AN ANALYSIS OF ENERGY EFFICIENCY AND RENEWABLE ENERGY GOVERNANCE IN U.S. STATES THROUGH INDEPENDENT ENERGY ADMINISTRATIONS

by

Cheng-Hao Shih

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Energy and Environmental Policy

Spring 2018

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ADMINISTRATIONS

by

Cheng-Hao Shih

Approved: _____
S. Ismat Shah, Ph.D.
Chair of the Energy and Environmental Policy Program

Approved: _____
Babatunde Ogunnaike, Ph.D.
Dean of the College of Engineering

Approved: _____
Ann L. Ardis, Ph.D.
Senior Vice Provost for Graduate and Professional Education

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: _____

William Latham, Ph.D.
Professor in charge of dissertation

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: _____

S. Ismat Shah, Ph.D.
Member of dissertation committee

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: _____

Lado Kurdgelashvili, Ph.D.
Member of dissertation committee

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed: _____

Andrea Sarzynski, Ph.D.
Member of dissertation committee

ACKNOWLEDGMENTS

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ABSTRACT

Recent United States energy efficiency and renewable energy (EERE) development has transformed state energy governance in the past decade. After restructuring, a new type of energy efficiency and renewable energy administration was established to coordinate resources and networks across state and local jurisdictions. Research into these administrations' essential role in coordinating resources, information, and networks among stakeholders across sectors can improve our understanding of these new administrations and their network in the current state energy governance.

This dissertation applied both qualitative and quantitative methods to study how independent state EERE administrations developed and collaborated with public sector, private sector, and civil society stakeholders on EERE programs and policies. The conceptual framework in the second chapter presents a general picture for state energy governance that centers on the independent state EERE administration and their governance networks, which include actors across different sectors of society.

The quantitative analysis in the third chapter examines if there is a correlation between the presence of these state administrations and the adoption of new state EERE policies. I construct an Event History Analysis model to estimate the relationship between the presence of a state EERE administration and the adoption of

Property Assessed Clean Energy (PACE) enabling legislation from 2008 to 2013. Results from the event history model show that the existence of a state EERE administration significantly correlated with PACE-enabling legislation adoption.

The case study analyses in the fourth chapter illustrates a detailed governance network for the two independent state EERE administrations, The Energy Trust of Oregon and Efficiency Vermont, and discusses the purpose of their collaborations with different stakeholders for their program operations in each state.

Both the quantitative and qualitative analyses contribute to conceptualizing the independent state EERE administration model and its governance network. By focusing on the independent EERE administration and explaining how this administration structure developed its network, this dissertation connects two strands of state-level energy governance research pertaining to energy administration structure and governance networks.

Chapter 1

INTRODUCTION

1.1   The Energy Transition and Governance Networks

Over the past few decades, several independent energy administrations have been established in the United States (U.S.) to assist in managing, implementing, and planning energy efficiency and renewable energy (hereafter EERE) investment and development. Research that examines the roles and organizational networks of independent EERE administrations can help practitioners and policy makers better understand the changing governance network and can contribute to building a more systematic understanding of U.S. state energy governance at the state level.

The current transition to a low carbon and efficient energy system in the U.S. has derived from concerns of energy resource scarcity, environmental degradation, and technological innovation (Rabe, 2006; Carley, 2011; Yi & Feiock, 2014). This transition[1] has induced a shift in how energy is produced, traded, and consumed in the country (O'Connor, 2010; Sovacool, 2016; Stokes & Breetz, 2018). Altogether, this

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[1] Sovacool (2016) defines an energy transition as "the time that elapses between the introduction of a new primary energy source, or prime mover, and its rise to claiming a substantial share of the overall market (p.1)."

extensive change has reshaped energy governance and policy making across federal, regional, state, and local jurisdictions.

In the field of public administration, governance is conceptualized as a system or arrangement that encompasses a range of actors across public, private, and civil society sectors (Lemos & Agrawal, 2006; Ansell & Gash, 2008; Sarzynski, 2015). Each actor in a governance system interacts, negotiates, and works with each other to address societal issues related to public assets and services (Ansell & Gash, 2008; Sarzynski, 2015).

In recent decades, scholars have become interested in studying the relationship among policy actors and stakeholders (O'Toole, 1997; Imperial, 2005). In this research, the concept of "network" or "Interorganizational network" was proposed to capture the social relations among policy actors and stakeholders. According to O'Toole (1997), networks "are structures of interdependence involving multiple organizations or parts thereof, where one unit is not merely the formal subordinate of the others in some larger hierarchical arrangement. Networks exhibit some structural stability but extend beyond formally established linkages and policy legitimated ties" (p. 45). Similarly, Imperial (2005) defines an "interorganizational network" as "the totality of all of the organizations connected by a certain type of relationship and is typically bounded by a common orientation such as a policy area, type of service, or geographic area" (p. 287). Understanding this governance network among actors can improve our understanding of information and resource flows as well as illuminate the power dynamics that influence decision making (Imperial, 2005).

To further our understanding of state energy governance networks, this dissertation explores the following questions: What is the independent state EERE administration? What is the composition of the governance network in which they are embedded? Is the existence of independent administrations correlated with new energy policy activity? In examining these questions, this dissertation attempts to provide a new perspective for a more complete comprehension of state energy governance networks with a focus on independent EERE administrations.

1.2 Energy Governance Studies

Scholars have examined how different actors and their interactions influence decision-making at different levels of U.S. energy governance. Research that focuses on the national or federal level governance typically investigates key federal institutions, including the U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and the Federal Energy Regulatory Commission (FERC), to explore their administrative structures and guiding principles for energy policy decision-making (Sovacool, 2011).

At the subnational level, regional level energy governance studies discuss energy policy issues related to the territory shaped by different electricity transmission grids, and study the activities related to Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs) (Koch Jr., 2005; Osofsky & Wiseman, 2014; Scott & Bernell, 2015; Wiseman & Osofsky, 2016). State level energy governance studies examine the administrations, policies, and market development in

different U.S. states and research how different actors interact within states (Sawyer S., 1984; Blumstein, Goldman, & Barbose, 2005; Sedano, 2011; Li & Bryson, 2015; Baldwin, Rountree, & Jock, 2018). City-level governance research, which has developed in recent decades, studies how urban energy regimes address critical energy policy issues related to clean energy deployment, environment sustainability, and climate change adaptation initiatives in U.S. cities or metropolitan areas (Monstadt & Wolff, 2015; Pitt & Congreve, 2017; Argyriou, Justice, Latham, & Warren, 2017).

In the 1980s, energy governance research began to shift attention towards the state as the responsibility of energy policy and administration gradually shifted away from the federal government (Sawyer S., 1984; Sawyer S. W., 1985). Prior to the 1990s, the state energy governance network was mostly limited to utilities and government regulators such as state energy offices and public utility commissions (Sawyer S., 1984; Baldwin, Rountree, & Jock, 2018). In the late 1990s to early 2000s, electricity market restructuring allowed more non-government and utility actors to actively participate in state level energy governance and policy decision making. Several states, including Oregon and Vermont, experienced dramatic changes in their electricity markets during restructuring (Blumstein, Goldman, & Barbose, 2005). In response, various administration models (public, utility, and independent) were adopted to administrate state energy programs (Goldman, 2003; Kubert & Sinclair, 2011; York, 2012). The choice of administrative model led to the development of distinct state energy governance networks (Blumstein, Goldman, & Barbose, 2005; Baldwin, Rountree, & Jock, 2018).

In the existing literature, researchers have conducted two strands of inquiry at the state energy governance level[2]. The first strand examines how administration structures and models function and influence energy policy making (Blumstein, Goldman, & Barbose, 2005; Sedano, 2011). For example, Blumstein et al. (2005) examined distinct types of energy-efficiency administration models used in different states and proposed criteria for evaluating the effectiveness of the program administration and delivery. Sedano (2012) continued this work by assessing and classifying ratepayer-funded energy efficiency administrations, and suggested a more comprehensive set of criteria for comparing their administrative structures and program operations.

The other strand of inquiry studies the governance network formed by various actors in each state. Existing research has examined the actors of the network and how this network influences energy policy and governance (Li & Bryson, 2015; Baldwin, Rountree, & Jock, 2018). Li and Bryson (2015) first proposed the collaborative network for state energy efficiency programs. In their research, this energy efficiency collaborative can be useful for gathering stakeholder inputs for improving state energy efficiency programs. This research further categorized various state collaboratives in terms of their operating budget level and statuary permanence and provided common

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[2] Most research conducted during this period studied the influence of restructuring on state energy governance. At that time, states faced the pressing issue of declining utility investment in energy efficiency and demand side management, and this became a core policy focus at the state level (Blumstein, Goldman, & Barbose, 2005; Sedano, 2011).

attributes of successful energy efficiency collaboratives. A more recent work from Baldwin et al. (2018) expanded the previous research by arguing that state-level energy efficiency governance is in the process of transiting from a formal centralized governance system into a more distributed, participatory, and horizontal governance system characterized by greater stakeholder involvement. Although the paper provides evidence of stakeholder collaboration in the energy efficiency governance of Connecticut and Maryland, the authors do not thoroughly describe or analyze the composition and evolution of specific energy governance networks formed by different actors at the state level. This dissertation seeks to address this lacuna by exploring the administrative structure and organizational networks of independent state EERE administration in greater depth.

These two strands of research both depict the regime of state-level energy governance. However, little research attempts to examine how one administrative structure develops its network overtime. Such an investigation is crucial in bridging the gap between the two strands of administrative structure and governance network inquiry. Understanding the composition of the network formed by the independent energy administration can help future researchers better contextualize and evaluate the efficacy of the governance network in states with independent EERE administrations.

1.3   The Independent Administration and Its Network

After restructuring, several states have adopted an independent third-party administration model for administrating state energy efficiency and renewable energy

programs. These single-purpose, non-government, non-utility organizations normally

take the form of public benefit corporations (e.g. New York State Energy Research

and Development Authority) or nonprofit organizations (e.g. The Energy Trust of

Oregon). To achieve their operation goals, these independent administrations connect

with several major stakeholders across sectors and serve as coordinators for state

energy governance networks. This dissertation contributes to research that suggests

these new independent administrations and their networks have transformed the

administrative structure of the conventional energy governance network which

focused primarily on government agencies and utilities (Blumstein, Goldman, &

Barbose, 2005).

1.4   Dissertation Outline

The research questions guiding this dissertation include: what is an

independent EERE administration, how does it differ from other state energy

administrations, and why did it form? How do independent EERE administrations

collaborate with actors from different sectors? Who are the actors with whom these

administrations collaborate? Is the existence of this administration associated with

new energy policy activities? A mixed-method approach that includes quantitative and

qualitative analysis was applied to answer these questions. Through collecting

empirical evidence and conducting quantitative and qualitative analysis, I explain how

these independent administrations collaborate with actors in the public sector, private

sector, and civil society to form a governance network and influence the policy activities in the states.

This dissertation has three parts. The first provides a conceptual framework for state EERE administrations and their collaborative networks, the second offers an empirical analysis of the correlation between the independent administration and energy policy adoption, and the third presents case studies on two independent EERE administrations and their networks.

In the second chapter, I develop a conceptual framework to conceptualize the development of independent administrations. This conceptual framework describes these administrations' essential roles in coordinating resources, information, and networks among actors in the public sector, private sector, and civil society.

In the third chapter, I study the correlation between these independent administrations and new energy policy adoption to examine the relationship between the administrative model and policy activities. This chapter provides a new institutional perspective on how this administration and its implicit network correlate with new energy policy adoption.

The fourth chapter of this dissertation employs two case studies on two independent EERE administrations: The Energy Trust of Oregon and Efficiency Vermont. These case studies use archival document analysis and elite semi-structured interviews to identify each state's EERE administration stakeholder network and examine the purpose and approach of each administration's interaction with its stakeholders.

The conclusion contains a brief overview of this dissertation, describes its limitations, and proposes future research directions. The conclusion also discusses the contribution of this research and offers ideas for how it might be applied by policy researchers and professionals who seek to develop energy administration models and programs.

Chapter 2

A COLLABORATIVE FRAMEWORK FOR US STATE-LEVEL ENERGY EFFICIENCY AND RENEWABLE ENERGY GOVERNANCE

2.1   Introduction[3]

As energy efficiency and renewable energy development has become a greater priority for the states in the United States (Rabe, 2006; Carley, 2011), several state-level renewable energy and energy efficiency program administrations have emerged in the past decade to support state energy efficiency and renewable energy programs. These energy program administrations play an essential role in coordinating resources, information, and networks among actors in the public sector, private sector, and civil society. This chapter attempts to understand the coordinative role and functions of these energy administrations, their network across different sectors, and their influence on state-level energy efficiency and renewable energy (hereafter EERE) governance. Lessons learned from this research can assist policymakers and researchers in understanding the coordinative role of state EERE administrations, their connections

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[3]This chapter was published in *The Electricity Journal* in 2016. A full citation of this paper is "Shih, C.-H., Latham III, W., & Sarzynski, A. (2016). A collaborative framework for U.S. state-level energy efficiency and renewable energy governance. *The Electricity Journal*, 29, 21–26." The permission to reprint this paper as a chapter of the dissertation is included in Appendix A.

among other key actors in the network, and how this collaborative network forms a more collaborative EERE governance.

The structure of this chapter is as follows: this chapter first examine the historical background of these administrations and introduce the concept of collaborative governance. This chapter then apply this concept to energy governance at the state level by identifying critical actors from different sectors and explain the governance network for EERE administrations. In the conclusion, this research summarize and indicate directions for future research using this framework.

2.2   The Historical Background of State-level Energy Program Administrations

The U.S. started to recognize the importance of energy conservation during the Organization of the Petroleum Exporting Countries (OPEC) oil embargo of the 1970s. In response to the economic and social impacts of sudden energy price shocks and shortages, Congress passed the National Energy Act (NEA) of 1978 and the Energy Security Act in 1980. These two national energy policies, which broadly sought to prevent another energy crisis by increasing U.S. energy security, provided a critical regulatory foundation for energy conservation and renewable energy development in the U.S. (Richardson & Nordhaus, 1995).

Among all the statutes included in the NEA, the Public Utility Regulatory Policies Act (PURPA) had the most significant consequences for energy conservation, renewable energy deployment, domestic energy sources, and small-scale energy

systems. This act also began the process of deregulation in the electricity market (Munson, 2005; Sovacool, 2011).

In 1990, the outbreak of Persian Gulf War and subsequent Iraqi oil embargo led to another significant U.S. energy crisis. With a 10 percent decrease in oil imports to the country, the price of petroleum products rose significantly for U.S. customers (Munson, 2005, p. 110). Congress reacted by passing the Energy Policy Act (EPACT) in 1992, which sought to improve energy security by reducing the nation's dependency on foreign oil. This act fundamentally transformed the U.S. wholesale electricity market to an open market to increase market efficiency and renewable energy deployment (Munson, 2005; Ardoin & Grady, 2006). This act was also the first federal-level energy policy to promote energy efficiency through utility Integrated Resource Planning (IRP), which requires utilities to plan their future operations based on an assessment of social benefits and costs (Eto , Goldman , & Kito , 1996).

The EPACT of 1992 and the 1996 Federal Energy Regulatory Commission (FERC) Order 888 triggered the restructuring of the electricity market (Ardoin & Grady, 2006). These two pieces of legislation[4] opened the wholesale market to other non-utility electricity suppliers (Prause, Crookshank, & Stipe, 2007). In addition to increasing competition in the electricity market, restructuring had economic impacts for state energy-efficiency programs. Before restructuring, the EPACT allowed state

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[4] The FERC order is not a legislation. However, such orders have a significant influence on the industries that FERC regulates.

energy regulators to command the vertically integrated investor-owned utilities (IOUs) to include energy efficiency program costs in their electricity rates (Nadel & Kushler, 2000). During restructuring, increasing competition in the electricity service market caused utilities to decrease spending on their energy efficiency programs (Blumstein, Goldman, & Barbose, 2005). The IOUs were concerned that including energy efficiency program costs in rates would decrease their competitive advantage—customers might avoid the price increase by switching to competitors, which was possible in a restructured market.

The economic impact on energy efficiency programs inspired a new rationale termed "market transformation'' for many state regulators to plan and manage long-term state EERE programs (Blumstein, Goldstone, & Lutzenhiser, 2000). The new "Market Transformation" rationale focused on supporting existing energy policy objectives in a broad policy umbrella. This rationale attempted to make long-term changes by reducing market barriers for energy efficiency and renewable technology to permanently transform state energy markets. States started to recognize the importance of financial mechanisms that can sustain state EERE development regardless of restructuring. To achieve this goal, several states established Public Benefit Funds (PBFs) as part of their restructuring legislation or other regulations to serve as an innovative funding mechanism for supporting state EERE program development. These PBFs secure their funding through a ''non-bypassable'' charge or "system benefit charge'' on customer utility bills (Blumstein, Goldman, & Barbose, 2005; Nadel & Kushler, 2000). The transition to the "Market Transformation"

rationale and creation of PBFs allowed states to experiment with a more diverse and flexible administrative arrangement.

Several independent administrations were established and assigned to manage state public benefit funds and EERE programs. These administrations are single-purpose organizations that focus on assisting the delivery, development and implementation of state EERE programs (Blumstein, Goldman, & Barbose, 2005). The establishment of state-level EERE program administrations (See Figure 1) influences the institutional network and arrangement for state-level energy governance. This new institutional network and arrangement allows key actors to collaborate with each other for state EERE policy and planning.

The Establishment of State EERE Administrations

(Number of States)

NY (1975)
NC (1980)
CT (1998)
VT(2000);OR(2002),DE (2007);MD(2008),HI (2009);MA(2009),ME (2009)
D.C. (2011)

1970-1980   1980-1990   1990-2000   2000-2010   2010-2015   *(Year)*
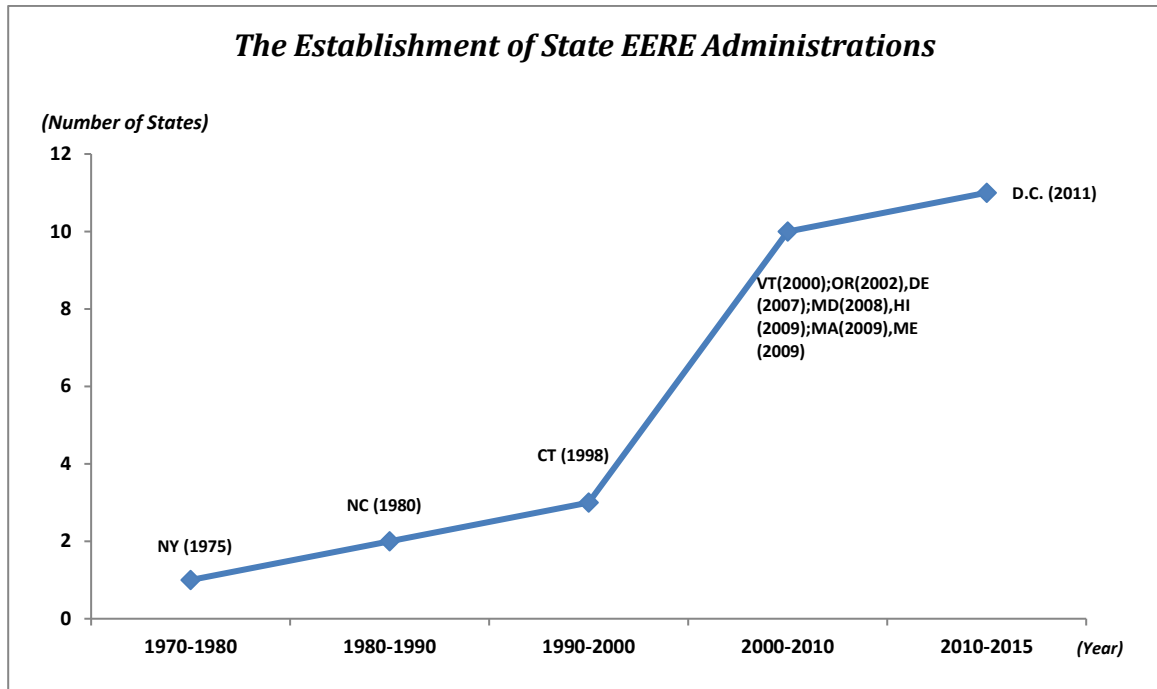
Figure 1 The establishment of state EERE program administration in the U.S.[5]

2.3 Collaborative Governance

In the field of public administration, the discourse surrounding governance has traditionally centered on the role of the public sector (government) in addressing public issues (Vigoda, 2002; Sarzynski, 2015). However, the complex and interdependent essence of public issues has extended the inquiry beyond the

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[5] in Figure 1, DC is showed as established in 2011. However, it should be noted that DC established the DC Sustainable Energy Utility (DC SEU) in 2008 through the enactment of the Clean and Affordable Energy Act (CAEA) (The District of Columbia Sustainable Energy Utility, 2017). In 2011, after a public bidding, the DC Department of Energy and Environment (DOEE) contracted the operation of the DC SEU with the Vermont Energy Investment Corporation (VEIC) and eight other local organizations (The District of Columbia Sustainable Energy Utility, 2017).

boundaries of the public sector and incorporated other sectors, such as businesses and local communities. Scholars have examined how the linkages among the actors that compose this organizational network affect the governance of public or societal issues (Vigoda, 2002; Lemos & Agrawal, 2006; Sarzynski, 2015)

The theme of collaborative governance has also diffused to other fields, such as environmental policy, climate change adaptation, and natural resources management (Imperial, 2005; Lemos & Agrawal, 2006; Sarzynski, 2015). This research shares a common recognition that each actor in the social and organizational network participates in public issues and has a different and unique role to play (Vigoda, 2002; Jung, Mazmanian, & Tang, 2009). This cross-sectoral network encourages society to form a structurally interdependent collaboration through communication, knowledge sharing, and the exchanging of resources (O'Toole, 1997). Collaborative governance emphasizes the collaboration of organizational entities across sectors. This inquiry provides a new definition of governance as the process of planning, facilitating, implementing, and monitoring cross-sectoral organizational arrangements for addressing public policy problems.

