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Potential Solar Consumers' Understanding of Energy Policy Development in Hawaiia

Kristin Li McGill
Walden University

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Walden University

College of Social and Behavioral Sciences

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Kristin Li McGill

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Review Committee

Dr. Christopher Jones, Committee Chairperson,
Public Policy and Administration Faculty

Dr. Karen Shafer, Committee Member,
Public Policy and Administration Faculty

Dr. Michael Brewer, University Reviewer,
Public Policy and Administration Faculty

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Abstract

Potential Solar Consumers' Understanding of Energy Policy Development in Hawai'i

by

Kristin Li McGill

MS, American Public University, 2015

BS, The Florida State University, 2005

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Policy and Administration

Walden University

November 2019

Abstract

Hawai‘i has implemented renewable energy goals that assume continued investments by solar consumers who seem unaware of their role in the policy’s success. Without the renewable resource generation that will come from these investments, the state will be unable to achieve its energy mandate. Using Sabatier and Jenkins-Smith’s advocacy coalition framework and Ajzen’s theory of planned behavior as the foundation, the purpose of this study was to better understand the perspectives of potential solar consumers on the Island of O‘ahu regarding the state’s renewable portfolio standards, their level of knowledge regarding consumer impact on this policy, and their perceptions of the roles of the public utilities commission and electric utility company in the implementation of projects associated with achieving the state’s energy goals. Data were collected through interviews with 17 participants who represented a small portion of consumers who had begun the solar program application process but had not received approval to install panels at their residences. These data were inductively coded and subjected to a thematic analysis. Key findings indicate that consumers lack sufficient education about the state’s energy goals, and that their participation in the policy process is essential for the continued growth of customer-sited solar installations. Implications for positive social change stemming from this study include recommendations for policymakers and solar program developers to engage in more inclusive educational outreach with consumers regarding the state’s required renewable energy goals.

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Dedication

I dedicate this research study to my husband, Jonathan, who has shown great patience and provided unyielding support throughout this process. When I was stressed or exhausted, he managed to make me smile or say what I needed to hear to keep me going. I also dedicate this to my late grandfather, Harry, whom I know would be proud of what I have accomplished during my doctoral journey. I also would like to thank my entire family for their encouragement and positivity that has kept me focused over the past few years. There is no doubt I would have given up long ago if it were not for them. Thank you and I love you all.

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Chapter 1: Introduction to the Study

Introduction

The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai'i's population of potential solar consumers as new renewable energy policies and the associated electric utility-developed projects are presented to them. This study may create an opportunity for the state's legislators to evaluate how the current policymakers develop and introduce new policies to the general public, including the distribution of information or educational materials. This study may also provide an opportunity to better understand how future solar technology consumers might engage during the development of Hawai'i's renewable energy policies to be better informed about the state's policy-planning process.

The high cost of living in Hawai'i is further exacerbated by the extraordinary value of electricity that the state's residents currently endure. With its geographic isolation, high dependence on imported fossil fuels to meet consumer energy demand, and the state's swelling population, Hawai'i's lawmakers have sought alternative means by which energy independence and economic stability may reach a commonplace. The revision of the state's renewable portfolio standards (RPS) in 2015 was designed to address the state's potential for increased levels of renewable energy options as part of the overall energy mix (Hawaiian Electric Companies, 2016). This policy produced a mandate that necessitates progressive electric grid infrastructure changes with an assumption that the growth in the customer-sited solar generation will continue. Without

ongoing support by local consumers to invest in solar technologies, the realities of achieving the state's RPS goals will be in jeopardy. How the RPS goals are introduced to the public and the extent to which these significant contributors to its success realize their role in its implementation remains a vital missing component of Hawai'i's current policy-making process.

In this research, I employed a qualitative evaluation research approach to interview current Hawai'i residents who have expressed an interest in installing solar panels at their homes but had not yet had their tariff applications processed by the state's Public Utilities Commission (HPUC) and the Hawaiian Electric Company (HEC). Investigating what knowledge (or gaps thereof) exists between future solar consumers and the state's RPS requirements provides insight into how current energy policy-making processes are developed, how the public is informed of these policies, and to what level the information provided (if any) is sufficient to properly educate consumers at a local level. From a policy-planning perspective, this is especially important because the future success or failure of Hawai'i's RPS goals relies heavily on the continued contribution of solar generation (and thus, solar technology investment) by the state's electric ratepayers.

In this chapter, I provide a brief synopsis of the background of the research, problem statement, purpose, research questions, assumptions, delimitations, and limitations of the research.

Background

When Hawai‘i’s revised RPS was enacted in 2015, the state reported the highest cost per kilowatt-hour (kWh) for electricity in the United States with nearly 90% of its energy needs obtained through imported fossil fuels (U.S. Department of Energy, 2017). Over the past few decades, Hawai‘i residents have seen a steady increase in the average cost per kWh for electricity, reaching \$0.30—three times the national average—at the end of 2016 (U.S. Department of Energy, 2017). The primary driver of these increasing costs is the imbalance of the state’s energy mix. Despite the state’s lawmakers introducing an aggressive RPS mandate, the primary participants responsible for developing viable and sustainable renewable energy programs have often neglected to include insight or guidance from the individuals who will play a role in Hawai‘i’s RPS success.

The future of the state’s RPS programs assumes the continued growth of customer-sited solar installations. As of November 2018, there were 31,901 installed customer-sited solar systems on O‘ahu, with an additional 12,927 awaiting approval from the HEC (Hawaiian Electric Companies, 2018a). Due to the lack of interconnection technology that can safely permit additional installations of these systems (Hawaiian Electric Companies, 2018b), the ability for the HEC to approve pending and future solar program applications is not possible without the addition of advanced grid technologies onto the electric grid (Hawaiian Electric Companies, 2017). In 2018, the HEC filed their comprehensive Grid Modernization Strategy (GMS) application seeking approval to

deploy advanced technologies and software capable of managing the electric grid as new renewable resources are fed into the energy mix (Hawaiian Electric Companies, 2018a). This project application was recently approved by the HPUC, with the first phase of implementation scheduled to begin in late 2019 (Hawaiian Electric Companies, 2019).

Renewable Energy Policy

The United States is one of few developed nations with no federal energy policy standard (Schelly, 2014). Relying on states to establish their own set of renewable energy goals, 45 have passed legislation requiring some level of RPS implementation as of 2014 (Nicholson-Crotty & Carley, 2016). Hawai‘i’s RPS goals were first introduced in 2002 and revised in 2015, requiring 100% renewable generation into the electric grid by 2045 (RPS, 2015).

The primary contributor to Hawai‘i’s renewable energy goals is the continued investment in solar technology, specifically by customer-sited installations. With nearly 200,000 homes across Hawai‘i obtaining their power from these solar systems, and roughly two-fifths of the state’s renewable energy generation accounted for by solar energy (U.S. Department of Energy, 2017), the dependence on the early adopters of solar technologies’ involvement in the RPS planning and implementation process is imperative. This is particularly evident in future solar forecasting models that leverage an assumption of continued solar adoption across the state.

Public Knowledge and Understanding of Energy Policy

The introduction of Hawai‘i’s revised RPS and the expansive GMS project planned by the HEC have attempted to address the need for more renewable energy opportunities in Hawai‘i, but have appeared to lack input from potential solar consumers as to their role and impact on renewable energy growth in the state. Funk and Kennedy (2017) found that 83% of adults in the United States support a transition to more renewable energy options, such as solar, for their electricity needs. Lu and Gao (2016) pointed out that support for renewable energy options is encouraged if it is economically feasible on an individual level, while Noblet et al. (2015) found that a majority of renewable policy support hindered on an individual’s interpretation of the policies and how they directly impact them.

Many researchers have acknowledged the need for localized perspectives during the policymaking process, though few have considered knowledge dissemination as it relates to early adopters of solar installations. For Hawai‘i, this is particularly significant given the proportion of solar system deployments needed for the state's RPS future. As Llewellyn, Rohse, Day, and Fyfe (2017) asserted, local support for policy implementation reaches beyond technology adoption, requiring lawmakers to create suitable educational materials that will engage and inform the public throughout the policy planning and implementation processes. With proper engagement and education, early adopters of Hawai‘i’s solar energy future may influence the state’s RPS development beyond merely achieving the required mandate goals.

Public Beliefs and Engagement in Policy Development

Belief, as it relates to the understanding of Hawai‘i’s RPS and the subsequent need for new technologies, likely varies among individuals, communities, and policymakers. Belief can be influenced by proper education to ensure individuals are accurately informed of their options throughout the policy’s development. Current researchers generally agree that knowledge and understanding are often driven by one’s beliefs (Wallenborn & Wilhite, 2014). Maximizing stakeholder education—influencing their beliefs—drives successful planning and efficient implementation in the long term (Martin & Rice, 2015). For individuals to make informed decisions about the policies that impact them, they must understand how those policies will affect them.

To create a more comprehensive RPS engagement process, Hawai‘i needs to deviate from traditional policy techniques that use consumer-based opinion polls with predisposed responses (see Krause, Pierce, & Steel, 2016) and apply specific consumer-focused policy knowledge investigations to better scope their RPS framework. According to Ielite, Olevsky, and Safiulins (2015), researchers noticed that the use of open-ended educational platforms across all stakeholders helped to better develop successful green infrastructure policies. Considering the heightened risks associated with Hawai‘i’s energy and economic instability imminently facing its communities, alternative opportunities to better engage with and educate early adopters of solar technologies about the state’s RPS impact have yet to be addressed.

Problem Statement

The geographic isolation of Hawai‘i creates energy policy and economic sustainability issues, specifically as it relates to meeting energy demand, lowering electricity costs, and expanding available energy options. Leading the nation in the highest cost per kWh for utility consumers (see U.S. Department of Energy, 2017), Hawai‘i’s electricity investments and their financial impacts to its population have pushed the state toward introducing energy policies that are meant to rely heavily on renewable energy resources in hopes of achieving a sustainable solution. In June 2015, Hawai‘i’s governor passed revised legislation to the state’s preexisting RPS law, requiring that Hawai‘i’s electric utilities produce 100% renewable generation by 2045 (Hawai‘i State Energy Office, 2015). The state’s primary electricity provider, the HEC, responded to the RPS amendment with their expensive and complicated GMS as a means to guide future program applications toward aligning with the hardline RPS requirements (Hawaiian Electric Companies, 2018a).

Hawai‘i’s RPS goals and the HEC’s comprehensive strategic response have acknowledged the need for an advanced grid that can handle the state-mandated influx in anticipated renewable energy production. Neither has recognized the consumer perspective, specifically those of the potential early adopters associated with the primary renewable energy resource in Hawai‘i —solar—as a critical component of success or failure in the near or long-term. The absence of insight from this sect of electric consumers is particularly important given the fact that applications previously approved

by the state's HPUC have only increased the costs incurred by the HEC's solar ratepayers, with little quantifiable benefits realized outside of the electric utilities' bottom line (HPUC, 2017). The apparent lack of overall awareness by solar consumers and the impact that new projects and their policies will have on consumers over time appears to be a key factor that has yet to be addressed. What the HEC, the HPUC, and Hawai'i's RPS have presented is a complex paradigm where policy and cost-benefit relationships have been examined but at a generalized level, excluding the perspectives and potential adoption risks of Hawai'i's population of solar consumers who may be most impacted.

Purpose of the Study

The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai'i's population of potential solar consumers as they are introduced to new renewable energy policies and the associated electric utility-developed projects. To address this gap, I applied a qualitative evaluation research approach and interviewed potential early adopters of solar systems in the state. Through the interviews, I sought to determine the future solar consumers' level of understanding of the state's RPS goals, the role of the HPUC in the approval and regulation of RPS-related projects, and the HEC's subsequent planning and development of aligning programs. Assessments of the participants' responses, in conjunction with publicly available information presented by the HEC's filings acknowledging solar consumers' interests, were cross-referenced to determine where and to what extent gaps in knowledge exist. This information derived has the potential to assist the HEC, the

HPUC, and the state's RPS analysts moving forward in planning, revising, and developing renewable energy policies and strategies.

Research Questions

I investigated two main research questions:

1. What are the predominant perceptions that drive an electric utility customer who plans on installing a solar system at their home to engage with and understand the state's RPS process in Hawai'i?
2. How does a potential solar consumer perceive Hawai'i's three main RPS stakeholder groups (the HPUC, the HEC, and the governor's legislative office) relative to engagement and interaction during the solar program application process?

Theoretical Foundation

I evaluated my research through two theoretical frameworks: (a) the advocacy coalition framework (ACF), and (b) the theory of planned behavior (TPB). The nature of both frameworks involves investigating behavior, social norms, self-interests, and knowledge bias about policy development, change, and adoption.

Sabatier and Jenkins-Smith first developed the ACF as a means to address wicked (or cross-sectional) problems within the context of public policy (Sabatier & Weible, 2014). Pierce, Hicks, Peterson, and Giordano (2017) posited that the ACF comprises three foundational components: advocacy coalitions, policy change, and policy-oriented learning. Advocacy coalitions involve elected officials, researchers, and interest group

leaders who collectively assimilate to a singular belief system that is determined by their consensus on fundamental core values, cultural assumptions, and policy-related problematic determinants (Cerna, 2013). Policy change occurs when these coalitions address a social problem, new information is provided to further the knowledge of the social impact, and personal beliefs are either modified or solidified to facilitate the policy's success (Pierce et al., 2017). Policy-oriented learning derives from the ability of an individual or coalition group to modify their beliefs to conform to the new standard of the policy's objective, leading to a change in policy (Cairney, 2016).

This theoretical foundation was applicable for this study because I was able to lay the foundation to investigate how a potential solar consumer in Hawai'i understands the state's RPS goals, how they obtain information to learn more about the RPS, and how the existing RPS policy process has impacted their energy decisions. Application of the ACF to this study provided a platform by which policymakers may gain additional insight into how individuals who represent a significant advocacy coalition group (i.e., early adopter solar technologies) perceive the state's RPS mandates. Any gaps in knowledge may feed into their beliefs, which may then lead to these potential solar consumers supporting or opposing Hawai'i's RPS. A more detailed discussion is provided in Chapter 2.

Originally introduced by Madden, Ellen, and Ajzen in 1992, the TPB expands upon the theory of reasoned action (TRA)—established by Ajzen (1991)—by including individuals' beliefs as a predictor of behavioral intention and attitude. Keller, Halkier, and Wilska (2016) noted that the TPB establishes a direct relationship link between

behavior and human action through the association of perception as it relates to one's knowledge, attitude, and intent. Behavior ultimately dictates knowledge, interest, and understanding, feeding into one's ability to obtain new information that may influence their actions.

With Hawai'i's early adopters of solar technologies, their continued investment in solar energy is necessary for Hawai'i to achieve its RPS goals. Their understanding of the state's RPS requirements may influence the longevity of their solar technology investments. By applying TPB to this study, assessments of those early adopters' responses during the interviews provided a new level of understanding that was previously neglected. A more detailed discussion is presented in Chapter 2.

Nature of the Study

I used a qualitative evaluation research approach, which was consistent to understand how Hawai'i's potential solar consumer population perceives and understands the state's RPS goals and the role of the HPUC in approving new RPS-related projects that are proposed by the HEC. Applying Sabatier and Jenkins-Smith's ACF was valuable in determining the overall level of understanding of Hawai'i's future solar consumers relative to the state's policy development and project implementation processes. Cross-referencing between the data collected from the interviews and the publicly available documents previously filed by the HEC and the state's consumer advocacy groups helped to develop the gaps in understanding that exist among the participants interviewed. This

information may prove beneficial to be addressed through future policy planning and development processes.

Definitions

Customer-sited: Refers to photovoltaic (PV) or rooftop solar panels installed at a customer's residential property (Hawaiian Electric Companies, 2016).

Customer grid supply: Refers to the newest solar technology program offered by the HEC. It is required by the HPUC to permit new program applications required of electric utility customers in Hawai'i for new solar installations to be integrated into the electric grid (Hawaiian Electric Companies, 2018a).

Distributed generation: An industry term that refers to a small generator located at or near where the electricity will be used and is attached to the distribution grid. Distributed generation may be either a primary or secondary source of power and uses a variety of technologies such as combustion turbines, solar rooftop panels, and wind turbines (Hawaiian Electric Companies, 2018a).

Net energy metering: Refers to customers on the existing HEC-net energy metering program who wish to add additional PV or battery storage systems to their existing grid-supply equipment (Hawaiian Electric Companies, 2018a).

PV: Also known as rooftop solar, refers to the method of generating power by converting sunlight into electricity through the use of solar panels (Hawaiian Electric Companies, 2018a).

Smart export: A HEC-specific program that allows private residents to install solar PV systems at their homes and feed the excess generation back into the HEC's grid through a battery storage system (Hawaiian Electric Companies, 2018a).

