary action on the development and implementation of home battery storage?

To address these questions, the research draws on a case study of home battery storage in Canberra, Australian Capital Territory (ACT). The Next Generation Renewables Energy

Storage Pilot (Next Gen Pilot), one of the first such projects in Australia, that is rolling out energy storage to more than 5000 homes and businesses between 2016-2020. The primary focus in the case study is on industry actors as the emerging evidence suggests they have played a pivotal role. Moreover, the study aims to generate empirical data that can lead to theoretical insights.

1.2 Structure of thesis

The thesis is structured as follows.

Chapter 2 – Literature Review

The literature review draws together two distinct bodies of literature: first, the emergence of home battery storage in Australia in the context of energy transitions and secondly, the governance of energy transitions, the role of intermediary actors and the process of intermediation. It then sets out the research framework which conceptualizes the process of intermediation within a space of 'in-betweeness'.

Chapter 3 – Methodology

This chapter sets out the research aims and questions, research approach – the qualitative methodology and case study, the rationale for case study selection, and the three phases of research methods: desktop mapping, semi-structured interviews, and data analysis.

Chapter 4 – Introducing the case study

The first findings chapter addresses research question one – How, and by who, is home battery storage being developed and implemented? Specifically, it introduces the case study – The Next Generation Renewable Energy Storage Pilot by setting out the key aims and objectives, the process of implementation and the policy context before introducing the key actors involved.

Chapter 5 – Industry actors and the process of intermediation

The second findings chapter addresses research question two – How and why are industry actors operating as intermediaries in this context? It explores the process of intermediation from the perspective of the three proponents – Solarhub, ITP Renewables, and ActewAGL Retail, along three interfaces: industry–industry, industry–government and industry–consumer. In this context, it specifically focuses on the relationships developed within these

interfaces, their motivations for doing so, their priorities in terms of developing these relationships and the actions they have taken.

Chapter 6 – Discussion: the impacts of intermediation

This chapter considers the wider significance of the research findings by addressing research question three - What is the impact of intermediary action on the development and implementation of home battery storage? It explores the intermediary landscape of home battery storage as the multiple layers of this landscape and how the process of intermediation is undertaken in relation to the case study, before setting out some theoretical implications of the empirical material.

Chapter 7 - Conclusion

The final chapter of the thesis sets out the conclusions. It revisits the research aim and summarises the key findings of this research. It then reflects on further opportunities for research before finally exploring the policy and practice implications.

2 Literature review

The literature review draws together two distinct bodies of literature: first, the emergence of home battery storage in Australia in the context of energy transitions and secondly, the governance of energy transitions, the role of intermediary actors and the process of intermediation.

2.1 Energy transitions and home battery storage in Australia

Australia is positioned to be the world leader of home battery storage (Stock, 2015). According to a report by The Climate Council (Stock, 2015) – an independent, crowd-funded organization in Australia – the prospects for the uptake of home battery storage in Australia is promising. According to this report, the renewable energy sector is booming globally, technological advances and rapidly falling costs – such as a 75% drop in the price of solar PV modules in the past five years – are driving record-breaking capacity additions, and growth in global clean energy investment and jobs. As battery costs continue to fall, battery storage will become an increasingly attractive option for storing renewable electricity at the household, business and community level. Australia is projected to be one of the largest markets for battery storage due to the high cost of electricity, the huge number of households with solar panels and excellent solar resources.

The emergence of home battery storage in Australia sits within a broader landscape of literature on energy transitions. The concept of 'energy transitions' is now widely used within energy studies and provides an analytical focus to assess historical and current shifts in energy systems at national and global scales (Barry D., 2011). Research on historical energy transitions centres on significant shifts in the role of different primary fuels and conversion technologies in the energy mix, such as the transition from wood and water power to coal in the 19th century, or from coal to oil in the twentieth. Much of this research showed that energy transitions also impacted societal change – industrialisation, urbanism, and consumerism (Verbong, 2007, Bridge, 2012, While, 2013).

However, in more recent timeframes, the topic of energy transitions is mostly associated with managing climate change and the global effort to shift mankind's reliance on fossil fuels, that produce carbon dioxide emissions as they are burned to produce energy, to renewable energy sources – such as solar and wind that have zero emissions. In this context, issues of energy governance, societal acceptance of new energy technologies, and governance perspectives on

intermediation are significant extensions to this important and evolving body of work (Hargreaves, 2013, Stigka, 2013, Sovacool, 2014, While, 2013).

Calvert (2016) makes the case that energy transitions are inherently socio-material because they involve users and institutions in addition to built infrastructure and natural resources. In other words, resource availability and technological efficiency are by themselves insufficient to explain the evolution of energy systems. For example, failed efforts at rural electrification programs in areas where local populations could not afford the appliances necessary to utilize electricity, nor had they developed a set of cultural practices that necessitated or valued electricity consumption in the first place (Calvert, 2016). New renewable energy paradigms that are likely to include domestic PV integrated storage will require different elements of policy and governance to promote the development of this emerging renewable energy technology. It is also important to recognize this, as a geographical process whereby there are wide diversity different socio-economic and cultural backgrounds, there is no one-energy emissions policy that will fit all countries. As such, energy governance is fundamentally a geographical process that involves reconfiguring current spatial patterns of economic and social activity (Bridge, 2012, While, 2013).

While the literature provides a multitude of varying definitions on the term *governance,* the meaning of the word in the context of this research topic needs clarification. As noted by Rhodes (1996), governance is not a synonym for government; rather, it has evolved to mean a 'new process of governing' or 'a changed condition of ordered rule' (Rhodes, 1996). As argued by Moss (2010), and Backhaus (2010), the topic of governance has become an important topic to capture the growing complexity of 'institutional structures, political processes, and social relations involved in the collective pursuit of public, common, or individual interests' (Moss, 2009, p. 1483). In this regard, Moss (2010) argues that there are 'new realities' of energy governance emerging that demonstrate new interfaces between government organisations, business groups and community groups. This concept provides an understanding of how innovative intermediaries can emerge to influence the pursuit of collective goals under shifting energy governance structures and processes (Rhodes, 1996, Backhaus, 2010b, Moss, 2009).

2.2 Actors and the role of intermediaries

The topic of 'intermediaries' has been associated with climate change and energy literatures for more than a decade, particularly in the United Kingdom and Europe (Goldthau, 2014). Examples of intermediaries defined in the literature include formal and informal government

and semi-government energy agencies, Non Governmental Organisations (NGOs), agencies and organizations' sponsored by utilities, energy services companies and providers (ESCOs) (Piore, 2001, Medd, 2008, Hodson, 2013), local communities, grassroots and networking platforms (Hodson, 2013), research and technology organisations, chambers of commerce, innovation centres, and industry associations and partnerships (Parag Y., 2014, Hargreaves, 2013).

There is, however, no common conceptual understanding, or even an agreed definition, of what intermediaries are. The term is used in a variety of literatures to describe organizations operating between other actor groups and is used to explore diverse types of actors. For example, Medd and Marvin (2008) identify a wide range of organizations termed 'intermediaries' including: 'social intermediaries' changing relations between culture and economy; 'market intermediaries' within the context of shifting relations between production and consumption; 'labour intermediaries' addressing labour-market restructuring; 'knowledge intermediaries' within the new knowledge economy; 'welfare intermediaries' enabling 'joined-up' working in social welfare; and 'planning intermediaries' facilitating the coordination of public-private initiatives in town-centre management (Medd, 2008). According to Bruton and Williamson (2005), intermediaries act at the intersection of the public, private, and civil sectors. These organisations assume the roles and characteristics of each where some act like agencies of government, and others as member organisations (Bruton and Williamson, 2005).

As global economies transition to renewable energy and technology, the addition of 'energy intermediaries' – defined by their capacity to facilitate change in the energy system, have emerged in the academic literature. In this context, these actors are characterized as energy intermediaries in the literature by the intermediary nature of the work they do. For example, whether facilitating dialogue, providing guidance, bridging gaps, advocating reform, or pioneering novel forms of interaction, their arenas of action are defined by their 'in-between-ness', cutting across the provider – user – regulator triad where globalization processes have rendered these actors an integral part of global governance (Bruton and Williamson, 2005, Backhaus, 2010b, Moss, 2009). Further, Backhaus (2010) argues that energy intermediaries may strategically position themselves between other actor groups in the energy sector and mediate the interests of these parties towards common goals for a more sustainable and secure energy future (Backhaus, 2010b). According to Hodson et al., (2013), 'energy intermediaries' play an integrated role in energy transitions where there is a multiplicity of social interests that cross scales of governance and non-state governance and that involves a wide variety of

actors (Hodson, 2013). The authors compare two cities in the UK with a focus on the organization of urban low carbon transition activity. Their analysis provides a conceptual framework that considers the variable and multiple motivations embodied in energy programmes and in reconfiguring energy transitions.

As traditional boundaries between actor groups in the energy system – such as provider, user, and regulator, are eroding and being redefined, Moss (2009) considers the concept of 'governance intermediaries' to explain the types of intermediary actors who do not neatly fit into one of the three categories of provider, user, or regulator (Medd, 2008, Moss, 2009).. Further, Moss (2009) argues that the study of intermediaries can help substantiate our understanding of governance - looking beyond simple, functional distinctions between state, the market, and civil society and revealing what happens at the more open and blurred interfaces between the public and the private, the regulator and the regulated. According to Moss, "As traditional boundaries between actor groups are being eroded or redefined, intermediaries would appear to play an important role in communicating across cultures of compliance (state), of competition (market), and of collaboration (civil society)" (Moss, 2009, p. 1492). As such, his work contributes to the understanding of how intermediaries can influence the pursuit of collective goals under shifting governance structures and processes.

The concept of 'systemic intermediaries' provides a more nuanced understanding of what intermediaries are and how they operate at system or network level. Defined by van Lente et al. (2003) 'systemic intermediaries' are important in long-term and complex changes which include transitions to sustainable development that require the coordinated effort of industry, policy makers, research institutes and others. The paper provides a useful framework of the roles of intermediary organizations at the interface of technology innovation such as the PV integrated home battery storage technology. The authors suggest that this approach addresses the intellectual challenges posed by complex and long-term transitions where the crucial ingredient to any system of innovation is the intermediary organization that connects, translates and facilitates flows of knowledge (van Lente, 2003).

