The Implementation of Wind Energy Policies in Australia and the United States

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List of Acronyms

AAC	Australian Aluminum Council
ABARE	Australian Bureau of Agriculture and Resource Economics
ACA	Australian Coal Association
ACF	Australian Conservation Foundation
ACORE	American Council on Renewable Energy
ACRE	Australian Center for Renewable Energy
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AGL	Australian Gas Light Company
AGO	Australian Greenhouse Office
ALGA	Australian Local Government Association
ANGA	American Natural Gas Alliance
ANU	Australian National University
API	American Petroleum Institute
APPEA	Australian Petroleum and Exploration Association
AUD	Australian Dollar
AWEA	American Wind Energy Association
BCSE	Australian Business Council for Sustainable Energy
BLM	U.S. Bureau of Land Management
BP	British Petroleum
CEC	Clean Energy Council
COAG	Council of Australian Governments
CPUC	California Public Utilities Commission
CTH	Commonwealth
DCCEE	Department of Climate Change and Energy Efficiency
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of Interior
DRET	Department of Resources, Energy and Tourism
EERE	Office of Energy Efficiency and Renewable Energy
EFL	Electricity Feed-in Law
EIA	Energy Information Administration
ELI	Environmental Law Institute
EPA	Environmental Protection Agency
EPACT	Energy Policy Act
ERAC	Electrical Regulatory Authorities Council
ERIG	Energy Reform Implementation Group
ESC	Essential Services Commission
ESCOSA	Essential Services Commission of South Australia
ESAA	Electricity Supply Association of Australia
EWG	Exempt Wholesale Generator
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas
GW	Gigawatt
GWEC	Global Wind Energy Council
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
IRS	Internal Revenue Service
ISF	Institute for Sustainable Futures
ITC	Investment Tax Credit

KW/h	Kilawatt/hour
MRET	Mandatory Renewable Energy Target
MW/h	Megawatt/hour
NAFI	National Association of Forest Industries
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NEPA	National Environmental Policy Act
NIMBY	Not In My Back Yard
NQ	New Qualifying Facility
NRC	Natural Resource Commission
NREL	National Renewable Energy Laboratory
NWF	National Wildlife Foundation
OPEC	Organization of the Petroleum Exporting Countries
ORER	Office of the Renewable Energy Regulator
PTC	Production Tax Credit
PURPA	Public Utility Regulatory Policies Act
QF	Qualifying Facility
R&D	Research & Development
REC	Renewable Energy Certificate
RET	Renewable Energy Target
RPS	Renewable Portfolio Standards
FiT	Feed-in Tariff
MMS	Minerals Management Service
SEIA	Solar Energy Industries Association
SO4	Standard Offer 4
TVA	Tennessee Valley Authority
UNSW	University of New South Wales
USACE	United States Army Corps of Engineers
USD	United States Dollar
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VRET	Victorian Renewable Energy Target
WWEA	World Wind Energy Association

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Abstract

Renewable energy technologies are increasingly seen as viable alternative energy sources to fix economic, security and environmental problems associated with the continued utilization of fossil fuels and nuclear energy. Available global data suggests that wind energy has been growing fastest among renewable energy technologies. Yet, there are startling variations among different nations. This thesis will explore the implementation of wind energy policies in the United States and Australia. In particular, it seeks to unravel the puzzle as to why we observe such marked differences in the growth of wind energy in both countries. This is despite similar levels of wind resources and, amongst other things, are similar in both being federal democracies and strong industrialized economies. Drawing on an institutional approach to political science, it aimed to discover the differences by using two major approaches to implementation analysis: top-down and bottom-up approaches.

The top-down approach emphasizes the structures and mechanisms used by government institutions in implementing policy goals. In contrast, the bottom-up approach focuses on the interactions among the network of actors involved in implementation and how this influences policy outcomes. The results showed that it is the interaction of the top-down and bottom-up approaches that allowed for the United States to have a faster adoption rate than Australia. From the top-down approach, the existence and nature of the legislation including the economic mechanisms used proved to be more effective in implementing wind energy in the US than what is used in Australia. It was the combination of a number of pieces of legislation which set in place economic mechanisms and regulation and that these were available at the state and federal levels which proved to be a large facilitator to the wind industry in the US. The nature of Australia's legislation does not prove to be enough of an incentive for significant growth of the industry. In addition to the top-down, variables from the bottom-up proved to be important. The network of actors in the United States is larger and plays a more active role in facilitating the implementation of wind energy. There is a main trade association for the wind industry (AWEA) which works closely with government to assure the industries needs are being met. This is seen through the continuation of the Production Tax Credit and strong political support for the industry. The interaction of AWEA among other groups with government has allowed for the continuation of the PTC which is a large facilitator for the development of the wind industry. If it were not for the network of actors, these formal government mechanisms would not be in place. Furthermore, were it not for these formal government mechanisms, inter-market competition would not be as strong. Compared to Australia, the United States has legislation that works to create incentives and a competitive market for wind energy, in addition to a network of actors involved in implementation and has the ability to influence government to provide the incentives that allow the wind industry to grow. A comparative analysis has shown that the nature of the legislation and the network of actors are what have allowed the United States to have faster implementation of wind energy than Australia.