Assumptions

For this study, early adopters of customer-sited solar technologies (or potential solar consumers) refer to individuals who have filed the appropriate solar program application with the HEC (e.g., customer grid supply, smart export, and net energy metering), collectively referred to as the interconnection application. These applications were not approved at the time the interviews took place by either the HEC or the HPUC. I assumed that the study participants were honest and truthful in their responses and that they were the head-of-household living in a single-family structure (i.e., not an apartment building) to align with the requirements of their respective interconnection application requests. I assumed that their RPS comprehension was necessary to support policy implementation, that the level of knowledge of Hawai'i's RPS mandate corresponded to their accepting RPS-related projects, and that Hawaiian locals wanted to participate in the energy policy planning and implementation processes. By requiring that the study's participants were head-of-household and living in single-family dwellings, I assumed that they make the decisions regarding all energy investment opportunities and that their intent to install solar panels at their home was a result of the high cost of electricity they have incurred. I also assumed that the HEC has provided some form of educational outreach geared toward potential early adopters of customer-sited systems, that the

HPUC has relied on these educational materials to inform the public about RPS-related projects, and that the state's governor's office has provided opportunities for interested individuals to participate in the policy process through a public comment period, at minimum.

Scope and Delimitations

Participants in this study were English-speaking, Hawaiian residents who lived in single-family dwellings on O'ahu. They were between 25 and 55 years of age, were head-of-household (i.e., they were the primary account holder on their electric bill), and had begun their solar program application process at the time of the interview. The selected participants could not work for nor be contracted for work with the state's governor's office, the HPUC, or the HEC to confirm they had not held any preconceived notion or insight into the state's RPS mandate and their subsequent role within its implementation.

The demographic age requirement for this study was necessary to accommodate the average age of college students in Hawai'i, and to ensure that the participants were able to make significant financial decisions. The location of the participants was selected for ease of access to a potential participant pool because a majority of the state's population resides on O'ahu. The interviews were originally planned to be face-to-face and to take place in a neutral, private setting at the hotel where I stayed while in the area to perform the data collection. However, due to poor weather conditions and the participants' scheduling conflicts, all interviews were performed either over-the-phone or online (Skype).

Limitations

To accommodate adverse weather and the participants' schedule availability, the interviews were completed over-the-phone and online. Each interview was conducted in a single session and lasted no more than 1 hour. The participants were required to agree to and digitally sign an adult consent form prior to the interviews commencing, all of which was done online through the SurveyMonkey site. Each participant was given the option to download a copy of the form if they wanted a copy for their records. No demographic information outside of what was required for this study was obtained, and all participants were assigned a unique reference number which coincided with their submission of the demographic screening form hosted through the SurveyMonkey site. The findings of this research cannot be generalized to apply to any given demographic group in Hawai'i, and no implied perception or knowledge of the individuals interviewed has been or will be extended to apply outside of the scope of this research.

My research faced potential limitations in two categories: question bias and participant restrictions. Thorough steps were taken to ensure that question bias was avoided during this study, especially given my role as the researcher and employment with the HEC. To prevent any inadvertent leading of participant responses, the interview questions were vetted through a triangulation process before the formal interviews to clarify any language used.

To avoid participant restrictions, I used a third-party research organization not affiliated with the HEC, the HPUC, or the state's governor's office. I accessed the

organization's research participant pool for the purposes of recruiting viable study participants. This intermediary served as the interface between me and the participants to ensure they were comfortable and confident that no personal information was collected as part of the study's analyses or findings. I anticipated in advance that recruiting participants through the third-party organization could have led to some form of bias if the final participants ended up clustered from specific areas of O'ahu, comprised a specified age range, or had ulterior connections or incentives in mind that drove them to participate. I made no promises to any participants and was assured by the third-party organization that they did not provide any information that would persuade individuals to participate.

Because I collected the data and interpreted the responses, I knew I had the most influence on how the information was gathered and assimilated. I did my best to categorize and organize the responses in a fluent and objective manner, and did not use any classification that embodies linguistic tendencies common in my writings as part of my job with the HEC. Chapter 3 provides more information on the coding and analysis methodologies that were originally planned (and used) for this study.

Significance

This research may help fill a gap in understanding with its focus on a specialized view of Hawai'i's potential solar consumers' understanding and perspective of the state's complex RPS goals, the influence the HPUC has on HEC's renewable energy project approvals, and the overall perceived impact such projects have on these segmented

consumers. This study was unique because it explored how Hawai‘i’s potential solar consumers interpreted energy policy, inclusive of the long-term impacts, as a means to better steer policy development. The state’s electric utility projects currently recognize potential solar consumers as participants but not as stakeholders, which often shifts the focus of the project's cost-benefit relationship toward the advantage of the electric utility as the foundation to whether or not the project is viable (HPUC, 2017). The results of this study may provide much-needed insight into how potential solar consumers perceive energy policy, electric grid project applications, and renewable energy programs. The findings of this research may also address whether there is foundational support given to specific benefits over others based on any preconceived consumer-oriented notions or understandings. Because the success of Hawai‘i’s RPS goals rely heavily on the adoption of renewable energy programs, acknowledging the comprehension level of the state's future solar consumers as these new concepts are introduced provides a more comprehensive policy planning and project implementation process. This recognition may provide broader understanding of solar consumer adoption and success opportunities in the future.

Conclusion

Hawai‘i’s cost of electricity is the highest in the nation. To help circumvent the rising financial impacts of the state’s continued dependence on imported fossil fuels, the state’s governor’s office passed an amendment to its RPS goals in 2015 that required 100% of its energy generation come from renewable resources by 2045. In response, the

HEC submitted its GMS to build out the existing electric grid with more advanced technologies aimed at integrating additional levels of renewable energy necessary to achieve the state's RPS mandate. The HEC's approved GMS and the state's RPS obligation rely heavily on utility ratepayers to continue to invest in customer-sited solar technologies.

Previous researchers often neglected the primary, community-level constituents within the policy development process. This void has resulted in a level of investigation into Hawai'i's RPS mandate that has focused on how the state would achieve these goals, rather than how such policies were understood and impacted by the very population necessary to reach success. I conducted a qualitative evaluation research study that included interviews with individuals who expressed an interest in installing solar technologies at their homes through the HEC's interconnection application program. The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai'i's population of potential solar consumers as they are introduced to new renewable energy policies and the associated electric utility-developed projects. Applying the ACF and the TPB provided the theoretical frameworks for understanding how belief and behavior impacted policy change and comprehension for potential early adopters of solar technologies on O'ahu.

In Chapter 2, I have evaluated and consolidated the literature collected on state-level energy policy goals, their energy policy planning processes, and the relationship

between early adopters of solar technologies and the stakeholders who speak for them at the legislative level.

Chapter 2: Literature Review

Introduction

The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai‘i’s population of potential solar consumers as new renewable energy policies and the associated electric utility-developed projects are presented to them. This chapter provides a comprehensive overview of current and historical literature that comprises the knowledge base of the phenomenon I explored. I reviewed existing research and established a foundation from which thematic trends relative to consumer understanding of energy policy processes and expanded stakeholder engagement and education were extracted. This was done to initiate the investigation into how and to what extent Hawai‘i’s potential solar consumers interact with and understand the state’s RPS. In this chapter, I introduce the theoretical frameworks applicable to my research as well as the research concepts and variables employed as part of the investigative process.

Hawai‘i’s geographic isolation has created an economic and energy imbalance—the highest cost per kWh for electricity in the United States and a majority of its energy mix fed by imported fuel mixes (U.S. Department of Energy, 2017). In 2015, Hawai‘i obtained more than 90% of its energy needs from fossil fuel (U.S. Department of Energy, 2017), and petroleum-dominant mixes have met roughly three-fourths of the state's electricity generation demand over the past 2 decades (Hawai‘i State Energy Office, 2015). This inequitable dependency on nonrenewable energy resources forced the state’s

governor's office to enact one of the most aggressive RPS goals in the country—mandating that 100% renewable electricity generation be achieved by 2045 (RPS, 2015).

The implementation and success of the state's RPS goals are possible but requires collaboration among the three primary actors: the HPUC, the state's primary electric utility provider—the HEC, and early adopters of customer-sited solar systems. The HPUC approves proposed RPS-related projects, the HEC develops economically viable RPS-related projects and programs, and the early adopters of solar technologies are expected to finance the installation of the solar equipment. These installations feed the excess generation into the electric grid and account for a substantial portion of the required RPS generation estimates.

Although Hawai'i's RPS planning process encourages the participation of the electric utilities and policymakers, it lacks the necessary involvement by potential solar consumers. The state's policy process necessitates input from these individuals to determine where inefficiencies or gaps in the policy planning process may occur. With more than 30 states currently mandating some form of RPS goal (Upton Jr. & Snyder, 2015), and Hawai'i's economic and energy future hanging in the balance, there is compelling evidence that participation from potential solar consumers to assess their understanding and comprehension of how and to what extent the state's RPS law will have an impact on them is necessary. The feedback obtained from potential early adopters of customer-sited solar installations may be significant as their energy transition

would have a direct impact on what, if any, renewable generation is provided to the electric grid.

This chapter provides the background and introduction to the phenomenon I researched. In addition to investigating the literature relevant to stakeholder engagement and education, energy policy planning and implementation, and public perception and opinion, this chapter also addresses existing literature related to the theoretical frameworks of the ACF and the TPB. In doing so, core concepts surrounding how traditional policy planning and implementation approaches coincide with planned solar consumer behavior were applied to better frame the findings of this study. Core concepts surrounding the renewable energy planning process, stakeholder engagement representation at local and state levels, and how past researchers have categorized and performed public knowledge studies on energy policy were also assessed to further define the noticeable gap I sought to address. In this chapter, I lay the foundation for a new perspective on consumer input for policy development using knowledge as a critical driver for policymakers in Hawai'i to better formulate future stakeholder engagement and education processes.

Literature Search Strategy

Several library databases, search engines, and government websites were used to access the literature reviewed and historical data collected: the Walden University Library database, the Hawai'i State Legislature, the HPUC's Docket Management System, the U.S. Department of Energy's Energy Information Administration,

BillTrack50, IEEE Xplore Digital Library, and Google Scholar. The main thematic research terms used during the literature review process were: *renewable portfolio standards, renewable energy planning, solar energy, photovoltaics, stakeholder engagement, public policy, public perception, general knowledge, and public participation.*

The search strategies used for this research project involved literature published within the last 5 years and focused on the preexisting consensus relating to energy and general state-level policy planning, stakeholder inclusion and representation, and public perception relating to renewable energy policy within urban communities. Additional research external to these parameters was also investigated to draw comparisons, specifically regarding geographically similar populations and comparable policy requirements.

Theoretical Foundation

Two theoretical frameworks emerged as appropriate platforms from which I evaluated this study: the ACF and the TPB. The nature of both theories involves investigating the behavior, social norms, self-interests, and knowledge bias concerning policy development, change, and adoption. These frameworks provided conceptual themes which helped to solidify the significance of this study.

Advocacy Coalition Framework

Sabatier and Jenkins-Smith first developed the ACF as a means to address wicked (or cross-sectional) problems within the context of public policy (Sabatier & Weible,

2014). These include major social issues associated with policy goal conflicts and technological hurdles that require multilevel government facilitations for successful development and implementation (Cerna, 2013; Sabatier & Weible, 2014). Pierce et al. (2017) posited that the ACF comprises three foundational components: advocacy coalitions, policy change, and policy-oriented learning. Sabatier and Weible (2014) noted that the ACF constitutes a layer of assumptions that feed these primary components: (a) Most policy-making decisions and processes are initiated and controlled by a set of specialists within a given subset of the policy, but these specialists are behaviorally-restricted by the broader socioeconomic and sociopolitical spectrum; (b) individual beliefs are derived from psychological norms; and, (c) digesting multiple views from various actors within a given policy process is easiest when those individuals are segregated into beliefs-based coalitions. Due to the heavy dependence and interest in addressing personal beliefs within the application of the ACF to a policy problem, Cerna (2013) noted that the ACF uses beliefs over interests because it is presumed that one's views can be verified through the use of investigative analyses.

Acknowledging the complexities in applying the ACF to policy-making within modernized societies encourages individuals who wish to embed influence toward policy change to specialize their beliefs to adopt toward the collective policy-making process (Sabatier & Weible, 2014). The ACF can help to explain differences in views that impact policies over a prolonged period and how these beliefs correlate to causality and value within the public policy process (Cerna, 2013). For Hawai'i's RPS goals and its

subsequent dependence on customer-sited solar installations to be successful, applying the ACF to this study served to show how potential changes in solar consumers' understanding of the state's RPS goals may influence their adoption or acceptance of any policy implications associated with Hawai'i's energy future. Through the identification of potential coalitions that comprise representatives of Hawai'i's early adopters of solar energy, there lies an additional level of complexity in providing adequate education and information to inform the individual consumer better. This issue is particularly important given that current coalition memberships appear to be delegated to legislative officials, electric utility representatives, and community leaders, inadvertently minimizing direct input from solar consumers and individuals seeking to understand the RPS process and its impact better.

Advocacy coalitions, according to Cairney (2016), involve elected officials, researchers, and interest group leaders who collectively assimilate to a singular belief system that is determined by their consensus on fundamental core values, cultural assumptions, and policy-related problematic determinants, and who participate in policy development processes through *nontrivial* levels of collaboration. Cerna (2013) pointed out that the beliefs promoted by the advocacy coalitions ultimately hold influence over government officials, especially if these beliefs are in direct support or opposition to proposed policy decisions that could eventually lead to major policy changes. However, critics of the ACF have addressed the fact that the framework invokes vague assumptions regarding interest groups, political parties' participation levels, and decision-making

hierarchies while promoting the need for supermajorities in order to make significant policy changes—negating the influence of external input and involuntary individual understanding and adoption (Sabatier & Weible, 2014). The use of advocacy coalitions may seem to equip local communities better to have representation at the policy level, although policymakers frequently fail to encourage individual involvement from potential solar consumers during the policy planning process. Policymakers often focus on existing members of the solar community who already have established customer-sited solar systems. Because the future of Hawai‘i’s RPS success is dependent on the creation of additional solar generation, community participation in the installation process needs to include those individuals who are interested in customer-sited solar as well. This expanded participation can only occur if future solar consumers are knowledgeable and fluent in the RPS requirements and how they impact customer-sited installations directly (and indirectly). Changes to Hawai‘i’s RPS that considers these potential consumers appears to be lacking, and the policies themselves may not be able to evolve to address changes in consumer interests, behavior, or need.

Policy change through these advocacy coalitions occurs through either internal or external systemic shocks to the coalitions’ beliefs (Cerna, 2013), influencing them to change their stances (or shift coalitions) on a particular aspect of a policy due to new informational advancements or modifications to a governing agency (Sabatier & Weible, 2014). These changes can be minor or major, depending on the level of new knowledge obtained or the degree to which the overseeing coalition entity is disrupted (Cairney,

2016). These changes may also reflect alterations in the coalition's policy objectives and instrumental beliefs (Pierce et al., 2017). Changing a coalition's beliefs or objectives requires, at a minimum, acknowledging the types of beliefs that are being modified and in what way those beliefs correspond to the policy itself. For instance, deep core beliefs are difficult to change as they are developed during childhood and embedded as part of one's cultural affiliation or identity (Sabatier & Weible, 2014).

Policy-related values and secondary beliefs, according to Pierce et al. (2017), may result from a perceived problem that a policy needs to address, and therefore can be modified or changed if alternative pathways or strategies are identified as sufficient options for the policy's success. Hawai'i's need to transition its electric grid from a heavy dependence on fossil fuels to renewable resources is driven by the high cost of energy and the geographic restrictions and limitations of its current grid infrastructure—all magnified by the passing of the state's RPS goals. As the current legislative platform stands, insight into additional frameworks or alternatives that may lead to Hawai'i's RPS success is lost if sufficient education and information is not provided to those potential consumers that will account for the electric grid's renewable energy basis. This gap in understanding may lead to a gap in useful and beneficial policy-related feedback, and could contribute to unnecessary investments, stranded assets, and an inefficient and imbalanced electric system.

For policies to be effectively changed, they must be conveyed to those impacted by them through some level of standardized learning. The policy positions of advocacy

coalitions and their subsequent beliefs that influence those policies are subject to the concept of policy-oriented learning as part of any significant policy change (Sabatier & Weible, 2014). Policy-oriented learning directly affects one's secondary beliefs that then feed into the potential for policy change. The level of policy change, whether minor or significant, centers on an advocacy coalition adapting its existing level of knowledge through the modification of its secondary beliefs due to the introduction of new information (Cairney, 2016). However influential this new information is, the reality of any level of change to existing policies may only be realized through a shift in policy over time (Cerna, 2013). Expansion of existing solar advocacy coalition groups to include future consumers of customer-sited solar can potentially provide insight into what beliefs and levels of knowledge drive future solar consumers to invest in solar systems, inclusive of how those beliefs may shape or modify the future policy positions of the advocacy coalitions themselves.