A critical challenge for collaborative governance research is identifying the key actors in fragmented social settings and explaining how the collaboration processes can effectively enhance current governance. Different from the previous suggestion that the government (public sector) should take the lead in initiating and organizing collaboration, scholars noted that actors from other sectors or an

independent collaborative organization might take the lead in facilitating collaboration across the entire network (Imperial, 2005).

2.4　A Collaborative Governance Framework for State-level Energy Efficiency and Renewable Energy Governance

The polycentric structure of the federal system in the U.S. creates opportunities for different actors to collaborate with each other (Imperial, 2005). The recent diffusion of renewable energy and energy efficiency technology also stimulates the transition towards state-level energy governance. Energy efficiency and renewable energy (EERE) technologies are distributed and decentralized, which means that they require and rely on wide adoption from individual customers to attain the effective scale for operation. Such a characteristic directly influences EERE policy and governance.

Based on these political and technical factors, EERE governance is different from the conventional centralized energy governance, which focuses on a few major actors in the public and private sectors. In contrast, EERE governance repositions and endows end-use consumers with a more active participatory role in energy-related public issues (Houck & Rickerson, 2009). In light of these changing dynamics, a collaborative governance framework is proposed for conceptualizing the current trend towards collaborative networks for state-level EERE governance.

This collaborative governance framework is conceptualized based on the existing actors in the current energy governance paradigm. Different from the

conventional focus on the public and private sectors, this collaborative framework

identifies the influence of collaborative actors and their networks during the entire

policy cycle (designing, planning, implementing, and evaluating). This collaborative

state-level EERE governance framework is constructed with actors from the public

sector, private sector, civil society, and a collaborative administration. A diagram of

this framework is shown in Figure 2.
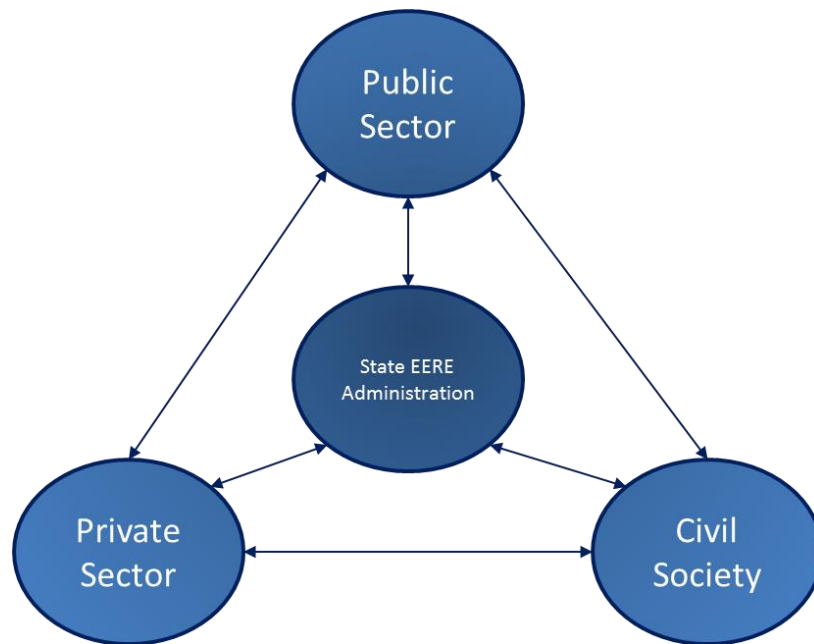
Figure 2 The Collaborative Governance Framework for State-level EERE Governance

The following parts identify the key actors in each sector of the governance

network and explain each sector's role in collaborative state EERE governance.

2.4.1 Public Sector

For state-level energy governance, the public sector normally includes the public utility commission (PUC) and state energy office. Established in the 1970s, state energy offices (SEOs) have acquired institutional expertise on state energy conditions over time (Sawyer, 1984). Typically, SEOs are in charge of policymaking and planning, whereas the public utility commissions are the regulatory oversight agencies.

The regulatory commission or designated SEOs are responsible for monitoring and supervising the implementation of state energy programs. These state agencies establish and implement primary program goals and monitor the overall performance of the program administrator (Blumstein, Goldman, & Barbose, 2005). Despite the significant role these actors play in terms of monitoring and supervising, internal constraints, such as staffing and budget limitations, and the procurement process still exist in this sector (Eto, Goldman, & Nadel, 1998). These constraints can influence the efficiency and effectiveness of management, especially when it comes to responding to the swift changes in the current EERE market. Hence, a practical way for the public sector to manage the state energy program is to collaborate with different sectors. This collaboration may create more flexibility, resilience, and comprehensiveness for the state energy program while also bringing more attention, support, and resources to the existing government initiatives (Imperial, 2005; U.S. Department of Energy (DOE) Technical Assistance Program (TAP) State and Local Solution Center, 2013).

2.4.2   Private Sector

There are three major types of the utilities in the U.S.: Investor-Owned Utilities, Public Utilities, and Rural Electric Cooperatives[6] (U.S. Department of Energy (DOE) Technical Assistance Program (TAP) State and Local Solution Center, 2013).Among these three types of utilities, Investor-Owned Utilities (IOUs) cover the largest service region and serve the most customers in the U.S. (IOUs cover around 68.4% of total customer in the U.S.) (The American Public Power Association, 2016). IOUs are private, shareholder-owned companies that provide electricity and/or natural gas service to grid-connected customers (residential, commercial, and industrial) within their service territory. Typically, the core mission of these utilities is to provide reliable electric power services at reasonable rate to their customers, and they are regulated by the state's public utility commissions.

Investor-owned electric and gas utilities were the administrators of demand side management programs in most states before restructuring. This background makes them an essential actor for state-level EERE governance based on their knowledge and previous work experience. In most states, utilities are able to significantly influence state energy programs due to the economies of scale of energy supply, their capability and knowledge of grid management, their access to vast

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[6] Public Utilities are the publicly owned municipal utilities. They are not-for-profit utilities and are affiliated with the state or local county or municipal governments (California Energy Commission, 2016). Rural electric cooperatives (coops) are mostly locally controlled not-for-profits entities. These consumer-owned utilities are mostly prevalent in the rural areas (National Rural Electric Cooperative Association, 2016).

customer energy demand information, and the advantage of utilizing the existing

billing infrastructure (Eto, Goldman, & Kito, 1996; Houck & Rickerson, 2009;

Mackres, Alschuler, Stitely, & Brandt, 2012).

The changing market forces resulting from EERE diffusion creates a conflict

of interest for centralized system utilities (especially for the IOUs), which strive to

maintain their current level of sales revenue and operation profit (Houck & Rickerson,

2009). In recent times, more utilities have become more actively involved in the

delivering of energy efficiency and renewable energy services to their customers as

the result of the market transformation rationale and incentives from the federal and

state energy agencies (Mackres, Alschuler, Stitely, & Brandt, 2012; U.S. Department

of Energy (DOE) Technical Assistance Program (TAP) State and Local Solution

Center, 2013; Pacific Gas and Electric Company, 2016).

2.4.3   Civil Society

By definition, civil society consists of numerous Non-Governmental

Organizations (NGOs) and community-based interested citizens (Sarzynski, 2015).

Traditionally, members of civil society participate in public affairs through voting or

social movements that create social pressure on the public and private sectors

(Sarzynski, 2015). In recently developed state-level EERE governance, civil society

organizations have a specific advantage that can contribute to the governance network:

local relationships (Mackres, Alschuler, Stitely, & Brandt, 2012). By properly utilizing

their local relationships, NGOs have the ability to utilize their local networks for

outreach, education, and workforce mobilization. Collaborating with these NGOs and

their networks can contribute to the delivery of state EERE programs and improve the

effectiveness and comprehensiveness of their implementation (Stout, Coughlin,

Hanna, & Legg, 2002; Hewitt, et al., 2005).

In the state EERE governance network, NGOs and community-based

organizations commonly act as change agents or opinion leaders that provide the

community with access to information regarding the localized incentives of EERE

projects (Noll, Dawes, & Rai, 2014). Within their networks, these organizations also

help to reduce the barriers to the adoption of renewable energy and energy efficiency

through active campaigning at their communities. Due to pressure from some critical

voices in civil society, state agencies and EERE program administrations started to

include representatives from civil society in their advisory committees (Hewitt, et al.,

2005; Vermont Energy Investment Corporation, 2016; Energy Trust of Oregon, 2016).

Collaborative partnerships with various NGOs provides opportunities for civil society

to voice their opinion on state energy program decision-making and implementation

(Clean Energy Group and SmartPower, 2009; Aylett, 2013).

2.4.4   Collaborative Organization

Beyond the three sectors identified above, a key coordinative role has

developed for state-level EERE governance in recent decades. Several independent

state EERE administrations evolved from public benefit fund administrators to more

sustainable, comprehensive administrations focused on planning, implementing, and

evaluating state EERE programs. These administrations are normally non-profit or public corporations (e.g. New York State Energy Research and Development Authority or Energy Trust of Oregon) with boards of directors across different sectors (Blumstein, Goldman, & Barbose, 2005; Energy Trust of Oregon, 2016; Vermont Energy Investment Corporation, 2016). These independent EERE administrations play a critical collaborative/coordinative role for state EERE governance. They work with utilities, state energy agencies, and NGOs in collecting information, conducting research, evaluating programs, and providing advice to different sectors.

The emergence of these collaborative/coordinative administrations responds to a common concern of limited resources (e.g., staffing, funding, and expertise) and administrative burdens (Imperial, 2005). By establishing new collaborative administrations, the governance network can more effectively pool resources (e.g., funding, staff, and information) from different sectors and can enhance their collective capacity for addressing public problems. In state EERE governance, these state EERE administrations act as a convener and conduit for information, knowledge, and resources to flow through different sectors.

These independent coordinating energy administrations hold several characteristics in common (Houck & Rickerson, 2009):

1. Central contact: these administrations provide a critical point of contact in their states for communicating with different sectors. This activity is essential for ensuring the flow of knowledge, opinions, and resources within the governance network.

2. Comprehensive scope: in planning and implementing state EERE programs, these administrations serve customers across different levels and in different sectors within their states.

3. Self-sufficiency: financial support from public benefit funds or government bonds secures the long-term financial stability of these administrations and neutrality in terms of implementing and evaluating state EERE programs.

2.4.5   A Collaborative Network for State EERE Governance

As shown in Figure 2, this new collaborative governance is structured as a network among the public sector, private sector, and the civil society with the collaborative administration at the center. This new form of governance network is based upon the recognition that no single actor in this network has the comprehensive capacity to address highly complex and interdependent energy issues.

In Figure 2, the outer triangular cycle describes the linkages/network for conventional energy governance. In this network, the public sector (state energy agencies and regulatory commissions) has the authority to monitor and regulate the private sector (utilities). The private sector (utilities) provides services to civil society (end-user customers). By communicating public opinion, civil society actors can express their opinions through elections or social movements.

Different from conventional energy governance, state EERE administrations provide the critical nodal points that allow for all three sectors to link with each other in collaborative state EERE governance model. The state EERE administrations are overseen by the public sector but allowed to advise state regulatory agencies through

their research reports or strategic plans. Such advising normally comes from their cross-sectoral advisory board and experienced staff.

As for the linkage to private sector, these state EERE administrations work with utilities to implement EERE programs and serve customers with different income-level beyond the individual utilities' service territory (Houck & Rickerson, 2009). Partnerships with different utilities from the state EERE administrations will not only expand the scale and scope of the program services, it also allows these administrations to congregate resources and customer information for advising state EERE program implementation.

In terms of the partnerships with civil society, these administrations organize and collaborate with local NGOs for assisting communities in understanding specific EERE programs and educate these communities on effectively utilizing relevant incentive programs for adopting EERE technologies. On the other hand, the civil society is allowed to provide their opinions and experiences in assisting state agencies from public sector and utilities to identify barriers for implementing state EERE programs.

Ultimately, the increasing collaborations among different sectors and organization networks can facilitate more discussion, participation, and mutual understandings, thereby enhancing the state EERE governance capacity for trust, accountability, and public acceptability (Sarzynski, 2015).

Table 1 presents a list of eleven state EERE administrations that exemplify the current trend of state-level EERE governance in the U.S.

Table 1 A list of state-level energy program administrations[7]

Connecticut
The Connecticut Energy Efficiency Fund (CEEF)-Energize Connecticut
1998

Delaware
Delaware Sustainable Energy Utility (DE SEU)-Energize Delaware
2007

Hawaii
Hawaii Energy
2009

Maine
Efficiency Maine
2009

Maryland
Maryland Clean Energy Center (MCEC)
2008

Massachusetts
Massachusetts Clean Energy Center (MassCEC)
2009

New York
The New York State Energy Research and Development Authority (NYSERDA)
1975

North Carolina
The North Carolina Advanced Energy Corporation
1980

Oregon
Energy Trust of Oregon
2002

Vermont
Efficiency Vermont: Vermont Energy Investment Corporation (VEIC)
2000

Washington D.C.
The District of Columbia Sustainable Energy Utility (DC SEU)
2011

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[7] In Table 1. the critical organization under the Energize Connecticut is showed as the Connecticut Energy Efficiency Fund. However, another important organization of the Energize Connecticut- the Connecticut Clean Energy Fund (now The Connecticut Green Bank) should also be included. The Clean Energy Fund was created at the same time along with the Connecticut Energy Efficiency Fund in 1998 (U.S. Department of Energy, 2017). In 2011, the Connecticut Green Bank superseded The Connecticut Clean Energy Fund through Public Act 11-80 and have been worked closely with the Connecticut Energy Efficiency Fund (Energize Connecticut, 2017).

To enhance this collaborative network capacity and improve upon the success of current state EERE administrations, three recommendations—legislative support, long-term policy and financial plans, and adequate checks—have been suggested (Hamilton, 2008):

> 1. Provide appropriate designation and support (such as an "Order of Appointment") through the legislature. Designation from the legislature or regulative authority would identify specific obligations and endow the EERE administrations with the authority to conduct recordkeeping, investigations, reports, and coordinating activities with other key parties in the network.
>
> 2. Develop long-term goals and budget planning for state EERE administrations. This long-term plan, combined with other short-term goals, could create additional stability and security. The short-term goals within the long-term plan can be evaluated at different phases and provide a more solid foundation for evaluating the longer-term goals.
>
> 3. Conduct adequate and regular checks for state EERE administrations. Introducing unbiased third-party organizations to conduct independent evaluations of these administrations could help maintain the efficiency of their operations and assist in the evaluation of EERE program goals and budget plans.

2.5   Conclusion

In this chapter, a collaborative governance framework for state-level EERE governance was conceptualized, and the key actors were identified and examined across the public sector, private sector, and civil society. This chapter presents a general picture of a trend towards more collaborative state-level EERE governance. This framework provides a foundation for future examinations of this dynamic state-level EERE governance network.

Potential future studies can focus on conducting horizontal or vertical analyses. In horizontal analyses, key actors can be identified from each sector and linkages among them can be examined through empirical testing. Another critical phenomenon for studying these state EERE administrations is the diffusion of the administration model to different states in recent years. Some early-established administrative models (e.g., NYSERDA and Efficiency Vermont) have transferred to other states or regions. Vermont transferred their administration model to help District of Columbia establish their own EERE administration (Sedano, 2011; Hayes & Mackres, 2012). Moreover, some administrations have expanded their service territory beyond state lines by collaborating with other local governments or utilities from adjacent states. (For example, Oregon's administration expanded its service to some regions of Washington state (Database of State Incentives for Renewables & Efficiency, 2015). Such diffusion patterns require future observations and research to understand the dynamic role of these administrations and their potential influence on inter-state energy policy governance.

As for the vertical analysis, future research can focus on multi-level collaboration. A multi-level analysis across federal, regional, state, county, and city-level networks can expand the boundaries for understanding the collaborative role of state EERE administrations and their linkages to other entities from different levels. These different research directions for state EERE governance network can help policymakers and decision makers build up a more comprehensive understanding of

how this new form of governance can enhance the planning, implementation, and

evaluation of state energy programs and policies.

Chapter 3

AN EMPIRICAL ANALYSIS OF THE ASSOCIATION OF U.S. STATE EERE ADMINISTRATIONS ON STATE EERE POLICY ADOPTION

3.1 Introduction[8]

With increasing concerns over global climate change and energy security, several states in the U.S. have begun to prioritize energy efficiency and renewable energy (hereafter EERE) development (Rabe, 2006; Yi & Feiock, 2014).

Since 2000, several state-level EERE administrations have emerged to coordinate resources, information, and networks across the public sector, private sector, and local communities to support EERE development. These new administrations serve as single-purpose organizations which advocate and coordinate stakeholders during the decision making process of state EERE policies and programs. Using a discrete non-repeated event history analysis (EHA) model, this research examines the association of state EERE administrations with the adoption of Property Assessed Clean Energy (PACE) enabling legislation.

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[8] The preliminary results of this research were presented at the 2016 Behavior Energy and Climate Conference (Convened by American Council for an Energy-Efficient Economy, Berkeley Energy and Climate Institute, and Precourt Energy Efficiency Center at Stanford University).

Results from this chapter provide new empirical evidence that the presence of independent state EERE administrations has a positive relationship with the adoption of PACE-enabling legislation. Lessons learned from this research can help energy policy researchers further examine this new administration model and its governance network and provide new directions for research on EERE policy adoption and diffusion.

This chapter begins with a review of the literature on EERE policy adoption at the state-level. In the second section, I discuss a key institutional determinant—a state's EERE administration—and the selection of PACE-enabling legislation as our test legislation. I then discuss our methodological approach of event history analysis and describe our data collection process. In the discussion section, I present statistical results and discuss their implications. In the conclusion, I discuss limitations and future research directions.

3.2   Review of Literature

Over the past few decades, United States (US) state-level energy policy and governance has undergone a transformation to EERE development due to concerns over energy security, climate change, and environmental degradation (Rabe, 2006; Huang, Alavalapati, Carter, & Langholtz, 2007). A variety of EERE policies were adopted primarily at the state-level, which spurred research on EERE policy adoption (Huang, Alavalapati, Carter, & Langholtz, 2007; Matisoff, 2008; Stoutenborough & Beverlin, 2008; Chandler, 2009; Young & Sarzynski, 2009; Carley & Miller, 2012).