This thesis will show the importance of applying both the top-down and bottom-up approaches to implementation theory which has not been used explicitly for these two countries in this context before. In addition this thesis used applied implementation analysis which has not been done on wind energy policies in these two countries comparatively. This thesis, by applying top-down and bottom-up approaches, sought to enhance the understanding of wind energy policy implementation in a comparative context.

Chapter 1: The Politics of Wind Energy Implementation

Background and Objectives

Renewable energy is any energy resource that is naturally replenished. It is either derived directly from solar energy (solar thermal, photochemical, and photoelectric), indirectly from the sun (wind, hydropower, and photosynthetic energy stored in biomass), or from other natural energy flows (geothermal, tidal, wave, and current energy) (Cleveland & Morris, 2009). Renewable energy sources have become an important political and commercial issue because of growing environmental, security, and energy supply concerns associated with fossil fuels (Global Wind Energy Council [GWEC], 2008a). Green parties, scientific communities, media, the public, and international agreements and treaties, have put pressure on current governments for an increased share of renewable energy supply. A popular choice is wind energy which is the fastest growing renewable energy source in the world, growing at an average annual rate of 25.3% (Zahedi, 2010). Wind energy has the potential to provide a stable and environmentally sustainable alternative energy source in comparison to fossil fuels (Komor, 2004) and be generated worldwide on a scale that is able to tackle these problems (GWEC, 2005).

Globally wind energy is being installed at different rates. The Wind Force 12 report states that the average growth rate from 1999-2004 for the global annual installed capacity of wind energy was 15.8% (GWEC, 2005). From 2008-2009, wind power has shown a growth rate of 31.7% and since 2001 wind capacity has doubled every three years (World Wind Energy Association [WWEA], 2009). The World Wind Energy Report has documented growth rates of wind energy from 2008-2009. Among the major markets, the USA (39.3%), Canada (40.1%), and France (32.8%) were all above average growth rates. Australia had forty times less the installed capacity than Germany the world leader in 2004 with 380MW installed (GWEC, 2005). The Global Wind Energy Outlook Report 2008 shows that Europe has the most installed wind capacity followed by North America, and then Asia. Already having a major generating market of wind power in addition to increasing annual growth rates makes these regions powerful leaders in the world wind industry (GWEC, 2008a).

There has been a large variation in the adoption of wind energy globally since the mid-1990s until 2010. Many countries, such as those in Europe, have taken full advantage of the technology whereas other developed countries have not. The United States and Australia have similar systems of government and economies, yet they have very a large difference in the adoption rate of wind energy. This study will compare the two countries to see why Australia has a slower adoption rate than the United States. Theoretically the study will be divided into the top-down and bottom-up approaches to political science. Within each approach there are a set of variables which were seen in the literature to be critical facilitators or inhibitors to the implementation process. To unravel this puzzle, several research questions were asked and hypotheses were generated.

The Puzzle and Significance

Why given the similarities between the US and Australia, are there significant variations in the amount of wind capacity being generated between the two countries? Figure 1 shows a comparison of the cumulative installed wind capacity over the past decade. It can be seen that the amount of wind energy in the United States, especially from 2006-present, has increased substantially compared to Australia. It can also be seen that the gap is getting bigger over time as to the amount of wind energy installed. By the end of 2009, the US wind industry broke all previous records by installing 10,000MW of new generating capacity (39% rate of growth) thus having a total of more than 35,000MW of generating wind power (American Wind Energy Association [AWEA], 2008). The United States in recent years has taken the lead in the amount of new installed wind capacity totaling 35,159MW in 2009 (British Petroleum [BP], 2010). Australia from 2008-2009 has had a growth of 18.8% with a total of 1,886 installed capacity MW (WWEA, 2009). Currently Australia has 0.2% of the total primary energy consumption from wind energy (Geoscience Australia & the Australian Bureau of Agricultural and Resource Economics [ABARE], 2010) where it is close to 2% in the United States (GWEC, 2011).