Application of the ACF to energy policy planning in Hawai'i is useful from a top-down approach as a means to interpret the current state of Hawai'i's energy policy planning process, inclusive of localized community representation as part of the energy policy development process. Previous researchers have shown that a majority of ACF applications have been related to environmental and energy policy contexts due in large part to their complex, multi-layered approach to solving what is commonly perceived to be a significant social issue (Pierce et al., 2017). With Hawai'i's current RPS policies and the lack of potential solar adopters' participation in the RPS design and implementation

process, an evaluation of the ACF and how it feeds into the state-level imposition of the RPS requirements may ultimately guide the policymakers and state legislature to use future solar consumer input as part of the energy policy process in the future.

Theory of Planned Behavior

The TPB emerged as an extension to the TRA due in large part to the inability of the TRA-specific constructs to predict behavior, necessitating the introduction of the perceived behavioral control proponent as a means to determine behavioral intention and attitude (Montano & Kasprzyk, 2015). Initially introduced by Ajzen in 1991, the concept of the perceived behavioral control was developed to correlate one's beliefs with behavior through the facilitation of internal drivers and one's self-perceived social affiliation (Tan, Ooi, & Goh, 2017). For example, one's moral view or obligation can feed into how they will behave within their community to ascertain their level of significance or contribution to that community. This behavior may include investing in renewable energy technologies (e.g., rooftop solar) if an individual perceives the investment to coincide with their community's (or their own) view toward the environment.

Madden et al. (1992) suggested that the TPB extends the limits of the TRA through the inclusion of an individual's beliefs, as they are internally determined in conjunction with the ability to expel those beliefs through a single or multi-faceted behavioral endeavor. This process presents a multi-dimensional impact of one's perception as to whether or not they can act, and whether it is influenced by the effects of

perceived external forces. The function of the TPB establishes a direct relationship link between behavior and human action through the association of these concepts as they relate to one's knowledge, their attitude, and how they intend to use that knowledge (Keller et al., 2016). In other words, the attitudes and perceived level of behavioral control of an individual directly feed into their intention to act (Moradhaseli, Ataei, & Norouzi, 2017). For Hawai'i, this is an important consideration to achieve the state's RPS goals, especially given that a potential solar consumer's knowledge of the state's energy policies and how they directly impact them may play a role in whether the consumer intends to invest in a customer-sited solar system. The state's RPS goals can only be achieved through the continued growth in solar energy generation into the electric grid. This growth is only possible through additional instances in customer-sited solar installations. The knowledge and intended behavior of these potential solar consumers requires an increased level of participation to better understand what their current level of energy policy comprehension is.

The inclusion of solar customers as part of Hawai'i's energy policy development process necessitates a vetted approach from a bottom-up examination of the state's energy policies. This process is required to better gauge the extent of knowledge and understanding these potential participants have of past and present legislative processes within the state. This may then correlate to their beliefs or cultural norms as they perceive them to be within their local communities. As Tan et al. (2017) acknowledged, there have been an abundance of studies performed to date, both nationally and internationally,

where researchers have applied TPB to investigations that sought insight into environmental and energy-efficiency friendly behaviors. The application of the TPB to investigate this avenue of inquiry provides a channel for potential solar customers to offer their insight as it relates to not only the state's RPS goals but also the overall legislative process as a whole. This opportunity creates an opportunity to provide additional information to the current advocacy coalitions involved in Hawai'i's RPS development that can use external drivers, leading to significant policy changes in the future.

Literature Review Related to Research Variables and Concepts

To address the nature of the problem, this section is organized by themes core to examining policy implementation processes and engagement surrounding Hawai'i's economic and energy future. I have organized the review by related ideas: (a) electricity costs in Hawai'i and the high demand on imported fuels; (b) the RPS and renewable energy policy in Hawai'i; (c) public beliefs and knowledge of energy policy processes; and, (d) civic engagement in policy development.

Electricity Costs in Hawai'i and the High Demand on Imported Fuels

The high cost of electricity coupled with the state's geographic isolation have created a need for Hawai'i's governor's office to enact mandated energy policy goals in an attempt to reduce the state's dependence on imported fossil fuel. According to the U.S. Department of Energy (2017), Hawai'i's cost per kWh of electricity averages near \$0.30, virtually three times the national average, making it the highest cost of electricity in the nation. In 2016, the petroleum and coal fuel sources imported to the state accounted for a

combined 80% of the net generation mix (U.S. Department of Energy, 2017). For comparison, Prasad, Bansal, and Raturi (2017) studied the impacts of large fossil fuel dependencies on the Fijian economy and found that the energy imbalance of the island nation was reflected in consumers' high electric bills, even with a large percentage of their energy needs (roughly 45%) met by hydroelectric resources. Although renewable opportunities are being exploited, these high costs are likely due to a technological breakdown in the electric grid's design or functionality (see Wijayatunga, George, Lopez, & Aguado, 2017), or as a result of a lack of policy advancement that would enable additional renewable energy options from being integrated into the electric grid (see Kuang et al., 2016). Much like Fiji, the continued dependency to meet the state's energy needs primarily through imported fuel resources can be attributed to Hawai'i's geographic isolation and noninterconnection to nearby electric grid systems, prohibiting electric energy resources from being diversified and advanced technologies from being used to help stabilize costs.

Existing research on isolated communities often focuses on small island developing states (SIDS), emphasizing their political, social, and geographic isolation as a means to investigate what contributes to their high energy costs. Hawai'i, while not recognized globally as a SIDS representative, can be analyzed using similar techniques due in large part to the parallel demographic, geographic, and economic structures it encompasses. Ioannidis and Chalvatzis (2017) found that previous research on noninterconnected islanded communities showed that electricity diversity was scarce and

impacted local communities' ability to access affordable options for meeting their energy needs. Though this is typically more common with SIDS (Wolf, Surroop, Singh, & Leal, 2016), the application to Hawai'i's current cost of energy demand is appropriate. The similarities between SIDS' and Hawai'i's isolation playing a role in the high import of fossil fuels further emphasizes how important interconnection is to managing electricity costs to consumers where renewable energy investments are limited or expensive.

Hawai'i's electric system comprises four independent electric grids spread among the state's six populated islands. This lack of grid interconnection that is common as part of the U.S. Federal Energy Regulatory Commission's (FERC) interstate sale of electricity and generation on the U.S. mainland has proven to be an ongoing hurdle to reducing Hawai'i's high energy costs. With interconnected transmission systems, mainland utilities can buy and sell excess energy generation from neighboring utility companies within the same FERC region as a means to increase diversity within their energy mix (FERC, 2017). This process keeps costs to the electric ratepayers low while sharing resources among various utilities to help balance the electric grids' reliability. Because of its geographic location, Hawai'i is one of few U.S. populations not currently part of a FERC region, making it ineligible to participate in shared energy resource distribution projects from nearby utilities that would likely have a positive impact on the economic burden currently exhibited by its import-heavy energy resource matrix.

The absence of a FERC membership has led Hawai'i to an unsustainable electricity infrastructure that continues to struggle to meet the state's growing

populations' energy and economic needs. Hawai'i's electricity demand is provided through the Hawaiian Electric Industries on the islands of O'ahu, Maui, Lana'i, Moloka'i, and Hawai'i, while the island of Kauai has an established co-operative electric utility. Although a single electric parent company comprises the majority of the state's energy needs, none of the islands can share energy resources (U.S. Department of Energy, 2017). A bulk of the electricity investment costs are subsidized by the HEC and the state's most populated island, O'ahu, in an attempt to minimize the economic impact to the neighbor islands (Hawaiian Electric Companies, 2016). Much like SIDS, Hawai'i's electricity costs are driven by the rise and fall of imported fossil fuels (Wolf et al., 2016), however, Raghoo et al. (2018) found that, unlike Hawai'i, SIDS lack a balanced energy distribution platform and subsequent policies that would help build out available renewable energy opportunities. Paving the way for future independent grid success, Hawai'i has enacted legislation requiring the Hawaiian Electric Industries and Kauai's cooperative electricity utility to meet specific renewable energy goals by 2045.

The RPS and Renewable Energy Policy in Hawai'i

It is not a new notion that the world's energy demand must be met by renewable resources to sustain the expanding global population's stress on the electricity market. Roughly 90% of the world's energy consumption derives from fossil fuels (Lardizabal et al., 2014). This imbalance of energy resourcing has contributed to the onslaught of heightened carbon dioxide emissions (Upton Jr. & Snyder, 2015) and increased environmental degradation (Lee, Kim, & Lee, 2016). The Organization for the Economic

Cooperation and Development found that in 2010, 50% of the total global emissions resulted from the 36 members who comprise the organization (Polzin, Migendt, Taube, & Von Flotow, 2015). One of the most well-known attempts to counter growing environmental impacts from fossil fuels is the Kyoto Protocol to the United Nations Framework Convention on Climate Change, which was signed in 1997 and committed 141 countries to reducing their greenhouse gas emissions to 5% of their recorded 1990 levels by 2012 (Treki & Urban, 2015). Along with the Kyoto Protocol, Kieffer and Couture (2015) noted that there were roughly 59 renewable energy targets enacted by 164 countries in 2015, a growth rate of more than double since 2005. These global energy policy goals are a result of the nations' leaders acknowledging the serious impact their country's energy demand has had on their populations' sustainability, health, and economic independence.

The global shift toward both acknowledging and addressing renewable energy as a factor in reducing the negative consequences stemming from the continued dependence on fossil fuels has not always been successful. Treki and Urban (2015) noted that many renewable energy targets tend to enforce financial strain on the local economies, often resulting in inefficient or ineffective policies well in advance of any near-term goals. These shortcomings may be a result of a lack of involvement or interest by governing agencies to invoke renewable energy options as part of their overall energy planning and policy processes (Berry, Laird, & Stefes, 2015). Stokes and Breetz (2018) found that current research typically lacks a conceptual view of how renewable energy policies are

developed by varying government organizations, such as the United States, and that this can lend itself toward a failure in market design if such policies are driven by outdated, fossil-fuel interests (Polzin et al., 2015). For renewable energy policies to be successful, it is imperative that existing policy structures be flexible to align with any new technologies or energy sources as the public is introduced to them. There is also a need for transparency to ensure that new policies are adaptable to a population's overall economic, environmental, and energy opportunities.

Economic and environmental degradation are a growing concern as new electric grid infrastructure changes are introduced into the energy landscape. Von Hatzfeldt (2013) found the face of rising energy costs and limited energy resources in local communities drove the surge in the restructuring of existing electric grid planning and energy policies meant to satisfy a population's high demand for energy consumption. Schelly (2016) noted that some renewable mandates are introduced as a means to expand the available distributed generation options (e.g., solar) while simultaneously minimizing the environmental impacts the high energy consumption has levied against the local ecosystem. Solar-produced distributed generation provides many opportunities to take advantage of renewable energy resources that offset the dependence on fossil fuels, and may contribute to a state's renewable energy policy requirements (Byrd, Ho, Sharp, & Kumar-Nair, 2013). These transitions require high economic investment, increased participation in distributed generation projects and programs, and, perhaps, multi-level government support and collaboration.

Federal renewable energy policies are common within most major developed nations as they provide the necessary framework to support localized renewable energy goals. The United States is one of few urbanized societies that does not have a federal renewable energy policy standard in place (Schelly & Price, 2013), even while 13% of its total electricity generation comes from renewable energy resources (Maguire & Munasib, 2016). Instead, each state can enact independent legislation or goals that stipulate the levels of renewable energy generation the state wishes to include into their energy mixes (Kieffer & Couture, 2015). This option can create a complex paradigm where individual states establish their own renewable energy goals while being bound to their respective FERC region's share of available energy resources.

The success of these state-level renewable energy policies is still partially dependent on federal subsidies and FERC affiliations for their successful deployments to help mitigate the investment costs involved with transitioning electric grids from fossil fuels to more renewable energy options (Berry et al., 2015). With no federal standard to conform to, many state-level renewable energy policies fluctuate depending on the appropriateness of the renewable energy resources available to them (Upton Jr. & Snyder, 2015). These RPS goals, initially introduced between 1994 and 2002, require electric utilities to incorporate a certain level of renewable energy generation into the electric grid by a given year (Stokes & Breetz, 2018). These RPS goals are meant to implement state-level regulations that facilitate domestic energy production to reduce emissions further and prolong economic balance within a state (Baran, 2015). As of 2014, 45 states had

instituted some form of a state-level RPS (Nicholson-Crotty & Carley, 2016), with nearly 95% of these states having met their interim goals by 2016 (Barbose, 2016). This success likely came with high financial investment and assistance from their FERC region affiliation that may not be fully realized until the final milestone dates for each respective RPS goal are reached.

Not all states are members of a FERC region and therefore cannot benefit from shared renewable resources typical of multi-state energy mixes. Hawai'i, with its geographic isolation, is incapable of participating in the federal government's FERC program because it is unable to interconnect to any other electric grids. This isolation forces any renewable energy policies enacted by the state, including an RPS, to wholly depend on the capabilities of its local electric utilities to meet the renewable energy generation requirements to be successful. Polzin et al. (2015) found that the high-investment nature and long-term uncertainties surrounding reasonable payback periods for renewable energy projects typically deter outside investors from providing financial support to isolated communities. This lack of funding opportunities then requires all of the financial investments necessary to support the renewable energy generation-related projects to be vetted through the state's ratepayers. The comparison between incurring the actual costs of fossil fuel imports against the investments needed to incorporate additional levels of renewable energy into the electricity mix is often not investigated.

For Hawai'i, the push to incorporate additional levels of renewable energy resources onto the electric grid has influenced the passing of one of the most aggressive

RPS mandates in the United States to-date—100% renewable generation by 2045 (RPS, 2015). Initially introduced in 2002, Hawai‘i’s legislation constructed the state's RPS as a means to reduce the high cost per kWh that electric utility customers pay while also addressing the potential high-levels of renewable penetration and generation opportunities that are possible, specifically customer-sited rooftop solar. With nationwide solar installations increasing nearly 64% in 2010, and annual growth rates averaging 75% as of 2015 (Schelly, 2014), the opportunities for Hawai‘i to take advantage of its solar potential to meet or exceed its RPS requirements appears to be an ideal investment opportunity to address economic and environmental concerns. As the U.S. Department of Energy (2017) noted, the total solar production per capita in 2016 for Hawai‘i exceeded all other states—driving the likely success of reaching its RPS goals through the state’s existing legal and financial opportunities (see Spiegel-Feld, Rudyk, & Philippidis, 2016). It is clear that solar energy is a crucial component of the state's renewable energy goals and plays an integral role in the state’s utilities achieving its RPS obligation.

As simplified as the steps to achieving the state's RPS goals may appear, what is unclear is to what extent early adopters of customer-sited solar installations look to understand Hawai‘i’s RPS policies and their roles in its success or failure. This unknown is especially important given the fact that at the end of 2016, solar energy powered nearly 200,000 homes and roughly two-fifths of the renewable energy generated within the state came from solar energy sources (U.S. Department of Energy, 2017). Having insight into the level of understanding of Hawai‘i’s potential early adopters of customer-sited solar

energy may benefit policymakers and other stakeholders as they progress forward with their RPS goals to ensure that the communities' needs are met within the required timeline.

Public Beliefs and Knowledge of Energy Policy Processes

Achieving Hawai'i's RPS goals will not only require significant infrastructure changes and localized investments (Hawaiian Electric Companies, 2018a), but it also represents a broadened need for increased levels of systematic reviews and public involvement to be successful (see Cowell & Devine-Wright, 2018). As amendments to the state's RPS requirements are introduced and milestone deadlines approach, Hawai'i's policymakers will need to understand local influence and knowledge better to shape future RPS-related projects. This process is increasingly important as it relates to public comprehension and the reasons driving increased interest in customer-sited solar installations (see Merrill & Sintov, 2016). Knowledge dissemination, therefore, requires that potential early adopters' perspectives and their underlying understanding of how their solar installations impact the RPS policies intersect with what is currently a lack of command within the regulatory frameworks that develop such complex energy policies (see Zapata-Lancaster & Tweed, 2014). To continue the growth of customer-sited solar installations, the regulatory frameworks built on the assumption of expanding solar energy generation in Hawai'i need to ensure they are addressing the common gaps in understanding that impact a solar consumer's support of the state's RPS and the related HEC-proposed projects.