A more recent contribution to the genre of intermediaries is that offered by (Grandclément, 2015). They argue that the 'intermediary process' provides a more accurate understanding of how energy intermediaries operate, namely that rather than focusing on who or what intermediary organisations are, it is instead the *process* of intermediation that is important. Based on the research on a new low-energy building in France, the authors suggest tensions could be avoided by including an intermediary process at all stages of the project design. As

such, they suggest that where intermediary actors are able to mediate between actor groups, it is possible to avoid tensions and aim for mutually best outcomes.

2.4 Summary and research framework

The literature review has explored the emergence of battery storage in Australia within a broader body of literature about energy transitions. This has identified new governance arrangements as a way of situating an exploration of the role of intermediaries and the process of intermediation.

This research project specifically draws on the work of Backhaus (2010) who has focused on the 'in-between-ness' of the work of intermediary actors to understand how they facilitate change. This provides an important perspective to understand how intermediaries, and the process of intermediation

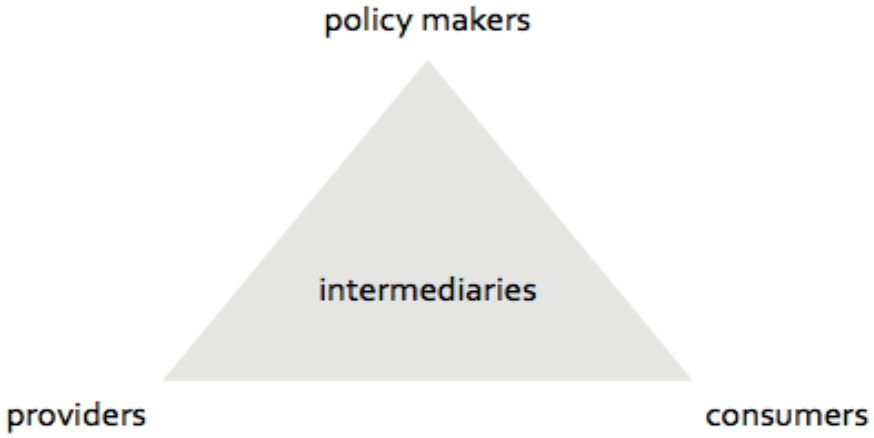

Figure 2.1 The operating space of intermediaries
(Backhaus, 2010, p. 90 drawing on Moss et. a., (2009)

As identified in Figure 2.1, Backhaus (2010) identifies three main actor groups in the energy system are identified – policy makers, providers, and consumers. In this framework, intermediaries are positioned within an operating space that is 'in-between' these actors. This provides an important perspective to understand the process of intermediation as the character and work of intermediaries are defined by their 'in-between-ness', rather than their organizational structure or any particular focus of their work (Backhaus 2010).

The Backhaus model, therefore, provides a relevant conceptualization for this research as it allows exploration of the *process* of intermediation by looking at how industry actors (or

providers in the model) function within the operating space between the main actor groups. Further, the model provides a platform for this research to explore *relationships* that are facilitating this process of intermediation.

This framework thus provides a theoretical platform for this research to explore the process of intermediation from the perspective of the industry proponents along three interfaces – industry–industry, industry–government and industry–consumer. In this context, the research specifically focuses on an in-depth exploration on the relationships that they have developed within these interfaces, their motivations for doing so, their priorities in terms of developing these relationships and the actions they have taken.

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3 Methodology

This chapter sets out the qualitative methodology approach for the research project to explore and understand the process of intermediation in the Australian context. Section 3.1 sets out research aims and questions. Section 3.2 sets out the qualitative research approach and the rationale for selecting a case study selection. Section 3.3 sets out the research methods across three phases: – desktop mapping, semi-structured interviews, and data analysis.

3.1 Research aim and questions

While the topic of intermediation has been explored in scholarly debates in the UK and Europe over the past decade (Piore, 2001, Medd, 2008, Hodson, 2013), there has been little research that explores intermediation in the Australian context. This therefore provides a unique opportunity to contribute new knowledge to this field and particularly so, where Australia is positioned to be the world leader of home battery storage (Stock, 2015); and where anecdotal evidence suggests there has been an absence of climate and energy policy leadership at a federal level over the past few years (Nelson, 2013, Stefan, 2016a, Wood, 2016)

Therefore, the overall aim of this research is to understand the process of intermediation in the context of energy transitions in Australia, with specific reference to the emergence of home battery storage. In so doing, it addresses the following questions:

1. How, and by who, is home battery storage being developed and implemented?
2. How and why are industry actors acting as intermediaries in this context?
3. What is the impact of intermediary action on the development and implementation of home battery storage?

3.2 Research approach

This research utilized a qualitative approach, with the emphasis primarily exploratory intended to elucidate human environments, individual experiences, and social processes. This was judged the most relevant research approach where … 'the number of people interviewed, projects observed, or texts read is less important than the quality of who or what 'we' involve in the research' (Bradshaw, 2005). In this regard, the research aim and questions influenced the research design as the type of research questions posed (how, what, why) are more aligned to a qualitative 'intensive' design methodology where questions that ask 'how many'

focuses on quantification and statistical analysis (Clifford, 2012, Flowerdew, 2005, Hay, 2005). Therefore, a qualitative approach was relevant in this context of this research.

The original research design for this this research project was to explore the role of intermediary organisations nationally in the Australian context. However, to enable a greater in-depth analysis, the research design shifted to a case study methodology. The decision to adopt a case study methodology approach was further cemented after reading examples of case studies undertaken in an Australian context as provided by the author Howitt, R., (2001). As Howitt R., (2001) explains, a case study methodological approach provides the researcher a unique opportunity to understand and gain insights from those participants directly and hence, contribute new knowledge to the research field (Howitt, 2001).

The specific case study selected was the Next Generation Renewables Energy Storage (Next Gen) pilot in Canberra, Australian Capital Territory (ACT). This was selected as it was one of the first such projects in Australia and thus providing an opportunity to explore the view of multiple actors involved in energy transitions in Australia specifically, the role of intermediary groups and how might this change in the future. Furthermore, the timing of this research aligned with the first stage of the rollout of home battery storage – making it a suitable case study for the research. Within the case study, I chose to focus explicitly focus on industry actors due to anecdotal evidence from media and industry reports that showed that industry was spearheading the progress of battery storage technology and innovation in Australia (Stock, 2015, Thornton, 2017, Wood, 2016).

The case study was also influenced by logistical and financial constraints arising from the MRes timetable. This MRes project was undertaken with a 9-month (FTE) timeframe – comprising research design, literature review, data collection and analysis and writing up. As such, it was important that the case study was in relatively close proximity to Macquarie University in Sydney (Canberra is approx. 300km or 2.5 hours drive). Canberra is also the nation's capital and the location of key government and industry actors that were willing to be involved in the research.

3.3 Methods

The research project was conducted in three phases, as set out below.

Phase 1: Desktop mapping and policy review

The desktop mapping review provided an entry point for the research project where I was able to explore and review government and other actors websites, policy documents, and media articles to identify emerging themes. While 'desktop mapping' is a secondary data source and as such, has limitations in that is information provided by organisatons, it provided a context for the primary data for the research project – such as sourcing organisations aims and objectives that is available publicly on organisational website pages. In this context, the secondary data provided overlapping types of context – geographical, historical and socio-economic.

The desktop mapping enabled me to become familiar with case study from a range of perspectives as it allowed initial analysis of a) the key developments of the case study policy landscape and b) the actors who are engaged with the case study including: industry, government and consumers. It also enabled the identification of appropriate interviewees to invite them to participate in the research.

Phase 2: Semi-structured interviews

Compared to a questionnaire, the semi-structured interview format is not to be representative, but designed to understand how individual people experience and make sense of their lives (Eyles, 1988). Therefore, this was judged to be the most appropriate method where the interviewees in this research consist of a wide variety and therefore not representative of one sample set. Interviews, in contrast to using a questionnaire, are generally unstructured or semi-structured and they take a conversational dialogue to elucidate explanations to research questions (Flowerdew, 2005). In terms of understanding how and why the actors involved in this case study operate in an intermediary process, the semi-structured interview format did provide for some flexibility to allow participants' the chance to explore the subject from their own perspective (Hay, 2005).

Fieldwork comprised of 10 semi-structured interviews with representatives from government, industry and non-governmental organisations (NGOs) associated with the home battery storage pilot project in Canberra either directly or in a policy context. These comprised:

- Industry actors – the three proponents of the scheme: ActewAGL Retail; ITP Renewables; SolarHub; and Reposit Power.
- Government actors - ACT Government Environment, Planning and Sustainability Development Directorate – Energy Markets and Renewables; Australian Renewable Energy Association (ARENA); South East Region of Renewable Energy Excellence

(SERREE); and Regional Development Australia (RDA) ACT; Department of Environment and Energy.

- Non-Government Organisations - Australian Solar Council / Energy Storage Council; and Beyond Zero emissions (BZE).

The interviews were conducted face to face and the participants were asked questions across the research themes - motivations, priorities, actions, relationships, challenges and barriers. (See Appendix 1). These questions were based on their involvement and perception of the ACT home battery storage roll out case study alongside exploring the nature of the relationships in facilitating this project.

Phase 3: Data analysis

Data analysis involved the preparation of full transcripts from interviews and secondly, analysis of these transcripts using established qualitative data analysis techniques of coding and organising data thematically. Two trial types of coding were initially employed – 'open coding' and 'thematic coding' (Clifford, 2012) to gauge insights and emerging themes. However, the 'thematic coding' that helped to develop theme building was selected to be the most relevant approach as it enabled the organization of information into theme building that is central to qualitative, interpretive work as it enables the researcher to categorise information … 'to trends, categories and common elements that are theoretically important' (Clifford, 2012, p. 448).