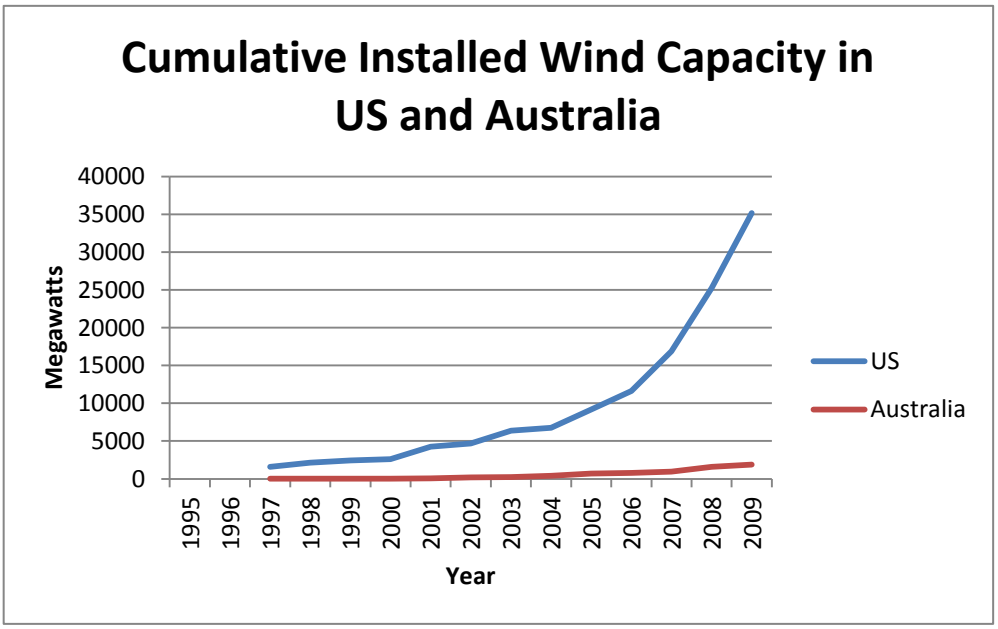


Figure 1- Comparison of cumulative installed wind capacity in US and Australia from 1997-2009. (British Petroleum [BP], 2010)

The extent of wind resources available for generation is an important factor in determining the implementation of wind energy. So, it is important to determine if each country has the same potential to develop the same amount of wind energy. A study by Stanford University's Global Climate and Energy Project found that the areas with the strongest wind potential are the northern coastal areas of North America, Southern Australia, Northern Europe, and the southern tip of South America (Archer & Jacobson, 2005). The amount of wind resources available in Australia and the

United States for the generation of electricity is roughly the same, thus the resource base cannot be the reason for such variations (Archer & Jacobson, 2005; BP, 2010; AWEA, 2008; GWEC, 2008a; WWEA, 2009).

In addition, Australia and the United States have strong industrialized economies and stable democratic and federal governments. The decision-making process is similar in the US and Australia both with an elected House of Representatives and Senate where legislation is passed (Parliamentary Education Office, 2010). The United States is implementing policy to develop more renewable energy through federal and state legislation such as State Renewable Portfolio Standards. Twenty-nine states now have mandatory renewable portfolio standards which require them to increase production of energy from renewable energy sources (Wiser, 2008). The Mandatory Renewable Energy Target (MRET) is Australia's national target and under the Renewable Energy (Electricity) Act 2000 introduces a legal liability for wholesale purchasers and individual electricity users to purchase from accredited renewable energy sources. In 2009, legislation passed the Australian Senate for a national target of 20% renewable energy for electricity generation by 2020 (National Association of Forest Industries [NAFI], 2008). Wind energy plays a major role in meeting this target, yet Australia's rate of growth for wind energy has been below world average. There are factors affecting the policy implementation process of each country which are causing differential implementation rates. This thesis will seek to investigate these factors by using the top-down and bottom-up approaches to political science. The top-down approach will look at formal government actions towards the implementation process while the bottom-up approach looks at the network of actors involved in implementation and their ability to influence the process.

Research Questions

In order to unravel the puzzle as to why, given the similarities between the US and Australia, is the implementation of wind energy faster in the United States, this thesis will use the top-down and bottom-up approaches to address the following three questions.