EERE policy adoption research usually employs the event history analysis (EHA) framework from Berry and Berry (1990). The framework offers a unified model structure that can incorporate both internal determinants and external regional diffusion determinants to explain influences and forecast policy adoption trends (Berry & Berry, 1990; Matisoff, 2008; Stoutenborough & Beverlin, 2008; Matisoff & Edwards, 2014; Berry & Berry, 2014). In this framework, the internal determinant incorporates a state's political, economic, and social conditions, while the regional diffusion determinant includes other external influences from neighboring states (Mooney, 2001; Berry & Berry, 2014). When building an EHA model, different sets of determinants can be chosen to fit the unique circumstances surrounding the specific policy area in a state or region (Berry & Berry, 2014).

Among EERE policies, Renewable Portfolio Standards (RPS) are the most studied. Past research using the internal determinant model found that the political ideology of state residents is a significant predictor for whether a state adopts an RPS (Huang, Alavalapati, Carter, & Langholtz, 2007; Lyon & Yin, 2010). Following the internal determinant model, other RPS adoption research used an EHA model with a regional diffusion factor and discovered similar evidence suggesting political ideology plays a large role in state RPS adoption (Matisoff, 2008; Chandler, 2009; Carley & Miller, 2012).

In addition to the RPS, policy researchers have examined other critical EERE policies, such as electricity deregulatory bills, net metering, and solar energy financial incentives (Ardoin & Grady, 2006; Stoutenborough & Beverlin, 2008; Young &

Sarzynski, 2009). A comprehensive review by Matisoff and Edwards (2014) examined eight prominent EERE policies (RPS, corporate and personal tax credits, net metering, and Public Benefit Funds (PBF)), and concluded that politics and political culture are key factors influencing the adoption of these policies.

Building on these studies, recent EERE adoption research has begun to examine the policy determinants that may influence states to adopt new EERE policies (Yi & Feiock, 2012; Cheng & Yi, 2017). Yi and Feiock (2012) first introduced the theoretical framework of policy interactions among EERE policies and examined the influence of several EERE policies on state RPS adoption. Following this study, Cheng and Yi (2017) further examined the policy determinants and the interrelations among three critical EERE policies: RPS, PBF, and corporate incentive programs.

The recent progress and diffusion of EERE technology stimulates and increases participation from end-use consumers in the U.S. electricity market. Such changes also influence the institutional network and arrangement of state-level energy governance (Houck & Rickerson, 2009). Over the past sixteen years, several state legislatures passed legislation to establish independent state EERE administrations to manage and assist the implementation of state EERE programs (Blumstein, Goldman, & Barbose, 2005). The establishment of this new type of institution for administrating EERE programs addressed some of the concerns associated with utility-led energy administrations, such as conflict of interest, and alleviated some of the administrative constraints of government-led administrations, such as staffing and budget limitations (Eto, Goldman, & Nadel, 1998; Goldman, 2003; Kubert & Sinclair, 2011).

The institution building process for this type of independent single-purpose administration requires the support of all stakeholders to maintain its effective operation (Goldman, 2003). This requirement motivates this administration to reach out and collaborate with different stakeholders from the public sector (state energy office, public utility commission, state legislature), private sector (utilities, energy service companies), and civil society (local communities and non-government organizations). These new independent administrations operate as collaboration organizations during the collaboration process and form a coordinative network within their states. The phenomenon of this organizational network is compatible with collaborative governance networks seen in public administration, natural resource management, and environmental governance, which suggests that the enhanced collaborative governance network could influence public decision making and policy changes (O'Toole, 1997; Imperial, 2005; Thomson & Perry, 2006; Ansell & Gash, 2008; Jung, Mazmanian, & Tang, 2009; Sarzynski, 2015; Li & Bryson, 2015). Based on this theory, I intend to capture the presence of these independent EERE administrations and test their association with the adoption of new EERE policy. In doing so, I seek to provide empirical evidence for the relationship between this type of collaborative organization and subsequent EERE policy changes. The focus on the state EERE administration leads to the key hypothesis of this analysis: The existence of an independent state EERE administration as a collaboration organization correlates with a state's adoption of EERE policies.

3.3 State EERE Administrations and PACE-Enabling Legislation Adoption

3.3.1 Institutional Determinant of State EERE Administrations

As of 2016, nine states have established an independent EERE administration to support the management of EERE programs and coordinate stakeholders from the different sectors. These administrations are normally non-profit and public benefit corporations and their connections to different sectors form a collaborative network that can help coordinate competing programs and clarify inconsistent program rules in different EERE policies and programs (Fazeli, 2016). The enhanced collaboration among sectors may have the potential to further influence the adoption of innovative EERE policies and promote statewide EERE development.

Examining the correlation of state EERE administrations forms a key independent variable for testing whether the existence of a state EERE administration correlated with the state's adoption of EERE policy. To estimate this association, an institutional dummy variable was introduced to capture the presence of nine state EERE administrations[9].

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[9] Based on Shih et al. (2016), the list of state EERE administrations and year of establishment included in this research are: The Connecticut Energy Efficiency Fund & Connecticut Clean Energy Fund (now The Connecticut Green Bank) -Energize Connecticut (1998), Delaware Sustainable Energy Utility - Energize Delaware (2007), Efficiency Maine (2009), Maryland Clean Energy Center (2008), Massachusetts Clean Energy Center (2009), The New York State Energy Research and Development Authority (1975), The North Carolina Advanced Energy Corporation (1980), Energy Trust of Oregon (2002), and Efficiency Vermont (2000).

3.3.2 Selecting PACE-enabling Legislation for Testing the Institutional Association

After examining recent EERE policies[10], PACE-enabling legislation was selected as the dependent variable for testing its association with state EERE administrations in our EHA model[11].

The concept of PACE was first introduced in 2008 (Saha, 2012; The Center for Climate and Energy Solutions, 2013; Qiu & Durkay, 2016). PACE is an innovative and flexible financing mechanism that allows state and local governments (e.g. county or city government) to fund EERE installations, such as rooftop solar PV and energy efficient retrofits, in residential, commercial, and industrial properties (Saha, 2012; The Center for Climate and Energy Solutions, 2013; Deitchman, 2014). In this mechanism, the initial government fund is normally raised from bond issues and recovered through property taxes (Saha, 2012; The Center for Climate and Energy

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[10] These recent policies include Public Benefit Funds, Renewable Portfolio Standards, Net Metering, Energy Efficiency Resource Standards, Corporate and Personal Tax Credits, and Public building energy standards. In this chapter, this research selected PACE-enabling legislation because it hasn't been empirically studied in this fashion.

[11] Another key form of EERE legislation that can also be used for examining the institutional effect of a state's EERE administration is the green bank legislation. Green bank legislation was first adopted by Connecticut in 2011. By 2014, only 6 states had enacted this legislation and 2 states had introduced this legislation (National Conference of State Legislatures, 2014). Hence, the study of the adoption of green bank legislation may be premature for this kind of analysis and PACE-enabling legislation adoption is more appropriate for examining the relationship with state EERE administrations. However, future research should continue tracking this policy to further evaluate the correlation between the presence of these EERE administrations and the adoption of green bank legislation.

Solutions, 2013; Deitchman, 2014). It is essential for the state legislature to enact

PACE- enabling legislation before any PACE program is launched at the state or local

level (Fazeli, 2016). This enabling legislation is intended to provide guidance and

organization for governments (state and local), property owners, and private sector

companies (Fazeli, 2016) but does not guarantee activity under PACE.

In recent years, state EERE administrations in Connecticut, Maryland, Oregon,

and Vermont have assisted state governments and legislatures in adopting PACE

enabling legislation and PACE programs (Adamczyk, 2012; Maryland Clean Energy

Center, 2016; PropertyFit Oregon, 2017; U.S. Department of Energy, 2017). The

presence of an established state EERE administration assured state legislatures that the

state was capable of administrating and developing PACE programs (Adamczyk,

2012). Several state EERE administrations actively provided advice and information

to the state legislature on the feasibility and design of PACE programs (Adamczyk,

2012; ECONorthwest, 2012; Maryland Clean Energy Center, 2016). After the

enabling legislation was enacted, some state EERE administrations were designated

the role of developing, administrating, reviewing, and coordinating PACE programs in

partnership with other local governments and community banks (Adamczyk, 2012;

PACENation, 2017a; PACENation, 2017b).

The adoption of PACE-enabling legislation is the dependent variable in our

EHA model. It is a dichotomous variable (1 if a state adopted this legislation for that

year and 0 otherwise) based on data collected from the PACENation (formerly known

as PACENow), National Conference of State Legislatures, and Database of State

Incentives for Renewables & Efficiency databases (PACENation, 2013; Qiu &

Durkay, 2016; Database of State Incentives for Renewables & Efficiency, 2016). As

this legislation normally can only be enacted once (although it may be amended or

renewed), this research treat the first adoption of PACE-enabling legislation as a non-

repeated event and a state will be dropped out from the dataset after it adopts PACE-

enabling legislation.

In the following table, this research present the year the independent EERE

administration was established and the year the PACE-enabling legislation was

adopted for the nine states.

Table 2 Year of state EERE administration establishment and PACE legislation
adoption

State	Year of EERE administration establishment	Year of PACE legislation adoption
Connecticut	1998	2012
Delaware	2007	2014
Maine	2009	2010
Maryland	2008	2009
Massachusetts	2009	2010
New York	1975	2009
North Carolina	1980	2009
Oregon	2002	2009
Vermont	2000	2009

3.4   Methodology

Testing a policy determinant in a discrete non-repeated event history analysis

model can help researchers estimate the correlation of a previous policy choice on the

likelihood that a new policy will be adopted (Berry & Berry, 2014). Here this chapter

test the likelihood of a state adopting a new EERE policy – namely PACE-enabling

legislation – using the presence of an institutional determinant and other internal and

regional diffusion determinants.

3.4.1 Sample Data

The data for examining the relationship between state EERE administration presence and PACE-enabling legislation adoption were collected from 2008-2013[12]. This period captured the adoption of PACE-enabling legislation from 2008 (California and Colorado) to 2013. In this period, 32 states and Washington DC adopted this legislation (Qiu & Durkay, 2016). The final compilation forms a discrete longitudinal dataset with 200 observations, which includes 49 states[13] during 2008-2013.

When estimating the association from a policy-derived institution (e.g. the state EERE administration) on new policy adoption, the establishment of the institution should take place before the new policy event. During this study period, this

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[12] Following the same method as Berry and Berry (1990) in defining the risk set, this research started the observation at 2008 because no states had adopted PACE legislation prior to this year. The reason for stopping at 2013 is because the data for the critical control variable-citizen ideology is only available to 2013.

[13] Hawaii is excluded because it used a preexisting authority to launch its PACE program rather than legislation (Deitchman, 2014). Currently, there are no residential or commercial PACE programs operating in Hawaii (PACENation, 2017d). DC is excluded for the following reasons. First, it has missing data in citizen ideology. Second, due to its unique urban geography and electricity market, DC is different from the other 50 states and is not suitable for comparing its independent EERE administration and PACE enabling legislation adoption with other states. DC first adopted the independent EERE administration model and established the DC Sustainable Energy Utility (DC SEU) through the Clean and Affordable Energy Act (CAEA) in 2008 (The District of Columbia Sustainable Energy Utility, 2017). After a public bidding, the contract of the DC SEU was awarded to the Vermont Energy Investment Corporation (VEIC) and eight other local organizations and DC SEU began its operation under this contract in 2011 (The District of Columbia Sustainable Energy Utility, 2017). During this period (2008-2011), DC passed its PACE enabling legislation in 2010 (PACENation, 2017c).

research find that eight out of nine states with EERE administrations subsequently

adopted PACE-enabling legislation, representing 89%. Delaware adopted PACE

legislation in 2014, which is out of our study period 2008-2013 (Qiu & Durkay, 2016).

By contrast, 22 of the 40 states without EERE administrations adopted PACE

during the study period, representing 55%. Thus, this research find, at least initially,

that there is a higher likelihood of adopting PACE among states with EERE

administrations than among states without these institutions. Our research investigates

whether the presence of EERE administrations retains its association with subsequent

EERE policy adoption once controlling for other factors likely to influence policy

adoption.

3.4.2 Event History Analysis Model

A function for estimating the adoption of PACE-enabling legislation and other

independent and control variables is presented in the equation below. The left-hand

side of the equation shows the dependent variable, which indicates the probability of

adopting PACE-enabling legislation for state i at time t. The right-hand side includes

X as representing a vector of the independent and control variables, and Beta as the

vector of the parameters for these variables.

$$PACE\ Legislation\ Adoption_{it} = \frac{e^{\alpha+\beta X_{it}+\varepsilon}}{(e^{\alpha+\beta X_{it}+\varepsilon} + 1)}$$

This EHA model is estimated with regular Logistic regression[14] . Following prior research, this chapter applied robust standard errors clustered by state to address geographic and temporal heteroskedasticity concerns, while also including a simple time trend variable to control for the time effect on state policy adoption in the logistic regression[15](Matisoff, 2008; Carley & Miller, 2012; Matisoff & Edwards, 2014; Cheng & Yi, 2017).

3.5   Control Variables for Internal and Regional Diffusion Effects

Aside from the institutional association with policy adoption, this research also included several theoretically relevant variables from existing state-level energy and environmental policy adoption research as control variables. Based on the prior empirical studies of EERE policy adoption, this research selected control variables that reflect internal contexts and regional diffusion influences[16]. These control

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[14] In this research, this chapter examine the likelihood of PACE-enabling legislation adoption for the average state with an EERE administration compared to the average state without an EERE administration. Using regular logistic regression with standard errors clustered by state is specifically appropriate for this case (Sribney, 2017).

[15] Following the suggestions from other studies, this research also used a complementary log-log regression to address the rare event nature of policy adoption (Buckley & Westerland, 2004; Carley & Miller, 2012; Allison, 2014). Similar results were obtained from this model compared with the results from regular logistic regression.

[16] In this study, the regional diffusion effect reflects the influence from the adjacent states. The adjacent states are formed by geographic contiguity. Adjacent states often share similar political, social, and economic contexts (Mooney, 2001). As most state EERE policy adoption research focuses on state-level regional diffusion, this research

variables can be categorized into five groups that influence a state's internal and external conditions: state economic context, political and citizen ideology context, regional endowment context, and regional diffusion influence factors.

3.5.1 State Economic Context Determinant

In extant EERE policy adoption research, a state's economic condition is generally hypothesized to have a positive influence on its willingness to adopt a new policy (Huang, Alavalapati, Carter, & Langholtz, 2007; Carley & Miller, 2012; Berry & Berry, 2014). To capture this in our EHA model, this model monitored state economic activity condition by retrieving data on the percentage change of state real GDP since prior year from the Bureau of Economic Analysis (The United States Census Bureau, 2017; Bureau of Economic Analysis, 2017). To capture a more authentic economic context, this model used a state's real GDP percentage change since prior year to prevent large states with large GDPs from having a disproportionate influence.

3.5.2 The Electricity Market Context

The state's electricity market is another critical factor that can influence EERE policy adoption (Carley, 2009; Young & Sarzynski, 2009; Lyon & Yin, 2010; Carley

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also control for this regional diffusion effect (Matisoff, 2008; Stoutenborough & Beverlin, 2008; Chandler, 2009; Carley & Miller, 2012; Matisoff & Edwards, 2014; Cheng & Yi, 2017). Other potential external influences from federal policy will be discussed in the conclusion.

& Miller, 2012). This chapter selected the percentage change in the average electricity price for all sectors as a variable for capturing the state's electricity market context:

To account for electricity prices, this research retrieved the average annual state electricity price for the industrial, commercial, and residential sectors from the U.S. Energy Information Administration dataset (The U.S. Energy Information Administration, 2016). To reflect price change trends in each state, this research calculated the percentage change in the average annual electricity price, to control for the locational effect of electricity prices, and lagged one year due to the expectation that policy makers would normally have information on previous electricity price changes.

3.5.3 Political and Citizen Ideology Context

Most policy adoption studies indicate that a state's election period and citizen ideology are empirically significant for affecting policy adoption (Huang, Alavalapati, Carter, & Langholtz, 2007; Matisoff, 2008; Chandler, 2009; Lyon & Yin, 2010; Carley & Miller, 2012; Matisoff & Edwards, 2014). Following these empirical findings, this research controlled the state legislature election period and the political ideology of its citizens.

The state legislature election is a critical variable to control for two reasons. First, Berry and Berry proposed that an elected politician's decision to adopt a new policy is influenced by the politician's level of electoral security which is related to the time until the next election (Berry & Berry, 2014). Secondly, a state legislature

generally cannot pass legislation during an election year when it is not in session (Young & Sarzynski, 2009). Considering these two factors, this research included a dummy variable to record the state legislative election year from the databases of Ballotpedia and National Conference for State Legislatures (Ballotpedia, 2016; National Conference of State Legislatures, 2017).

The political ideology of the state's citizens is another critical determinant thought to influence policy adoption (Matisoff, 2008; Chandler, 2009; Young & Sarzynski, 2009; Carley & Miller, 2012; Berry & Berry, 2014). This chapter retrieved citizen ideology indicator data for 2008 to 2013 from the "revised 1960-2013 citizen ideology series" of the Berry/Ringquist/Fording/Hanson (BRFH) indices (Berry, Ringquist, Fording, & Hanson, 1998; Fording, 2016). The BRFH's citizen ideology index is widely used in the field of policy research to capture a state's political ideology (Matisoff, 2008; Carley & Miller, 2012). This index provides a longitudinal dataset for the mean citizen ideology on a continuum scale from 0 (conservative) to 100 (liberal) (Berry, Ringquist, Fording, & Hanson, 1998)

3.5.4   Regional Endowment Context

A state's natural resource endowment and population size can be positively related to its renewable energy supply and demand, respectively (Carley & Miller, 2012). As a result, these variables are commonly hypothesized to have positive impacts on EERE policy adoption (Huang, Alavalapati, Carter, & Langholtz, 2007; Matisoff, 2008; Chandler, 2009; Young & Sarzynski, 2009; Carley & Miller, 2012;

Cheng & Yi, 2017). Since the PACE program focused mostly on solar PV and energy efficiency in residential and commercial sectors, this research controlled for each state's population size and solar potential as the regional endowment context in our EHA model[17]. The population size of each state was measured by taking the natural log of the population estimate from US Census data, while solar potential was retrieved from the National Renewable Energy Laboratory data and recorded in watt-hours per meter squared per day to represent the average annual amount of energy received from solar radiation (Young & Sarzynski, 2009; National Renewable Energy Laboratoy, 2016; The United States Census Bureau, 2016).

3.5.5 Regional Diffusion Effects

Other research suggests that a regional diffusion effect has a significant influence on state policy adoption (Walker, 1969; Stoutenborough & Beverlin, 2008; Berry & Berry, 2014). This regional diffusion effect implies that adjacent states may share similar political, social, and economic contexts (Matisoff, 2008). Such similarities can affect a state's decision to adopt new policies. For example, a state may be more inclined to adopt a particular EERE policy after a neighboring state has already experienced success with it. In line with the previous EERE policy adoption literature, this research coded the percentage of neighboring states that enacted PACE-

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[17] In practice, population size can be used for estimating the energy demand and energy saving potential (International Energy Agency, 2016).

enabling legislation in that year or earlier to represent regional peer pressure (Matisoff,

2008; Matisoff & Edwards, 2014; Cheng & Yi, 2017).

The following Table 3 summarizes the independent and control variables in the

EHA model.

Table 3 Descriptive statistics for independent and control variables

Variable	Mean	Standard deviation	Min	Max
Key independent variable				
State EERE administration	.125	.3315	0	1
Control variables				
Annual changes in state real GDP (percentage)	.0047	.0335	-.084	.222
Annual changes in average state electricity price (percentage, lagged by one year)	.0397	.0518	-.1135	.2364
Election	.515	.5010	0	1
State citizen ideology	51.0322	16.5093	16.9606	91.9040
Population size (logged)	14.9798	.9475	13.2105	17.4157
Solar potential (Wh/M^2/day)	4754.349	646.892	2450	6363.31
Regional diffusion effect	.3421	.2991	0	1

The correlation table below shows a correlation between the presence of state

EERE administrations and citizen ideology. This correlation is expected, as the

existing literature indicates that political ideology may be associated with new policy

and institution adoption. This relationship may be helpful for future research that

examines the drivers for states to establish independent EERE administrations.