Llewellyn et al. (2017) noted that the additional steps for a policy to become successful, such as Hawai'i's RPS, necessitate that localized support extend beyond simply accepting or adopting new renewable technologies—alluding to the need to further include steps by policymakers to provide proper education for long-term policy success. Though there are ample researchers who have acknowledged that public acceptance and awareness are intertwined, they appear to be indifferent to how varying levels of comprehension contribute to supporting and adopting policies (Diaz, Adler, & Patt, 2017). While the adoption of renewable energy technologies (e.g., customer-sited solar) contribute to the state's existing and future renewable energy platform, Hawai'i's current legislative process lacks a cohesive model that supplements present literature with consumer knowledge, inclusive of how such policies and the renewable technologies coalesce (see Wojuola & Alant, 2017). Centered on this complex gap in the current regulatory development process is the method by which existing public opinion polls are generated, and how such information is translated into a generalized representation of the population's interests, comprehension, or needs.

Within the realm of policy research, a common presumption of public opinion surveys is typically categorized by responses that are organized by replies of “don't know” or “no opinion,” clumping them with the “no response” bracket, and inevitably failing to investigate how proper knowledge or education about the given policy may have influenced the response in a different way (Edwards, 2018). Furthering this shortcoming is the apparent lack of addressing the consumer's impact on policy success

or failure, especially given the fact that the consumer's interests may not necessarily align with the desired outcomes of some policies (Sommerfeld, Buys, & Vine, 2017). Freibe, Flotow, and Taube (2014) noted that policies are often enacted without more direct feedback from individuals or groups who would likely play an integral role in the policy's success. Considering this, the clear starting point from which future policies may benefit involves investigating the gaps in understanding that exist between consumers who directly impact said policies and how those policies impact the consumer—a reflexive assessment to see where policies are lacking simultaneous to where consumer knowledge is deficient. With Hawai'i, this is especially important given that the state is highly dependent on the continued growth of customer-sited solar generation to achieve its regulatory requirements associated with its RPS goals. There appears to be a deficiency in the research that effectively investigates how potential early adopters in Hawai'i interpret and understand the state's RPS mandate currently.

Investigating public knowledge of complex energy policies, such as Hawai'i's RPS, will require an elaborate and objective development of content that will necessitate a social construct that works toward extracting the gap in understanding that may exist. Instead of the previously nonsubstantive responses that have driven existing policymaking processes (see Sutterlin & Siegrist, 2017), the comprehension of Hawai'i's early adopter customer-sited solar consumers may provide insight to legislators and the electric utilities alike. This new level of acumen may offer the missing connection that presently exists among renewable energy adoption, consumer support, and long-term

renewable energy policy goals—a significant triad necessary for successful policy implementation (He & Veronesi, 2017). Customer knowledge and comprehension will be fed by specific inherent behaviors that, coupled with the level of engagement that is provided to them during the policymaking process, will likely breed support or opposition (Feldman & Hart, 2018). Potential solar consumers of customer-sited generation serve as the critical group to examine this knowledge and comprehension paradigm because their participation in the HEC’s RPS-related projects is necessary for Hawai‘i’s renewable energy future.

Public Engagement in Policy Development

Previous researchers have shown that limited policy direction and education have contributed to a lack of interest by consumers (Daniel, 2016), and that more often than not, policymakers and stakeholders have neglected the interests or needs of the smaller sects of the population when introducing or planning new policies at a state-level (Adjei-Amoako, 2016). It is often a topic of debate as to whom is permitted to participate in the policy planning process, even when significant social, economic, and environmental issues are at stake (Madero & Morris, 2016). It is unknown to what extent the HPUC or the HEC communicates with potential solar consumers regarding Hawai‘i’s RPS or its related projects. It is also not known to what extent the state's governor’s office promotes or encourages additional educational outreach when introducing or amending renewable energy policies that are enforced by the HPUC and implemented by the HEC. What

knowledge exists, if any, by potential solar consumers of the state's RPS is a necessary avenue that policymakers, regulators, and the electric utility need to investigate.

Current researchers generally agree that knowledge and understanding are often driven by one's beliefs (Wallenborn & Wilhite, 2014)—both of which may be derived by engagement between parties that can lead to changes in beliefs or further understanding. These beliefs may ultimately influence policymakers in support of a state's RPS goals (Stokes & Warshaw, 2017). Attitude drives behavior and can often play a significant role in how one's behavior feeds into their actions toward adopting renewable technologies or policies, according to Lee et al. (2016). With the use of a consumer framework that heavily relies on limited public opinion polls and uses generalized attitude and belief-related responses to feed into the legislative process (Krause et al., 2016), a more expansive engagement progression could work to benefit policymakers, states, and local utilities in their endeavors toward a greener energy infrastructure. Feldman and Hart (2018) found that framing techniques that focus on specific key terms or interests may influence individual perceptions, while Llewellyn et al. (2017) discovered that framing could be realigned to address new information obtained through redeveloped policy strategies. This information may be derived from beliefs that are inherent to individuals, and may only be divulged through personalized conversations or interviews. These conversations could open the door to what knowledge these consumers have and where more information is needed to educate the consumers better to either solidify their beliefs

or amend them to the new information provided by policymakers, regulators, or the electric utilities.

However extensive existing literature is on the topic of renewable energy policies and the associated technologies, there appears to exist an investigative absence into what way knowledge plays a role in driving energy policy from the consumer perspective, according to Dasgupta and De Cian (2018). This gap is commonly associated with legislative processes mimicking national policymaking procedures to accommodate state or localized policy needs, neglecting the inherent differences that arise when populations are accommodated at a national versus a local level (Bertsch, Hyland, & Mahony, 2017). This discrepancy may have driven the way public opinion polls have been developed in the past, leading to insufficient education or understanding by consumers who will play integral roles in the success or failure of the implemented policies. Sutterlin and Siegrist (2017) discussed that in response to failed renewable energy policies in the past, several countries restructured how they introduced these policies, emphasizing the need for flexibility by policymakers for long-term success. While federal-level policymaking has seen changes in recent years, Nurlaila, Yuliar, Kombaitan, and Madyo (2015) noted that the implementation of these policies often remains stagnant with little outreach to or insight from local community groups or representatives. Hawai'i's potential solar consumers' voices may have not been heard, even by the HEC or the HPUC, making it difficult for the state's policymakers to address their RPS goals with a realistic view of how costly or successful these renewable energy policies could be.

Considering the consensus regarding proper policy development would include a level of engagement that acknowledges consumer interests, especially when it comes to renewable energy policies, it is regularly forgotten that effective policymaking requires citizen participation to be successful (Steel, Pierce, & Warner, 2015). Authors of a recent study focusing on Riga, Latvia found that stakeholder engagement that included providing citizens and major organizational groups equal feedback and educational opportunities drove more successful policies that were used to achieve the city's sustainable energy development plans (Ielite et al., 2015). Martin and Rice (2015) noted that maximizing stakeholder engagement, even down to a community or individual level, further drives successful policy planning and implementation. While Michaels and Parag (2016) pointed out that prosumers (i.e., early adopters of renewable energy technologies) represent a major player in the renewable energy policy construct because they are the drivers behind future energy generation, and thus, determine whether renewable energy goals are met. It is evident that policymakers and academia need to establish a foundation from which proper education and outreach can be achieved to create a cohesive pathway for long-term policy adoption and understanding by the communities most impacted (Greco, Locatelli, & Lisi, 2017). To this end, participation from Hawai'i's potential solar consumers may not necessarily be required at the policy, regulatory, or utility level simultaneously, but it is possible that lack of involvement in any one level of the state's RPS implementation could negatively impact future solar consumers' financial or renewable energy interests.

Conclusion

Existing energy policymaking processes in Hawai‘i neglect direct consumer feedback to accommodate what gaps in knowledge, if any, may exist. What this means for Hawai‘i’s RPS goals and its early adopters of solar energy is inherently clear—the state’s existing legislative process is too broadened and based on antiquated procedures, and future solar energy customers may not have adequate knowledge of how Hawai‘i’s RPS goals will impact them directly. Social awareness and localized stakeholder engagement through more vigorous educational platforms may build upon existing policy planning processes to build a more robust renewable energy future. Creating strong comprehension and knowledge may result from increasing outreach and including citizens directly impacted by state-level policies.

Using established concepts, Hawai‘i’s policymakers can learn from early adopters of solar generation through empowering their voices to be heard, further refining existing educational processes, and promoting a more localized support and engagement platform that will drive a comprehensive policy agenda. This localized empowerment and a new sense of engagement have been shown to build public support for complex policies, such as renewable energy goals, in other jurisdictions seeking to invoke more public involvement and support. The findings from this study may build a more complete picture of Hawai‘i’s early adopters of solar energy through their own words, leading to the establishment of better educational options which will fill in the current knowledge gaps they may have about the state’s RPS goals.

Chapter 3: Research Method

Introduction

The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai'i's population of potential solar consumers as new renewable energy policies and the associated electric utility-developed projects are presented to them. To that end, I used over-the-phone and online (Skype) interviews from a representative population of electric ratepayers who met the minimum demographic requirements. The information obtained from these interviews may provide a level of consumer insight that was not previously provided to, nor required by, the state's policymakers, public utilities, or the state's governor's office. This information may result in expanded forms of stakeholder engagement that address potential gaps in knowledge of the state's RPS goals, refocusing the future policymaking processes toward a more consumer-centric platform.

In the previous chapter, I examined the scope of this project through the lens of the related scientific literature published within the past few years. Based on this examination, it is clear that past researchers addressed gauging policy success or failure through stakeholder engagement that frequently neglected the consumer perspective. It is possible that state policymakers felt that consumer representation by elected officials was sufficient to acknowledge localized understanding of the policy process and its implementation impact. There is no clear evidence, however, that any policy-level analysis of Hawai'i's RPS goals have been created to seek where a lapse in education and

information exists at the consumer level. This inadequacy may lead to a potential gap in understanding that has not recognized, and it could contribute to potential solar consumers' inadequate knowledge of their role in Hawai'i's RPS success.

This chapter provides the foundation for the methodology used for the research. This platform includes the research design and rationale, the role of the researcher, and a comprehensive look at the study's methodology (i.e., participant selection, instrumentation, data collection, and data analysis plan). This chapter also addresses how this research tackled the validity of the participants, data interpretation, and any potential ethical complications or biases that may have occurred.

Research Design and Rationale

The purpose of this research was to gain insight into the level of knowledge (and subsequent knowledge gaps) that exist from the perspective of a potential solar consumer regarding Hawai'i's RPS goals. There were two primary research questions established in order to investigate these concepts: (a) What are the predominant perceptions that drive an electric utility customer who plans on installing a solar system at their home to engage with and understand the state's RPS process in Hawai'i, and (b) how does a potential solar consumer perceive Hawai'i's three main RPS stakeholder groups (the HPUC, the HEC, and the governor's legislative office) relative to engagement and interaction during the solar program application process?

I used a qualitative evaluation research approach which helped to identify the gaps in knowledge of Hawai'i's RPS policy through one-on-one interviews. Seale (2007)

noted that the inclusion of consumer perspectives in the analysis of policy success or failure has contributed to the need for more stakeholder engagement within qualitative evaluations that specifically concentrate on the consumers' insight. Luton (2010) found that planning, organization, engagement, respect, clear analytic techniques, and proper presentation are the key factors that feed into a qualitative research approach. With these conditions in mind, the application of a qualitative methodology was appropriate for this study as it aligned with the basic concepts that qualify for this type of methodology. This alignment involved the experiences of the individuals interviewed, which was based on their perspectives and beliefs (see Ngozwana, 2018). I sought those beliefs as a means to interpret their level of understanding of the complex energy policies in Hawai'i.

According to Van den Berg and Struwig (2017), qualitative research seeks to explain that which is not immediately known, which is what this study evaluated in regards to how fluent potential solar consumers are about the RPS policy that directly relies on their continued solar energy system investments.

The alignment of the main research questions presented above with an evaluation research approach that used first-person accounts to extract the necessary gaps in understanding served as the foundation for this study. The use of qualitative evaluation studies is often associated with providing opportunities for localized and contextual points of view because the information collected is heavily dependent on stakeholder perspectives (Balmer, Rama, Martimianakis, & Stenfors-Hayes, 2016). The primary goal of a qualitative evaluation study is to apply human thought and response to how a

program or policy impacts them (Rubin & Rubin, 2012), which can provide accountability and advocacy for potential improvement of said program or policy (Ravitch & Carl, 2016). As more emphasis is given to the individual experience, a better understanding of to where and to what extent this insight will provide to the larger spectrum becomes part of the in-depth analysis of the major research problem—a key component of a successful qualitative investigation (Korstjens & Moser, 2017). My goal for this research was to ascertain where gaps in understanding from potential solar consumers exists as they relate to Hawai‘i’s RPS mandate. The use of a qualitative evaluation was the most appropriate means in which this information would present itself. The application of a qualitative evaluation approach for this research investigation may provide an opportunity to inform policymakers about a new avenue for strategic alignment that acknowledges individual consumer needs in context with the state's RPS policy goals, driving more successful policy implementations in the future.

Role of the Researcher

My role was to extract insight from the study’s participants in hopes of collecting previously unknown themes that represent their level of knowledge (or gaps thereof) relative to Hawai‘i’s RPS goals. My goal was to ascertain what the subsequent drivers were that have steered potential solar consumers toward adopting RPS-related technologies. My role was paramount in gauging my interactions with potential study participants to determine how these interactions may have been influenced, and to determine to what extent triangulation was needed to ensure the validity of the results and

the data collection strategies (see Hyett, Kenny, & Dickson-Swift, 2014). Tuval-Mashiach (2017) argued that although the researcher may perceive himself or herself exterior to the study participants they are interviewing, they must acknowledge that their presence alone embeds them within the context of the study's subjects. This assimilation ultimately requires that, regardless of the researcher's participation, they need to recognize their potential influence and address it throughout the process accordingly. Though my interaction with this study's participants was perceived to be objective and outside the scope, I endeavored to take the necessary steps to ensure that the interviews, data collection, and analysis were as free from bias as possible. I also put forth the effort to ensure that the interview questions were nonleading so that the participants' responses were as true to their interpretation of the context as possible.

To develop a cognitive, unbiased set of standardized interview questions that did not lead the study's participants in any particular direction, I provided a preliminary copy of what I planned to ask to a few nonparticipants to assess: (a) whether the questions were easy to understand; (b) whether the questions led a response in a particular direction; (c) whether the questions required additional knowledge that the participants may not have; and, (d) whether any language was outside the scope of the research. The triangulation of this subject matter helped me to refine the interview questions better to ensure that the study data were concise and appropriate. Given that as a qualitative researcher I can influence the research process (see Korstjens & Moser, 2017), I

consciously worked to ensure that I did not inadvertently misconstrue or mislead any participants during the interview process.

Methodology

I investigated the level of knowledge of Hawai‘i’s energy policies through the perceptions of potential solar consumers living on O‘ahu. I focused on their interactions and views of the three main RPS stakeholders relative to the state’s RPS goals and the subsequent solar projects. Participants in my research were 17 individuals between the ages of 25 and 55 who had begun their solar program application process but had not yet received approval to install the equipment at their homes.

Participant Selection Logic

Homogenous sampling of Hawaiian residents, who were between 25 and 55 years old, who were the primary account holder for their residential monthly electric bill, who spoke English (although it did not have to be their primary language), and who lived on the island of O‘ahu were screened-in using an online demographic screening questionnaire. The selected participants were also prohibited to work for or be contracted to work with the state’s governor’s office, the HPUC, or the HEC (including as a consultant or advisor). These stipulations were necessary because my goal was to obtain feedback on the state's RPS goals from individuals who were not privy to its development, implementation, and impact.

The technique for finalizing the sample size of the potential participants required a three-step process to confirm the validity of the data results. As Malterud, Siersma, and

Guassora (2016) pointed out, this triad of sample size evaluation includes: (a) initial planning prior to the start of the study; (b) assessment during the study to determine if saturation is met; and, (c) a final check to confirm if the sample size and saturation level is adequate for the study's purpose. Because of the interpretive nature of this research, the sample size was relatively small compared to the total population of potential candidates (see Ponelis, 2015). The group size was 17 participants. Saturation determined that this was a sufficient number of individuals needed for the data collection. Additional outreach was not needed, so snowball sampling was not used to recruit more candidates.

Individuals interviewed have added to the unknown variables that feed potential solar consumers' understanding of state-level RPS goals. Weis and Willems (2017) pointed out that it is essential that a solid selection process and adequate representation of the population is used to ensure the data the study provides will manifest valid, generalizable results. Additional participants could have been selected through the use of snowball sampling as a means to obtain additional volunteers and local participation. The use of the snowball sampling technique would have allowed this study to gain additional involvement through recommendations from others who may be from the same communities or background (see Ngozwana, 2018). Because Hawai'i's communities are close-knit and culturally insular, the use of snowball sampling would have proven beneficial to this research, had it been needed, to help gain access to individuals who may have otherwise not been interested in speaking with me.