The thematic coding process initially started with six broad themes that paralleled with the 10 research questions (motivations, priorities, actions, relationships, barriers and opportunities). Following this initial coding process, four broad themes – motivations, priorities, actions and relationships - were further interrogated as these were generating important insights. For example, under the thematic coding of motivations, most of the participants felt that – 'government policy', 'energy transitions' and 'consumer expectations' were the most important. Under the thematic coding of priorities – most of the participants felt that 'promoting the scheme', 'developing the renewable energy industry' (that encapsulating a range of priorities such developing the supply chain) were the most important. Under the thematic coding of actions - 'knowledge sharing' (that encapsulated also building relationships) was the most important. This process enabled me to develop and clarify the relationship between the key thematic codes – motivation, priorities, actions, and relationships, and the materials - the full transcriptions, and my diary notations and reflections

that I noted after each interview, to develop gain insights into how the process of intermediation was being implemented in the case study.

The following chapters set out the key findings from the research. Chapter 4 introduces the case study and sets out the key aims and objectives, the process of implementation and the policy context before introducing the key actors involved; while Chapter 5 explores the process of intermediation from the perspective of the three proponents (Solarhub, ITP Renewables, and ActewAGL Retail) along three interfaces: industry–industry, industry–government and industry–consumer.

4 Introducing the Next Generation Renewable Energy Storage Pilot

This chapter addresses research question one – How, and by who, is home battery storage being developed and implemented? Specifically, it introduces the case study – The Next Generation Renewable Energy Storage Pilot by setting out the key aims and objectives, the process of implementation and the policy context before introducing the key actors involved.

4.1 Aims and objectives of the Next Gen Pilot

One of the first such projects in Australia, the Next Generation Renewable Energy Storage Pilot (Next Gen Pilot) comprises the rollout of energy storage to around 5,000 Canberra homes and businesses between 2016 and 2020. The scheme was proposed by the ACT government in 2015 and started in early 2016, with the Government awarding three grants of $200,000 for proponents to install subsidized battery storage in around 200 Canberra homes and businesses.

The overall concept of the Next Gen Pilot is to provide new technology that combines battery storage with a rooftop solar system. The household battery is charged with solar energy from the rooftop that allows it to be used when needed even when the sun is not shining. The key aims and objectives of the Next Gen Pilot include:

- To mitigate climate change through the reduction of greenhouse gas reductions.
- To generate valuable real-world data on energy storage system costs and performance.
- To develop the solar and battery storage industry in the ACT.
- To position the ACT as Australia's Solar Capital and a national leader in solar innovation and investment (ACT Government Environment, 2016b).

An overarching aim of the project is to demonstrate success in order to enable roll out to a wider audience. In this way, households and businesses participating in the Pilot not only benefit from the support of the ACT Government, but are participating in research that seeks to speed up the renewable energy transition (ACT Government Environment, 2016a)

There are numerous consumer benefits from battery storage. These include a reduction in energy bills by using the battery at peak times when it is most expensive to buy from the grid; control over when the stored energy is used; and the provision of backup power during an outage (ACT Government Environment, 2013, ACT Government Environment, 2016a). As well as benefiting individual households, battery storage benefits the ACT's energy grid

(which is connected to the national grid) by saving the money through reducing peak demand on the energy network. Battery storage will also keep energy bills down due to fewer costly network upgrades that have caused price increases to other parts of Australia's National Network Electricity Market. In this regard, the ACT Government estimates it will be a cost saving of up to $220 million (ACT Government Environment, 2016a).

4.2 Policy context and implementation

The Next Gen Pilot is a strategic program to mitigate climate change and reduce greenhouse gas emissions. In this context, the Next Gen Pilot is broadly aligned with three key policies (shown below in further detail) as follows: the Climate Change and Greenhouse Gas Reduction Act (ACT Government, 2016); the Climate Change Strategy Action Plan (AP2) (ACT Government Environment, 2010); and he Renewable Energy Target (ACT Government Environment, 2012).

The Climate Change and Greenhouse Gas Reduction Act was introduced in the ACT in October 2010 with the aim to meet greenhouse gas reductions commitments both locally and globally. The Act establishes emissions reductions targets of: Zero net greenhouse gas emissions by 2060; Peaking per capita emissions by 2013; 40% per capita emissions reduction by 2020; and 80% reduction of 1990 levels by 2050" (ACT Government Environment, 2013).

This was followed by the Climate Change Strategy Action Plan (AP2). The key aims and objectives of the AP2 is to provided a pathway for ACT to achieve the Territory's legislated 2020 greenhouse gas reduction targets in order to become a sustainable and carbon neutral community. In a policy context, this was the first time that the Next Gen Pilot was introduced as it sits within Action 6 of the AP2 strategy to facilitate local research and investment into battery storage as an important 'sunrise' industry (ACT Government Environment, 2013, ACT Government Environment, 2012).

The Climate Change Strategy Action Plan (AP2) was introduced alongside the Renewable Energy Trust Target to become the formal establishment in law of a 90% renewable energy (electricity) target for the ACT to be achieved by 2020. Minister of the Environment and Sustainable Development, Simon Corbell advised that 90% of electricity used in the ACT renewable energy sources, such as solar, wind or biomass, would reduce greenhouse gas

emissions by around 1.5 million tonnes (ACT Government Environment, 2015a). In this statement, the Minister advised the following:

> "The 90% renewable energy target was foreshadowed in the ACT climate change policy, AP2, and will underpin efforts to achieve our greenhouse gas reduction targets. The Renewable Energy Target will position the ACT as Australia's Solar Capital and a national leader in solar innovation and investment." (ACT Government Environment, 2013).

The Next Gen Pilot has been implemented over a number of stages, as illustrated in Figure 4.1 below. In 2015, the ACT government initiated a 'Next Generation Solar' Expression of Interest and 30 submissions were received. The Expression of Interest provided valuable insights into the emerging opportunities for solar and energy storage in the ACT and informed the development of the Government's strategy and program going forward. After looking at the options and ideas presented, Minister of the Environment and Sustainable Development, Simon Corbell and his team, selected battery storage for homes and businesses as the best strategy in line with the Government's Climate Change Action policy and its Renewables investment program.

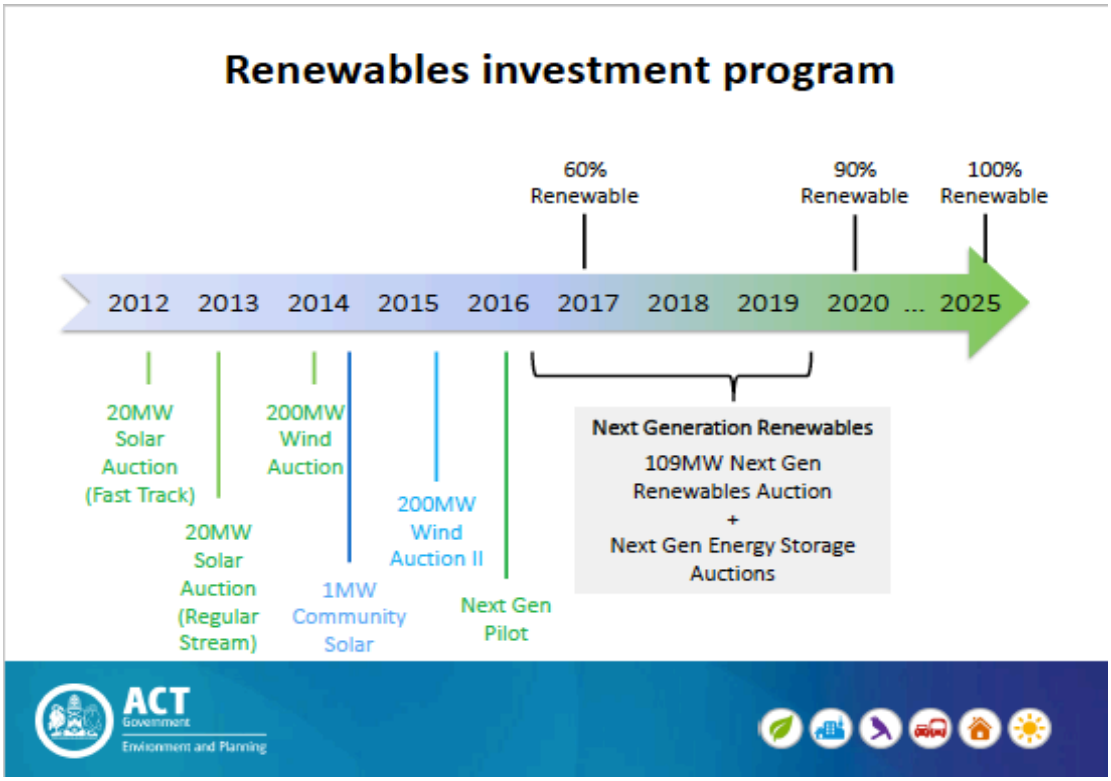

Figure 4.1 Timeline for renewables investment program
(ACT Government, 2016)

The ACT Government announced its support for the Next Gen Pilot on 18th December 2015 and commenced in early 2016 with the Government awarding three grants of $200,000 for companies to install subsidised battery storage in around 200 Canberra homes and businesses. The grants were awarded to three proponents: Solarhub, ITP Renewables, and ActewAGL. As specified in their deed of contract, these companies are responsible for the implementation, monitoring and promotion of the scheme (ACT Government Environment, 2015a, ACT Government Environment, 2012, ACT Government Environment, 2016a). It is these three companies that are the primary focus of my thesis.

A second round of grants were awarded in September 2016[1] through a similar competitive process that saw the ACT Government award $2 million in funding across eight companies to provide subsidised battery storage for around another 600 Canberra homes and businesses by 31 August 2017. The successful proponents of this round include the three initial proponents of the Next Gen Pilot – Solarhub, ITP Renewables, and ActewAGL Retail, alongside five new companies - Energy Matters, EPC Solar, Evergen, Origin Energy, and Power Saving Centre. The aim of the increased number of companies for the second rounds is to encourage competition and innovation, and support a wider range of technologies (ACT Government Environment, 2015b).

The overall scheme will see more than 36 MW of battery storage rolled out in more than 5000 Canberra homes and businesses over a four year period. According the ACT Government's website 'That makes it the most ambitious national program to date for battery storage, bettering a program by the South Australian Government' (ACT Government Environment, 2016b). The chapter now turns to introduce the multiple actors involved in the Next Gen Pilot.