1.) How are government structures and mechanisms including bureaucratic organization, the nature of the legislation and economic mechanisms used and do they facilitate or impede the implementation process?
2.) How does the network of actors including advocacy coalitions interact and manage conflict, inter-market competition, and public resistance and does this facilitate or impede the implementation process?
3.) How do these government mechanisms and structures, along with the network of actors interact to influence the adoption speed of wind energy policy, and what conclusions can be drawn about the implications for renewable energy policy more generally?

The thesis will explore the importance of the variables relating to state policy (top-down approach) and the network of actors involved in implementation (bottom-up approach) in explaining the variation of adoption speeds in new technology cross-nationally.

The key hypotheses are that the adoption speed of new technology is likely to be quicker in a country where:

- The state has a clear and strong policy framework, effective market, legislative and other mechanisms to facilitate the introduction of that new technology; and
- The network of actors, including advocacy coalitions, supporting that new technology are able to acquire and exert more political power in policy implementation relative to other economic and social interests opposing that new technology.

While this thesis looks at these top-down and bottom-up hypotheses separately, it is important to look at the interactions between the two because government and society cannot be separated. Where the state can establish an appropriate policy framework is likely to be an important determinant of the relative ease or difficulty of implementing policy for the adoption of new technologies. For instance, it might be expected that new technologies would be more readily introduced where the state is able to develop appropriate economic mechanisms, such as subsidies and financial incentives, to handle the risks associated with new technologies relative to existing ones.

Even if the state is able to develop an appropriate policy framework, the extent to which the network of market and political actors supporting that new technology are able to influence policy processes is likely to be a critical determinant of the speed of adoption of that technology. It might be thought that new technologies would be more difficult to introduce where the network of actors supporting the new technology are not able, for instance, because they are unorganized and have diffuse interests, to enhance their power relative to more organized and concentrated corporate interests supporting existing technologies.

Testing these contentions comparatively is likely to enable an analysis of which factors were more important in accounting for differential adoption speeds. For example, assume there are two countries A and B and that the speed of technology introduction was faster in county A relative to country B. We might observe that the policy commitment and framework, including the use of economic incentives, in both countries was more or less similar. Under these conditions, it is likely that differences in the nature and structure of the network of actors involved in implementation is likely to account for the variations observed in adoption of that technology.

Significance of Study

By unraveling the puzzle, this study is significant theoretically, comparatively, and in a policy sense. The theoretical framework will use an institutional approach to political science, specifically the top-down and bottom-up approaches for policy implementation analysis. There is a range of literature used in different policy arenas, but there appears to be very little on wind energy. For example, Feld

& Kirchgassner (1999) look at public debt and budgetary procedures in Switzerland by using the top-down and bottom-up approaches. Lesbirel (1990) uses the approaches with nuclear energy in Japan, for example. Top-down and bottom-up approaches are the theoretical frameworks for this study, and will contribute to the literature by using wind energy analysis.

A comparative interest using top-down and bottom-up approaches will show the similarities and differences in the United States and Australia's policy implementation processes. Most of the literature compares European countries with each other or studies on the United States in a single country context. A comparison of the United States to Australia will contribute to the implementation literature by creating a larger scope of analysis outside Europe and put the study into a comparative context. In addition, this study will contribute to the understanding of the uptake of wind energy in Australia. There is very little literature on Australia's wind energy implementation therefore this study will contribute to the literature using a comparative analysis.

Significance in a policy interest is with the factors that inhibit and facilitate wind energy introduction which is likely to assist policy makers. The United States is faster to implement wind energy than Australia; by looking at their policy-making process can be of potential assistance to Australia and any other country that is implementing wind energy below average, and wishes to increase their speed of adoption.

Organization/Structure

Chapter 2 will explore in detail the top-down and bottom-up approaches; the two main approaches to the implementation process in political science. The chapter will describe what the approaches entail and the variables that emerged. These variables are important to the top-down and bottom-up approaches within implementation and technology introduction literature. Hypotheses will be stated about each of these variables. In addition, the comparative method will be discussed and its importance to this study will be portrayed.

Chapter 3 will use the top-down approach to implementation theory to analyze the implementation process in the United States and Australia. It will examine the importance of the institutional structures, nature of the legislation, and the economic mechanisms. The similarities and differences of these variables between countries will be explored to understand why there are two different rates of adoption of wind energy.