The setting for the interviews was originally planned to take place in a private conference room space at the hotel I was staying at in Honolulu on O‘ahu. Due to adverse weather and scheduling limitations of the participants who were screened-in, all of the interviews were conducted over-the-phone or online (Skype) over a 2-week period. Each interview lasted no more than 45 minutes.

Instrumentation

I based this research on a study performed by Carr and Bradley-Levine (2016). They applied an evaluation research design to a qualitative study where they investigated the effectiveness of an elementary school program in a large Midwestern city of the United States. The authors served as external, independent evaluators of the program, interviewing the school's faculty and parents, to determine the level of involvement with the development of the school's curriculum and their perceptions of its effectiveness. The researchers' findings emphasized the need for inclusiveness and expanded stakeholder engagement with individuals beyond the faculty or school board members who implement the school's programs, to include parents and students who will have a direct impact on the success or failure of the program.

The general concepts derived from Carr and Bradley-Levine's (2016) study guided me in the development of the interview questions that were used for my research. I served as the instrument, which required me to interview all participants and analyze their responses. Within qualitative studies, it is the responsibility of the researcher to provide evidence that whatever instrument is used as part of the study be consistent

throughout the process, so that the instrument used will give the same results if the study were to be duplicated (Frankfort-Nachmias, Nachmias, & DeWaard, 2015). The interview protocol used for this study, including the interview questions that were asked of each participant, are provided in Appendix A.

The researcher is also required to methodically assess any potential biases or skillset shortcomings throughout the process to avoid undermining the quality of the final study (Ravitch & Carl, 2016). With this in mind, my role as the primary instrument necessitated that I remained objective as I spoke with the participants during the interview process, focusing on their output and interpreting it with as little prejudiced inference as possible. While I served as the primary instrument for this research, phone and online interviews served as the main method by which gaps in knowledge toward Hawai'i's RPS goals were collected. Moser and Korstjens (2018) showed that interviews involve a relationship between the researcher and the participant, whereas the two individuals interact in a direct, personal manner in an attempt to engage in semistructured conversations. The direct interactions with each participant allowed me an opportunity to collect valuable insight and perceptions directly to better vocalize their understanding of the state's RPS goals, with the hopes that it will help to restructure future policies or policy development processes.

The application of Ajzen's (1991) TPB within the context of this study's instrumentation methodology was most appropriate given that the true reasons (or beliefs) that are driving Hawai'i's potential solar consumers' to install PV systems at

their homes may not be known to the state's policymakers, the HPUC, or the HEC. The questions created as part of this study aligned with Ajzen's (2006) suggested construction of a TPB-oriented protocol, whereas the behavioral outcomes of solar consumers were investigated based on their interactions with the state's governor's offices, the HPUC, and the HEC, to determine where gaps in educational outreach or policy understanding may exist. These gaps were further evaluated based on salient responses in open-ended formats to allow for a flow of information that was free of inadvertent influence frequent of multiple-choice questions.

Alignment of the interview questions' TPB-structure with a small representation of the solar consumer population in Hawai'i established the bi-directional basis from which the ACF and the TPB were applied to better understand the phenomenon that was the focus this research. The beliefs and knowledge that the participants held regarding the state's RPS may be subject to modified behavior or planned avoidance in future RPS-related projects should they feel their role in the policy process is inadequate or undervalued. Application of the ACF provides an opportunity to have beliefs and knowledge changed within a given coalition group, while the TPB establishes an opportunity for a coalition group's behavior to drive their future decisions or planned RPS-related participation. With both of these frameworks in mind, I sought to assess the levels of knowledge of Hawai'i's RPS by potential solar consumers simultaneous to their perceptions of how the three main actors of the RPS policy process educate and interact with them.

Procedures for Recruitment, Participation, and Data Collection

In advance of the phone and online interviews, participants were recruited through social media campaigns and in collaboration with a Hawai'i-based, local research organization. Kelly, Margolis, McCormack, LeBaron, and Chowdhury (2017) noted that qualitative studies should include a diverse representation of a population's demographic but should focus on a specific sect that is relevant to the study. To accommodate this, I recruited participants through online advertisements posted on social media sites (i.e., Facebook and Twitter) and by accessing the available participant pool provided to me through my agreement with the local research organization. The use of the local community research organization provided an opportunity for me to reach individuals that may not come forward through the social media platform alone.

Prior to participating in the interviews, each respondent was required to complete an online demographic evaluation form to confirm they met the minimum requirements to participate. These requirements included: (a) the individual had to be between 25 and 55 years of age, (b) they had to reside on the island of O'ahu, (c) they had to be head-of-household and able to make major financial decisions, (d) they had to have begun their solar program application process but have not yet installed any equipment, (e) they had speak and understand English, and (f) they could not have been employed by or contracted to work with the HEC, the HPUC, or the state's governor's office at the time the interviews took place.

The goal of the interviews was to allow participants to provide open-ended responses. Only one interview was required for each participant. All interviews were recorded, and notes were taken during the interviews to collect any additional feedback that may not have translated through to the tape recordings. Following each interview, participants were provided \$40 each in compensation for their time and contribution. This payment was handled by the local research organization to accommodate the phone and online interview schedules. None of the individuals who responded to the social media recruitment ad were screened-in as eligible to participate in the study.

Data Analysis Plan

I disseminated the interview data and found that they fed into the research questions and the overall purpose for the research topic. Qualitative data analysis requires inductive reasoning skills to interpret and aggregate raw data into thematic sets as a means to infer the responses provided (Wildemuth, 2017). Moser and Korstjens (2017) noted that analysis of qualitative data is complete upon saturation, that is, the point in which participant responses begin to correlate with one another and do not provide additional insight to the questions presented. For each of the participants' responses, I recorded the answers and took notes as well. I transcribed each conversation and applied coding mechanisms for specific themes that arose both during and immediately following each interview. These transcriptions and coding procedures assisted me in the data aggregation and saturation assessment processes necessary to complete the qualitative analysis procedures.

The coding mechanisms that were appropriate for this study incorporated a mixture of magnitude, evaluation, and simultaneous coding processes. Combining the frequency of certain words or themes derived with the potential for the study's participants to provide their perspectives of Hawai'i's RPS policy justified the application of both magnitude and simultaneous coding for this study (see Saldana, 2016). Saldana (2016) stated that research structured as a qualitative evaluation study might use techniques directly associated with evaluation coding, aligning with the need to address how policies or programs are perceived or understood by those they directly impact. This stipulation is particularly significant given that the outcome of the participants' responses may be leveraged by future studies or by policymakers to determine the effectiveness of the state's RPS planning and implementation processes.

To assist in the assessment of the qualitative data analyses for this study, I used the Atlas.ti qualitative data analysis software. The use of software can help to organize and structure the coding mechanisms to better shape the aggregation and analysis processes (Moser & Korstjens, 2018). Ponelis (2015) found that although there are a variety of options for content and data analysis within qualitative studies, it is up to the researcher to ensure that the process used is well-organized and methodically structured so that the validation of the data aggregated is explicit. The use of Atlas.ti did not exclude the need for the interview data and transcriptions to be prepared independently but was helpful so that I was able to familiarize and interpret the responses as an initial analysis pass-through. This collective process by which the interview responses to the

questionnaire were analyzed helped to further confirm the validity and quality of the research.

Issues of Trustworthiness

Credibility

A qualitative study requires a level of trustworthiness to validate the results. Concurrently, the core concept surrounding trustworthiness is the ability by which the credibility of the research can be verified and found worthy of studying (Levitt, Motulsky, Wertz, Morrow, & Ponterotto, 2017). For example, Jonsen, Fendt, and Point (2018) noted that the researcher's process throughout a qualitative study needs to incorporate a high degree of authenticity to achieve credibility.

The use of triangulation, member checking, or participant debriefs can help to establish credibility, thus validating the data collection methodology and analysis process (Ravitch & Carl, 2016). The use of preinterview transcript triangulation with a test sample of nonparticipants assisted in the ongoing efforts to achieve credibility of the results for this study. With the use of measures to support credibility, the findings may provide the foundation for future research on this phenomenon.

Transferability

The findings of this study will contribute to the existing literature and provide an opportunity for future research that is interrelated. Because the goal of qualitative research is not to establish a generalization of data based on a small population (Ravitch & Carl, 2016), this research did not solve the knowledge gaps between Hawai'i's local

communities and the state's policy planning processes. The data collection process and methodology applied to this study comprised of assumptions to ascertain a baseline for the demographic population selected (Frankfort-Nachmias et al., 2015). The findings and application toward future studies can be considered generalizable—to an extent—and will provide a level of dependability for future research investigations. Transferability of this research was supported through the use of proper instrumentation and alignment of the research questions. This allowed for open-ended responses that added to the existing level of comprehension Hawai'i's policymakers may have about the state's solar community's education and engagement level.

Dependability

To address the dependability of this research, each step of the study processes has been articulated to allow future researchers to replicate the study to gauge their results or to deliver new information. This includes how the interview participants were recruited, copies of the interview questions and how they were triangulated before the formal interviews to verify validity, and how the themes were established from the participants' responses to create the gaps in knowledge sought by this research.

Confirmability

Qualitative studies, similar to quantitative and mixed-methods studies, require that the data can be validated and verified. In doing so, the data collected and the process by which it is disseminated demand a level of scrutiny through the application of quality assurance techniques (Van den Berg & Struwig, 2017). Although qualitative researchers

are not expected to seek complete objectivity, researchers are expected to incorporate a level of bias acknowledgment while remaining as neutral as possible throughout the investigative process (Ravitch & Carl, 2016). The use of multiple methods to achieve confirmability, such as debriefing with participants following interviews to confirm interpretations, allows for a heightened level of validity of the results (Frankfort-Nachmias et al., 2015). I achieved confirmability for my findings by intrinsically providing details that are replicable for future investigations, such as copies of the interview questions and recruitment strategies used. This layer of validation helped guide my findings toward a more objective and honest representation of the participants' responses, contributing to more ethically balanced and trustworthy results.

Ethical Procedures

The anonymity and confidentiality of all participants of this study were and will continue to be protected. Due to my direct interaction with interviewees, I was aware of and accepted that these interactions could lead to emotional or involuntary responses during the interviews (see McClelland, 2017). I was conscious of the potential impact this study may have had on interviewees (see Frankfort-Nachmias et al., 2015) as well. While I did not anticipate any inadvertent negative implications for those who participated, nor any negative pushback resulting from my participation, I was mindful of accommodating those potential ethical situations had they occurred.

To better address potential conflicts or ethical issues, I sought approval from the Walden University Institutional Review Board prior to collecting any data (Approval

#06-04-19-0270462). This screening included the use of a consent form which each participant was required to digitally sign. Equal and ethical representation of all participants was guided by these documents, as well as throughout the entire interview process and analysis. These steps will continue through to publication of the study and until all data collection information is destroyed.

Participation was voluntary, and interviewees were permitted to withdraw from the study if they chose to do so. I provided an opportunity for individuals to contact me by phone or email at any point during the screening, consent, and data collection steps. No individuals reached out to me with questions. I recruited participants through online social media platforms and a third-party, nonaffiliated community research organization as a way to engage with locals through recognizable means. The organization was reputable and only provided me access to its participant pool as an outlet to engage with potential interviewees. The organization was not involved in the interviews, data collection, transcription, analysis, or any writing relating to a description of my findings.

The data collected from the interviews, including any notes taken and audio recordings, have been kept confidential, and all hard copies will continue to be stored in a locked filing cabinet in a secured office at my home. All digital versions of the data collection and aggregation will remain stored on my laptop, which requires secured authentication to access. I will continue to retain all files, hard copy and digital, for 5 years. At the end of the 5-year term, I will delete all data and pertinent information through both physical and digital shredding processes.

Conclusion

The purpose of this qualitative evaluation research was to obtain insight as to the level of knowledge potential customer-sited solar generation consumers have regarding Hawai'i's RPS goals, inclusive of its current policy requirements and the subsequent impact these requirements may have on this specific set of consumers. Participants were recruited through online social media platforms and through a local nonaffiliated community research organization. I reached saturation with 17 participants.

Participants were required to complete an online demographic screening form and digitally-signed an adult consent form before participating to ensure they met the minimum requirements and agreed to the terms to volunteer. Although no conflicts of interest were expected from the participants or myself, all measures were taken to ensure that those who participated were forthcoming in their demographic evaluations to confirm they were not employed by nor contracted to work with any of three actors that have direct input in Hawai'i's RPS policies. All participants were treated with the same level of ethical respect, and all information relative to demographic identifiers and interview responses have been and will continue to be stored in a secure location. Data collected will be kept for 5 years following the completion of my dissertation, after which it will be deleted permanently to further protect the participants' information.

Chapter 4: Results

Introduction

The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai'i's population of potential solar consumers as new renewable energy policies and the associated electric utility-developed projects are presented to them. A majority of researchers that have explored consumer views of state policies tend to rely on the use of predetermined response mechanisms seeking to gauge the level of interest rather than the level of understanding. Little research has been done that takes into account that an individual's response to a question about policy may be influenced by their comprehension of what that policy means and how it will impact them. As a result, the information that is derived from many of these studies lacks a foundational capacity to be adequately translated so the various stakeholders, including local communities, can become informed of the policy and its implications (Martin, Mullan & Horton, 2019). My research provides an opportunity for Hawai'i's governor's office, the HEC, and the HPUC to be aware of the potential improvements in outreach and educational materials that may improve local consumer support of the state's RPS policies in the future.

I attempted to fill a void in the scientific literature by addressing the potential gap between Hawai'i's RPS policy development and its implementation, and the potential solar consumers who are necessary for its success. The research questions were: (a) What are the predominant perceptions that drive an electric utility customer who plans on

installing a solar system at their home to engage with and understand the state's RPS process in Hawai'i, and (b) how does a potential solar consumer perceive Hawai'i's three main RPS stakeholder groups (the HPUC, the HEC, and the governor's legislative office) relative to engagement and interaction during the solar program application process?

In this chapter, I describe the processes for participant recruitment, how the data collected were obtained, stored, and analyzed, and the verification steps used to ensure trustworthiness and ethical compliance.

Participant Recruitment

Potential solar consumers without PV systems currently installed at their residences were the subjects of this study. These individuals represent the transition population between consumers who now have PV systems installed at their homes and those who do not but who have shown an interest in PV through the submission of the required solar program application with the HEC. With nearly half of the current percentage of renewable energy coming from customer-sited solar installations on O'ahu, the continuation of PV investments and installations by the HEC's customers is necessary to meet the state's RPS goals by 2045 (Hawaiian Electric Companies, 2018c). To ensure that customer-sited solar growth continues, these potential solar consumers' role in the success of the RPS necessitates that policymakers and solar program developers provide educational information about the RPS that caters to consumer behavior.

A local research organization was contacted to request access to their volunteer participant pool to broaden the scope of potential interviewees eligible to participate in

this study. A final agreement with this organization established that they would send out a study notification email to their participant pool network and direct individuals interested in learning more about the research to access an online link to the demographic screener and adult consent forms that were hosted on a SurveyMonkey site. This provided interested individuals with more information about the study and an opportunity to complete the online screening form to validate their eligibility to participate. There was also information provided for those interested to contact me directly with any questions. No participants contacted me with any questions prior to or following each of the interviews. A simultaneous recruitment effort was used through social media which provided a link to the online demographic screener and adult consent form. Both methods afforded the best opportunity for recruitment given that the study focused on individuals living in Hawai'i, where I did not reside.

Both study notification outreach methods were sent on the same day, and over 67 respondents completed the online demographic screener and adult consent form within 24 hours. The eligibility requirements were built into the metrics designed for the SurveyMonkey site, and the responses received filtered out all but 17 respondents as eligible to participate in the study. Arrangements were made for the interviews to be conducted conveniently for the participants, and included options for in-person, over-the-phone, or online (Skype) to accommodate the schedule, transportation, or accessibility needs of the interviewees.

For those participants interested in face-to-face interviews, accommodations were flexible and offered an option to use an available business center meeting room space at the hotel where I stayed on O‘ahu. To avoid any misconstrued notion of the role that the local research organization played, I avoided using space at the organization’s offices and decided to use a business center meeting space at the hotel that provided privacy and a neutral setting. This confirmed that there were no personal or organizational influences toward the participants or their perceptions at any point during the interviews nor the analyses of the data collected. This same inference was derived with individuals who opted for over-the-phone or online participation as well, as they were able to complete the interviews in a setting that was convenient and comfortable for them.

Data Collection

A total of 17 participants were interviewed. The study was conducted over-the-phone and online due to the schedule availability of the participants and adverse weather on O‘ahu the week I was in Hawai‘i. Each interview lasted approximately 45 minutes, and the entire series was completed over 2 weeks. Each participant was screened-in through the SurveyMonkey site and digitally signed an adult consent form before the interview to confirm their eligibility to participate in the study. The criteria required that the participants lived on O‘ahu, were head-of-household where they made the financial decisions for the home, were between the ages of 25 and 55 years, were able to speak and understand English, and were not employed by or contracted for work with the HEC, the

HPUC, or the state's governor's office at the time of the interview. All individuals who were screened-in and digitally signed the adult consent form were interviewed.