4.3 Governing the Next Gen Pilot: introducing the key actors

The primary government actor involved in the Next Gen Pilot is the ACT Government Environment, Planning and Sustainable Development Directorate. This is divided into a number of departments (see Figure 4.2) and primary responsibility lies with the Department of Energy Markets and Renewables that set the agenda for the Next Gen Pilot and issued the deed of grants to the three proponents (ACT Government Environment, 2017).

[1] Fieldwork for this project was undertaken prior to the announcement of the second round of grants. As such, the empirical findings focus exclusively on the three proponents identified in the first round.

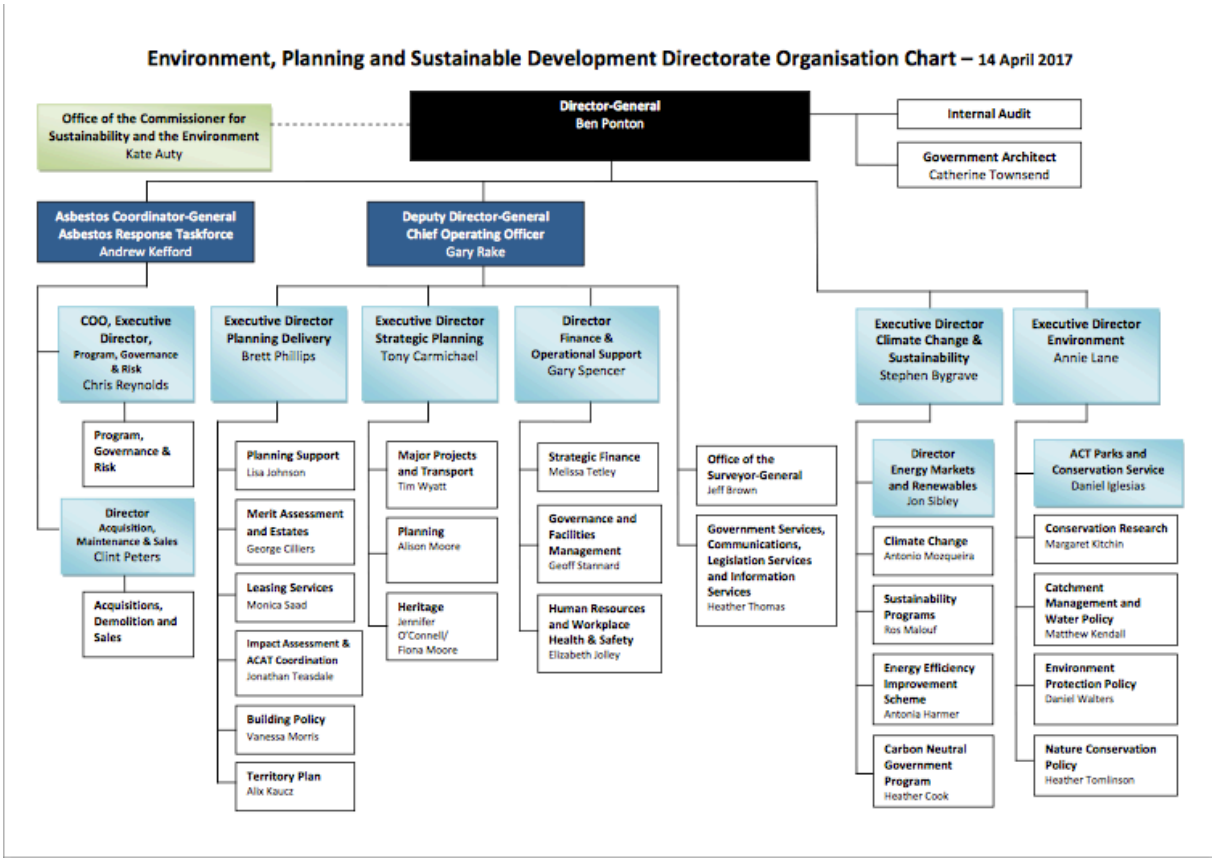

Figure 4.2 ACT Government Organisation Chart
(ACT Government Environment, 2017)

At a Federal level, the Department of Environment and Energy is not directly involved in the Next Gen Pilot, however is involved through a commonwealth policy context where they are focusing on a broader energy market transformation and watching the Next Gen Pilot with interest.

The focus of this research is on the intermediary process that is undertaken by the three proponents - ITP Renewables, ActewAGL Retail, and Solarhub. These companies were selected by the ACT Government to bring the Next Gen program to householders and businesses across the ACT. In this capacity, selected proponents sell and install subsidised batteries. Their key responsibilities include "meeting project milestone, minimum generation amounts and commitments made by proponents regarding community engagement and local investment" (ACT Government Environment, 2016a). This involves the implementation of the scheme, monitoring data for further analysis knowledge exchange across multiple scales of industry, research and government, and promoting the scheme to consumers. Although these three actors are deeded with the same responsibilities, they have different aims and objectives, as set out below.

ITP Renewables - has historically been a renewable energy consulting company. The respondent from ITP Renewables highlighted that the organisation has worked in remote power and renewable energies, not just in Australia but also in the Pacific. If an aid company, or the World Bank, or a private company in Australia is looking to install renewables and don't quite know how to go about it, this company prepares and reviews the specifications for them to go out to tender. More recently, however, the company has started to move more into engineering and implementation, and that includes residential scale in the ACT, which is where the ACT Government grant came from. They have experience with battery systems due to their previous work with renewables including solar energy, they have had. In the Pacific, this has mostly been with lead-acid batteries; this is because they are reliable, they work, they're simple for people to learn how to use and maintain however technology is moving towards the Lithium-ion based technologies (Interview, ITP Renewables). Their key aims and objectives from participating in the Next Gen Pilot include gaining experience from the ACT Government's project and being is at the forefront of that change. Part of what helped this company to transition to that as well is that they won a grant from ARENA to set up a Lithium-ion battery-testing centre at the Canberra Institute of Technology. From the ACT Government project, they would like to get more experience in installing these battery systems, working with them from a very consumer-based point of view which is something they haven't really done in the past (Interview, ITP Renewables).

ActewAGL Retail - is part of a multi-utility that looks after electricity and gas for Southeast New South Wales and ACT. As the representative from ActewAGL noted the company is different to a typical utility because it operates as both ActewAGL Distribution – that is the poles and wires of the business brand; and as a retailer - that looks after the billing, customers service, energy efficiency schemes and retail solar and a range of other products. The retail side is 50% owned by Icon Water (government owned) and 50% owned by AGL. The distribution side is 50% owned by Icon Water (government owned) and 50% owned by Jemena (Interview, ActewAGL Retail). Their key aims and objectives from participating in the Next Gen Pilot include: helping organisations understand changes to the energy market framework with the introduction of demand tariffs, alongside actively promoting renewables into the residential market (ActewAGL Retail).

Solarhub - started in 2012 as a broker of retail systems and in this capacity acted as consultant on renewable energy and IT and see battery storage as part of Australia's energy transition. As noted when both the New South Wales bonus schemes – feed-in-tariff and the ACT – premium feed-in-tariff scheme collapsed, the industry went through a consolidation

phase that provided Solarhub the incentive to become a retailer As an energy services company, this company has become what it describes as an 'aggregrator' where they bring a lot of companies together to provide a solution for a homeowner. In this regard, they have teamed up with another local company called Reposit Power that provide Grid Credits technology that they have invented and developed that allows homeowners to sell their energy back to the grid (Interview, Solarhub). Their key aims and objectives from participating in the Next Gen include: implementing renewable energy on the grid with a particular focus on solar energy. They believe that solar is one of the best renewable options presently available, perhaps other than wind. As a key objective, energy storage is important where it will play a major part in underpinning these renewables (Interview, Solarhub).

Further to the ACT Government and the three proponents – Solarhub, ITP Renewables, and ActewAGL Retail that are directly involved in the Next Gen, the following organisations also participated in the research.

Reposit Power – industry actor, developer of battery storage IT smart technology called 'Grid Credits' that allows consumers to sell their stored electricity back to the grid. Founded in Canberra as a small tech start-up, a key aim for this organization is to revolutionise the grid. This actor has partnered with Solarhub in the Next Gen Pilot and is so is directly involved in the Next Gen Pilot in this capacity.

The Australian Renewable Energy Agency (ARENA) – a commercially oriented government agency established 1 July 2012 by the *Australian Renewable Energy Agency Act 2011* with objectives to improve the competiveness of renewable energy technologies, increase the supply of renewable energy in Australia, an Australian economy and society increasingly powered by competitive renewable energy, and share knowledge to help the renewable energy industry and other stakeholders learn from each other's experiences - involved in progressing renewable energy in Australia.

Regional Development Australia (RDA) ACT – a government funded agency one of 55 RDA Committees which work with all three tiers of government, regional business and the wider community to boost the economic capability and performance of their region. RDA ACT is a key facilitator of a regional development initiatives and projects in the Australian Capital Territory of which SERREE Renewable Energy Industry Cluster is a key initiative – involved in progressing renewable energy in the ACT.

South East Region of Renewable Energy Excellence (SERREE) — a key initiative of the RDA ACT branch set up to facilitate networking with a renewable energy industry cluster of 750 stakeholders who together represent the diversity of the sector across industry, businesses, governments related organisations, and allied businesses, research, education and community - involved in progressing renewable energy in the ACT.

Beyond Zero Emissions (BZE) - Non Government Organization (NGO) is an internationally recognized climate solutions think tank. The Zero Carbon Australia Plan is a series of publications by this organization that details how every sector of the Australian economy can move to zero emissions within 10 years using off-the shelf, cost-effective technologies - involved in progressing renewable energy in Australia.

The Australian Solar Council / Energy Storage Council – NGO, plays a critical role developing industry and encouraging best practice for the solar and energy storage sectors – involved in progressing solar and storage in Australia.

4.4 Summary

This chapter has set out the key aims and objectives of the Next Gen Pilot. It is a strategic program that is aligned with the ACT Government's climate change polices and renewable energy targets and representative of the ACT Government's commitment and leadership to address global greenhouse gas emissions. Specifically, it has been developed under Action 6 of the AP2 strategy to facilitate local research and investment into battery storage (ACT Government Environment, 2013, p.1). Alongside this, this chapter introduced the key government and industry actors involved in developing and implementing the project. This chapter shows there exists a variety of actors directly or indirectly involved in the Next Gen scheme. Although the ACT Government initiated the Next Gen pilot, the three proponents – Solarhub, ITP Renewables and ActewAGL – who have primary responsibility for implementing it, have played a key role. These actors will become the focus of this research. The thesis now turns to look at how these three organisations act as intermediaries in the context of this case study.