Table 4 Correlation matrix

	State EERE administration	State real GDP	State electricity price	Election	Citizen ideology	Population	Solar potential	Regional diffusion effect
State EERE administration	1							
State real GDP	-0.084	1						
State electricity price	-0.073	-0.087	1					
Election	0.004	0.169	-0.036	1				
Citizen ideology	0.455	-0.165	-0.018	0.109	1			
Population	-0.055	-0.274	0.044	0.025	0.068	1		
Solar potential	-0.145	-0.102	0.003	-0.003	-0.394	0.178	1	
Regional diffusion effect	-0.008	0.099	-0.101	0.157	-0.279	0.133	0.219	1

3.6   Data Analysis and Results

The logistic regression results from the EHA model are presented in Table 5. In this table, the Chi-square value indicating the chosen independent variable and controlled variables in the model are jointly significant in explaining the state's adoption of PACE-enabling legislation. The link test result suggested our model has no specification error.

The regression indicates that the key independent variable—the state EERE administration—has a significant positive association with the likelihood of adoption

of PACE-enabling legislation. This positive correlation supports our hypothesis that there is a correlation between the state EERE administration's presence and the PACE-enabling legislation's adoption when controlling for other critical political, economic, electricity market, geographical, and regional diffusion contexts. Certainly, states without EERE administrations adopt PACE-enabling legislation, although the likelihood of adoption increases with the presence of EERE administrations.

In addition to the state EERE administration variable, only one control variable, state population size, shows statistical significance in affecting the state's adoption of PACE-enabling legislation. Based on the result, the higher the state population size increases, the more likely the state will adopt PACE-enabling legislation. It could be the case that the higher population size indicates a larger market potential for energy efficiency in a state, which drives the state to adopt PACE-enabling legislation to promote energy efficiency adoption in the residential and commercial sectors.

Aside from the presence of a state EERE administration and state population size, our study does not find election, regional diffusion effect, solar potential, state GDP and electricity price changes, or citizen ideology to be significant contemporaneous determinants of PACE-enabling legislation adoption. However, all these control variables have the expected directions for their coefficient which are compatible with the existing energy policy adoption literature.

Table 5 Logistic regression results for adoption of PACE enabling legislation (2008-2013)

Variable	Coefficient	Robust standard error
Key independent variable		
State EERE administration	1.4911***	.5737
Control variables		
Annual changes in state real GDP (percentage)	4.1625	6.3518
Annual changes in average annual state electricity price (percentage, lagged by one year)	1.2261	4.3574
Election	-0.5115	.3993
State citizen ideology	0.00014	.0219
Population size (logged)	0.6547**	.2772
Solar potential (Wh/M^2/day)	0.00037	.00057
Regional diffusion effect	1.5406	1.2137
Time	-0.1566	.2066
Constant	-13.7456**	5.671
Prob > |z| Linktest (_hat) test	.044	
Prob > |z| Linktest (_hatsq) test	.657	
Number of observations	200	
Wald X^2	28.11***	
Pseudo R^2	0.120	
Notes: *p < 0.1; **p < 0.05; ***p < 0.01; Robust standard errors are clustered by state.		

To show that the significant coefficient of the presence of EERE

administrations is not an artifact of the construction of the model and time, this

research conducted a comparison of the overall model performance with and without

the EERE administration as an explanatory variable and another set of comparison

estimations from a truncated sample data (2009-2012). The estimation results from the

different data samples show that the presence of state EERE administrations has a

robust significant correlation with PACE-enabling legislation adoption in both data

samples. In terms of the comparison estimations without the state EERE

administration as an explanatory variable in both data samples, the model for

explaining PACE-enabling legislation adoption became insignificant and a model

specification error was detected. All the tables and results are presented in the

following tables.

Table 6 Comparison of regression results for 2008-13 for states with and without
EERE administration

Variable	With EERE administrations	Without EERE administrations
State EERE administration	1.4911*** (.5737)	----
Annual changes in state real GDP (percentage)	4.1625 (6.3518)	4.7064 (6.1651)
Annual changes in average annual state electricity price (percentage, lagged by one year)	1.2261 (4.3574)	0.2534 (4.3599)
Election	-0.5115 (.3993)	-0.5642 (0.4127)
State citizen ideology	0.00014 (.0219)	0.021 (0.1462)
Population size (logged)	0.6547** (.2772)	0.55** (0.2711)
Solar potential (Wh/M^2/day)	0.00037 (.00057)	0.0003 (0.0005)
Regional diffusion effect	1.5406 (1.2137)	1.7247 (1.1512)
Time	-0.1566 (.2066)	-0.1826 (0.206)
Constant	-13.7456** (5.671)	-12.6385** (5.7659)
Prob > |z| Linktest (_hat) test	0.044	0.066
Prob > |z| Linktest (_hatsq) test	0.657	0.483
Number of Observations	200	200
Wald Chi-square	28.11***	11.38

Pseudo R-square	0.12	0.0894

Notes: *p < 0.1; **p < 0.05; ***p < 0.01; Robust standard errors are clustered by state.

Table 7 Comparison of regression results for 2009-2012 for states with and without an EERE administration

Variable	With EERE administration	Without EERE administration
State EERE administration	1.796** (0.7959)	---
Annual changes in state real GDP (percentage)	11.1799 (7.3997)	11.622 (7.3539)
Annual changes in average annual state electricity price (percentage, lagged by one year)	-4.8635 (4.7514)	-6.9487 (4.3592)
Election	0.5571 (0.5838)	0.4369 (0.5794)
State citizen ideology	0.0047 (0.0263)	0.029700 (0.02)
Population size (logged)	0.922** (0.3818)	0.7693** (0.3652)
Solar potential (Wh/M^2/day)	0.0005 (0.0007)	0.0005 (0.0006)
Regional diffusion effect	0.3442 (1.2586)	0.5886 (1.1421)
Time	-0.9691** (0.387)	-1.0133** (0.3913)
Constant	-16.6255** (6.9216)	-15.0649** (6.9383)
Prob > |z| Linktest (_hat) test	0.001	0.001
Prob > |z| Linktest (_hatsq) test	0.151	0.046
Number of Observations	129	129
Wald Chi-square	21.47**	14.35*
Pseudo R-square	0.2234	0.1857

Notes: *p < 0.1; **p < 0.05; ***p < 0.01; Robust standard errors are clustered by state.

3.7 Limitations and Future Research

Although our study found a significant correlation between the presence of state EERE administrations and the subsequent PACE-enabling legislation adoption, several restrictions exist in our study and model.

While this chapter intends to capture the phenomenon of the presence of state EERE administrations and their correlation with PACE legislation adoption, this model was not designed to predict and explain PACE legislation adoption per se. However, future research can build on this study and further examine the drivers for PACE legislation adoption. Future work can focus on investigating other possible hidden and/or omitted variables from other policy determinants, such as innovative financial and tax programs, and from the effects of other energy policy-related institution determinants, such as the state department of energy and environment or public utility commissions. Additional analysis on these determinants might increase the predictability of the model and explain the causality among variables. Future studies can employ qualitative research methods to discover shared characteristics among the nine states with state EERE administrations that adopted PACE-enabling legislation as well as the shared characteristics across the 22 states without EERE administrations that adopted PACE-enabling legislation.

The second restriction of this model derives from the fixed right censoring due to the data availability of one critical control variable: state's citizen ideology. Since this data are only available to 2013, our data includes the adoption of PACE-enabling legislation by 30 states but excludes PACE legislation policy changes in an additional

five states[18]. It would be helpful for future research to extend the time frame after 2013, when additional citizen ideology data becomes available, to examine whether the correlation this research found is still present.

Third, many of the control variables included in this model are not as significant as the existing literature indicated. Additional analysis using alternative measurements for regional diffusion effect, regional endowment, and state economic and electricity market variables might tell a different story for these variables in the future. The concern is that the EERE administration variable may be capturing the influence of omitted variables rather than the unique association with EERE administrations.

As an analytic technique, event history analysis is a relatively blunt tool to examine policy impact. As modeled here, it allows us only to examine the difference in the likelihood of adoption as averaged across states with and without EERE administrations. It can tell us little about how the operation or design of the administrations actually influences subsequent policy adoption or consumer behavior. To obtain that information, future research must turn to comparative case studies that examine EERE administrations in more depth, including with whom they collaborate and how they influence decision-making within their state context.

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[18] The new PACE legislation activity after 2013 can be summarized as follows: Delaware adopted in 2014, Alabama and Kentucky adopted in 2015, Nebraska adopted in 2016, and Louisiana repealed in 2016 (Qiu & Durkay, 2016; PACENation, 2017d). Delaware established a state EERE administration in 2007, but the other four states have not established a state EERE administration as of 2017.

3.8 Conclusion

This research employed a discrete non-repeated event history analysis model to identify and estimate the correlation of the presence of state EERE administrations with state PACE-enabling legislation adoption. The results indicate the importance of considering the impact of these arrangements on EERE policy.

Further studies can examine the drivers of establishing independent administrations for the existing nine states as well as studying the actual operations, functions, and network around these administrations during the policy making cycle (decision making, implementing, and evaluation) and in the current state energy governance. To understand the organizational network around these administrations, it is important for future research to use qualitative approaches to analyze the state EERE administration's network during the institution building process and the relationship with other state energy-policy related institutions[19].

In terms of examining the interaction between different policies and EERE administrations, future research can use a similar EHA model and include other critical state EERE policy and regulations (e.g., Public Benefit Funds, Renewable Portfolio Standards, and Net Metering Policies) to examine the interactions among these policies and state EERE administrations. A multiple event model (competing

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[19] These institutions include but are not limited to state energy offices, the state legislature, public utility commissions, utilities, energy service companies, local communities, and non-governmental organizations (Shih, Latham III, & Sarzynski, 2016).

risk model) can be applied to estimate the effect from these determinants and compare their relationships (Allison, 2014). In addition, state EERE policies can also be influenced by federal policy, such as the U.S. Department of Energy's State Energy Program grants funded by the American Recovery and Reinvestment Act (ARRA), and regional programs, such as the Regional Greenhouse Gas Initiative (RGGI) (Deitchman, 2014). A multilevel model can be constructed to capture the influences of these different level policy effects. These policy effects from different levels can help researchers further specify potential impacts to state EERE policy adoption and study their relationships with state EERE administrations.

In the end, future research should continue tracking the development of state EERE administrations in each state, along with their networks, to study the impacts to current energy governance and transition.

Chapter 4

**CASE STUDIES OF INDEPENDENT STATE EERE ADMINISTRATIONS:
OREGON AND VERMONT**

4.1   Introduction

In recent decades several types of independent state energy efficiency and

renewable energy (EERE) administrations have emerged to support energy efficiency

and renewable energy development at the state and local levels. These state EERE

administrations play an essential role in coordinating the use of resources and

distributing information through networks of stakeholders across the public sector, the

private sector and civil society at large. Careful study of these administrations'

coordinative roles among different stakeholders can improve our understanding of the

operations of these new administrations and their networks in current state energy

governance.

In this study, I examine the collaborative activities of two pioneering

independent state EERE administrations: Efficiency Vermont, founded in 2000, and

The Energy Trust of Oregon, founded in 2002. I identify the key stakeholders from

different sectors (public, private, and civil society) using the collaborative governance

framework developed in chapter two. By documenting the patterns of network

development and expansion for these two administrations, I illustrate how each

developed as a cross-sectoral coordinator and established a collaborative governance

network that unites actors from government agencies, utilities, business associations, local communities, and nonprofit organizations.

My research goals are: (1) to identify and describe each state's EERE administration stakeholder network, (2) to examine the purpose and approach of each state's EERE administration to interaction with these stakeholders, and (3) to infer and analyze potential challenges to the effective operation of the stakeholder networks around each state's EERE administration. This research seeks to confirm and expand upon the conceptual framework in chapter two to better understand the independent administration's role in state energy governance.

First, I discuss the historical development of the independent administration model following the restructuring of the energy sector. Next, in a methodology section, I introduce the research design for collecting and analyzing data for each state. In the third section, I present an analysis of the archival documents which identify key stakeholders and their collaborative roles vis-a-vis the EERE administrations. In the fourth section, I summarize results from semi-structured interviews of stakeholders within each state's independent administration network. In the conclusion, I articulate the key findings from this research and provide suggestions for future research directions.

4.2 State-level Energy Program Administration and Development In the Post-restructuring Era

Before electric industry restructuring began in the 1990s, energy program administration and governance were the responsibility of public utility commissions, state energy offices, and regulated public utilities (Sawyer, 1984). During the 1990s and early 2000s, the opening of retail competition in the energy sector had a significant economic impact on conventional utility-operated energy efficiency programs (Nadel & Kushler, 2000; Blumstein, Goldman, & Barbose, 2005). The restructured market no longer required utilities to include efficiency programs in their integrated resources planning. For utilities, including such programs in a restructured electricity market would decrease their competitiveness. Therefore, utilities started to cut back their spending on energy efficiency programs (Nadel & Kushler, 2000; Blumstein, Goldman, & Barbose, 2005).

While this market impact decreased both the number of, and spending on, utility efficiency programs, many state regulators still recognized the critical benefits of these EERE programs to the public (Blumstein, Goldman, & Barbose, 2005). In addressing the issue of declining utility programs, some states, including Vermont and Oregon, adopted a new market transformation rationale to encourage long-term planning and program operation that would diminish market barriers for more sustainable and robust state energy markets (Blumstein, Goldman, & Barbose, 2005; Sedano, 2011).

Based on this rationale, states established a non-avoidable charge to rate-payers and created public benefit funds (PBFs) to provide stable, sustainable funding sources for statewide EERE programs, low-income assistance, and weatherization programs (Glatt, 2010). With the creation of this new funding mechanism, different models for administrating these PBF-funded EERE programs were developed. They can be classified as public agency (such as Ohio and Illinois), utility (such as Colorado and Iowa), and independent administration models (such as Oregon and Vermont) (Goldman, 2003; Glatt, 2010; Kubert & Sinclair, 2011; York, 2012).

The public agency administration model typically relies on state public agencies, such as state energy offices, public utility commissions, and departments of economic development for planning and administrating the EERE programs (Goldman, 2003; Kubert & Sinclair, 2011). In contrast, the utility administration model relies on each distribution utility to design and implement their own energy programs under the supervision of the public utility commission (Goldman, 2003; Kubert & Sinclair, 2011; York, 2012). A third type of energy program administration model was developed in the post-restructuring era. An independent (non-government and non-utility) single-purposed entity was established to oversee the development of statewide energy programs (Goldman, 2003; Kubert & Sinclair, 2011; York, 2012). The advantages and disadvantages of the different models (Eto, Goldman, & Nadel, 1998; Goldman, 2003; Kubert & Sinclair, 2011; York, 2012) are summarized in Table 8.

Table 8 Advantages and disadvantages of the three EERE administration models.

Administration Model	Advantages	Disadvantages
Public agency	May achieve the economies of scale that provide abundant funding and cover all utility service regions. Agencies share similar missions that are compatible with state EERE policy goals. Uniform state-run programs have lower administrative costs than individual utility programs.	Easily influenced by political pressure that might affect program funding, design, and implementation. Staffing and budget limitations might influence the efficiency of program administration. The procurement process in public agencies is slower in responding to changes in the EERE market.
Utility	Utilities have the technical and administrative expertise and experience in energy program administration. Access to customer data and can leverage existing customer relationships for improved program delivery and adoption. Utilities have relatively more flexible procurement rules than government agencies in contracting.	Programs are confined by utility service territories, which might cause inefficiencies in the market and program administration. Potential conflict of interest between EERE development and the utility's revenue performance model might impact the effectiveness of programs. Multiple separate utility programs do not have the advantage of the economies of scale that can be achieved with uniform statewide programs.
Independent	A uniform statewide program that covers all utility service regions can provide the advantage of economies of scale for program implementation and greater consistency in a fragmented utility market. Clear and specific missions are strongly aligned with state EERE policy goals.	The institution and infrastructure-building needed to establish independent entities require time, resources, and political/legislative support. New independent entities may lack customer recognition and confidence at the initial stage. Independent entities may have difficulty accessing customer

	A single-purpose administration can recruit new qualified administrative and technical staff.	data and information.

Previous research has proposed three criteria that can be used to evaluate the effectiveness of an energy administration (Blumstein, Goldman, & Barbose, 2005; Sedano, 2011; Baldwin, Rountree, & Jock, 2018). These three criteria are: (1) institutional legitimacy and capacity, (2) accountability, and (3) communication. Institutional legitimacy and capacity refers to an organization's ability to maintain an effective role in its network and adapt to challenges that arise during the decision-making process. Accountability focuses on whether an administration's performance was reviewed and evaluated by an unbiased third-party actor. A third-party independent evaluation can verify that the administration met their performance goals or provide suggestions for correcting underperformance. Communication refers to whether an administration established a two-way communication channel to acquire and distribute information to and from its stakeholders. Such a communication channel can facilitate the administration's operation and assist the administration in adapting to any potential contingencies.

Among the weaknesses of the independent administration model (Table 1), the absence of adequate institution-building presents a particular threat to institutional legitimacy and capacity (Blumstein, Goldman, & Barbose, 2005; Sedano, 2011; Baldwin, Rountree, & Jock, 2018). To overcome this weakness, independent administrations have collaborated with different stakeholders across public agencies, utilities, and civil society organizations in activities such as policy planning, program

delivery, policy advocacy, and education. This process of institution-building and collaboration reinforces the legitimacy and capacity of these independent administrations and helps them to form unique collaborative networks within their states.

To study this institution- and network-building process I focus on two cases, Oregon and Vermont. I elucidate the motivations for, and means through which, each state's independent administration extended its reach and developed its collaborative network. Oregon and Vermont are the two earliest states that adopted the independent administration model for administrating their statewide EERE programs. Their two long-standing EERE administrations, The Energy Trust of Oregon and Efficiency Vermont, have operated and collaborated with many actors within their states. They are both considered pioneers of the independent administration model and provide good examples for other states seeking to adopt this model (Nichols, Sommer, & Steinhurst, 2007; Sedano, 2011).

In the next section, I describe my case-study research design and the two data collection methods I used to examine the two cases.

4.3   Methodology

In this chapter, I employ precisely the same process (a literal replication) for examining each of the two independent state EERE administrations and their networks. The purpose of a literal replication is to select two critical and independent cases that can generate exemplary analytic conclusions concerning the independent

energy administration and the form of organizational network around them (Yin, 2014, p. 61). In each case, I applied a holistic research design to study how state EERE administrations identify and interact with stakeholders. Within this holistic design, I also include several embedded subunits for discussing each of the actors from the different sectors and their collaborations with the EERE administrations to supplement my analysis and prevent the research from digressing from the topic (Yin, 2014, p. 55).

This research design helps us to achieve three core research goals: (1) identify the key stakeholders that collaborate with each of the EERE administrations; (2) examine the purposes and approaches of each to collaborating with the key stakeholders; and (3) infer and analyze potential challenges to the effective operation of the stakeholder networks around each state's EERE administration.

First, I collected and analyzed the archival documents related to independent state EERE administrations. This analysis allowed me to understand the historical background, legislative design, program development, and collaboration activities between each administration and its stakeholders. After the archival document analysis, I conducted semi-structured interviews with professionals in these administrations to confirm information and fill in gaps left after the document analysis. Data from the archival documents are used to provide evidence that an organizational network around the independent EERE administration exists and to elucidate how and why the administration collaborated with different actors. Data obtained through semi-structured the interviews are used to confirm the evidence

taken from the archival documents and to obtain additional information on challenges the administration faced when collaborating with actors.

4.3.1 Archival document analysis on the organizational network around independent administration

Both of my target independent state EERE administrations have comprehensive sets of documents that record collaborations and program development activities. This information provides complete, first-hand empirical data for understanding their development.

My analysis included all the publically available archival documents from the creation of the administration to the present. These documents can be classified into three levels.

Primary sources. Primary sources for my archival document analysis included annual reports, action plans, and strategy plans from the EERE administrations as well as the dockets and reports from the state public utility commissions. The annual reports, action plans, and strategy plans are the official records of these administrations that are reported to the public utility commissions in their states. These documents were downloaded from the administrations' websites as well as the state public utility commission's website.