Participants were provided the option to download a copy of the adult consent form when they digitally signed it and to ask any questions before moving on to the interviews by emailing or calling me. Each participant was compensated \$40 after the interview was completed by the local research organization that provided access to its participant pool. This was done to accommodate flexibility in the study location and data collection process to accommodate the participants' schedules.

The interviews were immediately transcribed after taking place, and the notes, transcripts, and other materials have been and will continue to be stored on a password-protected computer with encryption enabled. Hard copies of all transcripts, notes, and associated materials have been and will continue to be stored in a locked file cabinet in my home office. Transcripts were coded using Atlas.ti software with the password protection enabled for further security reinforcement. No identifying information, other than the digitally assigned numerations that coincided with each respondent's screener and signed adult consent form, was associated with any of the transcripts or supporting material

Demographics

Using homogenous sampling, 17 individuals were interviewed. Of the 17 participants, four had solar water heater panels installed, one lived in a multigenerational home, one lived in a townhouse where solar installations were permitted, and 15 lived in

single-family residences. One participant began the HEC solar program application process within 1 month of the interview, seven participants began application process within the last 12 months of the interview, five began the process within the last 5 years of the interview, and four were not sure exactly when the process began. No names were requested nor were any offered. Each participant was assigned a unique digital identification number which coincided with their submission through the SurveyMonkey site.

- Participant Number 1, lived in a single-family home and began the HEC solar program application process less than 12 months before the interview.
- Participant Number 2, had a solar water heater panel installed, lived in a single-family home, and began the HEC solar program application process within the last 5 years prior to the interview.
- Participant Number 3, had a solar water heater panel installed, lived in a single-family home, and began the HEC solar program application process within the last 5 years prior to the interview.
- Participant Number 4, lived in a single-family home and began the HEC solar program application process within the last 5 years prior to the interview.
- Participant Number 5, lived in a multigenerational home and began the HEC solar program application process less than 12 months before the interview.
- Participant Number 6, lived in single-family residence and began the HEC solar program application process less than 12 months before the interview.

- Participant Number 7, lived in a single-family residence and began the HEC solar program application process within the last 5 years prior to the interview.
- Participant Number 8, lived in a single-family residence and began the HEC solar program application process less than 12 months before the interview.
- Participant Number 9, had solar water heater panels installed, lived in a single-family residence, and was unsure when the HEC solar program application process began.
- Participant Number 10, lived in a single-family residence and began the HEC solar program application process less than 1 month before the interview.
- Participant Number 11, lived in a single-family residence and was unsure when the HEC solar program application process began.
- Participant Number 12, lived in a single-family residence and began the HEC solar program application process less than 12 months before the interview.
- Participant Number 13, lived in a single-family residence and was unsure when the HEC solar program application process began.
- Participant Number 14, lived in single-family residence and began the HEC solar program application process less than 12 months before the interview.
- Participant Number 15, lived in a single-family residence and began the HEC solar program application process less than 12 months before the interview.

- Participant Number 16, lived in a townhouse where solar installations are permitted and was unsure when the HEC solar program application process began.
- Participant Number 17, lived in single-family residence and began the HEC solar program application process within the last 5 years prior to the interview.

Data Analysis

The interview transcriptions were analyzed by applying a two-tier approach. This approach of thematic analysis included both inductive and deductive processes. The deductive process provided the overarching development for the coding bracket that separated the participants' responses into two distinct categories: RPS policies are known or are not known. These categories were established to align with the main purpose of the study to ensure that the participants' responses answered the research questions appropriately.

The inductive analysis served as the subtext for each interview question, whereby the codes applied to each of the participant's responses were a reflection of the terminology or phrasing they used. Because the goal was to gain direct insight into the perceptions of a potential solar consumer's interpretation of Hawai'i's RPS policies, the application of an inductive process promoted this through analysis of the participants' words using magnitude, evaluation, and simultaneous coding (see Ravitch & Carl, 2016). Simultaneous coding was applied during each interview, while magnitude and evaluation

coding were completed after all interviews were done to find common generalized responses or words to help consolidate the final code list.

Following these initial coding and analyses processes, the code list was further narrowed to minimize each respondent's answers to one or two words that best encompassed their tone and perception toward each interview question. This step also helped with locating redundancies among participant answers that signaled similar perceptions for each question. This two-tier approach established the foundation from which themes and concepts began to emerge through the identification of their recurrence within the participants' responses (see Maguire & Delahunt, 2017). An additional step of dissemination of the participants' responses helped to further solidify the four main themes that evolved as part of the analysis of the data collected. These included information sources, stakeholder interactions, PV installation barriers, and RPS shortcomings. Summation of the findings was the final step in the data analysis process of the study.

Evidence of Trustworthiness

During and upon conclusion, transcription, and analysis of the interviews, the verification process was completed. The study findings were authenticated through the application of several methods. For participant validation, I ensured that I remained consistently engaged with the participants throughout the interview process. I was also consistent in how I would code each of the responses, both during and after the interviews, to reaffirm that the answers were a reflection of each participant's views. As

the data collection progressed, the interview questions were triangulated to identify the emergent themes and to establish points in which saturation was reached, as recommended by Ravitch and Carl (2016). No additional interviews were needed as data saturation was reached with the initial screened-in participant group.

To avoid inadvertent bias or subjectivity into either the data collection or analysis, bracketing was applied. I neglected my perception and understanding of the research topic to truthfully describe the participants' views. I was objective, nonjudgmental, and strived to not influence any of the results or findings through the lens of any of my personal bias or experiences. I did not apply any preexisting assumptions about any participant's perceptions or knowledge, and endeavored to convey their views directly from the words and responses they provided. My role was to listen to their answers and I provided only clarifying context as long as it did not influence their responses toward a specific theme.

Study Results

The purpose of this research was to determine the level of understanding, and the subsequent drivers that provide the knowledge base for Hawai'i's population of potential solar consumers as new renewable energy policies and the associated electric utility-developed projects are presented to them. I also sought to investigate the views of the three main RPS stakeholders as it relates to their conveyance of information about both the RPS policy they enacted and the subsequent solar programs that are needed for the policy's success. Each participant was provided the opportunity to express their

perceptions openly and freely. The themes below were derived from the responses each participant provided through the process of thematic analysis.

RPS Comprehension

According to Reidenberg, Breaux, Carnor, and Fench (2014), policy narrative is complex, long, arduous, and rarely ever read through its entirety by anyone outside of those who authored it. Interest in policy success or failure has grown in recent decades due in large part to the readily available resources of online information. Wu, Ramesh, and Howlett (2017) found that general competency of public policies directly impacted the capacity in which such policies would be successfully implemented by the governing agencies involved. For Hawai'i's RPS to be successful and for it to meet the required renewable energy goals by 2045, continued public support and integration of additional levels of customer-sited PV systems are necessary. With little research done that has investigated the relationship between policy knowledge and consumer understanding, whether the state's RPS goals are achievable remains unknown as long as potential (and future) solar consumers continue to be ill-informed of what the RPS means and their role in its success. When asked about their perceptions of Hawai'i's RPS goals, the participants' responses conveyed an abundance of misinformation or an overall lack of education.

Limited knowledge. While several of the individuals interviewed expressed a lack of familiarity with Hawai'i's RPS, two participants were aware of what the renewable energy goals were and that the HEC was responsible for meeting these goals.

Participant 3 noted that while they were not familiar with the RPS mandate, they assumed they were, “beneficial to the residents and the environment” of Hawai‘i. Participant 17 was the most informed of all of the participants, and commented that the state’s RPS required, “100% by 2045. The standard is great, but is it realistic? There are a ton of renewable projects—solar, wind, geothermal—but are we doing enough?”

For the several participants who admitted to being unfamiliar with the state’s RPS goals, they had specific views about what they believed it represented. Participant 1 perceived the policy to be related to tax incentives for solar customers, noting, “The incentives are there but compared to other states that give a sales tax break on the purchase of systems, Hawai‘i should provide the best incentives and advertise the goals better.”

Participant 10 mirrored this perception of the RPS and its connection to available tax incentives, while Participant 6 stated that, “I think we could do better.” Participant 7 called it “ridiculous,” and Participant 8 felt that the RPS was “overreaching,” connecting it with a political preference, and continuing, “The Democratic Party makes goals that are achievable.” None of these individuals were aware of what the goals were or what role the HEC’s available solar programs played in meeting the RPS goals in the long-term.

One of the more negative perceptions of Hawai‘i’s RPS goals was conveyed by Participant 16, describing the RPS as “poor,” adding that, “It seems only the newer built homes are solar-ready. We who have older homes are pretty much left out. Seems too expensive to start from [the] ground up to install panels.”

Disconnect between goals and the RPS. Of the two participants who expressed familiarity with the RPS requirements, only one was clear on the percentage of renewable energy generation needed to be produced by the HEC and the timeframe it was required within. Participant 14 acknowledged that the RPS, “endures that the HEC provides a percentage of renewable energy,” but was not clear on what the timeframe was for this goal to be accomplished. All but four participants were forthcoming in that, even after being briefed on the goals of the RPS, they were not aware that the RPS and the state's renewable energy goals were synonymous.

Information Sources

Previous researchers have discussed how self-learning or education obtained through indirect means influences individual views or perceptions about a given subject. Albright (2017) investigated the impact of third-party information gateways and how they played a role in determining individual perceptions of fact-based versus trend-based information dissemination. Bonk and Lee (2018) expanded upon this concept by dissecting how individuals self-learn, and the impact of this process on their ability to digest complex topics. Both studies’ authors recognized that many individuals require quick answers to complex questions, and that they often seek insight from their own interpretation of the facts or through the interpretation of others who appear better informed.

Participant 4, when speaking about their knowledge of the available solar projects at HEC and information on the state’s RPS, commented,

I've seen or heard the various ads in print and media, as well as at some physical locations (e.g., banks). My perception of the governor's office is that it has not done much to promote residential solar, other than to acknowledge the legislature's goal of 100% renewable by 2045.

This person acknowledged that they obtain their information on both the available solar projects and the RPS primarily through print and media ads.

Participant 17 confirmed that although they obtained their information on the RPS through third-party agents, such as "Hawaiianenergy.com or DBEDT," they were not clear or confident that the goals are attainable:

There is little to no education about the state's energy goals and policies. Public awareness is based on solar installation commercials. Milestones need to be covered periodically...the same way that homelessness is covered in the news—like [when] a new shelter opens, homeless counts decreased, a private company contributes to a housing project—we need to be informed of progress made toward energy security and meeting our state goals. We also need to understand things, like why LNG is not a renewable option.

Five participants acknowledged the lack of available resources from the HEC, the governor's office, and the HPUC. These participants encouraged the agencies to use local media resources, such as television and radio, as a means to spread more educational awareness. Four participants interviewed preferred that information be shared directly from the source through public events or direct mailers. It is not clear to what extent the

HEC, the governor's office, or the HPUC currently use local media, direct mailers, or public events as a means to inform the the public about the state's RPS goals or the subsequent solar projects that are available. None of the participants in this study recalled any direct contact or outreach from any of the three main RPS stakeholders, nor had they initiated contact with the HEC, the governor's office, or the HPUC directly about either of these topics. A majority of the respondents noted that their awareness and information about Hawai'i's RPS and the available solar programs came from local solar vendors or through online search results.

Participant 4 provided an alternative approach to educational outreach through formal information sessions and opportunities:

I think it starts in the schools. Students learn about the goals, policies, and [the] renewable portfolio standards so that it becomes part of their culture and is second nature. Others, the ones like myself, need additional education on the issues but I'm not sure what the best way would be.

Harrison and Waller (2017) investigated the connection between policy success and expanded outreach. They found that more direct interactions between policymakers and local communities helped to establish a pathway toward success for policies that required consumer acceptance to be effective. This same communication pathway may be applied to the educational outreach gap that appears to exist among the HEC, the governor's office, the HPUC, and potential solar consumers in Hawai'i.

Stakeholder Interaction

The lack of direct interaction between the participants of this study and the three main RPS stakeholders may play a role in the perceptions these potential solar consumers' have toward Hawai'i's RPS. As Cooke (2017) found, the access to and abundance of misinformation online has manifested alternative views that, even when countered with correct or fact-based rebuttals, often remain easily available for anyone to find. This may be further exacerbated by word-of-mouth experiences resulting in more trust from third-party sources that supersede an individual's interest in core issue at hand.

In regard to the HEC, 10 participants had some level of interaction with the electric utility, but none of those interactions were specific to their available solar programs or the state's RPS goals. Participants 1 and 7 noted that their customer service interactions with the HEC were "not always great" and that the HEC was "nonresponsive" to their questions about available energy savings programs in the past. While Participants 14 and 17 both attended local fairs and community events where the HEC was present, but spoke with the HEC about various topics unrelated to the RPS or available solar programs at that time. Six participants felt that even with the interactions they have had they still lacked sufficient and adequate customer engagement and education about their available energy options from the electric utility.

The level of interaction between the respondents and the HPUC was limited to four participants. However, their views of the HPUC's role and responsibility in providing information on the RPS or the available solar projects were in line with many

of those interviewed who had expressed having no interaction with the HPUC.

Participants 6 and 15 both noted that the HPUC's role is, "to regulate utilities for the public and keep pricing fair," and that, "they have a big responsibility in making these programs available." Participant 16, who stated they had no interactions with the HPUC, admitted, "I don't even know what the HPUC does or who they work with."

Three participants did not believe that the HPUC and potential solar consumers should interact about the RPS or the available solar programs. Participant 17 stated, "My perception is that the HPUC does not have as direct a role or interaction with solar consumers as the HEC does." Paralleling this response, Participant 10 thought that the HPUC's interaction was, "much less than the HEC and private companies." Two participants felt that the existing level of interaction was adequate, calling it "good enough" and "sufficient" for the purpose of learning what they needed to.

None of the participants interviewed had any direct communication or interactions with the governor's office. Six participants perceived the governor's office to be ineffective and absent when it came to the RPS educational outreach. Participant 9 stated that they were, "not sure what the office does," and Participant 17 commented, "This governor's office is more hands-off than other administrations." Although four participants viewed the governor's office favorably, none of the participants felt that the RPS goals were clearly defined by the office, or that consumers were properly informed. Participant 17 noted, "The energy policies and goals are very bold, but it is not clear how we will achieve these goals or how close we are to meeting them."

Two participants had visited the websites of the HEC or the governor's office to obtain information on the RPS or available solar programs, noting that they found the site(s) "useful." Participant 3 stated that they were, "not interested in researching," and Participant 5 commented that they, "didn't know [they] had to [research]." Four participants obtained information about the RPS or available solar programs through online search engines, while six participants sought information through local media sources.

Stakeholder perceptions. Emotional triggers, such as interest, hope, fairness, and influence, have shown to play an integral role in determining public support or opposition to policy endeavors (Drews & Van den Bergh, 2015). These triggers may be derived from personal or third-party experiences, or a combination of both. With little direct interaction with the main RPS stakeholders, potential solar consumers may feel the need to fill the knowledge void with experiences influenced by their emotional interests rather than proper information.

Several of the interview questions sought to address the respondents' tone toward the RPS stakeholders individually. For the HEC, six participants expressed negative views toward the HEC, regardless of the interaction level (or if they interacted with the HEC at all). Participant 4 called the HEC a "roadblock" toward enhancing customer engagement about available solar programs. Participant 16 noted that, "The HEC hasn't made quite the effort to inform the public about solar installations. Most information that I've received comes from private solar installation companies."

Participant 11, conceding to no direct interaction with the HEC, commented that they, “heard that the HEC approval takes a long time.” And, Participant 17 expressed frustration by the fact that the HEC, “changes policies and rules (like terminating net energy metering)...causing problems for homeowners and delaying installations.”

Six participants perceived the HPUC negatively in terms of their educational outreach about the RPS and available solar programs. Participant 1 called them “lukewarm” in their engagement efforts, while Participant 2 suggested they were “nonexistent.” Both Participants 16 and 17 were not familiar with any outreach or availability of relevant information, and felt that the HPUC should take the initiative to provide this information to consumers. Eleven participants held positive views of the HPUC’s role as a regulator between the HEC and potential solar consumers when it comes to rates. Although three participants did not feel as though the HPUC’s outreach was equal to the HEC, they did not consider it essential for the HPUC to serve as the primary driver of educational materials for the state’s RPS or available solar programs.

For the governor’s office, who is the primary driver of the RPS mandate in Hawai‘i, the participants’ perceptions varied. Five respondents held positive views of the governor’s office and the availability of and access to information about the RPS.