5. Industry actors and the process of intermediation

This chapter addresses research question two – how and why are these industry actors operate as intermediaries in this context. It explores the process of intermediation from the perspective of the three proponents – Solarhub, ITP Renewables, and ActewAGL Retail, along three interfaces: industry–industry, industry–government and industry–consumer. In this context, it specifically focuses on an in-depth exploration on the relationships that they have developed within these interfaces, their motivations for doing so, their priorities in terms of developing these relationships and the actions they have taken.

5.1 The industry-industry interface

The first interface considered is that of industry-industry – namely relationships between industry actors. For proponent Solarhub, 'relationships' with industry actors and networking is "hugely important" (Interview, Solarhub). This actor views Australia's energy transition and the importance of relationships from a historical, current and future perspective. Being one of the longest standing solar companies in the region, this actor witnessed the collapse of the industry when the two premium feed-in-tariffs – New South Wales and ACT – closed leading to a rapid decline in the number of solar retailers. However, this actor notes that the collapse also had a positive side as it provided industry the opportunity to take advantage of this industry consolidation. However, while this gave consumers less choice, it presented new opportunities to build on their relationships with like-minded businesses that also have aspirations to progress battery storage with innovative technology with new business models.

One example of this is the partnership with Reposit Power – a small innovative IT start up company in Canberra that developed 'Grid Credits' that benefits from the experience and entrepreneurial expertise of Solarhub (Figure 5.1). As noted:

> *"So typically we were just a retailer for solar and installer of systems; but now with energy storage coming on board, we have become an aggregator where we actually bring a lot of companies together to provide the best solution for a homeowner. It's no longer just about buying some panels and buying a battery. We also team up with another local company called Reposit Power that developed IT software for batteries called 'Grid Credits' (Interview, Solarhub).*

In this regard, Solarhub's perspective across time scales has worked in their favour as they have built industry relationships by meeting face to face with like-minded actors that enables them to progress progress the development of battery storage through innovation and technology.

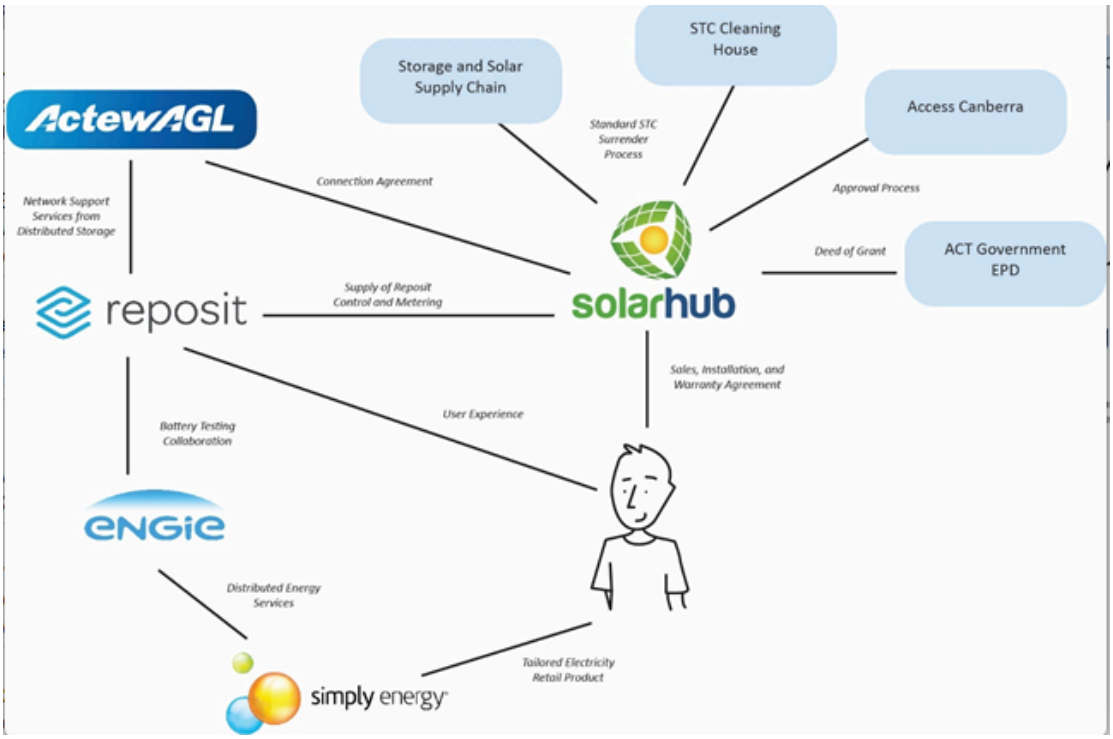

Figure 5.1 Next Gen industry-industry interface partnership
(Solarhub, 2016)

Industry-industry partnerships – Solarhub, Reposit Power, Engie and Simply Energy, provide an innovative solution for Next Gen consumers that choose to sell their rooftop PV generated electricity back to the grid. For example, partnerships such as the Solarhub and Reposit model have provided an innovative model for consumers to become part of the grid. This was particularly important to Reposit as noted:

> *"It's been very important in allowing us to form and develop relationships with other parties, because we're a small company and we must partner" (Interview, Reposit Power).*

Key priorities that underpinned these relationships included themes 'promoting the scheme' and 'developing a renewable energy industry' – which encapsulated an array of priorities such as getting installers experienced, innovate new ways to do business, sharing knowledge and

supply chain. In this 'developing a renewable energy industry' theme, the proponents were quite concerned with the logistics of this. Of these, developing the supply chain was seen as an important priority. This involved suppliers of the technology itself such as hardware suppliers from overseas that have to fit the requirements of the Next Generation Energy Storage Program. In this regard, all proponents deal with suppliers at some point, either at an industry forum, or as a third-party operative, or directly with international suppliers.

In relation to actions – another key thematic code, some interesting findings emerged. For example, most participants felt that 'Industry-industry knowledge sharing' (that was also mentioned as important priority) was an important action and involved industry meetings, forums, and participating in discussions where these actors were learning first hand what was working, what wasn't. For proponent ITP Renewables particularly, although they have vast expertise in renewables on a global scale, the company was new to renewables in terms of operating as a retailer and installer of home batteries. Therefore building relationships and knowledge sharing was very important where they were starting from the ground up.

Proponent ActewAGL Retail, although a recent newcomer to the retailer solar market, has been part of the ACT energy landscape through their AGL 'poles and wires' distribution company. They perceived knowledge sharing to be the industry's biggest opportunity to have an efficient renewable energy industry and to lead the renewable energy market and remove 'information asymmetry'. As noted:

> *"Not everybody along the renewable energy supply chain knows what everybody else is doing and the sharing of information up and downstream from each person's role is incredibly important when it comes to efficient operation of the market. So that' the typical economic concept of anytime there's information asymmetry, then there's obviously imbalance in the markets operating effectively. So the purpose of operating an efficient business the same applies" (Interview, ActewAGL Retail).*

In summary, the dynamics of this industry-industry interface suggests industry actors are playing an intermediary role in some form through developing priorities and the activities they carry out. These included 'developing industry relationships' and 'industry-industry knowledge sharing' through activities such as meeting with other industry actors upstream and downstream of the supply chain, collaborating with other like-minded industry actors and building on these to develop partnerships such as the Solarhub – Reposit Power industry-industry partnership (Figure 5.1). Much of their time involved other activities such as

participating at industry forums where new ideas and quality and safety issues were highlighted; and meeting with other industry actors involved in the energy system where the proponents acted as 'aggregators' to provide the best solutions for home owners and businesses. As noted:

> "*A lot of this type of work is done behind the scenes and so is to a large degree, not recognized by the government. These type of activities include: speaking at and participating in industry events, collaborating with industry groups to develop policy and regulations settings, best practice and discuss new innovations and ideas, meetings with training professionals to develop training programs for apprentices, meetings with government and industry networks to facilitate jobs and opportunities, and through the media" (Interview, Solarhub).*

In this regard, playing this intermediary role in some form, it was felt that much of their time spent interacting with these industry actors was done in their own time and also much of it was behind the scenes, not acknowledged by the government, and to a large degree 'invisible'.

5.2 Industry-government interface

The second interface is that of industry-government. In this context, government policy was seen as a particularly important motivation by most of the participants. For the three proponents of the scheme – Solarhub, ITP Renewables and ActewAGL Retail, the ACT Government's clear leadership position - manifest through its climate change policy and emissions reductions strategies (including Next Gen Pilot), and its visionary objective to make Canberra the renewable energy capital of Australia, provided an energy landscape where these specialist industry actors had the potential to contribute towards common goals.

In this context, while ACT Government actors play a key role in setting the Next Gen Pilot agenda, it is the proponents who are implementing the scheme. Consequently this industry-government interface is characterized by a shift in energy governance whereby responsibility is transferred to the three proponents as explained by Moss (2009), that is 'beyond purely top-down explanations of the exercise of power to a broader form of sociopolitical coordination between public and private actors' (Moss, 2009, p. 1483). In this context, the Next Gen Pilot is providing new opportunities for relationship building within an industry-government interface, which is pivotal for our understanding of the intermediary process in energy transitions.