Secondary sources. A secondary source of archival documents were published American Council for an Energy-Efficient Economy (ACEEE) conference proceedings authored by representatives of these two administrations. The ACEEE is a

long-standing nonprofit organization that supports energy efficiency in the U.S. Over the past several decades, their conferences have served as one of the most significant venues for EERE administrations to present their activities to other professionals in the field. Proceedings are drawn from two major ACEEE conference databases: the ACEEE Summer Study on Energy Efficiency in Buildings and the ACEEE Summer Study on Energy Efficiency in Industry.

Tertiary sources. Tertiary sources for this analysis included other independent evaluation reports and academic journal articles that discuss the administrations' operations and programs.

This research conducted a content analysis of the available archival documents related to the independent administrations. This analysis entailed identifying and reviewing statements related to the independent administration's collaboration and interaction with other actors across sectors in order to collect and compile evidence detailing the organizational network around the independent administrations and the purpose of their collaboration and interaction. The result provides an overview of how these administrations developed and the role they have played in state energy governance. These three types of archival documents provide multiple sources of evidence that assist with data triangulation; i.e., "the convergence of data collected from different sources, to determine the consistency of a finding" (Yin, 2014, p. 241). The data triangulation process illustrated in Figure 3 ensures that findings from this case study are supported through several different types of evidence, thus strengthening the construct validity of this research (Yin, 2014).
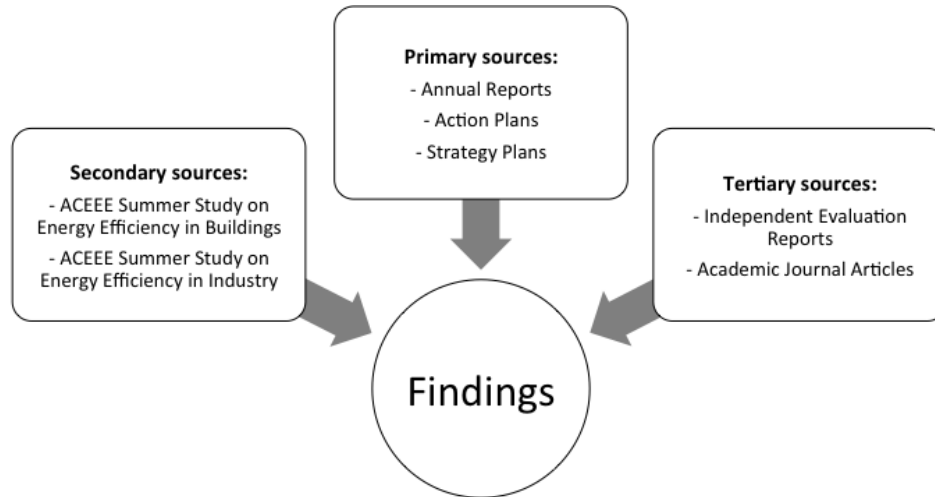
Figure 3 Types of archival documents used for data triangulation

4.3.2   Confirmatory semi-structured interviews

In addition to data triangulation, this case study also used methodological

triangulation to corroborate the results from the archival document analysis with

findings obtained through interviews. The purpose of the interview analysis is to

provide a confirmatory evidence for the historical and current collaboration status of

these administrations. I conducted six semi-structured "elite" interviews between

October 2017 and January 2018 with senior staff of the two target EERE

administrations to supplement and verify the results of my archival document analysis.

"Elite" interviews focus on a small group of interviewees that have substantial

experience and knowledge in the given research topics (Richards, 1996; Tansey, 2007;

Teller-Elsberg, Sovacool, Smith, & Laine, 2016). The appropriate sample size for elite

interviews varies according to the research design, quality of dialogue, sample

specificity, and the quality of dialogue (Baker & Edwards, 2012; Malterud, Siersma,

& Guassora, 2016). The sample size used in this study is comparable to those in similar studies that have conducted "elite" interviews in policy research to examine organizational operations (Baker & Edwards, 2012; Eaton, 2013; Teller-Elsberg, Sovacool, Smith, & Laine, 2016).

Upon receiving exemption from the University of Delaware Institutional Review Board (see Appendix B), I conducted six phone interviews, ranging from 45 minutes to one hour, with key informants. Target interviewees were identified from ACEEE conference proceedings and annual reports used in the archival document analysis or from a snowball sampling technique wherein interviewees were asked to identify other knowledgeable informants in their administrations.

The six key questions were each asked the following six questions to help confirm and build upon the evidence provided in the archival documents:

1.   Were you directly involved in some capacity with developing/administrating the EERE programs, outreach to stakeholders, and collaborating with the stakeholders in your states?

2.   When did you start at this position?

3.   How does/did your position assist your organization with coordination/collaboration with different stakeholders?

4.   Who are/were the stakeholders your organization is currently working with? How do/did you/your organization identify and reach out to these stakeholders?

5.   How do you consider the collaboration among different stakeholders influencing your organization in designing and implementing EERE programs? Are there any barriers (policy, regulatory, or other) you have encountered during the process of reaching out and/or collaborating?

6.   Which sector (public, private, or civil society) and stakeholder are/were most influential in the process of decision-making and collaboration? Can you think of any stakeholders/sector that were overlooked or underrepresented?

A synthesis of the interview results for The Energy Trust of Oregon and Efficiency Vermont is presented in the interview result analysis section. In the next section, I synthesize the results of the archival document analysis that discuss the actors of EERE administrations, government agencies, utilities, business and industry associations, and organizations in civil society.

4.4   Archival Document Analysis of the Organizational Network Around the Independent Administrations

In this section, I present evidence from the archival documents that illustrates how and why the actors in our target states collaborate within their networks. The Energy Trust of Oregon and Efficiency Vermont, along with their key stakeholders and participants in their networks are the relevant actors. The archival document analysis was conducted to depict and present how these administrations and their network were established and developed, while identifying the purpose of the collaboration with different actors.

Starting with Oregon, I examine the historical background of the EERE administration and explain its stakeholders from the public sector, private sector, and civil society, along with examples of their collaborations. A similar analysis of Efficiency Vermont follows.

4.4.1   State of Oregon

4.4.1.1   The Energy Trust of Oregon

The Energy Trust of Oregon was created in 2001 and began its operation in 2002. The organization emerged in response to the 2000-2001 restructuring that had engendered long-term underinvestment in energy efficiency and volatile electricity prices (Energy Trust of Oregon, 2009). In the aftermath of the restructuring, the state planner, various government officials, lawmakers and other stakeholders advocated for a more stable, independent, sustainable approach to conservation and energy efficiency development (Energy Trust of Oregon, 2009).

In 1999, the state legislature passed a restructuring law (Senate Bill 1149, SB 1149) which authorized the Oregon Public Utility Commission (OPUC) to allocate most (73%) of a public purpose fund[20] to energy efficiency and renewable energy market transformation programs (Oregon State Legislature, 2002; Energy Trust of Oregon, 2009). A non-profit, non-government, non-utility, independent organization, i.e., The Energy Trust of Oregon, was established by SB 1149 to be the principal administrator for EERE investment and program development with assistance from the Oregon Department of Energy and the two largest Investor-Owned Utilities,

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[20] This public purpose fund was also established through the restructuring law (SB 1149) in 1999 (Oregon State Legislature, 2002).

Portland General Electric and Pacific Power, in the state (Prause, Crookshank, & Stipe, 2007; Energy Trust of Oregon, 2009).

Since its creation, The Energy Trust of Oregon has operated under a grant agreement with the OPUC. This agreement details the administration's contractual responsibilities under SB 1149 (Oregon Public Utilities Commission, 2002; Gordon, Graham, Williamson, Baylon, & Manclark, 2004; Prause, Crookshank, & Stipe, 2007). Under this grant agreement, The Energy Trust of Oregon is obligated to present regular reports for activities, budget, and strategy plans to the Public Utility Commission, maintain a minimum performance measure requirement for operation and program effectiveness, and present a public purpose fund expenditure report to OPUC and state legislature every two years (Oregon Public Utilities Commission, 2002; Energy Trust of Oregon, 2017).

The Energy Trust of Oregon established a volunteer Board of Directors with several subcommittees. Board members include representatives from OPUC, the Oregon Department of Energy, major utilities, and other civil society stakeholders. Board members have served as advisors for the operation of The Energy Trust of Oregon's program. The Board also provides a platform for different stakeholders to exchange ideas for EERE development in Oregon (Gordon, Graham, Williamson, Baylon, & Manclark, 2004; Prause, Crookshank, & Stipe, 2007).

With the enactment of the Renewable Energy Act (SB 838) in 2007, the state legislature extended the public purpose fund to 2026 to provide more long-term stability (Oregon State Legislature, 2008; Energy Trust of Oregon, 2009). Soon after

this new legislation, the OPUC also issued new rules for The Energy Trust of Oregon

to collaborate with major utilities in customer data sharing and resource planning

(Energy Trust of Oregon, 2009; Energy Trust of Oregon, 2013).

Figure 4 illustrates the major events that led to the development of The Energy

Trust of Oregon.
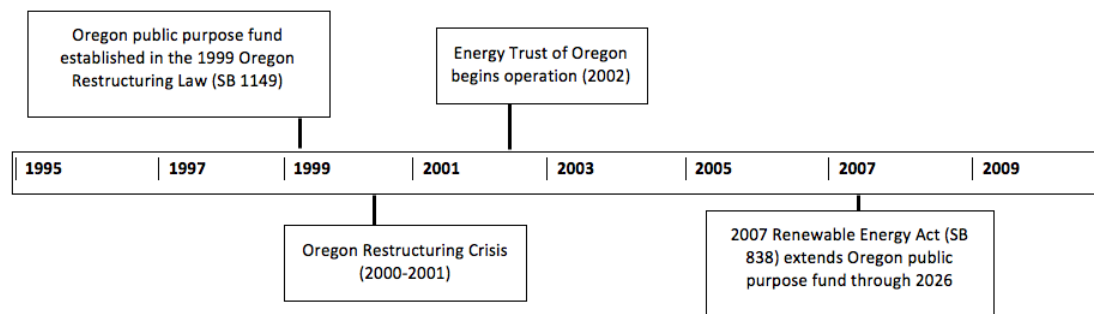
Figure 4 Energy Trust of Oregon Timeline

4.4.1.2 Oregon's public sector stakeholders

4.4.1.2.1 The Public Utility Commission of Oregon (OPUC)

The Public Utility Commission of Oregon (OPUC) regulates the state's

investor-owned electric and natural gas utilities[21] to ensure consumers in Oregon

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[21] People's utility districts, cooperatives or municipal-owned utilities do not fall in the authority of OPUC's regulation (The Oregon Public Utility Commission, 2017a).

receive utility service at fair and reasonable rates (The Oregon Public Utility

Commission, 2016).

Passed in 1999, SB 1149 authorized OPUC to commission the majority of the

public purpose charges to The Energy Trust of Oregon for investment in cost-effective

energy efficiency and renewable energy resources in all sectors (Oregon State

Legislature, 2002). Based on the grant agreement between these two parties, the

OPUC oversees The Energy Trust of Oregon's EERE investment programs and sets

annual minimum performance targets to evaluate The Energy Trust of Oregon's

performance (Energy Trust of Oregon, 2017).

Some critical points of these performance measures include (Energy Trust of

Oregon, 2017):

1. Maintaining low cost of program delivery for electric and gas saving.

2. Providing initial support for renewable energy projects.

3. Reporting the market transformation activities and other collaborative activities from Northeast Energy Efficiency Association.

4. Maintaining reasonable administrative costs at less than 8 percent of annual revenues.

5. Maintaining reasonable staffing expenditures.

6. Striving for continual progress in customer satisfaction for the programs.

The OPUC also serves on The Energy Trust of Oregon's board of directors, advisory councils, and other select committees to evaluate and review the administration's performance (Energy Trust of Oregon, 2017).

4.4.1.2.2   The Oregon Department of Energy

The Energy Trust of Oregon works with the Oregon Department of Energy (ODOE) to coordinate different energy programs and leverage funding sources such as tax credits, grants, and loans administrated by ODOE for EERE program development (Energy Trust of Oregon, 2017b).

The Oregon Department of Energy was established in 1975. The agency's primary responsibilities include energy facility siting, and planning and implementing tax credits, loans, and grants for utility customers. ODOE has been active in supporting investments in conservation, efficiency, and renewable energy development statewide (Gordon & Robison, 2006; Energy Trust of Oregon, 2017b). Due to their shared interest in EERE development, the ODOE has been a long-standing partner with The Energy Trust of Oregon in collaboratively delivering and planning EERE programs since 2002 (Gordon & Robison, 2006; Energy Trust of Oregon, 2017b).

ODOE administers several statewide residential and business Energy Tax Credits, an efficiency loan program, and Renewable Energy Development grants. To properly utilize these funding sources, The Energy Trust of Oregon developed their commercial energy efficiency programs in conjunction with the ODOE's Business

Energy Tax Credit (BETC) in 2002 (Energy Trust of Oregon, 2003)., The Energy Trust of Oregon also collaborated with ODOE to minimize differences in program requirements and streamline the application process (Energy Trust of Oregon, 2003; Energy Trust of Oregon, 2017b).

In addition to leveraging the program funding and management, The Energy Trust of Oregon also collaborated with the ODOE on energy codes in 2015 and launched several integrated programs for community renewable energy projects for solar PV and wind that went into effect in 2005 (Energy Trust of Oregon, 2005; Energy Trust of Oregon, 2012; Energy Trust of Oregon, 2013b; Energy Trust of Oregon, 2015).

4.4.1.3   Oregon's private sector stakeholders

4.4.1.3.1   Oregon's major utilities

Oregon's 1999 energy restructuring law (SB 1149) obtained funding for The Energy Trust of Oregon's EERE programs from customers of Portland General Electric, Pacific Power, Northwest Natural Gas, and Cascade Natural Gas. Customers (rate-payers) of these four utilities pay around 3 percent of their utility bills to the state's Public Benefit Fund, which is granted to The Energy Trust of Oregon to invest in energy-efficiency and renewable energy programs (Oregon State Legislature, 2002; Energy Trust of Oregon, 2017c).

In the electricity market, the programs administered by The Energy Trust of Oregon cover over 1.6 million Oregon customers, which represents 74 percent of electricity customers in the state (Energy Trust of Oregon, 2017c). These partner utilities include Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas, and Avista.[22] Beyond these major utilities, the Energy Trust of Oregon's program service territory includes customers of NW Natural in the state of Washington (Energy Trust of Oregon, 2017c).

The utilities in Oregon have strong resources and expertise in customer information, marketing, and the transmission and distribution of knowledge. The Energy Trust of Oregon collaborates with these utilities in deciding the annual funding levels and goals as well as the utilities' Integrated Resources Plans (IRP) and other transmission/distribution planning issues (Energy Trust of Oregon, 2002; Energy Trust of Oregon, 2007; Energy Trust of Oregon , 2009; Energy Trust of Oregon , 2013; Energy Trust of Oregon, 2014; Energy Trust of Oregon, 2015; Energy Trust of Oregon, 2017c). After the enactment of the Renewable Energy Act (SB 838) in 2007, the OPUC issued new rules allowing The Energy Trust of Oregon and utilities to reinforce their data sharing agreements (Energy Trust of Oregon, 2009; Energy Trust of Oregon, 2013).

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[22] The Energy Trust began serving Avista customers in 2016 (Energy Trust of Oregon, 2017c).

Several critical collaboration activities between utilities and The Energy Trust of Oregon can be summarized as follows:

1. Collaboration on data management and streamlining access to customer information (Energy Trust of Oregon, 2008).

2. Collaboratively providing strategic planning, reporting, and evaluation for EERE development in Oregon (Energy Trust of Oregon, 2007; Energy Trust of Oregon, 2008).

3. Cooperating in joint marketing (co-branding) campaigns and sponsoring outreach events with other stakeholder organizations to recruit more customers and increase customer satisfaction (Gordon, Graham, Williamson, Baylon, & Manclark, 2004; Energy Trust of Oregon, 2007b; Energy Trust of Oregon, 2008b; Energy Trust of Oregon , 2009; Energy Trust of Oregon, 2008; Energy Trust of Oregon, 2014b).

4. Collaborating in the launch of a 2003 utility-scale renewable energy program (Energy Trust of Oregon, 2004; Energy Trust of Oregon, 2005).

4.4.1.3.2   Oregon's trade allies and business associations

The trade ally and business association network in Oregon forms a broad network across different industries and communities. The Energy Trust of Oregon leverages this network to provide information, services, and incentives to customers and increase awareness of EERE programs (Energy Trust of Oregon, 2003).

Trade allies and business associations play an essential role in implementing programs and contracting projects due to their technical expertise and ties to local communities. The Energy Trust of Oregon has worked with different trade ally networks and business associations in several residential and community programs to provide marketing support, technical training, and referrals (Energy Trust of Oregon,

2003; Gordon, Graham, Williamson, Baylon, & Manclark, 2004; Energy Trust of Oregon, 2012b). According to the administration's 2004 Action Plan, "Over 250 trade allies have helped deliver cash incentives to over 4,700 homes and 200 businesses" (Energy Trust of Oregon, 2003: p.1). In addition, the Energy Trust of Oregon shifted program delivery responsibilities for their Existing Home Program to their 560 trade allies in 2012 to leverage the trade allies' ability to access more customers and lower implementation costs for the Energy Trust. The Energy Trust of Oregon continued to support the marketing, training, and reimbursement of the program delivery activities during the transition (Energy Trust of Oregon, 2013).

4.4.1.4   Oregon's civil society stakeholders

4.4.1.4.1   Oregon's local community groups and NGOs

Various local community groups, NGOs, and civil society organizations have worked with The Energy Trust of Oregon across several programs and community initiatives. The majority of these partnerships have centered on program outreach activities, marketing campaigns, and educational workshops intended to expand the network and scope of EERE development in Oregon (Energy Trust of Oregon, 2003b). Collaborating with these organizations helped The Energy Trust of Oregon increase public awareness of its programs, create long-term support for EERE development in the local community, and provide access and resources to hard-to-reach customers and remote communities (Hewitt, et al., 2005).

Some notable cases of collaboration between The Energy Trust of Oregon's and local communities included the following:

First, the Energy Trust of Oregon collaborated with Southeast Uplift Neighborhood Coalition to create Solarize Portland in 2009. This initiative intended to assist more customers in learning financial and technical knowledge of solar PV and to further increase the adoption of the technology in the community. Through a series of community workshops and campaigning activities, this project utilized community outreach and networks to encourage the participation of solar PV adoption in local communities (Rubado, 2010; Aylett, 2013; Energy Trust of Oregon, 2016).

Second, the Energy Trust of Oregon worked with the local nonprofit organization Enhabit (formerly Clean Energy Works) and the City of Portland to provide customers with energy-saving measures and financing opportunities for energy efficiency upgrades. In 2010, this pilot program received funding from the US Department of Energy and developed into a more financially independent and economically sustainable network that collaborates with utilities, local lenders, and local governments to provide energy efficiency services and information to utility customers in Oregon (Energy Trust of Oregon, 2015).

Third, in 2016, The Energy Trust of Oregon provided resources and energy-saving devices to help Bend Environmental Center and Corvallis Environmental Center encourage more local and first-time participation in EERE programs in their communities (Energy Trust of Oregon, 2017d).