Participant 13 commented, “I have a good impression of the governor's office. In many ways, I think they care about the concerns of the people and the environment.”

Participant 3 felt that they were “working for the citizens of Hawai‘i.”

Participant 16 held a strongly negative view of the governor's office and their handling of the backlog of solar program applications with the HEC:

I think if the governor wants to be eco-friendlier and energy-efficient, then more effort would be put into getting Hawai'i residents to install panels. We are the ideal state with lots of sunshine, so solar energy use should be a smart, wise choice. However, not much is done by the governor and state politicians to help local homeowners. Seems the extent of their 'save the environment' is to ban plastic bags, straws, etc. It seems only the newer built homes are solar-ready. We who have older homes are pretty much left out.

Participant 4 felt similar about the governor's office (and the state as a whole) and the lack of solar installations:

The primary shortcoming is that there isn't enough of a push by the state to convince the public to install solar in 100% of the homes. I think that the state needs to continue to subsidize the installation via tax credits.

Smith and Leiserowitz (2014) investigated policy support and opposition through the emotional lens of consumers. The authors found that the emotive connection individuals have for a policy plays directly into the way communication or outreach should be developed. The perceptions of those persons interviewed for this study may play significant role in their understanding and acceptance of the state's RPS, and may be emotionally-driven based on their experiences (or lack thereof) with the HEC, the HPUC, and the governor's office. What may be perceived as failures or inadequacies by these

potential solar consumers may be a result of inaccurate self-education, third-party interpretations, or a lack of initiative by the three main RPS stakeholders to make the necessary information available and digestible. Without direct interactions and the proper information readily available, it has been left up to the consumer to familiarize themselves with the RPS and how their participation in the HEC's solar programs impacts it.

PV Installation Barriers

The continued growth of customer-sited solar installations is necessary for Hawai'i's RPS goals to be achieved. The perception of barriers, whether accurate or assumed, may play an important part in influencing the views of the HEC held by this study's participants. These views may be further exacerbated if the information individuals receive is insufficient or inadvertently prejudiced by external parties.

Participant 1 suggested, "The HEC was lukewarm at best—not sure why. Maybe they are worried that they will lose money by selling less electricity." They also confirmed that most of their interaction to-date about the RPS or available solar programs came from their solar installer, with little direct interaction with the HEC. Participant 16 added to this sentiment: "The HEC hasn't made quite the effort to inform the public about solar installations. Most information that I've received comes from solar installation companies." Participant 09, also discouraged by their views of the HEC, added, "The HEC has soiled employees, and they are hard to work with. They don't make it convenient to work with on the solar application and filing."

Three participants experienced positive interactions with the HEC concerning the PV installation process. Participant 3 noted that “it has been good,” and Participant 13 commented that, “they seem to want to help make things run smoothly.” Others interviewed were more neutral in their views but affirmed that they had not reached the point in the solar program application process where the panels were able to be installed.

The perceptions held of the role of the HPUC in the HEC’s solar program application process was overwhelmingly viewed as an important factor to ensure that the HEC treats customers equally. It was also noted that as a regulator, the HPUC was necessary to ensure that the HEC was abiding by the rules and regulations embedded in the RPS mandate. Participant 17 best summarized the views of all participants interviewed saying, “The HPUC is responsible for ensuring that the HEC makes certain services and programs available to consumers at reasonable and fair prices. They are also responsible for oversight on the quality of the delivery of [those] services.”

Seven participants acknowledged that contributing to any renewable energy goals required personal contribution toward lowering Hawai‘i’s continued dependence on fossil fuels. Participant 2 specifically flagged the environmental benefit of their solar program participation as the key factor in continuing forward in the process. Both Participants 4 and 5 addressed energy efficiency and “going green” as their primary drivers. The other 10 participants spoke of the financial implications, specifically the reduction in their monthly bills, as the reason for their interest in the HEC’s solar programs. These individuals did not correlate their cost savings with any potential investment needs that

would arise as part of the HEC's RPS-related projects, such as the GMS program which was approved by the HPUC (Hawaiian Electric Companies, 2019).

RPS Shortcomings

A potential gap in understanding about Hawai'i's RPS by the potential solar consumers interviewed may be a result of these individuals' perception of any preconceived shortcomings of the RPS itself. Participant 1 said, "We are at the mercy of word of mouth—I have never heard of the renewable portfolio standards." While Participant 4 added:

The primary shortcoming is that there isn't enough of a push by the state to convince the public to install solar in 100% of the supported homes. I think that the state needs to continue to subsidize the installation via tax credits. I also think that the HPUC needs to enforce the timely approval of permits.

Participant 13 further expanded upon the idea of tax credits by commenting, "Some people feel intimidated by the initial cost of getting solar up. More offers or advertisements for tax deductions, loans, or payment plans in the beginning, to make it less intimidating."

Participant 8 felt that there needed to be more transparency by all parties about the impact of the RPS on costs to potential solar consumers. Participant 7 expressed, "I think it should be up to the customer as far as what they want," and noting that the RPS did not require any public input before being enacted. Skepticism for the RPS to achieve its milestones was felt by Participant 6, who said, "Whenever you're dealing with a

government agency, the lack of manpower on their end can cause problems with any private company.” Participant 6 clarified that the communication and needed partnership between solar installers and the state are at the will of frequent staffing shortages and diminished resources by Hawai‘i’s governor’s office.

Conclusion

This chapter provided the responses from potential solar consumers interviewed about their perceptions of Hawai‘i’s RPS goals, inclusive of their views of the HEC, the HPUC, and the governor's office relative to this policy. Participants offered succinct and informative accounts of their experiences with the three main RPS stakeholders and their subsequent understanding of the RPS. The participants also supplied information about where they felt gaps in outreach existed, and the roles of the RPS stakeholders in those lapses in engagement. Results of the study show while potential solar consumers lack consistent interaction and engagement with Hawai‘i’s RPS stakeholders, they held decisive views of the responsibilities and levels of engagement each stakeholder should provide. Participants also discussed what they perceived to be the main barriers to the HEC’s solar programs, and ways they felt the HPUC and the governor’s office could increase the deployment of solar within the state. Participants described where they believed the failures of the RPS exist, and their pessimism for the future of the RPS mandates to be reached. In Chapter 5, I stipulate an interpretation of the findings, the social change implications, recommendations for future research, and study conclusions.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai‘i’s population of potential solar consumers as new renewable energy policies and the associated electric utility-developed projects are presented to them. The state's legislature has recognized the need for the continued growth of renewable energy sources to meet the increasing energy demands of Hawai‘i’s rising population. The passing of the revised RPS, however, has failed to substantiate the role potential solar consumers play in achieving the required energy goals. The state’s RPS represents a growing yet problematic trend in energy policy development within Hawai‘i. Laws are enacted assuming continued investments by private citizens, with little to no knowledge as to whether those citizens fully understand the impact of such policies.

Existing studies on renewable energy policy comprehension have shown that researchers have mainly focused on levels of interest rather than levels of understanding. Few researchers have exclusively looked at Hawai‘i to gauge whether individuals comprehend the state's policies that impact them at an economic and social level. Noblet et al. (2015) found that renewable policy support is tied directly to a person’s view or understanding of the policy, including how the individual would benefit or be directly impacted. Before this study, there appeared to be minimal research done that investigated

the knowledge base or level of understanding that potential solar consumers have toward state-level RPS goals, specifically within Hawai'i.

Addressing the knowledge gaps that potential solar customers have toward Hawai'i's RPS goals may help to refine current and future customer-sited solar generation forecasts. This information may also play a role in the long-term strategy of the RPS moving forward, which may better inform policymakers toward a more successful policy development and implementation measure. Applying a qualitative evaluation approach, I explored the perceptions that individual potential solar consumers have toward Hawai'i's RPS goals. I also sought insight into these consumers' views of the role and experiences with the state's three main RPS stakeholders. This research design was selected due to the limited investigations that exist that specifically investigates this topic, providing an opportunity for these often-neglected perspectives to encourage additional outreach in the future.

I used open-ended, semistructured research questions that allowed for the participants interviewed to describe their views toward and understanding of Hawai'i's RPS, the role of the HPUC in monitoring the available solar-related projects introduced by the HEC, and their views of the state's governor's office in implementing the RPS goals. I explored how the participants perceived each of the three primary RPS stakeholders, including their assumptions and level of interaction with each. I also assessed how the participants obtained information about the state's RPS and the HEC's

related solar programs. The interviews took place over-the-phone and online, in a private setting to accommodate the schedule and availability of those interviewed.

Seventeen O‘ahu residents, between the ages of 25 and 55, who spoke and understood English, were head-of-household, and who had no working relationship with the three main RPS stakeholders were interviewed. Each of the participant’s views, feelings, interactions, and knowledge of Hawai‘i’s RPS, and how the three main RPS stakeholders influenced their understanding of the related solar programs, were the focus of this study.

Research Findings

Participants of this study offered insights into their perceptions of Hawai‘i’s RPS goals and its three main stakeholders. Through the analysis of their responses, four themes emerged: information sources, stakeholder interactions, PV system installation barriers, and RPS shortcomings. The interviewees acknowledged that a majority of the information they obtained about the RPS was derived from third-parties rather than directly from the three main stakeholders. The use of third-party sources was a result of a lack of educational information afforded to solar consumers by the RPS stakeholders.

Limited stakeholder interactions also appeared to play a role in the participants’ understanding of Hawai‘i’s RPS or the availability of related solar program options. Although more than half of the participants had direct interactions with the HEC, none confirmed that these exchanges included discussions related to the RPS or its associated solar programs. Fewer participants had direct contact with the HPUC or the governor's

office. This disconnection further exacerbated a lack of opportunity to educate themselves about the state's energy policy goals or available solar programs. Several participants expressed negative views of the HEC, the HPUC, and the governor's office. They confirmed that their opinions were based on indirect contact and preconceived assumptions derived from a lack of outreach they preferred to be initiated by the stakeholders.

Perceived barriers to installing customer-sited PV at their residences also appeared to play a role in the participants' views of the three main RPS stakeholders. High customer financial investments, delays by the HEC in approving solar program applications, the lack of or insufficient tax credits, and the perceived incompetence of the three stakeholders' employees appeared to influence the participants' confidence in the future of available solar programs and their support of the RPS requirements. Several participants also recognized their role in contributing to reducing the state's dependence on fossil and petroleum fuels in the electricity mix.

What several participants viewed as a lack of educational information contributed to their underwhelming understanding of the state's RPS and the role they play in its success or failure. Only two participants were moderately informed about the RPS. The primary misunderstanding relative to what the goals mean, what the requirements are, and how potential solar consumers play a role in its long-term realization remained constant. Several of the participants expressed an interest in being better informed about

the state's RPS. They expected the HEC, the HPUC, or the governor's office to provide the necessary information through direct mailers, public events, or local media.

Interpretation of the Findings

The purpose of this research was to determine the level of understanding and the subsequent drivers that provide the knowledge base for Hawai'i's population of potential solar consumers as new renewable energy policies and the associated electric utility-developed projects are presented to them. Participants provided concepts that represented their understanding of the state's RPS goals. These concepts derived from third-party information sources, limited stakeholder interactions, views of PV system installation barriers, and perceived RPS shortcomings. Limited knowledge and overall RPS comprehension impacted their ability to be appropriately informed and influenced their opinions of the HEC, the HPUC, and the governor's office.

Several themes materialized in response to assessing the two main research questions. Two participants were informed enough about Hawai'i's RPS to acknowledge either the required goals or the timeframe in which the goals had to be achieved. There were mixed perceptions on the necessary level of engagement each respective RPS stakeholder was expected to have with potential solar consumers. Most of the participants felt that the educational information needed to be expanded upon by the HEC and the governor's office. Few participants thought that the HPUC was responsible for conveying the RPS or its related solar program information to consumers.

Information sources. Fourteen participants noted that their awareness of and information about Hawai‘i’s RPS and the available solar programs came from local solar installers or online search results. Five participants recommended that the HEC and the governor's office expand existing local media advertisements, such as radio or television commercials, to better inform the general population. The use of direct mailers and public information sessions, including within schools, were suggested by four respondents.

Even with the use of existing outreach opportunities, several participants appeared misinformed by the correlation between the state’s RPS and their role in its implementation as a customer-sited PV consumer. The participants’ inference of the RPS and what is required of its long-term energy goals (at the infrastructure and financial investment levels) varied among those interviewed and appeared dependent on a third-party information source. This finding was consistent with studies performed by Llewellyn et al. (2017) and Zapata-Lancaster and Tweed (2014), where the authors concluded that there was a need to improve the policy process and outreach by policymakers. This enhancement is meant to better inform those at the localized level who may misunderstand how the policy impacts them directly.

Stakeholder interactions. Ten participants have had direct interactions with the HEC in the past, eight of which were through phone calls or email and two were through local public events. None of these interactions included discussions pertinent to the state’s RPS goals or available solar program options. Of those who had interacted with the HEC, more than half felt as though they received insufficient service and perceived

the HEC negatively as a result. The four participants who had engaged with the HPUC did not view their role in the RPS process any differently than the remaining 13 who had no interaction with the HPUC. None of the potential solar consumers interviewed had any direct contact with the governor's office, though six participants perceived it in an unfavorable view.

The interactions with each of the RPS stakeholders played a role in how the potential solar consumers interviewed understood the RPS. For the HEC, the negative views of the electric utility were apparent regardless of the interaction level between them and the customer. These views may contribute to a level of trust or participation that would drive the continued growth of customer-sited solar installations in Hawai'i. As Michaels and Parag (2016) found, the early adopters of policy implementation, such as the participants of this study, represent a populous of the planning process that ultimately determines the future of the energy policy goals. Without their continued support, the failure of Hawai'i's RPS goals is likely. This result was further confirmed by Edwards (2018), who found that views and education are intertwined, and that policy inference will be influenced by perceptions of who to trust and how they convey information.

PV system installation barriers. Although a majority of the participants felt that the HPUC played an integral role in managing the HEC's solar programs, they did little to address the barriers created by the HEC. These respondents also believed that the governor's office made little effort to address any obstacles presented by the HEC or the HPUC. Ten respondents felt that the consumers' PV investments were high, and that the

state should provide better tax incentives to help lower the overall economic impact to the customer. Several participants also felt that the time delay by the HEC to accept their solar program applications could be expedited if the HPUC approved the necessary permits quicker. None of the respondents were clear as to how the HEC's approved GMS program costs would impact them as the electric grid is updated with new equipment and software required to support additional renewable energy generation.

The HEC has acknowledged that the continued growth of customer-sited solar installations is necessary for the state to meet its RPS requirements. This is particularly important given that individual experiences drive public knowledge of the RPS during the policy implementation process. With an apparent lack in understanding by the participants about how the HEC's GMS will contribute to their existing solar investments, further education is needed. This finding is confirmed by Wojuola and Alant (2017), where they noted that renewable energy policies and their associated technologies are intertwined but are often disjointed from one another.

RPS shortcomings. The perceptions of where the state's RPS shortcomings exist varied among respondents. While many participants reiterated minimal interaction between themselves and the three RPS stakeholders, their views on how this deficiency impacted their knowledge of the RPS predominantly centered around a lack of transparency. Two participants suggested that the goals of the state's RPS should be clarified by the governor's office and the HEC. These two individuals also felt that expanded solar installations should be enforced to ensure that the goals are achievable.

Two different respondents felt that the individual consumer should be free to decide which of the available HEC solar program they could participate in. They also suggested that the costs for any large-scale, RPS-related projects should not be subsidized by customers who are unwilling or unable to install solar panels at their homes. Many of the potential solar consumers interviewed reiterated the need for additional financial incentives that directly correlate to the state's RPS goals.

It is not clear if the existing educational materials or websites for any of the RPS stakeholders provide the requested transparency that the respondents require. This may be because many of the participants obtain information through third-party sources. As Wallenborn and Wilhite (2014) found, knowledge and understanding are driven by one's beliefs. For the participants of this study, who appear to hold a predominantly negative view of the three RPS stakeholders, it is not surprising that these respondents choose to educate themselves through third-party sources. Lee and Kim (2016) further solidified this concept when they found that the attitudes one holds toward a stakeholder play a significant role in how that individual perceives or understands the role that stakeholder plays in the policy planning and implementation processes.

Theoretical Deliberations

Through this study's results, I found that the respondents' level of knowledge and understanding of Hawai'i's RPS were impacted by their perceptions of the three main RPS stakeholders. This includes the extent of their interactions with the stakeholders and the perceived role these stakeholders held in the solar program application processes.

Individuals with direct contact with the HEC, the HPUC, and the governor's office acknowledged that increased outreach, participation, and more transparency was necessary to improve the current educational opportunities available to them. Sabatier and Jenkins-Smith's (2014) ACF and Madden et al.'s (1992) TPB provided insight about the findings of this study. The ACF indicates that digesting multiple views from various actors within a given policy process is smoothest when those individuals are segregated into beliefs-based coalitions. The TPB further expanded on this concept when Madden, Ellen, and Ajzen developed a direct link between behavior and human action through the association with one's knowledge and their attitude toward external drivers.