It is important to note that the dynamics of an industry-government interface was in play well before the launch of the Next Gen Pilot when the ACT Government was interested in a range of renewable energy mitigation options including large scale solar, large scale wind and probably some storage (Parkinson, 2016). It was through meetings with local industry actors – Solarhub and Reposit Power, that convinced the ACT Government that 'distributed energy storage' was the best policy because, as Solarhub explained, it is much better for the network when it is distributed rather than having it all in one place. As noted:

> *"Reposit Power's model said that the government should do distributed storage because its it is better for the network having distributed rather than having it all in one place. That's the policy the ACT Government adopted – its distributed energy storage. We started all the way from developing policy all the way through to implementation and have had something to do with each part of the process which has been quite powerful for us" (Interview, Solarhub).*

In relation to this, most industry actors (including the three proponents) felt that energy transitions - involving the development of solar and storage, and consumer expectations involving a raised awareness and acceptance of new technology, required a collaboration between industry and government. As noted:

> *"The first priority is to make sure that that policy settings, consumer engagement and acceptance, and education, are such that solar has a clear path forward; that there aren't blocks being put in the way. On the other side we are very concerned about quality and safety. So we want to educate people that when they buy solar, when they buy batteries, that they're making a long-term energy investment and they really get a return over the long-term" (Interview, Australian Solar Council /The Energy Storage Council).*

The funding of innovation, research, commercially viable programs and industry networking is another important focus for the industry-government interface. Relationships between the ACT Government and proponent ITP Renewables was a result of these actors collaborating on research at the Canberra Institute of Technology. This ongoing industry-government relationship enabled this company to move more into engineering and implementation, including residential scale in the Next Gen Pilot, which is where the ACT Government grant came in. As noted:

> *"Having worked with renewables a lot in the past, and solar energy, we have had experience with battery systems that has mostly been lead-acid batteries. But obviously technology is moving towards the Lithium-ion based technologies and we want to be at the forefront of that change"* (*Interview, ITP Renewables).*

'Monitoring data' – noted as a key objective for the ACT Government, requires the dynamics of both industry and government for a successful outcome. In this regard, one proponent developed new software to coordinate this function and employed a full-time employee to manage the monitoring, collating and reporting of the data process. Government and research institutions such as the Australian National University (ANU) then undertake analysis to provide important information that will further contribute towards the development of battery storage and Australia's energy transition.

Industry and government actors also commented on the 'knowledge sharing' as an important priority and action to achieve the Next Gen program's aims and objectives although this was something that was expressed in different ways depending on the roles they played. Some industry and government actors, for example, felt that the best outcomes resulted from meetings where they met face-to-face. In such circumstances, knowledge sharing provided a space for new ideas to be born and the opportunity to share these ideas to see if they had merit or could be improved upon.

From an ACT Government perspective, the Next Gen Pilot provides an important demonstration on how battery storage may be implemented in Australia. In this regard, transferring that knowledge is particularly important. In this regard, the problem of 'system inertia' where too much or not enough power (where 50 Megahertz is the standard) causes problems on the grid. Batteries could provide a stable energy system and therefore a potential solution. As noted:

> *"Batteries may be part of the solution as to what an integrated energy system might look like in Australia" (Interview, Environment and Planning Directorate, ACT Government – Department of Energy Markets and Renewables).*

At a national level, ARENA advised that 'knowledge sharing' was one of their key objectives. Part of their legislative function is to collect knowledge from the projects that

they fund and disseminate it so that others learn from the experiences of the projects and bring the costs of renewables down.

> *"Knowledge sharing works because it helps drive down costs and spreads renewables around Australia" (Interview, ARENA).*

At a regional level, SERREE and Regional Development Australia ACT (RDA ACT) - government funded agencies that work collaboratively (SERREE is one of the RDA ACT's key initiatives), felt that 'government policy' was the most important priority because it allowed them to access government funding so they could facilitate linkages to develop jobs, programs and events and importantly, bring the cost of renewables down. For these actors, 'knowledge sharing' is also an important focus where they are involved in building a renewable energy cluster. As noted:

> *"Funding allowed us to continue building a renewable energy industry cluster which was just the opportunity for all these people to continue to come together and see new ideas: Federal government policy, that's definitely been challenging around renewables – you know, it's been pretty tragic for a few years" (Interview, RDA ACT).*

At a national level, the Department of Environment & Energy – a commonwealth government actor, although not directly involved with the scheme, this actor felt that 'knowledge sharing' was important as it would help the market regulators and jurisdictions understand how the Next Gen scheme would impact on the national regulatory and market frameworks. According to this actor, Australia's complex electricity framework includes a number of bodies: COAG Energy Council responsible for the policy and the overall governance of the national energy frameworks; the Australian Energy Market Commission (AEMC) that independently assesses the rules; and the National Electricity Objective that ensures any changes are in the long-term interests of consumers; the Australian Energy Regulator that makes regulatory decisions on behalf of the monopoly network; and the Australian Energy Market Operator (AEMO) responsible for managing the wholesale market that manages the dispatch of generation to where it needs to go including transmission planning. As noted:

> *"Understanding how that may or may not impact on the national regulatory and market frameworks, so yes, we're quite interested in what potentially will – what learning it will provide to everyone else. The other jurisdictions are also very*

interested in the trial the ACT is doing" (Interview, Department of Environment and Energy).

In summary, the dynamics of an industry-government interface – at regional and national scales, suggests 'knowledge sharing' is pivotal for progressing battery storage; new forms of energy governance is emerging in this context notably with the three proponents playing an important intermediary role in implementing the ACT Government's scheme.

5.3 Industry-consumer interface

Being responsible for the implementation of the scheme, the proponents act as a facilitator where they directly engage with consumers to implement the Next Gen Pilot. This involved every aspect from educating, helping consumers understand the concept and logistics of a battery system and working with them to provide the best solution for their immediate and future requirements that could potentially see them selling their captured electricity back to the grid at an agreed price if they chose to. Once consumers agreed to participate in the scheme, the proponents' role involved selling and installing the systems, administering rebates and warranties, and providing ongoing information and assistance. The logistics of implementation is explained further:

"As per the deed grant, the proponents receive $200,000 that allows them to provide a discount to the end-user when they install an energy storage system so they act as the facilitator. The money passes though the proponents so the government doesn't provide the rebate directly. For example, purchasing a Tesla battery under the government program, the end-user would receive a $2790 rebate for a 3.3 kilowatt system. Dividing that number by 3.3 is about $900 of which is the ACT Government's levelised grant price per kilowatt. That is the mechanism that the government uses to actually fund the Next Gen Pilot" (Interview, Solarhub).

The government will pay proponents who install a system $900 per kilowatt for that energy storage. However, the proponent installs it, does all the paperwork, promotes the scheme, and collects the data and sends it back to the government. From an energy governance perspective, these tasks have arguably been transferred to the proponents. In this regard, Moss (2009) argues there is an overarching interest within the governance literature that considers new perspectives for emergent governance models that reflect the work of actors who are positioned to pursue collective goals more effectively than public agencies alone. As

such, these key industry actors are strategically positioned to mediate and facilitate the ACT Government's Next Gen Pilot.

A key priority in this interface was undoubtedly their role in promoting the scheme to consumers. This was seen as an important priority for the three proponents because they were responsible for engaging with consumers to ensure that the scheme was a success but it none-the-less involved new and challenging dimensions to these organizations although for different reasons.

ITP Renewables felt that promoting the scheme was important because it presented a new and challenging dimension to their organisation. Although the organisation had vast expertise in renewable energy consultation at global and policy levels, it had not operated in a 'consumer space' before. This priority, although challenging, provided an opportunity for this specialist to learn from this experience. A priority, therefore, for this company is to gain more experience in installing battery systems and working with them from a very consumer-based point of view. Within this framework, this actor aims to replicate this experience in other states and territories as well as across Australia and they hope this experience will help them achieve this goal. As noted:

> *"For us, I guess it's been quite interesting what we've learned from this experience, because compared to the other two providers who have been in the business a long time, doing these residential installations to home owners, they've had everything set up. For us, we've had to start from the bottom in terms of reaching our consumer base and getting the message out there (Interview, ITP Renewables).*

In contrast, Solarhub – that previously operated as just retailer and installer of solar systems – has taken on the strategy to promote the scheme by becoming an aggregrator of knowledge and expertise. As noted:

> *"Now with energy storage coming on board we're actually becoming a little bit of what I call almost like an aggregator where we actually bring a lot of companies together to provide a solution for a homeowner. By that I mean it's no longer just about buying some panels and buying a battery. We also team up with another local company called Reposit Power" (Interview, Solarhub).*

For ActewAGL Retail, the ACT Government's aggressive climate change and carbon emission reduction strategies, works well to help organisations understand changes to the energy market framework. Within that residential solar market, this actor is the first utility to partner with a local developer to mandate 100 per cent solar in an entire suburb called Denman Prospect. As noted:

> *"This means 100 per cent of the houses that literally to build them now, have to have solar on rooftops ... and this creates a point of difference for the developer where they are looking for a point of difference" (Interview, ActewAGL Retail).*

On the horizon, proponent ActewAGL Retail felt that electric cars were soon to become an important factor to reach the ACT Government's policy targets. This may further strengthen the industry-consumer interface because electric cars were seen to "make sense".

As innovative thinkers go, industry actor Reposit Power foresees consumers revolutionizing the electricity grid where they become key drivers in the role of prosumers. As the developer of 'Grid Credits' – the smart IT software that allows batteries to perform functions such as shifting energy to and from the grid, this actor is already working in this industry-consumer interface space. In this 'rethinking' of how to revolutionise the electricity grid, this industry-consumer interface has the potential to shift Australia's energy transition to clean energy technology as consumers become more familiar with technology and the importance of acting on climate change now, become a key driver in this shift. This concept ties in with Reposit's Grid Credits methodology where the software performs a lot of important jobs for consumers who like the prospect of getting paid 'grid credits' every time they choose to sell energy back to the grid. This actor recognised that consumers and the demand side in electricity was going to play an increasingly important role in this energy transition. As noted:

> *"To allow consumers to become a main actor as they transition to the role of prosumers, they needed some software that provided a control system for the battery and interfaces to all the existing market systems. So there was a new category, a new type of generator, if you like, in the market and it needed some software to run it because it was very dispersed and had to do many jobs at once" (Interview, Reposit Power).*

Even though evidence suggests that residents in Canberra are backing the ACT Government's position to mitigate climate change (ACT Government Environment, 2010), and as such, are

considered by the proponents to be 'early adopters', battery storage technology is still a new technology and requires consumer education. Further, Olkkonen (2016) argues that energy prosuming is not typically initiated by utility companies and is … 'fundamentally a social phenomenon (Olkkonen, 2016, p. 1). In this regard, research undertaken on the social acceptance of renewable energy has observed that 'attitudes do not translate into action automatically' (Stigka, 2013, p. 105), and noted there was a hesitancy to shift to new electricity supplier and or products (Stigka, 2013). It is not surprising therefore, that educating and communicating this new technology takes a great deal of the proponents' time.