Figure 5 depicts the key stakeholders of The Energy Trust of Oregon.
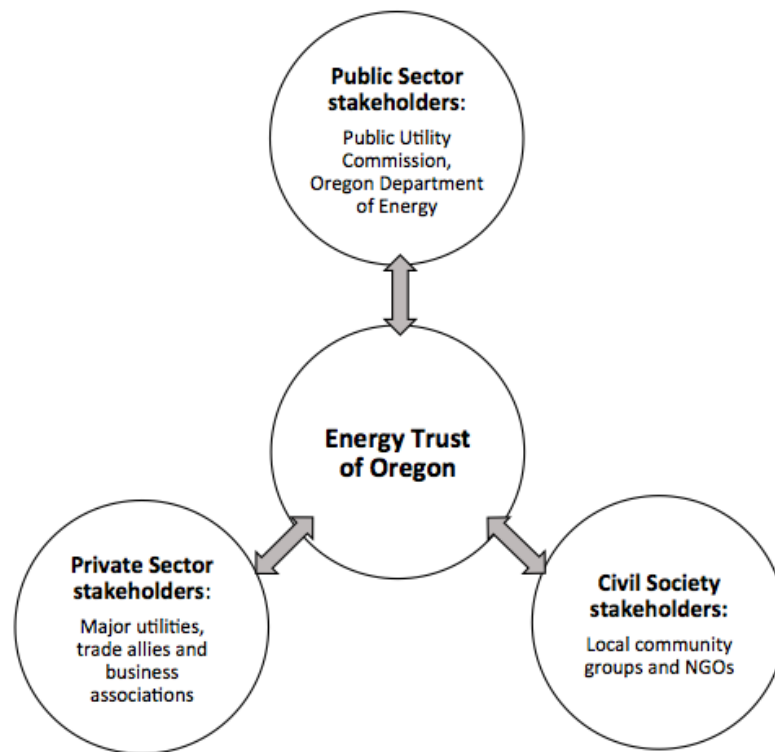
Figure 5 The Energy Trust of Oregon and its public sector, private sector, and civil society stakeholders

4.4.2 State of Vermont

4.4.2.1 Efficiency Vermont

An Energy Efficiency Utility (EEU) was first proposed in Vermont around 1996 during electricity restructuring deliberations (Hamilton & Dworkin, 2004). During this time, the EEU was expected to improve the availability and uniformity of the statewide energy efficiency program from the prior programs administered by 22 distribution utilities, reverse the decline in utility efficiency program spending from 1993-1999, reduce administrative costs and improve the program's delivery

efficiency, and increase coordination among different agencies in program delivery

(Bryk, Plunkett, & Coakley, 2002; Hamilton & Dworkin, 2004).

In 1999, the Vermont Legislature decided not to proceed with retail electricity

restructuring and authorized the Public Utility Commission to create an EEU in

Vermont (Vermont Public Utility Commission, 1999; Bryk, Plunkett, & Coakley,

2002; Hamilton & Dworkin, 2004). After reaching an agreement with distribution

utilities, government agencies, and other critical stakeholders, the Public Utility

Commission ordered the creation of the EEU, Efficiency Vermont, as a statewide,

non-utility, and independent entity to deliver uniform service in place of the previous

separate utility programs in Vermont (Hamilton & Dworkin, 2004).

Efficiency Vermont is administrated by a nonprofit independent organization,

the Vermont Energy Investment Corporation (VEIC) (Efficiency Vermont, 2018).

Efficiency Vermont was under a three-year performance-based contract with the

Vermont Public Utility Commission that requires Efficiency Vermont to design,

implement, and market statewide energy efficiency programs (Hamilton, Plunkett, &

Wickenden, 2002). In order to evaluate the performance of Efficiency Vermont's

programs and operation, several performance indicators such as quantifiable energy

saving goals and Total Resource Benefits were established under the oversight of

regulators (Hamilton, Plunkett, & Wickenden, 2002).

In 2009, the Public Utility Commission adopted a new structure that

transformed the three-year contract model into a twelve-year Order of Appointment

model (Hamilton, 2008; Vermont Public Utility Commission, 2009). This model

provides long-term stability in terms of resource planning and budget (Hamilton, 2008). This appointment also authorized and supported Efficiency Vermont in (1) applied research and development for new energy technology, smart grid, and electric vehicle projects; (2) participation in demand response and integrated resource planning with distribution utilities; (3) participation in transmission and distribution planning; and (4) engagement in policy development and regulatory activities (Parker & Huessy, 2012).

Figure 6 captures the major events that lead to the development of Efficiency Vermont.
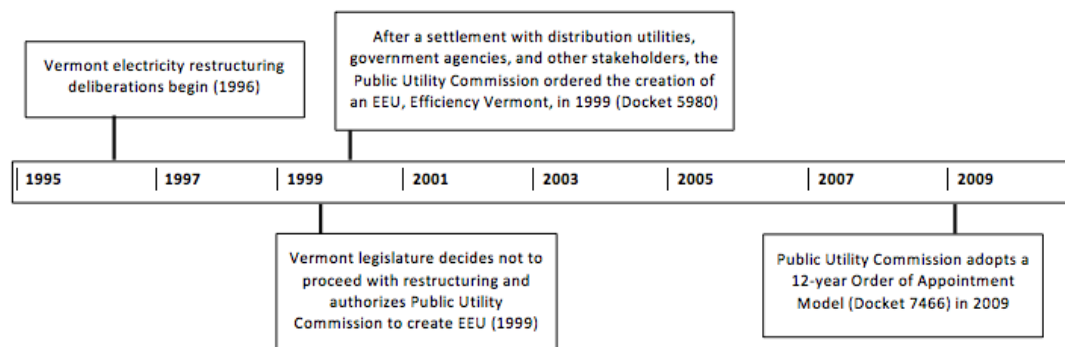
Figure 6 Major events that lead to the development of Efficiency Vermont

4.4.2.2   Vermont's public sector stakeholders

4.4.2.2.1   The Vermont Public Utility Commission

The Vermont Public Utility Commission (formally the Public Service Board) is a quasi-judicial commission that regulates electric and gas infrastructure, service, and rates (Vermont Public Utility Commission, 2018). In 1999, the Commission reached an agreement with the Vermont Department of Public Service, Distribution Utilities, businesses, and other environmental groups to create a new independent Energy Efficiency Utility for Vermont. This new administration took over the energy efficiency responsibility from the electric distribution utilities (Bryk, Plunkett, & Coakley, 2002).

Under Docket 5980, the 1999 settlement gave Vermont Public Utility Commission the authority to set the rules and structure for Efficiency Vermont. The Public Utility Commission has the responsibility to set public purpose charges across all distribution utilities in the state as the fund for Efficiency Vermont's programs. The Public Utility Commission assigned a performance-based contract to Efficiency Vermont and supervised Efficiency Vermont's operation and program effectiveness (Vermont Public Utility Commission, 1999; Bryk, Plunkett, & Coakley, 2002).

In 2009, the Vermont Public Utility Commission adopted new structural changes for Efficiency Vermont through Docket 7466. These changes included changing the previous contract model to an Order of Appointment model (Vermont Public Utility Commission, 2009). This long-term appointment (12-year term) granted

this administration more flexibility in program design and long-term planning (Hamilton, 2008). The Commission remained the key supervisor for Efficiency Vermont's operation and annual performance under this new model.

4.4.2.2.2   The Department of Public Service

The Vermont Department of Public Service provides energy, water, telecommunication, and wastewater programs and services to Vermont residents (The Vermont Department of Public Service, 2018). The Department has assisted the Public Utility Commission as a lead entity in evaluating Efficiency Vermont's saving claims and setting efficiency baselines for Efficiency Vermont. It also has the authority to request that Efficiency Vermont provide information and data for its review (Vermont Public Utility Commission, 1999; Hamilton, Plunkett, & Wickenden, 2002; Vermont Public Utility Commission, 2009).

Beside the role of evaluator, the Vermont Department of Public Service has also collaborated with Efficiency Vermont throughout the years. For example, the Department of Public Service helped to develop Vermont energy efficiency loan guarantee program for financing energy efficiency projects. This program was conducted through collaboration among Vermont Department of Public Service, Efficiency Vermont, and the Vermont Economic Development Authority. With the technical assistance and cash flow analysis from Efficiency Vermont, this program leverages funding from the Vermont Department of Public Service and loans from the Vermont Economic Development Authority to support energy efficiency projects at

different scales (Efficiency Vermont, 2013; Efficiency Vermont, 2014; Efficiency Vermont, 2015).

In addition, the Vermont Public Service Department collaborates with Efficiency Vermont and other utilities in participating in the Vermont System Planning Committee to work on the reliability of Vermont's electric transmission system (Efficiency Vermont, 2013; Efficiency Vermont, 2014).

4.4.2.3 Vermont's private sector stakeholders

4.4.2.3.1 Vermont's distribution utilities

Prior to 2000, energy efficiency programs and services were the responsibility of Vermont's electric distribution utilities[23] (Efficiency Vermont, 2018b). When the new EEU model was established in 1999, this obligation was transferred to Efficiency Vermont. According to Docket 5980, distribution utilities are required to actively support the operation and implementation of Efficiency Vermont[24]. The distribution utilities can advise the operation of Efficiency Vermont and may petition the Public

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[23] There were 22 distributed utilities mentioned in Docket 5980 (Vermont Public Utility Commission, 1999).

[24], Distribution utilities reached an agreement with Efficiency Vermont that they would "cooperate in good faith with the EEU [Efficiency Vermont]" on EERE program design and implementation (Docket 5980, cited in Vermont Public Utility Commission, 1999, p. 34).

Utility Commission to resolve issues between them and EERE administration

(Vermont Public Utility Commission, 1999).

The distribution utilities collaborate with Efficiency Vermont on customer data

management, communications, customer education, and project coordination for some

of the largest electricity consumers in Vermont (Efficiency Vermont, 2007; Efficiency

Vermont, 2013; Efficiency Vermont, 2015). Two critical collaborations[25] can be

summarized as followed.

First, Efficiency Vermont worked with the Green Mountain Power Corporation

(GMP) to provide joint efficiency services for customers in GMP's service region

(Efficiency Vermont, 2013). This collaboration leverages the GMP Energy Efficiency

Fund and the Community Energy and Efficiency Development Fund to provide

necessary funding for the operation. Efficiency Vermont provides suggestions for

program design and maintains coordination with GMP in program implementation

(Efficiency Vermont, 2014; Efficiency Vermont, 2015; Efficiency Vermont, 2017).

Second, Vermont Gas Systems and Burlington Electric Department (BED)

coordinate with Efficiency Vermont in implementing energy efficiency services and

initiatives (Efficiency Vermont, 2014; Efficiency Vermont, 2015). Coordinating

implementation can improve the administrative efficiency and avoid market confusion

in the region.

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[25] These two collaboration activities involved the two major utilities which cover the majority of the electricity customers in Vermont.

4.4.2.3.2 Vermont's business and industry trade associations

The business and trade associations in Vermont have worked with Efficiency Vermont in identifying and educating potential customers and supporting current customers (Efficiency Vermont, 2003; Efficiency Vermont, 2009; Efficiency Vermont, 2010; Efficiency Vermont, 2013). Efficiency Vermont has worked with over 75 professional and trade associations across Vermont (Efficiency Vermont, 2013). These associations cover most major industries and businesses in Vermont that are compatible with Efficiency Vermont's market-based strategy to develop initiatives and programs in the commercial and industrial sectors. As described in the Annual Report 2012, "Efficiency Vermont worked with more than 75 professional and trade member organizations representing a wide range of constituents. By sharing information about best practices in association newsletters, websites, and technical materials, as well as through event sponsorship, speaking engagements, conference and trade show participation, training workshops, and promotional and educational campaigns, Efficiency Vermont was able to inform business customers through trusted channels and with targeted messaging resonating with markets' particular priorities" (Efficiency Vermont, 2013, p. 12). In the 2008 Water and Wastewater Initiative, Efficiency Vermont worked with industry trade associations to contact and educate plant operators on issues related to plant operations and costs (Efficiency Vermont, 2009).

4.4.2.4   Vermont's civil society

4.4.2.4.1   Vermont's local community and NGOs

Efficiency Vermont collaborated with municipal energy committees, local organizations, non-profit organizations, and civic organizations to provide services throughout the state (Efficiency Vermont, 2009; Efficiency Vermont, 2013; Efficiency Vermont, 2015; Efficiency Vermont, 2017). This network provides an opportunity for customer engagement and participation in different towns and local communities. Efficiency Vermont provided technical and financial assistance, held meetings, created ad hoc committees, and trained volunteers to develop community-based energy efficiency and renewable energy projects at the local level (Efficiency Vermont, 2009).

Efficiency Vermont created the Community Energy Initiatives to leverage the community's interest in energy efficiency, energy independence, and climate change to support Efficiency Vermont's projects and operations (Efficiency Vermont, 2007). The Vermont Community Energy Mobilization initiative is a signature project of Community Energy Initiatives (Efficiency Vermont, 2010; Efficiency Vermont, 2012). This project mobilized trained community volunteers to conduct assessments for home energy efficiency improvement, install energy efficiency measures, and provide door-to-door visits with other community members to discuss energy efficiency opportunities (Efficiency Vermont, 2009; Efficiency Vermont, 2010; Efficiency Vermont, 2012).

Another critical community collaboration is the Community Energy

Partnership Grant Program (Efficiency Vermont, 2015). In this program, Efficiency

Vermont worked with non-profit organizations through a grant to provide basic energy

saving services to low-income households and communities in Vermont (Efficiency

Vermont, 2015).

Figure 7 presents the stakeholders for Efficiency Vermont.
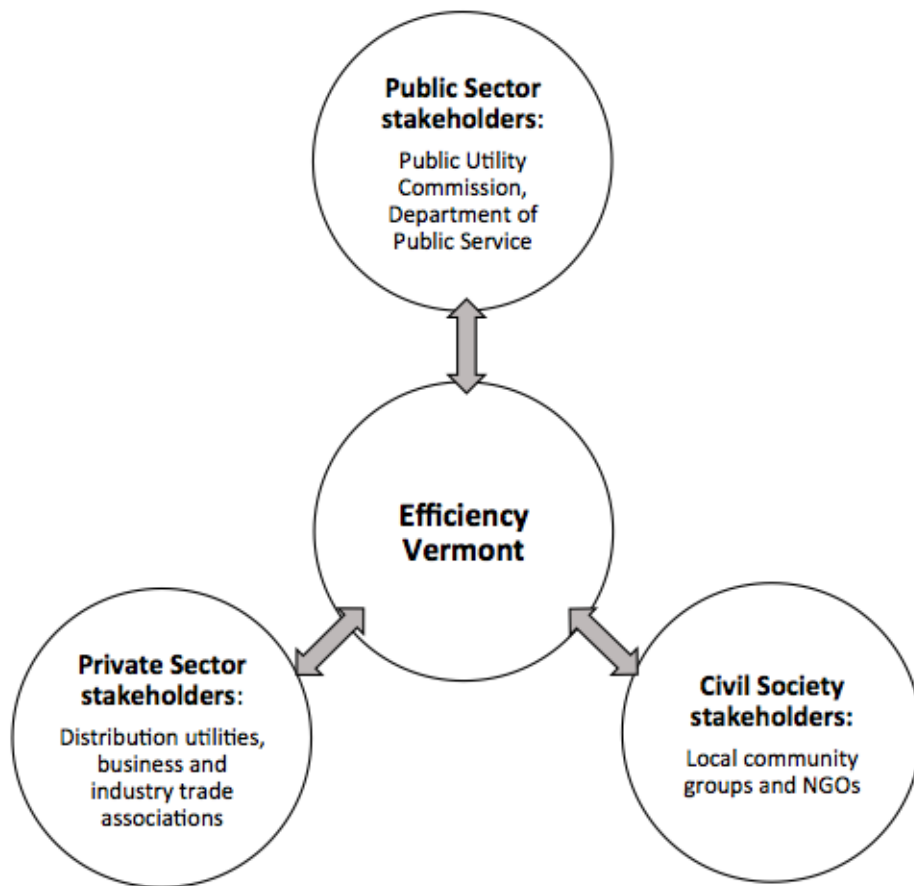
Figure 7 Efficiency Vermont and its public sector, private sector, and civil society
stakeholders

4.4.3   Analysis of archival documents from Oregon and Vermont

Overall, the archival document analysis suggests that the two administrations have identified and collaborated with diverse actors from the public sector, private sector, and civil society. The advantages of this collaboration were noted in Efficiency Vermont's annual report (2013, p. 25): "Key to Efficiency Vermont's achievement of its market transformation and energy savings goals were its ongoing partnerships with Vermont's efficiency service and product providers. These partnerships, although not always evident to the general public, have a profound impact on Vermonters' ability to lower energy use in their homes and places of business."

Archival documents suggest that both states created a similar stakeholder network that united government agencies, regulators, utilities, business associations, and nonprofit organizations. One of The Energy Trust of Oregon's strategy plans shows that the administration made the creation of a network an imperative: "Partner with representative consumer, advocacy, trade association, government, utility, energy efficiency, renewable energy and sustainability groups and other organizations with shared missions to leverage funds, pursue joint projects and help promote opportunities" (Energy Trust of Oregon, 2002b, p. 6).

However, differences can also be observed between the states. For example, The Energy Trust of Oregon and Efficiency Vermont developed different strategies (e.g. Strategic Energy Management (SEM) or Continuous Energy Improvement (CEI), programs (e.g. Efficiency Vermont's Geographic Targeting program), and management models (e.g. The Energy Trust of Oregon's Program Management

Contractor (PMC) model) that reflect the distinct market of their states (Peters, Hoefgen, Feldman, & Vine, 2007; Massie, Wasserman, & Hamilton, 2008; Rubado, Batmale, & Harper, 2015; Kociolek, et al., 2015; Baker G. , 2017).

Three critical findings can be generalized from the archival document analysis. These findings correspond to the critical criteria of the public administration structure outlined earlier, namely: institutional legitimacy and capacity, accountability, and communication.

First, both administrations recognized the importance of obtaining support from diverse stakeholders to strengthen their legitimacy and capacity. The institutional capacity of The Energy Trust of Oregon and Efficiency Vermont relies on the support of the state legislature, utilities, state energy agencies, public utility commissions, businesses, and civil society. This critical support was specifically indicated in an archival document from The Energy Trust of Oregon, "We [The Energy Trust of Oregon] enhanced Energy Trust program effectiveness through continuous collaboration with the three utilities, the Oregon Department of Energy, Northwest Energy Efficiency Alliance and others, independent program evaluations and constant improvements" (Energy Trust of Oregon, 2004, p. 2), as well as in a document from Efficiency Vermont: "The commitment and skill of these partners continued to be fundamental to the success of Efficiency Vermont's aims. Efforts with these providers included coordinated planning, program creation, information exchange, training, financial incentives, and cooperative advertising. These partnerships continued to enable Vermont homes and businesses to have access to a valuable network of

knowledgeable providers while strengthening these providers' bottom line"

(Efficiency Vermont, 2013, p. 25). Support from actors across different sectors

enables these two administrations to effectively coordinate and unite resources for

their energy programs and further expand their influence.

Second, as previously stated, accountability suggests that the performance of

the administration should be monitored and evaluated by a third-party actor. The

archival document analysis indicated that state regulators and other independent

evaluators have conducted regular and transparent audits and evaluations. All the

relevant documents and records regarding the independent EERE administration's

budget, planning, and implementation of programs are compiled on their official

websites and open to the public.

Third, the two administrations established two-way communication with their

stakeholders. The Energy Trust of Oregon and Efficiency Vermont held workshops or

participated in stakeholder meetings to obtain feedback while also sharing program

information with their collaborators. Such two-way communication can improve

program planning, operation, and implementation. As Energy Trust of Oregon noted,

"Energy Trust staff maintains ongoing communications and working partnerships with

a wide range of organizations throughout the state. In addition, we exchange

information and participate in a number of national and international organizations"

(Energy Trust of Oregon, 2003b, p. 10).

4.5 Analysis of Confirmatory Interviews

In this section, I summarize the results from six semi-structured interviews. The purpose of these confirmatory interviews is to corroborate the collaboration reported in the archival documents. All interviews were conducted by telephone with senior staff at The Energy Trust of Oregon and Efficiency Vermont. To protect the confidentiality of the participants, I excluded the first three questions regarding the interviewee's background and job title.

In the fourth question, the interviewees were asked, "Who are/were the stakeholders your organization is currently working with? How do/did you/your organization identify and reach out to these stakeholders?"

The results from the interviewees are compatible with the results of the archival document analysis. The interviewees reported that the two administrations collaborate with stakeholders from the public sector, private sector, and civil society.

In the case of Oregon, all respondents mentioned that several key stakeholders, such as the Oregon Public Utility Commission, Oregon Department of Energy, utilities, business, academia, and local communities have collaborated with The Energy Trust of Oregon for EERE programs, projects, and evaluations over the years. One interviewee in Oregon pointed out that Oregon has a long-established culture (civic tradition) of consulting and negotiating with different parties on energy policy issues. According to the interviewee, some of these stakeholders existed long before the creation of The Energy Trust of Oregon and provided unbiased and necessary

assistance for the administration's establishment. Over the years, The Energy Trust of Oregon staff continue to identify other stakeholders through networking events.