I have revealed through my research that the participants' views of the three main RPS stakeholders impacted how they obtained information about Hawai'i's RPS and its related solar programs. I have also offered evidence that potential solar consumers' perception of the RPS was influenced by the sources they used to educate themselves, and I have shown that some participants were flexible with their learning behavior if the HEC, the HPUC, or the governor's office improved the educational outreach made available to consumers. The belief and trust in the source of information provided to the respondents would supersede their interest in the RPS policies, a prime indicator of ACF and its applicability to this study (see Cerna, 2013).

I found that even with the PV installation barriers perceived to exist, the majority of the participants still planned to continue with the HEC's solar program application process. The predominant driver for installing solar at their residences coincided with

their views of how important renewable energy development was for Hawai'i: environmental degradation, high electricity costs, and fossil fuel dependency. The HEC addressed these similar issues in their approved GMS, though there continues to be a gap in knowledge about how customer-sited PV installations will contribute to the RPS requirements. The assumption by the stakeholders that customer-sited solar installations will continue to expand may be a result of a higher-level stakeholder view that presumes constant, unchanged behavior. However, as Ataei and Norouzi (2017) found, attitudes feed into behavior, and behavior is modifiable. Application of the TPB to this study allowed me to establish the bridge between presumed behavior by potential solar consumers and the ability for this behavior to change over time. These consumers' behavior may change as their attitudes and perceptions of the RPS and its stakeholders evolves.

Limitations of the Study

For this qualitative evaluation study, the sample size was small when compared to the total number of potential solar customers on O'ahu. Thus, the main limitation of this study was that it cannot be generalized to represent the full, or a larger sect of, the population of potential solar consumers in Hawai'i or elsewhere. Residents of Kauai, Maui, Moloka'i, Lana'i, and Hawai'i Island were not included. This exclusion was done primarily to take advantage of the island which hosts the largest population pool within the state.

Individuals who did not speak English were excluded due to the fact that I am not bilingual. There are multiple primary languages spoken in Hawai‘i that I could not learn within the confines of this study. Multilingual individuals’ views of the state’s RPS goals and its related solar programs do not appear to currently exist within the research environment. With limited investigations performed in Hawai‘i about consumer RPS knowledge, it is possible that individuals who do not speak English may have different views or levels of understanding about the state’s renewable energy goals.

I did not differentiate between sexes or cultural representation for this study. Because the participants’ ethnicity or sex was not recorded, it is possible that focusing on either or both of these demographic markers may have yielded different results. Although different housing types were represented in this study, there was no specific requirement related to housing for individuals to participate. Focusing on multifamily, townhomes, or single-family residences may have manifested alternative outcomes or perceptions from potential solar consumers.

Analysis of the interview responses is subjective, and it is possible that subtle bias or error may have occurred. I diligently worked to avoid these issues as I transcribed and coded each of the participant's responses. I ensured that the terminology was derived from their words and was not associated with industry-specific language or labels.

Recommendations for Future Research

Participants in this study were English-speaking O‘ahu residents and do not represent the entirety of Hawai‘i’s potential solar consumer population. An enlarged

qualitative or mixed-methods study with expanded language options and the inclusion of the remaining islands within the state may provide additional research insights.

Further studies focusing on individuals who live in different types of residence structures (i.e., condo, townhome, single-family, multifamily) may further inform policymakers about RPS educational deficiencies. This same process could be applied by neighborhood locations within Hawai‘i to gauge where information gaps exist and how individuals within those communities learn about the RPS or its available solar program options.

Alternatively, research exploring more targeted educational engagement may prove beneficial to enhancing public knowledge about the interrelationships between Hawai‘i’s RPS and customer-sited solar installations. This could be specific to investigating how the RPS stakeholders’ existing outreach materials relate to the drivers that many of the those interviewed expressed as reasons for their interest in installing solar at their homes. These included their desire to reduce their electricity costs, the concern for the state’s dependence on fossil fuel, and their interest in supplementing their PV systems with battery storage devices so they can incorporate electric vehicles. Providing a link between these concepts and the state’s RPS may help to clarify the disconnect many participants communicated as a factor in their ill-informed knowledge about their role in the RPS’ success.

There’s also an opportunity to investigate some of the themes that arose from this research more exclusively. For example, what information potential solar consumers have

received from third-party sources compared to the information available from the RPS stakeholders may provide insight into whether this material is misleading. This is particularly important for the RPS stakeholders to ensure that as they develop new educational materials or engage more with the local communities, that they are addressing this misinformation so that communication between them and potential solar consumers improves.

Finally, a more transparent representation of the steps involved for a consumer to install solar at their home, including the various parties involved and the factors that are necessary to complete the process from start to finish, may contribute to a more positive view of the solar program application process from a consumer perspective. Many of the individuals I spoke with expressed dissatisfaction towards what they perceived to be intentional delays in completing their solar applications by the RPS stakeholders. They were unaware that the process involves not only the HEC and the HPUC, but also legal agreements between the solar vendors and the HEC, and additional technological and functional software requirements on the electric grid.

Implications for Social Change

Hawai'i's RPS goals have acknowledged a need for increased renewable generation sources within the electric grids to meet the state's continued population growth. With the presumed expansion of investments by private citizens in installing customer-sited PV, it becomes clear that their role in the RPS policy process needs to increase substantially. To better inform the state's energy policies toward a successful

future, it is imperative that the primary drivers of the future of Hawai‘i’s solar production be properly educated about what the RPS is and what their role is in its success.

The results of this study provide awareness into the possible reasons behind the existing gaps in knowledge that exist between Hawai‘i’s policymakers and the potential solar consumers interviewed. It is conceivable that the information obtained through these findings could lead to improved educational outreach. This may involve employing multiple avenues to better inform the public about the RPS and its related projects. It is also possible that by expanding the educational options for consumers, their views of the RPS stakeholders may be improved. Future engagement may result in more refined discussions and conveyance of pertinent information, leading to a more positive experience for all.

The continued growth of solar energy generation within Hawai‘i’s electric grids will not only help to achieve the state’s long-term RPS milestones, but also aligns with several of the United Nation’s sustainable development goals. Of the 17 goals which were introduced in 2016, two are significant as it relates to Hawai‘i’s RPS mandate: (a) affordable and clean energy; and (b) industry, innovation, and infrastructure (United Nations, 2018). These goals necessitate that collaboration and engagement include all levels of both government and community to be successful.

Access to and generation of affordable and clean energy is found at the local and state-level in Hawai‘i’. Because solar generation is provided by both private citizens and the HEC, a collaborate partnership is likely needed to meet the state’s RPS goals. As this

relationship improves, this partnership may establish the foundation for which the state could substantially reduce its dependence on imported fossil and petroleum fuels. As more customer-sited PV systems are installed, the potential to lower energy costs and expand the energy mix to cleaner and sustainable sources will be more achievable. This is only possible, however, with the continued investments in solar systems by consumers and the ongoing support by the RPS stakeholders to enable these systems into the energy mix. It is ultimately up to the HEC, the HPUC, and the state's governor's office to ensure that the electric grid is capable of incorporating the new solar resource generated by these systems.

The production of affordable and clean energy and improving Hawai'i's electric grids' infrastructure may lead to better economic investments within the state, sustainable development of future energy policies and their related projects, and could reduce the environmental degradation that the current energy mix is partially responsible for. As many of the participants of this study noted, the interest in pursuing green energy opportunities that preserve the environment is one of the key factors in their pursuit to install solar PV systems at their homes. As the RPS pathway progresses, and enhanced education and engagement is introduced, the need for continued and sustained collaboration among the HEC, the HPUC, the state's governor's office, and the future solar consumers is necessary to ensure alignment moving forward.

Conclusion

Within the United States, several states have enacted renewable energy mandates that have established goals requiring a percentage of renewable generation by a specified timeframe. For Hawai'i, whose population is geographically isolated and therefore unable to share generation resources with neighboring states, the realization of achieving its RPS goals is critical. Of the varied opportunities for renewable energy generation within the state, customer-sited solar installations represent the highest percentage of renewable energy opportunities to achieve the required 100% renewable energy generation goals by 2045.

Even with the approval of the HEC's GMS in 2019, the connection between potential solar customers' RPS comprehension and the necessity of continued investments in customer-sited PV installations remains mostly unknown. This divide has been exacerbated by the limited educational outreach and low levels of RPS stakeholder interactions that many of the participants of this study have experienced.

Past researchers have typically focused on the level of interest rather than the level of understanding when investigating how individuals absorb state-level policy processes and implementations. For this study I sought to bridge the gap in the literature by providing an alternative view of consumer-level policy analysis in hopes it establishes an opportunity for future research.

What many of the participants perceived to be challenges or barriers to progressing through the arduous solar program application process with the HEC, did not

deter them from continuing to pursue the PV installations at their homes. This was primarily driven by the high cost of electricity within the state, coupled with their general concern for the environment and reducing their dependence on imported fossil fuels. Their interest in installing PV did not discourage them from addressing the lack of information and the need for proactive outreach by the three main RPS stakeholders to better inform local communities.

The findings from this study supported and expanded upon previous research. Limited knowledge of and confusion between the RPS and Hawai‘i’s renewable energy goals appeared to be driven by third-party information sources, limited stakeholder interactions, PV installation barriers, and RPS shortcomings. Past researchers have examined how perception, attitude, and behavior coincide with one’s ability to absorb complex policy implications. I have shown that those interviewed for this study shared many of these same disconnections.

As Hawai‘i’s RPS policymakers continue to depend on the growth of customer-sited solar installations to achieve their mandated milestones, it is necessary that the communication and engagement pathways between the potential solar consumers and the state’s policymakers improve. And as the RPS is amended or evaluated, any new projects or solar-related programs that the HEC introduces must continue to be monitored by the HPUC to ensure customer protection. The three RPS stakeholders need to further improve their public interactions and educational outreach opportunities so that future

solar customers obtain the necessary information they seek from the sources most appropriate to provide it.

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Appendix A: Interview Guide

Hello. My name is Kristin McGill and I am a doctoral candidate at Walden University. I am conducting dissertation research on potential solar consumers' understanding of Hawai'i's renewable portfolio standards. For this study I will be asking you questions about your views and knowledge of the state's renewable energy goals and the primary agents who enforce these goals.

I am pleased that you are prepared to meet with me and discuss your views regarding Hawai'i's renewable portfolio standards and your experiences as a potential solar customer. I will be speaking with several study participants to investigate your familiarity with Hawai'i's legislative process, the roles of the state's Public Utilities Commission and Hawaiian Electric Company in implementing renewable energy projects, and ways in which solar customers perceive methods to further engage and participate in the regulatory process.

The interviews will take roughly an hour. All responses to the interview questions are welcome. Providing truthful responses will be helpful in acquiring insight about how the state's legislators can better inform and educate locals about Hawai'i's renewable portfolio standards. Your responses will also aid in providing insight to the state's Public Utilities Commission and Hawaiian Electric Company to improve how they interact with local communities as new projects are introduced. Together, the policies and projects that result from Hawai'i's renewable portfolio standards' goals may become better informed by the insight you provide that directly addresses any gaps in understanding or

communication that the state, the Public Utilities Commission, or the Hawaiian Electric Company may not currently be aware of.

All comments and answers you provide will be kept confidential. No personally identifying information, such as your name or physical description, will be presented in my findings. To ensure accuracy, I will be recording our conversation and will be the only person to hear and transcribe what is discussed. All notes and recordings from these interviews will be destroyed after 5 years, which is the minimum timeframe required to retain the data collected for my dissertation. Do you have any questions before we begin?

I will now proceed with the verbal consent and interview. I will be asking a couple questions to reconfirm your eligibility for this study, then we will dive deeper into the questions themselves.

Interview Protocol

Date: _____

Time (HST): Start: _____ End: _____

Participant ID: _____

Do you currently reside on O‘ahu? Yes ___ No ___

Are you at between 25 and 55 years old? Yes ___ No ___

Are you head-of-household? Yes ___ No ___

Do you speak/understand English? Yes ___ No ___

What is your IIQ interconnection application number (to confirm your status only)? _____

Are you currently employed by or contracted to work with the State of Hawai‘i?
Yes ___ No ___

Are you currently employed by or contracted to work with the Public Utilities
Commission? Yes ___ No ___

Are you currently employed by or contracted to work with the Hawaiian Electric
Company? Yes ___ No ___

Interview Questions

1. Tell me about your experience(s) relating to your plan to install solar panels at your residence?
 - a. How is/was this process working with the Hawaiian Electric Company overall?
 - b. How long ago did you file your application to participate in the solar program(s) at the Hawaiian Electric Company?
 - c. What is the current status of your pending application?
 - d. What are the factors that make you want to install solar panels at your residence?
 - e. How would you characterize the customer engagement and support relating to your solar program application process from the Hawaiian Electric Company?
 - f. What other experiences have you had with the Hawaiian Electric Company?
 - g. What is your overall perception of the Hawaiian Electric Company and its interaction with customers interested in installing solar systems?
2. What are your experiences interacting with the Hawai'i Public Utilities Commission?

- a. What do you perceive to be the role or responsibility of the Hawai'i Public Utilities Commission in regulating the Hawaiian Electric Company's available solar programs and associated projects?
 - b. How would you characterize the outreach or availability of solar program information from the Hawai'i Public Utilities Commission?
 - c. What is your overall perception of the Hawai'i Public Utilities Commission and its interaction with solar consumers?
3. What are your perceptions of the State of Hawai'i's legislative offices?
- a. How would you characterize your interactions with the State's legislative offices?
 - b. How would you describe the state's energy goals or policies?
 - c. Where do you obtain information about the state's energy goals or policies?
 - d. How would describe the state's renewable portfolio standards?
 - e. How do you feel education and outreach about state energy goals, policies and the RPS should be handled?
4. What shortcomings do you currently perceive to exist between local solar consumers and the state's energy policies or goals (such as the RPS)? What do you think could be done differently?

5. How would you describe the relationship between the solar community in Hawai‘i and the state’s legislative offices? The Hawai‘i Public Utilities Commission? The Hawaiian Electric Company?

Appendix B: Probes and Prompt Questions

Say what you mean by [response or terminology]

It sounds like you're saying, "...". Is that correct?

Tell me more about that.

Can you give me an example?

Can you tell me more about that?

Why was that important to you?

Why does that matter?

How did you feel about that?

What might make you respond differently?

How do you feel about a policy like that?

How does that affect you?

Appendix C: Recruitment Flyer

I am seeking adult men and women on O‘ahu to volunteer to participate in a study.

- You must currently reside on O‘ahu.
- You must have a pending interconnection application filed with the Hawaiian Electric Company IIQ system.
- You must be between the ages of 25 and 55 years.
- You must speak and understand English; however, it does not have to be your primary language.
- You must be willing to be audio recorded.
- You must be able to attend an in-person 1-hour session in Honolulu, HI, or participate in a 1-hour phone conversation on (date) between the hours of 8am and 5pm HST.
- You cannot currently be employed by or under contract for work with the State of Hawai‘i’s governor’s office, the Hawai‘i Public Utilities Commission, or the Hawaiian Electric Company.
- You must meet the minimum demographic qualifications and sign an adult consent form to participate in the study.
- You must be willing to provide honest responses regarding your understanding and knowledge of Hawai‘i’s renewable portfolio standards.

Benefits of participating in the study:

- Those who complete any part of the interview will receive \$40 compensation for their time.

If interested and you meet the minimum requirements above, please contact me at XXX or via email at XXX@waldenu.edu. You will be asked to complete a brief screening questionnaire. You may also visit [website] to complete this questionnaire online. All interviewees who pass the screening requirements will be provided a copy of the adult consent form to sign via email, online or in-person.

Mahalo,

Kristin McGill

PhD Candidate, Public Policy & Administration

Walden University

Appendix D: Screening Questions for Participants

Date: _____

First Name: _____

Participant Number (Assigned): _____

Age: _____

Education Level: _____

Do you speak and understand English? Yes / No

Do you currently reside on O‘ahu? Yes / No

Are you the head-of-household? Yes / No

What is your IIQ interconnection application number (to confirm your status only)? _____

Do you currently have a pending interconnection application filed with the Hawaiian Electric Company? Yes / No

Are you currently employed by or contracted to work with the Hawaiian Electric Company? Yes / No

Are you currently employed by or contracted to work with the Hawai‘i Public Utilities Commission? Yes / No

Are you currently employed by or contracted to work with the State of Hawai‘i’s legislative offices? Yes / No

Are you willing to be audio recorded during the interview? Yes / No

Are you willing to sign an adult consent form to participate in this study? Yes /

No