At residential and commercial scales, ActewAGL Retail - both retailer and utility provider in the ACT, seeks to promote the scheme by developing relationships with both a commercial and residential focus. At a commercial scale, this involves helping organisations understand changes to the energy market framework such as with the introduction of demand tariffs and helping organisations understand that using energy at particular time of the day is more expensive and the reasons why. At a residential scale, ActewAGL are promoting the scheme in a number of ways. One of which is by working with local developers so that new developments, such as Denman Prospect, will be 100 per cent solar and at some point include energy as well as demonstrated in the following quote:

> *"Within that residential solar we've been working with local developers and we're the first utility to partner with a developer to mandate 100 per cent solar in an entire suburb, called Denman Prospect. So 100 per cent of the houses that literally to build them right now, have to have solar on the roofs" (Interview, ActewAGL).*

5.4 Summary

This chapter explored the process of intermediation from the perspective of the industry proponents across three interfaces - industry-industry; industry-government; and industry-consumer from the proponents perspective. This was observed from the perspective of the industry actors through the research lens of relationships, motivations, priorities and actions. In this context, the findings show that industry is positioned at the forefront of battery storage innovation and technology, and also, they are strategically positioned to implement the ACT Government's scheme in an intermediary context. Although government actors play a key role in setting the Next Gen Pilot agenda and consequently this industry-government interface plays a pivotal role where these actors share knowledge, it is the three proponents that are responsible for its implementation and governance of the scheme.

In this capacity, these actors mediate between other industry actors through relationships where they meet face-to-face in meetings to discuss ideas, what works – what doesn't, they participate at forums and in this regard, they perform multiple tasks much of which is invisible because they volunteer their time willingly as they are motivated towards common goals – to make the scheme a success; to develop a renewable energy industry; to provide the best solutions for consumers and to be at the forefront of battery storage technology in Australia. The findings point to a significant shift in how consumers engage with the grid. This is emerging predominantly from an industry-consumer interface as industry proponents are positioned to communicate, educate and promote the scheme directly to consumers. In this intermediary landscape, consumers transition to energy prosumers and they become key drivers towards to what an integrated renewable energy system with battery storage technology in Australia will look like.

6 Discussion: the impacts of intermediation

This chapter draws together the wider implications of this research. Section 6.1 explores the intermediary landscape of home battery storage as explored through this case study. Section 6.2 explores the multiple layers of this landscape and how the process of intermediation is undertaken. Finally section 6.3 brings together the wider theoretical implications of the empirical material.

6.1 The intermediary landscape for home battery storage

The empirical research has identified that there is an intermediary landscape in Australia in the context of the Next Gen Pilot. Importantly, the research has focused on the process of intermediation through the perspective of the industry proponents across three interfaces: industry-industry, industry-government and industry-consumers. From this perspective, the research has demonstrated that this landscape is comprised by a number of dimensions where these actors perform multiple tasks that are both visible and invisible. Importantly, industry actors, through their capacity to be 'in-between' key actor groups such as industry, government and consumers in Australia's energy transition, are defining this landscape but also responding directly to government and consumers.

In the context of this case study, the ACT Government's home battery storage rollout – Next Gen Pilot, is implemented by the three proponents across three interfaces - industry-industry; industry-government; and industry-consumer actor groups. Industry actors are positioned at the forefront of battery storage innovation and technology and through projects such as the Next Gen Pilot, are spearheading this energy transition where battery storage positions Australia to become the world's leading market (Stock, 2015).

Although the ACT government actors play a key role in setting the Next Gen Pilot agenda, and this industry-government interface plays a pivotal role where dimensions of 'knowledge sharing' is a key factor for progressing this energy transition, it is the key industry actors – the three proponents, that are strategically positioned to engage with all actor groups - requiring the capacity to distinguish between social and technical explanatory factors, that becomes an important role of implementation and governance of the scheme.

This research has observed that there exists a different intermediary landscape in Australia comprising a situation where industry actors interact with industry, government and consumers. The emergence of battery storage is providing the missing link to *'what an integrated energy system may look like in Australia'* (Interview, Environment and Planning Directorate, ACT Government - Energy Markets and Renewables), and thus it is not surprising that this energy transition has brought forth with it a new range of actors performing new tasks (Moss, 2009) that involve a restructuring of energy governance in this landscape that involves multiple layers of intermediary action.

6.2 The multiple layers of intermediary action

The research demonstrates that actors are performing multiple roles that are both 'visible' and 'invisible'. In this regard, 'visible' explains the roles that they perform that they are specifically deeded to do in the contract with ACT Government; whereas 'invisible' explains the voluntary work they do behind the scenes.

As implementers of the scheme, there are certain roles they perform – such as installing the systems, monitoring and recording data, administering necessary rebates and warrantees etc., that are 'visible'. However, there are multiple roles these actors perform that are often done in their own time, and are often done behind the scenes and not recognized by government. Across the three interfaces, these include: engaging directly with consumers and other industry actors where they are communicating and educating new technology where social acceptance and adaptation for a renewable energy transition is fundamental to its success (Grandclément et al., 2015); meetings to improve upstream and downstream supply relationships; participating and speaking at industry and community events; round-table meetings with other actors to share best practice, new ideas, what is or isn't working; meetings to bring businesses together to bring together best solutions for homeowners; meetings to provide feedback, think tanks to assist with policy settings, regulations and standards; meetings with training organisations for the training of apprentices; speaking at community events; speaking to the media.

These multiple roles demonstrate that this landscape is comprised by a number of dimensions where these actors perform tasks that are both visible and invisible. As a whole, these multiple layers demonstrate how the process of intermediation is carried out. In this case study, the intermediation process works dynamically across three interfaces gathering momentum as each actor group gains from knowledge sharing, builds relationships, and

through their capacity to mediate and work towards common goals, social acceptance of battery storage becomes the norm.

This Pilot has provided the opportunities for these actors to operate in an intermediary context. Although knowledge sharing and collaborating was seen as key factor to progress battery storage innovation in Australia, there also existed an element of non-transparency between the proponents where they are operating in a commercial sense as competitors. This corresponds to research undertaken previously in the UK and European context show there exists a multiple of interests in energy market transformations that are not always working towards common goals (Hodson, 2013). This area of non-transparency may prove to be a hindrance in future projects that will benefit from the innovative role of intermediaries in energy and environment sectors (Backhaus, 2010a).

In this regard, Grandclément et al., (2015) argue that projects that include the intermediary process in the planning stages of projects requiring social behavior adaptation to low-energy buildings where thermostats are designed to be at a minimum, or renewable technology involving battery storage as an example of this case study, will benefit due to the harmonizing benefits that come from the intermediary process that involves recognizing and understanding tensions from different actor groups or stakeholders (Grandclément, 2015). However, the benefits of an intermediary process have not yet been recognized in Australia.

Understanding the intermediary process through themes such as *motivations, priorities, actions,* and *relationships* provided a wide lens to gain insights. In this regard, the research found that participants shared similar motivations such as energy transitions, government policy, and consumer expectations as a reason for their organization being involved in the Next Gen Pilot. This was an unexpected finding where the actors are from different businesses and perform different roles in the energy system. Although not a focus of this research, three possible explanations are considered none-the-less that may hold interest for future research. The participants' hold similar environmental ethics (Kernohan, 2012) concerning the environment in such a way that directs their operational rational. Secondly, the actors are involved in the energy system and they share a common understanding that is gained from knowledge sharing. Thirdly, their sense of place that is the nation's capital and home of the most educated people in the country (Anderson, 2012) is a factor and may therefore be a determining factor for 'shared' motivations that are based on factual, empirical and scientific knowledge .

The multiple layers of intermediary action in this landscape highlight the importance of having a space for knowledge sharing. This was observed from the perspective of the three proponents who felt that industry-industry interface was at its best when like-minded actors were able to meet face-to-face to share knowledge, best practice and gain from each other's experiences and interpretations. In this regard, the dynamics of these face-to-face meetings enabled these actors to work from a platform of innovation where battery storage has the potential to make Australia the leading world market.

As demonstrated in this research, relationships and partnerships - such as the partnership of Solarhub – Reposit Power – Engie and Simply Energy (Figure 5.1), provides a solution where by prosumers have the opportunity to sell their stored electricity back to the grid and in doing so, the grid is transformed into a viable trading platform. This suggests that 'knowledge sharing spaces' where actors are able to meet face-to-face to discuss new ideas that includes revolutionizing the grid, rethinking how society engages with electricity, best practices etc., is integral to progressing a renewable energy transition where battery storage is providing a clear pathway in Australia.

In this intermediary landscape, battery storage has powerful potential to show policy makers what an integrated energy system would look like n Australia. From an economic perspective, such partnerships bring a competitive leverage to these actors businesses where they are increasingly developing the renewable energy industry through building relationships upstream and downstream of the supply chain. From a national and global perspective, Australia is seen to be an innovative leader in renewable energy technology and an important global investment market.

6.3 Theoretical implications

The research has produced new empirical data about the process of intermediation in energy transitions in Australia. This is important as there are few existing theoretical models that are directly applicable to the Australian context and as such, this project has sought to gather and analyse empirical data in order to generate theoretical insights.

The growing body of literature on intermediaries in Europe has provided conceptual understandings, both in terms of who and what intermediaries are but also how they operate in diverse contexts (Piore, 2001, Medd, 2008, Grandclément, 2015). The scholarly debate suggests that there is not one definition that defines their role and capacity to act, rather that 'energy intermediaries encompass many different types of organisations that operate between

government and industry and where such motivations and priorities also encompass many interests involving key actors involved in energy transitions' (Hodson, 2013, p. 1404).

This research has drawn from the Backhaus (2010) theoretical model that identifies energy intermediaries by 'the character and work of their 'in-between-ness', rather than their organizational structure or any particular focus of their work' (Backhaus, 2010b, p. 90) where this model conceptualizes intermediary actors 'in-between' three main actor groups – policy maker, regulator and consumer. This project specifically focused on the proponents of the scheme who had the independence to implement and promote the scheme and were strategically positioned to mediate in-between other actor groups (Figure 2.1). In addition to the Backhaus (2010) model, the research found relevance from a concept 'intermediary process' developed by the authors Grandclément et al., (2015).