The respondents mentioned several committees and councils within The Energy Trust of Oregon, such as the Board of Directors and its sub-committee, the Renewable Energy Advisory Council (RAC), and the Conservation Advisory Council. These committees and councils provide critical venues for different stakeholders to weigh public input, exchange ideas, and provide peer-review for programs at The Energy Trust of Oregon.

Two respondents mentioned that critical stakeholders also include regional actors. The Bonneville Power Administration and Northwest Energy Efficiency Alliance, Bonneville Environmental Foundation, Renewable Northwest, and Regional Technical Forum frequently collaborate with The Energy Trust of Oregon to develop programs, measures, and evaluations. As for city-level stakeholders, one respondent noted The Energy Trust of Oregon partnered with City of Portland's planning office. Currently, the city government is implementing home and building rating systems which help feed customers to The Energy Trust of Oregon's programs. Besides the collaboration with the City of Portland, The Energy Trust of Oregon also engages with Multnomah County to assist with their Property Assessed Clean Energy (PACE) program development.

Interviewees from Vermont reported that Efficiency Vermont has worked with stakeholders across the public sector, private sector, and civil society. Some notable stakeholders include distribution utilities at different levels, the Public Utility

Commission, Department of Public Service, state-level weatherization agency, Vermont Office of Economic Opportunity, regional development agencies, nonprofit organizations, Chambers of Commerce (in cities or towns in Vermont), local community groups, and grassroots organizations. In this network, Efficiency Vermont provides technical assistance and financial analysis for customers at different sectors, and trains contractors, distributors, manufacturers, and developers in energy project and service development.

In terms of stakeholder outreach, one interviewee explained that many outreach activities are conducted through workshops and frequent meetings with stakeholders. Efficiency Vermont has frequent (monthly or quarterly) meetings with distribution utilities. Efficiency Vermont also has meetings with the municipal governments and other public-sector actors periodically.

In the fifth question, the interviewees were asked, "How do you consider the collaboration among different stakeholders influencing your organization in designing and implementing EERE programs? Are there any barriers (policy, regulatory, or other) you have encountered during the process of reaching out and/or collaborating?"

The answers from the interviewees are similar to the results of the archival document analysis, but provide more detail on barriers. The interviewees from Oregon and Vermont indicated that stakeholder collaboration is critical to their administrations' operations. Interviewees from each state also noted several barriers that have the potential to hinder collaboration.

Two respondents in Oregon mentioned the importance of the Board of

Directors and its sub-committees in serving as peer reviewers and providing

information, suggestions, and public input on The Energy Trust of Oregon's programs,

operations, and strategic plans. One respondent noted that stakeholder comments and

discussions during these public meetings led to many of The Energy Trust of Oregon's

pilot programs.

In terms of barriers to collaboration, one respondent in Oregon reported that it

can be challenging to strike a balance between different stakeholders as different

institutions tend to have conflicting interests. One interviewee in Oregon mentioned

that fragmented utility service territories can be a constraint for renewable energy

project development because incentives for renewable energy projects are tied to each

utility's service territory or ability to wheel the electricity to one of these utilities.

Other constraints in Oregon also include technical and regulatory hurdles related to the

interconnection and transmission of distributed renewable energy.

In Vermont, interviewees mentioned an on-going relationship between

Efficiency Vermont and different stakeholders. According to one interviewee, the

coordination between Efficiency Vermont and utilities is still an on-going process, and

both sides are willing to improve the coordination for more effective program

operation under the market transformation. Two interviewees noted that the

stakeholder meetings held by Efficiency Vermont provide a valuable opportunity for

the EERE administration to collect feedback that can be used to structure future

programs. One interviewee pointed out that Efficiency Vermont leverages their

network to provide new program information to stakeholders, and to obtain feedback to inform future program development and customer outreach.

As for the barriers to collaboration in Vermont, two respondents pointed out that sometimes policies and regulations fail to keep up with market transformation and the redefining roles of actors in this market. As an example, the 2015 Renewable Energy Standard sets fossil fuel reduction targets for utilities, encourages utilities to develop and manage their own programs with the same efficiency measures that Efficiency Vermont is currently providing and counting toward its own performance metrics. This creates a conflicted situation between the utilities and Efficiency Vermont since both are seeking fossil savings from the same measures. One interviewee also indicated that the current customer hourly data is a much bigger dataset than the previous monthly data, and the utilities are now reluctant to invest resources to share this data with Efficiency Vermont. This situation creates a barrier for Efficiency Vermont to collect relevant customer data for their analyses. Another interviewee also relayed this problem, but expressed confidence that these two parties will continue to coordinate and work with each other in the future.

In the sixth question, the interviewees were asked, "Which sector (public, private, or civil society) and stakeholder are/were most influential in the process of decision-making and collaboration? Can you think of any stakeholders/sector that was overlooked or underrepresented?"

The interviewees from both states recognized the distinct importance of collaborating with stakeholders from different sectors. This result corroborates the first

insight from the archival document analysis. Specific answers from interviewees at Oregon and Vermont are organized in the following paragraphs.

In Oregon, all interviewees agree that the Oregon Public Utility Commission and the participating utilities are very influential for The Energy Trust of Oregon's direction, goals, and budgets. In the case of renewable energy development, one interviewee mentioned that private entities (e.g. customers and local businesses) and municipalities are important stakeholders for renewable project development in Oregon. In addition, one interviewee mentioned communities of color and lower income are underrepresented in The Energy Trust of Oregon's network. However, The Energy Trust of Oregon is currently working harder to build productive relationships with them.

In Vermont, all interviewees reported that it is important that all stakeholders have the chance to provide their feedback to Efficiency Vermont. In terms of stakeholder influence, one interviewee indicated that the legislators are the most influential actor. In addition, the interviewee stated that large utilities and large businesses in Vermont are also very important in program development. Another interviewee suggested that there might be an underrepresentation issue for some stakeholders. However, it depends on the specific programs and projects. The limitations of time and resources might be the cause of underrepresentation, and Efficiency Vermont understands that there is room for improvement in stakeholder collaboration on different projects.

4.6   Limitations and Future Research

This chapter identified a number of stakeholders that have actively collaborated with The Energy Trust of Oregon and Efficiency Vermont. Although additional actors can be identified and incorporated into future governance network research, this initial analysis provides a useful foundation for understanding the complex and network of independent EERE administrations.

Despite the contribution from this analysis, two limitations should be noted. First, this chapter provided several EERE programs and projects as evidence to demonstrate how independent administrations evolved through collaboration with stakeholders from different sectors. It is important to stress that each program, collaboration project, and relevant legislation can be studied in depth and serve as an individual case study to add to our understanding of the historical development of these administrations and their collaboration. Second, the archival document analysis and interviews used in this research were only able to identify some of the stakeholders that have collaborated with the independent administrations. The actors referenced here do not fully represent the entire governance EERE network of Vermont and Oregon. Future research can examine different collaboration activities across more programs and initiatives to capture other actors that collaborate with the independent administrations.

4.7   Conclusion

In this chapter, I conducted an archival document analysis and semi-structured interviews to better understand the coordinative role and networks of two target independent state EERE administrations: The Energy Trust of Oregon and Efficiency Vermont. The empirical evidence and analysis of collaboration activities show that these two independent administrations identified and recognized the unique roles of different stakeholders in state energy governance and take different strategies to collaborate with them to increase the effectiveness of EERE program operations and overcome the inherent disadvantages of the independent administration model. These collaborations and partnerships formed a unique collaborative governance network across the different sectors in each state.

Among all the evidence and analysis, two new findings reveal productive avenues for future research. First, the independent state EERE administrations developed different networks and partnerships according to the specific goals in each program. Whether these various networks complement or conflict with each other should be further recorded and examined. Second, contingencies in the market or regulation, such as Vermont's 2015 Renewable Energy Standard, can change the relationship between stakeholders and independent state EERE administrations. This will pose an uncertainty for the existing collaborative governance network and might lead to changes in the composition of the network in the future.

Beyond these two directions, this research also provides a foundation for several possible directions for examining the independent state EERE administrations

and their networks in the future. First, this research offers a foundation for exploring independent state EERE administrations and their networks in different states. In the future, more case studies of different state independent administrations should be studied and compared. Such replication of different state case studies and cross-case comparison will provide more solid ground for the theoretical development regarding the independent administration and the collaborative network it formed. Second, in the comparison study across different states, some critical context such as political and regulatory differences as well as the electricity market should be examined to understand their influence on the different management models and strategies of different independent administrations in developing their programs and networks. Third, this research was conducted from the perspective of the independent state EERE administration. In the future, different perspectives from other stakeholders and how they regard this collaboration and network can be studied. Finally, the collaboration between the independent state EERE administration and stakeholders at different levels, such as federal, regional, and city level, should be further studied to construct a multi-level governance network.

Chapter 5

CONCLUSION

5.1   A Brief Overview of this Dissertation

This dissertation examined the development of independent state EERE administrations in the United States in order to improve our understanding of state energy governance in the energy transition. Key research questions in this dissertation focused on how and why independent administrations evolved and collaborated with other actors, as well as their association with energy policy activities. To understand the nature of these independent administrations and the governance network in which they are embedded, this dissertation presented a conceptual framework, a quantitative analysis, and a qualitative case study. By focusing on the independent EERE administration and explaining how this administration structure developed its network, this dissertation was able to connect two strands of state level energy governance research pertaining to energy administration structure and governance networks.

In the second chapter, I examined the historical background of independent state EERE administrations and conceptualized their collaborative governance networks by identifying the critical actors across the public sector, private sector, and civil society that are well-positioned to collaborate with the independent state EERE administration on matters related to state-level energy governance. This conceptual

framework presented a general picture for state energy governance that centered on

the independent state EERE administration and included actors across different sectors

of society. The framework from this chapter provided a new perspective on state

energy governance that can assist policymakers and researchers in understanding the

coordinative role of state EERE administrations, their connections with other

stakeholders, and how this network con contribute to a more collaborative form of

energy governance.

In the third chapter, a discrete non-repeated event history analysis (EHA)

model was applied to examine the institutional influence of independent state EERE

administrations on the adoption of new EERE legislation. More specifically, the model

estimated the relationship between the presence of state EERE administrations and the

adoption of statewide PACE-enabling legislation. The results provided empirical

evidence that the presence of independent state EERE administrations positively

correlated with the adoption of PACE-enabling legislation. This new finding can

provide suggestions for future studies of U.S. state-level EERE policy adoption to

consider the association from these state EERE administrations.

In the fourth chapter, I conducted case studies of two independent state EERE

administrations, The Energy Trust of Oregon and Efficiency Vermont, which

examined their collaboration with stakeholders during EERE program administration

and implementation. The key stakeholders from different sectors (public, private, and

civil society) were identified using the conceptual framework discussed in the second

chapter. I documented how these two administrations collaborated with a stakeholder

network through archival document analysis and semi-structured interviews. The analyses in this chapter illustrated a detailed governance network for the two independent state EERE administrations and discussed the purpose of their collaborations with different stakeholders for their program operations in each state. This case study analysis provided empirical evidence that supports the conceptual framework in the second chapter. Findings from this research demonstrated the existence of a unique collaborative governance network formed by these two independent administrations and their stakeholders, and provided a foundation for future research on state energy administration and governance networks.

5.2   Limitations and Future Research

This dissertation presented a conceptual framework, a quantitative analysis, and two qualitative case studies for understanding independent state EERE administrations and their networks. Taken together, these analyses offer an in-depth inquiry into the independent state EERE administration model and their stakeholder networks. However, at least three limitations in this research can be identified. These limitations also provide several possible research directions for future energy governance research.

First, this research does not intend to suggest that independent state EERE administrations are inherently more effective than utility-led or government-led EERE administration models, or that other administrative models are unable to foster collaboration among stakeholders from different sectors. A comparison analysis can

be conducted to examine the network and policy activities of states that adopted the conventional utility-led or government-led administration model after restructuring. A distinct collaborative governance network might exist in these states as some research has indicated (Li & Bryson, 2015). In addition, a comparison analysis among different collaborative networks has the potential to shed light on the distinct ways state energy governance has developed across different states in the U.S.

Second, the quantitative analysis provided in this dissertation does not intend to suggest a causal relationship between the presence of an independent state EERE administration and PACE legislation adoption. As an analytic technique, discrete event history analysis can only show a correlation between the independent state EERE administration and PACE legislation adoption. The EHA model cannot explain how the operation or design of the independent state EERE administrations influences subsequent energy policy adoption. To deepen this inquiry, future research can turn to ethnographic case studies that examine and compare different independent state EERE administrations in greater depth. This comparison study can add to our knowledge by providing more information on specific collaborative activities and how collaborations influence decision-making.

Third, the case study research presented here does not include every actor involved in the state energy governance network for Oregon and Vermont. The case studies illustrate how a particular collaborative governance network that included actors from the public sector, private sector, and civil society evolved around an independent state EERE administrative structure. Future research could attempt to

identify other critical actors that play a role in these networks. Moreover, many critical actors, including the Public Utility Commission, Department of Energy, utilities, regional planning agencies, and nonprofit civil society organizations, have established their own networks which are embedded within the network formed around the independent state EERE administration. Future research can continue to explore these intertwined governance networks from the perspective of different actors.

5.3   Contribution of this Dissertation

This dissertation collected empirical data and employed quantitative and qualitative methods to examine and illustrate how independent state EERE administrations develop their governance networks and how this administration and network correlates with policy decision making.

The main contributions of this research can be summarized as follows:

Frist, this research can provide a roadmap for states who intend to adopt the independent state EERE administration model. The conceptual framework and network analysis provided in this dissertation can help state policy makers identify key actors across sectors and anticipate potential barriers to collaboration. Conversely, it can also help potential stakeholders understand how they might play a role in state energy governance.

Second, beyond state-level energy policy making, this research can benefit energy policy professionals and decision makers in states with independent state EERE administrations seeking to design, implement, modify, or evaluate collaborative

programs for energy efficiency and renewable energy at the federal, regional, city, and community levels.

Overall, the conceptual framework, event history analysis model, and case studies used in this dissertation provide a foundation for future research to explore the transformation of energy governance networks in response to ongoing policy, market, and technology transitions.

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Appendix A

THE PERMISSION TO REPRINT

Appendix B

IRB EXEMPT LETTER

UNIVERSITY OF DELAWARE   **RESEARCH OFFICE**

210 Hullihen Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: September 11, 2017

TO: Cheng-Hao Shih
FROM: University of Delaware IRB (HUMANS)

STUDY TITLE: [1114644-1] A case study analysis of two independent state EERE
                                   administrations and their networks.

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: September 11, 2017

REVIEW CATEGORY: Exemption category # *(2)*

                                   Waiver of Documentation of signed consent per 45 CFR 46.116 (d)

Thank you for your submission of New Project materials for this research study. The University of
Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal
regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make
any substantial changes to the project.

If you have any questions, please contact ▮▮▮▮▮▮▮▮▮▮ at ▮▮▮▮▮▮▮▮▮ or
▮▮▮▮▮▮▮▮ Please include your study title and reference number in all correspondence with this
office.

Appendix C

INTRODUCTION EMAIL FOR CASE STUDY PHONE INTERVIEWS

Good [morning, afternoon, etc.]. I am conducting academic research on (your organization's role and collaboration with other stakeholders in administrating/developing energy efficiency and renewable energy (EERE) programs in your state). I wish to speak with persons having direct knowledge of the processes and the persons involved in collaboration with different stakeholders for EERE programs in your organization. I obtained your name from [insert how got name]. I believe your experience and insights would contribute meaningfully to my research and understanding of this issue.

I would like to conduct an informational interview of approximately 45-60 minutes via phone at a time of your convenience. When we speak, I will briefly describe the research in more detail and the procedures in place to ensure the confidentiality of your responses. After we speak, I will follow up with a draft of the information I plan to release from the research. You may decline to participate in the research at any time, including at this draft stage.

If you are willing to assist in my research, please reply back with some dates and times at which you would be available for an interview. I well understand your busy schedule and appreciate your time.

Sincerely,

Cheng-Hao Shih
University of Delaware
Energy and Environmental Policy Program

Appendix D

WAIVER OF DOCUMENTATION OF INFORMED CONSENT

Project Title: A case study analysis of two independent state EERE administrations and their networks.

Principal Investigator: Cheng-Hao Shih, University of Delaware

Explanation:

A waiver of documentation of informed consent is requested as the risk of harm or discomfort to respondents is anticipated to be minimal and the interview involves no procedures that would require the use of written materials, aside from the consent form. Respondents will be recruited by email or phone and the interviews will be conducted by phone, making written consent impractical. The interviews are informational and are designed to verify and clarify information obtained from the archival documents. For this reason, the PI requests the ability to obtain verbal consent to participate at the start of the interview.

*****

Verbal consent script:

You are being invited to participate in a research study.

The purpose of this study is to investigate your organization's role and collaboration with other stakeholders in administrating/developing EERE programs in your state.

I am conducting 3-4 interviews with key informants in your organization that I found from my previous archival document research, including directors, program managers, and former employees who used to serve in these positions.

I expect your interview to last a maximum of one hour and to include questions about your involvement or knowledge of the processes and people involved with your organization's collaboration with other stakeholders in administrating/developing EERE programs in your state.

I recognize that EERE program development and collaboration among stakeholders is a highly politicized topic but I do not anticipate any notable risks for your involvement in the study. Should you feel uncomfortable answering a question, you may decline to answer at any time.

You will not be compensated for your participation.

1- Do you agree to participate in this research?
    If yes, continue
    If no, stop and thank you

If you agree, I would like to inform you that this interview will not be audiotaped but researcher notes will be generated. Your responses will be confidential and all documents will be securely held for 3 years at the University of Delaware. You will not be identified by name or any identifier code. I will provide you with a draft of any direct quote I anticipate using in later publications.

2. do you agree to continue with the interview, understanding I will only take written notes about the interview?
    If yes, continue
    If no, stop and thank you

I may also wish to follow-up with you after the interview to obtain additional materials or to clarify a point that was made.

3- Do you agree to this follow-up?
    If yes, thank you and continue
    If no, I understand, thank you, and continue

4- Do you have any questions about your agreement to participate in the research before we proceed?
    If yes, answer and then continue
    If no, continue

Appendix E

INTERVIEW GUIDE

Project title: A case study analysis of two independent state EERE administrations and their networks.

Principal investigator: Cheng-Hao Shih, University of Delaware

Interview guide [semi-structured]:

Your state:
__ Oregon
__ Vermont

Respondent name:
Interviewer name:
Interview date and time:
Interview location:

Consent questions: 1- Y/N   2- Y/N   3- Y/N   4- Y/N   (circle one each)

I would like to better understand your organization's role and collaboration with other stakeholders in administrating/developing EERE programs in your state.

Were you directly involved in some capacity with developing/administrating the EERE programs, outreach to stakeholders, and collaborating with the stakeholders in your states? Y/N
        If yes, continue
        If no, clarify no direct involvement and then end interview

When did you start at this position?

How does/did your position assist your organization with coordination/collaboration with different stakeholders?

Who are/were the stakeholders your organization is currently working with? How do/did you/your organization identify and reach out to these stakeholders?

How do you consider the collaboration among different stakeholders influencing your organization in designing and implementing EERE programs? Are there any barriers (policy, regulatory, or other) you have encountered during the process of reaching out and/or collaborating?

Which sector (public, private, or civil society) and stakeholder are/were most influential in the process of decision-making and collaboration? Can you think of any stakeholders/sector that were overlooked or underrepresented?

Thank you for your time.