In the context of this research, similarities to the Backhaus model emerged. The actors are involved in progressing energy transitions towards a sustainable and secure energy future through their common goals; they also strategically position themselves between other actors (industry-industry; industry-government; and industry-consumer) and mediate the interests of these actor groups towards common objectives – mainly in this case study, the ACT Government's scheme. However, while similarities were identified with the Backhaus (2010) model, this research focused more on the *process* of intermediation, as relevant to Grandclément et al., (2015). This is particularly relevant because the key industry actors – the three proponents – Solarhub, ITP Renewables and ActewAGL Retail, are not identified as intermediary actors and also, the terminology 'intermediaries' was not familiar with the participants in the research.

7 Conclusions

This final chapter of the thesis sets out the conclusions. Section 7.1 revisits the research aim and questions and summarises the key findings of this research. Section 7.2 reflects on further opportunities arising from this research. Finally, Section 7.3 explores the policy and practice implications.

7.1 Summary of findings

This research has explored the process of intermediation in the context of energy transitions in Australia, with specific reference to the emergence of home battery storage technology. In so doing, it has addressed the following research questions:

How, and by who, is home battery storage being developed and implemented?

The research has identified the existence of an intermediary landscape in the context of the Next Gen Pilot. This is comprised of multiple layers whereby home battery storage is being progressed and implemented by key industry actors. The three proponents – Solarhub, ITP Renewables and ActewAGL Retail – are responsible for the overall implementation of the scheme. In this capacity, industry actors are playing a role in terms of policy development and implementation as demonstrated by the industry-government interface. This is characterized by a shift in energy governance whereby responsibility is transferred to the three proponents as explained by Moss (2009) to that of … 'beyond purely top-down explanations of the exercise of power to a broader form of sociopolitical coordination between public and private sectors' (Moss, 2009, p. 1483). In this context, the Next Gen Pilot is providing new opportunities for relationship building within an industry-government interface, which is pivotal for understanding the intermediary process in energy transitions.

How and why are industry actors acting as intermediaries in this context?

The research demonstrates that there are multiple layers of intermediary action where key industry actors have both 'visible' and 'invisible' roles. 'Visible' roles involved selling and installing the systems, administering rebates, warrantees, monitoring and recording data and providing this to the government and other research bodies for analysis. In contrast, 'invisible' roles involve many activities that were more often behind the scenes. This involves – engaging with consumers, industry and government to impart knowledge and understanding to address the social acceptance of renewable energy and technology. It also includes face-to-face meetings with different actor groups, building relationships upstream

and downstream of the supply chain to foster 'information symmetry', and partnerships that facilitate innovative thinking and new solutions. Other invisible activities include speaking and participating in industry and community events, speaking with media, and developing training apprenticeships with professional trainers. These actors voluntarily give their time to these roles because they believe in developing a renewable energy industry, that will not only position Australia to be the world leader market in battery storage, but position the nation's capital to be the renewable energy hub of Australia. Where 'visible' roles are mostly recognized, have a value, and therefore predetermined in a contract, 'invisible' roles by contrast, do not. Although the terminology 'invisible' suggests that these roles are behind the scenes in some way and therefore not recognized, they are in fact the prominent activities that are taking place and facilitating energy transitions in the context of this case study where they comprise face-to-face encounters and are in this sense, are highly visible. However, in the context of this research, 'invisible' roles are part of the intermediary landscape where such innovative actors communicate and mediate complex and new technological innovations towards a common goal of energy security and global emissions reductions.

What is the impact of intermediary action on the development and implementation of home battery storage?

The dynamics of the industry-industry interface suggests industry actors are playing an intermediary role both through developing priorities and the activities they carry out. These included 'developing industry relationships' and 'industry-industry knowledge sharing' through activities such as meeting with other industry actors upstream and downstream of the supply chain and also, collaborating with other like-minded industry actors and building on these to develop partnerships such as the Solarhub – Reposit Power industry-industry partnership. In this regard, this intermediary role was behind the scenes and not acknowledged by the government and to a large degree 'invisible'.

In relation to the industry-government interface, although government actors play a key role in setting the Next Gen Pilot agenda, it is the three proponents that are responsible for its implementation and governance of the scheme. As observed in this research, the dynamics of the industry-government interface suggests new forms of energy governance emerging with the three proponents playing an important intermediary role in implementing the ACT Government's scheme. This industry-government interface was in place well before the launch of the Next Gen Pilot where industry actors such as Solarhub and Reposit Power met with government actors to provide input and feedback concerning distributed energy as a way

forward. This became the policy that the government proceeded with and is an indication of the importance of the industry-government interface.

The industry-consumer interface, involved industry actors communicating and mediating complex and new technological innovations directly to homeowners and businesses across Canberra. Although residents in Canberra are backing the ACT Government's position to mitigate climate change, and as such, are considered by the proponents to be 'early adopters', battery storage is still a new technology that requires social acceptance before it becomes mainstream. It is not surprising therefore, that educating and communicating this new technology takes a great deal of the proponents' time. An important dynamic for this industry-consumer interface that emerged from the research was enabling the potential shift of energy consumers to 'prosumers'.

7.2 Opportunities for further research

This research and the case study of the Next Gen Pilot represented a unique opportunity to explore the process of intermediation in Australia. As there was little academic or empirical research undertaken in the Australian context, the case study is one of the first such projects in Australia. Through the thematic coding process that focused on a key set of themes drawn from the 'in-between' conceptualized by authors Backhaus (2010 and Moss (2009), and more recently through the concept of 'intermediation process' by authors Grandclément et al (2015), the research undertaken was able to use these academic frameworks as a lens to provide a new perspective of intermediary actors in the Australian landscape.

The research questions helped me to focus on who these actors were, how and why they mediate in this context, and what impact they make on energy transitions and battery storage in the Australia. While it provided some interesting findings that in the context of this case study, it also presents opportunities for further research. In this regard, as industry and government actors noted 'consumer expectations' as a key motivation, future research could explore the perceptions of consumers. This could particularly explore the potential for consumers to transition to prosumers where they have the capacity to use the grid as a trading platform.

'Knowledge sharing' was also seen by the actors to be an important facilitator to progress battery storage innovation and technology. Future research could explore this 'knowledge sharing' space where face-to-face meetings in this research showed that they have the capacity to progress innovation in energy transitions. Interestingly, the actors shared a

common understanding that concerns the very serious impacts of climate change. Although not a focus in this research context, understanding why these actors have similar motivations may be an indicator as to why these actors act in an intermediary context and as a consequence, be beneficial for future projects that involves an intermediary process.

7.3 Implications for policy and practice

Innovative battery storage technology is demonstrating not only what an integrated renewable energy system might look like in Australia, it is demonstrating what a new perspective on energy governance looks like. In this regard, the Next Gen case study highlighted that actors performed multiple roles involving important implementation and governance responsibilities. As demonstrated in the research, the key role of actors in implementing the scheme involved the practical realities of the program such as the administration of the grants, installing systems, and monitoring data and reporting it back to the government.

It also highlighted how these actors undertook intermediary action, along three key interfaces and in doing so, were bridging gaps that would not have been possible by just one public agency. This strategic positioning not only gave these actors the credibility to sell the ACT Government's scheme, it provided them with knowledge and insights to understand what was required to progress the scheme so that it would be a success. In this perspective, the Next Gen Pilot, is reconfiguring new dimensions of both what an integrated energy system might look like in Australia; significantly, new paradigms of energy governance.

In terms of how and why the intermediary process could be put into policy and practice, research undertaken recently points to the importance of recognizing its value early on in a project such as with a design team. At the design stage, the intermediation process may be used to provide best scenario outcomes for all actor groups where energy transition involving new technology and changes in behavior are a requirement for the projects success (Grandclément, 2015). As shown in the Next Gen Pilot, the ACT Government has led the way where it has initiated the scheme and in doing this, they have also initiated an intermediary space that allows for innovative governance frameworks to evolve.

In summary, the process of intermediation adds value to programs such as the ACT Government's Next Gen scheme. Industry actors demonstrate the capacity to implement key responsibilities of programs because they are able to both implement and mediate programs towards common outcomes. This has important implications for the role of the state and responsibility for enabling future energy transitions.

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Appendix 1: Interview schedule

Interview Schedule
Case Study: Next Generation Energy Storage Pilot in Canberra, ACT

Background

- Question 1: Can you tell me the story about this organisation?
  Prompts: What is its history, its vision, who and why was it started it up, funding

- Question 2: How would you define your organisation?
  Prompts: For example - Government or Semi-Government; Non Governmental Organisation (NGO); Not-For-Profit (NFP); Agency sponsored by utilities, Energy Service Company Organisation.

- Question 3: What are the key energy and climate issues that your organisation is working on?
  Prompts: What are the key aims, objectives and targets? What are the key concerns regarding climate change and transitioning to renewable energy?

Priorities and actions

- Question 4: What are your priorities for the ACT Home Battery Storage (HBS) project? What do they want to achieve from the perspective of their organisation?

- Question 5: Where does the ACT HBS project sit within their organisation? e.g. top priority, sub project, marginal involvement

- Question 6: What types of activities does your organisation perform for the ACT project and why? Prompts: For example - Energy advice; energy audits consultancy services; project initiation; management; finance and co-ordination; demonstrations technology procurement; installation, promotion; advocacy; lobbying; dissemination and awareness-raising; organising campaigns; education; training and courses; network-building, other – please specify.

Relationships

- Question 7: Who are your key relationships with for ACT HBS? Prompts: government – local, state, federal; industry - associations, providers; development organisations; grassroots and community-based organisations, other environmental actors – please specify.

- Question 8: How and why do you interact with these groups e.g. meetings, face to face, email, newsletters, forums; policy, regulation, strategy or communication development, and how often – regularly - weekly/monthly, occasionally – bi / annually, when relevant?

- Question 9: What are the barriers and opportunities that your organisation has identified in working with these groups?

- Question 10: Overall, what do you perceive the role of intermediary groups to be in the ACT HBS context? And how might this change in the future?