Appendix F

DATA SET FOR EVENT HISTORY ANALYSIS

year	state	adoption of PACE	regional diffusion effect	presence of state EERE Administration	election	solar potential	Lnpop	state real GDP perc	state citizen ideology	state elec pri perc
2008	Alaska	0	0	0	1	2450	13.4408	0.015	67.104	0.03427
2008	Alabama	0	0	0	1	4948.46	15.3669	-0.005	48.3692	0.07072
2008	Arkansas	0	0	0	1	4885.14	14.8714	0.002	57.633	-0.00429
2008	Arizona	0	0.4	0	1	6363.31	15.6529	-0.036	48.5431	0.03641
2008	California	1	0	0	1	5891.22	17.4157	-0.003	63.9281	-0.00156
2008	Colorado	1	0	0	1	5722.8	15.4026	0.009	54.1716	0.01971
2008	Connecticut	0	0	1	1	4397.53	15.0812	-0.014	90.4484	0.10924
2008	Delaware	0	0	1	1	4676.06	13.6921	-0.044	81.8965	0.12043
2008	Florida	0	0	0	1	5239.98	16.7348	-0.044	58.417	-0.01148
2008	Georgia	0	0	0	1	5029.86	16.0673	-0.03	48.5957	0.03014
2008	Iowa	0	0	0	1	4578.9	14.9197	-0.017	56.9516	-0.02568
2008	Idaho	0	0	0	1	5000.69	14.2436	0.009	36.2553	0.03049
2008	Illinois	0	0	0	1	4589.71	16.3608	-0.024	67.279	0.19661
2008	Indiana	0	0	0	1	4455.55	15.6757	-0.007	50.4316	0.00619
2008	Kansas	0	0.25	0	1	5300.02	14.848	0.025	44.801	-0.00726
2008	Kentucky	0	0	0	1	4580.52	15.2718	0	52.2952	0.07551
2008	Louisiana	0	0	0	0	4988.72	15.3052	0.007	43.2403	0.01084
2008	Massachusetts	0	0	0	1	4344.69	15.6825	0.002	90.9569	-0.01877
2008	Maryland	0	0	1	1	4620.55	15.5533	0.01	78.7339	0.15578
2008	Maine	0	0	0	1	4232.41	14.1011	-0.009	91.904	0.23644
2008	Michigan	0	0	0	1	4178.52	16.1128	-0.054	71.8923	0.04791
2008	Minnesota	0	0	0	1	4350.09	15.4732	0.005	69.1557	0.0659
2008	Missouri	0	0	0	1	4804.59	15.5945	0.019	60.4509	0.04127
2008	Mississippi	0	0	0	0	4946.76	14.8966	0.041	50.066	-0.03601
2008	Montana	0	0	0	1	4822.5	13.7916	0.001	62.6993	0.03184
2008	North Carolina	0	0	1	1	4873.82	16.0465	0.024	62.4319	0.03984
2008	North Dakota	0	0	0	1	4527.06	13.3963	0.098	67.2606	0.03382
2008	Nebraska	0	0.16667	0	1	5166.26	14.4013	0.013	48.3028	0.0346
2008	New Hampshire	0	0	0	1	4263.14	14.09	-0.013	59.7238	0.01012

Year	State									
2008	New Jersey	0	0	0	0	4540.29	15.9801	0.003	72.1822	0.09512
2008	New Mexico	0	0.2	0	1	6252.99	14.514	0.023	68.0904	0.0095
2008	Nevada	0	0.2	0	1	5949.1	14.7914	-0.048	57.4903	0.03738
2008	New York	0	0	1	1	4180.65	16.7711	-0.021	80.38	-0.00327
2008	Ohio	0	0	0	1	4306.35	16.2592	-0.018	62.2883	0.02594
2008	Oklahoma	0	0.16667	0	1	5248.96	15.1154	0.018	33.8433	-0.00137
2008	Oregon	0	0.25	1	1	4917.19	15.1423	0.056	74.0672	0.07504
2008	Pennsylvania	0	0	0	1	4241	16.3502	0.015	71.8254	0.04608
2008	Rhode Island	0	0	0	1	4406.54	13.8691	-0.032	84.9047	-0.06152
2008	South Carolina	0	0	0	1	5027.67	15.326	-0.005	47.9015	0.02865
2008	South Dakota	0	0	0	1	4906.38	13.5913	0.044	55.8855	0.02836
2008	Tennessee	0	0	0	1	4707.27	15.6477	0.006	47.7805	0.01435
2008	Texas	0	0	0	1	5466.35	17.0064	0.006	47.6915	-0.02224
2008	Utah	0	0.16667	0	1	5749.97	14.795	-0.018	28.3976	0.07012
2008	Virginia	0	0	0	0	4716.58	15.8739	-0.002	87.2779	0.0379
2008	Vermont	0	0	1	1	4149.49	13.3441	0.008	60.0031	0.05893
2008	Washington	0	0	0	1	4357.05	15.6968	0.008	68.7725	0.03746
2008	Wisconsin	0	0	0	1	4332.23	15.5456	-0.013	79.282	0.04305
2008	West Virginia	0	0	0	1	4360.96	14.4254	0.027	60.8374	0.05952
2008	Wyoming	0	0.16667	0	1	5325.78	13.2105	0.079	29.6466	0.0038
2009	Alaska	0	0	0	0	2450	13.4573	0.087	64.2383	0.10994
2009	Alabama	0	0	0	0	4948.46	15.3753	-0.035	27.263	0.13474
2009	Arkansas	0	0	0	0	4885.14	14.8791	-0.025	44.2342	0.09195
2009	Arizona	0	0.8	0	0	6363.31	15.6629	-0.076	44.1794	0.06674
2009	Connecticut	0	0.33333	1	0	4397.53	15.0858	-0.042	78.0496	0.08207
2009	Delaware	0	0.33333	1	0	4676.06	13.7009	0.038	77.6008	0.09075
2009	Florida	0	0	0	0	5239.98	16.7415	-0.055	54.4236	0.03969
2009	Georgia	0	0.2	0	0	5029.86	16.0794	-0.038	44.6079	0.12468
2009	Iowa	0	0.33333	0	0	4578.9	14.925	-0.021	53.3074	0.00878
2009	Idaho	0	0.33333	0	0	5000.69	14.2566	-0.043	27.6924	0.12229
2009	Illinois	1	0.16667	0	0	4589.71	16.3647	-0.026	63.701	0.09102
2009	Indiana	0	0.5	0	0	4455.55	15.681	-0.063	48.2239	0.09077
2009	Kansas	0	0.5	0	0	5300.02	14.8567	-0.041	42.512	0.08918
2009	Kentucky	0	0.375	0	0	4580.52	15.2781	-0.038	44.9558	0.07192
2009	Louisiana	1	0.33333	0	1	4988.72	15.3177	0.021	41.7478	0.12515
2009	Massachusetts	0	0.33333	1	0	4344.69	15.69	-0.018	86.2589	0.07058
2009	Maryland	1	0.2	1	0	4620.55	15.5613	0.001	65.9942	0.1313
2009	Maine	0	0	1	0	4232.41	14.1004	-0.016	81.4113	-0.05415

2009	Michigan	0	0.75	0	0	4178.52	16.1082	-0.084	61.2385	0.04689
2009	Minnesota	0	0.2	0	0	4350.09	15.4797	-0.04	56.8782	0.04704
2009	Missouri	0	0.25	0	0	4804.59	15.6008	-0.02	51.8688	0.04268
2009	Mississippi	0	0	0	1	4946.76	14.9003	-0.041	39.9343	0.11955
2009	Montana	0	0	0	0	4822.5	13.7994	-0.018	53.8143	0.08275
2009	North Carolina	1	0.25	1	0	4873.82	16.0615	-0.039	49.5936	0.0166
2009	North Dakota	0	0	0	0	4527.06	13.4075	0.021	52.3276	0.04206
2009	Nebraska	0	0.16667	0	0	5166.26	14.4103	0.013	35.1681	0.04777
2009	New Hampshire	0	0.33333	0	0	4263.14	14.0902	-0.012	56.3963	0.04649
2009	New Jersey	0	0.5	0	1	4540.29	15.9852	-0.042	67.9346	0.10915
2009	New Mexico	1	0.6	0	0	6252.99	14.5269	0	60.392	0.12231
2009	Nevada	1	0.4	0	0	5949.1	14.8031	-0.081	53.6389	-0.01001
2009	New York	1	0.2	1	0	4180.65	16.776	0.021	77.7581	0.08213
2009	Ohio	1	0	0	0	4306.35	16.2604	-0.044	54.7267	0.06068
2009	Oklahoma	1	0.5	0	0	5248.96	15.1286	-0.022	21.1318	0.07133
2009	Oregon	1	0.5	1	0	4917.19	15.1528	-0.01	62.5926	0.03134
2009	Pennsylvania	0	0.5	0	0	4241	16.3545	-0.029	62.8115	0.02753
2009	Rhode Island	0	0	0	0	4406.54	13.8678	-0.011	81.6989	0.22256
2009	South Carolina	0	0.5	0	0	5027.67	15.3394	-0.038	48.3335	0.09331
2009	South Dakota	0	0	0	0	4906.38	13.6012	0.009	47.1213	0.03628
2009	Tennessee	0	0.25	0	0	4707.27	15.657	-0.036	44.102	0.157
2009	Texas	1	0.75	0	0	5466.35	17.0264	-0.006	45.183	0.08704
2009	Utah	0	0.5	0	0	5749.97	14.8174	-0.02	28.131	0.01248
2009	Virginia	1	0.4	0	1	4716.58	15.8857	0	85.4297	0.1236
2009	Vermont	1	0.33333	1	0	4149.49	13.3452	-0.021	48.7531	0.02409
2009	Washington	0	0.5	0	0	4357.05	15.7127	-0.033	61.9823	0.02826
2009	Wisconsin	1	0.25	0	0	4332.23	15.5506	-0.027	62.7306	0.06132
2009	West Virginia	0	0.6	0	0	4360.96	14.4295	0.001	53.5325	0.05056
2009	Wyoming	0	0.16667	0	0	5325.78	13.2354	-0.017	27.2055	0.07183
2010	Alaska	0	0	0	1	2450	13.4786	-0.016	50.9792	0.02374
2010	Alabama	0	0.5	0	1	4948.46	15.3811	0.021	19.2529	0.02794
2010	Arkansas	0	0.14286	0	1	4885.14	14.8876	0.034	32.1732	-0.00395
2010	Arizona	0	0.8	0	1	6363.31	15.674	0.002	39.1737	0.0494
2010	Connecticut	0	0.66667	1	1	4397.53	15.0901	-0.005	68.4033	0.01517
2010	Delaware	0	0.33333	1	1	4676.06	13.7099	-0.014	71.3519	-0.01454
2010	Florida	1	0.5	0	1	5239.98	16.7517	0.008	45.9704	0.06983
2010	Georgia	1	0.4	0	1	5029.86	16.0889	0.009	39.732	-0.00339
2010	Iowa	0	0.66667	0	1	4578.9	14.9306	0.021	48.0927	0.06967

2010	Idaho	0	0.33333	0	1	5000.69	14.2675	0.009	19.7222	0.14411
2010	Indiana	0	0.75	0	1	4455.55	15.6859	0.065	40.4287	0.07475
2010	Kansas	0	0.75	0	1	5300.02	14.866	0.02	35.0522	0.07114
2010	Kentucky	0	0.5	0	1	4580.52	15.2848	0.045	37.4906	0.04153
2010	Massachusetts	1	0.66667	1	1	4344.69	15.6961	0.035	68.041	-0.04806
2010	Maine	1	1	1	1	4232.41	14.0989	0.01	68.9159	-0.04928
2010	Michigan	1	1	0	1	4178.52	16.1058	0.054	54.7406	0.05263
2010	Minnesota	1	0.2	0	1	4350.09	15.4852	0.032	50.478	0.04493
2010	Missouri	1	0.25	0	1	4804.59	15.6066	0.01	42.5129	0.07456
2010	Mississippi	0	0	0	0	4946.76	14.9041	0.005	31.1657	-0.01557
2010	Montana	0	0	0	1	4822.5	13.8064	0.036	44.5441	-0.01813
2010	North Dakota	0	0.33333	0	1	4527.06	13.4217	0.083	46.4306	-0.00897
2010	Nebraska	0	0.33333	0	1	5166.26	14.4201	0.043	19.2561	0.09574
2010	New Hampshire	1	1	0	1	4263.14	14.0907	0.024	51.8602	0.03144
2010	New Jersey	0	0.5	0	0	4540.29	15.9904	0.005	56.3911	0.00693
2010	Pennsylvania	0	0.5	0	1	4241	16.3579	0.027	54.8511	0.02894
2010	Rhode Island	0	0	0	1	4406.54	13.867	0.023	78.9301	-0.11347
2010	South Carolina	0	1	0	1	5027.67	15.3494	0.015	44.5501	0.07261
2010	South Dakota	0	0.16667	0	1	4906.38	13.6127	0.015	38.7543	0.03501
2010	Tennessee	0	0.5	0	1	4707.27	15.6651	0.015	32.0643	0.06235
2010	Utah	0	0.5	0	1	5749.97	14.8367	0.018	27.0221	0.04314
2010	Washington	0	0.5	0	1	4357.05	15.7242	0.019	51.4696	0.00611
2010	West Virginia	0	0.6	0	1	4360.96	14.4328	0.027	49.7456	0.18538
2010	Wyoming	0	0.16667	0	1	5325.78	13.2436	-0.018	21.4577	0.07231
2011	Alaska	0	0	0	0	2450	13.4906	0.027	55.6035	-0.02187
2011	Alabama	0	0.5	0	0	4948.46	15.3845	0.011	36.0237	0.0068
2011	Arkansas	0	0.14286	0	0	4885.14	14.8934	0.02	29.1735	-0.03831
2011	Arizona	0	0.8	0	0	6363.31	15.6831	0.018	47.2821	0.0136
2011	Connecticut	0	0.66667	1	0	4397.53	15.0938	-0.017	68.95	-0.03818
2011	Delaware	0	0.33333	1	0	4676.06	13.7188	0.024	67.9696	-0.01885
2011	Iowa	0	0.66667	0	0	4578.9	14.9355	0.019	42.5024	0.03935
2011	Idaho	0	0.5	0	0	5000.69	14.2753	-0.002	24.2631	0.00461
2011	Indiana	0	0.75	0	0	4455.55	15.6899	0.005	39.5053	0.00656
2011	Kansas	0	0.75	0	0	5300.02	14.8698	0.032	30.7065	0.04637
2011	Kentucky	0	0.5	0	0	4580.52	15.2903	0.014	37.4924	0.03221
2011	Mississippi	0	0	0	1	4946.76	14.9069	-0.014	45.3738	-0.02938
2011	Montana	0	0.25	0	0	4822.5	13.8132	0.029	53.6144	0.0343
2011	North Dakota	0	0.33333	0	0	4527.06	13.4375	0.111	41.1818	0.0724

2011	Nebraska	0	0.5	0	0	5166.26	14.4265	0.043	26.2137	0.043
2011	New Jersey	0	0.5	0	1	4540.29	15.9951	-0.009	60.6582	0.01032
2011	Pennsylvania	0	0.5	0	0	4241	16.3606	0.013	50.751	0.07396
2011	Rhode Island	0	0	0	0	4406.54	13.8662	-0.008	84.4993	-0.01055
2011	South Carolina	0	1	0	0	5027.67	15.3573	0.022	41.5231	0.00831
2011	South Dakota	0	0.33333	0	0	4906.38	13.6221	0.062	46.2277	0.05819
2011	Tennessee	0	0.5	0	0	4707.27	15.6716	0.027	34.112	-0.00921
2011	Utah	0	0.66667	0	0	5749.97	14.8506	0.027	28.0116	0.02511
2011	Washington	0	0.5	0	0	4357.05	15.7357	0.008	50.5385	0.01062
2011	West Virginia	0	0.6	0	0	4360.96	14.4334	0.021	48.5427	0.1203
2011	Wyoming	1	0.16667	0	0	5325.78	13.2492	-0.004	23.3125	0.01974
2012	Alaska	0	0	0	1	2450	13.5023	0.053	54.5122	0.08943
2012	Alabama	0	0.5	0	0	4948.46	15.3878	0.01	37.571	0.02362
2012	Arkansas	0	0.14286	0	1	4885.14	14.8971	-0.001	30.1678	0.0206
2012	Arizona	0	0.8	0	1	6363.31	15.6959	0.021	47.7773	0.00206
2012	Connecticut	1	0.66667	1	1	4397.53	15.0949	-0.001	67.8145	-0.05926
2012	Delaware	0	0.66667	1	1	4676.06	13.7287	-0.016	67.9709	-0.04094
2012	Iowa	0	0.66667	0	1	4578.9	14.9391	0.035	40.497	-0.01305
2012	Idaho	0	0.5	0	1	5000.69	14.2828	0.002	27.0864	-0.01529
2012	Indiana	0	0.75	0	1	4455.55	15.6931	0.003	37.6868	0.04433
2012	Kansas	0	0.75	0	1	5300.02	14.8754	0.006	35.8547	0.06467
2012	Kentucky	0	0.5	0	1	4580.52	15.2934	0.007	35.295	0.06538
2012	Mississippi	0	0	0	0	4946.76	14.9095	0.022	45.621	0.02212
2012	Montana	0	0.25	0	1	4822.5	13.8207	0.007	55.294	0.04974
2012	North Dakota	0	0.33333	0	1	4527.06	13.4613	0.222	48.4497	0.05485
2012	Nebraska	0	0.5	0	1	5166.26	14.4337	-0.007	37.9783	0.04787
2012	New Jersey	1	0.5	0	0	4540.29	15.9989	0.019	57.4517	-0.02589
2012	Pennsylvania	0	0.66667	0	1	4241	16.3626	0.016	48.6029	0.01358
2012	Rhode Island	0	1	0	1	4406.54	13.8668	0.004	79.4278	-0.07321
2012	South Carolina	0	1	0	1	5027.67	15.3679	0.003	35.9032	0.03651
2012	South Dakota	0	0.33333	0	1	4906.38	13.6346	-0.009	46.6151	0.02941
2012	Tennessee	0	0.5	0	1	4707.27	15.6804	0.031	37.8282	0.07782
2012	Utah	0	0.66667	0	1	5749.97	14.8647	0.013	16.9606	0.02738
2012	Washington	0	0.5	0	1	4357.05	15.7465	0.029	50.7232	0.01802
2012	West Virginia	0	0.6	0	1	4360.96	14.4341	-0.015	48.8899	0.05772
2013	Alaska	0	0	0	0	2450	13.5107	-0.045	60.2768	0.01555
2013	Alabama	0	0.5	0	0	4948.46	15.3912	0.008	35.7853	0.00879
2013	Arkansas	1	0.14286	0	0	4885.14	14.9003	0.028	29.7749	0.02557

2013	Arizona	0	1	0	0	6363.31	15.7079	0.005	45.4442	0.0103
2013	Delaware	0	0.66667	1	0	4676.06	13.7378	-0.017	66.4166	-0.03659
2013	Iowa	0	0.66667	0	0	4578.9	14.9444	0.008	44.6906	0.01984
2013	Idaho	0	0.66667	0	0	5000.69	14.2935	0.031	24.316	0.07453
2013	Indiana	0	0.75	0	0	4455.55	15.6981	0.024	40.5552	0.03496
2013	Kansas	0	0.75	0	0	5300.02	14.8788	0.002	34.2966	0.04949
2013	Kentucky	0	0.625	0	0	4580.52	15.297	0.01	41.2756	0.01255
2013	Mississippi	0	0.25	0	0	4946.76	14.9115	-0.002	46.6365	-0.0205
2013	Montana	0	0.25	0	0	4822.5	13.8303	0.007	49.5711	0.00243
2013	North Dakota	0	0.33333	0	0	4527.06	13.4923	0.025	44.7005	0.044
2013	Nebraska	0	0.5	0	0	5166.26	14.4409	0.025	34.5457	0.06218
2013	Pennsylvania	0	0.66667	0	0	4241	16.3635	0.019	52.2173	-0.05167
2013	Rhode Island	1	1	0	0	4406.54	13.8675	0.005	78.0734	-0.02301
2013	South Carolina	0	1	0	0	5027.67	15.3783	0.019	41.7807	0.03409
2013	South Dakota	0	0.33333	0	0	4906.38	13.6477	0.013	44.1776	0.05466
2013	Tennessee	0	0.625	0	0	4707.27	15.6869	0.016	37.7375	-0.00108
2013	Utah	1	0.66667	0	0	5749.97	14.8812	0.025	20.9792	0.09958
2013	Washington	0	0.5	0	0	4357.05	15.7577	0.022	52.974	0.0236
2013	West Virginia	0	0.6	0	0	4360.96	14.4326	0.006	47.898	0.03299