Chapter 4 will use the bottom-up approach to implementation theory to study the policy implementation process in the United States and Australia. The bottom-up approach focuses on the network of actors working informally on implementation, and how the interactions between networks have an effect on a policy outcome. In particular, it will focus on competition and public resistance. How bottom level actors influence the policy process for wind energy implementation will be outlined in a comparative context.

Chapter 5 will draw conclusions on the previous chapters and will summarize the key conclusions about the factors that inhibit or facilitate the implementation process. Chapters 3 and 4 will compare top-down and bottom-up approaches to implementation in the United States and Australia. From these two chapters, conclusions can be made as to why the United States is quicker to implement wind energy over Australia. Industry and policy implications for countries wishing to implement more wind energy will be outlined. It is important to see what this study says about the secondary literature and the scope for future research based on this and previous studies.

This chapter has raised the question of why Australia and the United States have different adoption rates of wind energy from the mid-1990's until 2010. The two countries are similar in that they both have federal and democratic governments and industrialized economies. Countries are looking to renewable technologies to fulfill the world's energy supply based on the three main reasons of energy security, supply, and environmental concerns. A puzzle and several research questions emerged and this thesis hopes to answer them.

The thesis is organized theoretically by using the top-down and bottom-up approaches to political science. The top-down approach analyzes formal government actions to implementing policy while the bottom-up approach explores the network of actors involved in implementation with the ability to influence policy decisions. Certain variables within each approach were found to be important. Within the top-down approach, bureaucratic structure, the nature of the legislation, and the economic mechanisms used will be examined. Within bureaucratic organization this thesis will investigate the structure of federal and state agencies involved in the implementation of wind energy. The goals, authority and power of the federal and state governments will also be explored. The nature of the legislation will be explored, and this will show what the legislation has achieved, for example incentives or regulation. This study will identify the key federal and state legislation which have an effect on wind energy in the United States and Australia. By looking at the goals each country has set through the legislation implemented, it will show their commitment or lack of to renewable energy and the effectiveness of the legislation. Economic mechanisms will also be explored. Effectiveness of the economic mechanisms and their ability to adopt more wind energy will be interrogated. This research will unveil all the economic mechanisms used to promote wind energy in the United States and Australia at a federal and state level in addition to showing government support for other industries such as fossil fuels. From that information, a comparison of the effectiveness of the mechanisms each country uses can be made in addition to the strength of support for other industries.

Variables researched from the bottom-up approach include the network of actors, inter-market competition, and public resistance. The major coalitions in support of the wind industry and other major industries (fossil fuels, nuclear, etc.) in the United States and Australia will be revealed. Their effectiveness will be measured as to how much power coalitions have in influencing policy outcomes by if each country has a technology specific advocacy coalition, their lobbying tactics, number of

members, and foundation within the country. Inter-market competition will explore how competitive the wind industry is in each country compared to other industries. The United States has the addition nuclear industry whereas Australia does not. Public resistance issues to wind farms, such as NIMBY, will be researched in the United States and Australia and the level of opposition will be compared.

The next chapter will discuss what the literature says about implementation theory and what variables are most important within these approaches. These variables are important to the top-down and bottom-up approaches within implementation and technology introduction literature. Hypotheses will be stated for each variable. Also, Chapter 2 will emphasize the significance of comparative methodology and how it fits into this study.

Chapter 2: Analyzing Policy Implementation Theory and Comparative Methodology

This thesis will use the top-down and bottom-up theoretical approaches in the context of institutionalism. An institutional approach to political science focuses on the "informal conventions of political life in addition to formal constitutions and organizational structures." It identifies the interactions between formal and informal institutions and individuals within the political system (Lowndes, 2002). The top down approach identifies government actions which affect the policy implementation process. The top down approach, however, does not identify informal actions by societal interests. The bottom-up approach was developed to recognize that informal actors have a role in the implementation process as well. These two approaches within the institutional context unfolds why government institutions and societal interests cannot be separated. The framework developed by the top down and bottom up approaches has included variables which help to analyze the puzzle.

The puzzle as to why the United States is faster to adopt wind energy from the mid-1990's until 2010 than Australia can be understood through comparative methodology. Each of these variables will be analyzed within the context of each country and then directly compared. This comparative framework will outline the similarities and differences in each country and which variables inhibit or facilitate the adoption of wind energy. Comparative methodology will show the faults that a single context study will not. For example, if a variable is deemed to be important in facilitating wind energy then it might be implied that this would be the same for all countries. When the same variable is put into a comparative context, the results from the one country may be different in another.

Top-Down and Bottom-Up Approaches to Implementation

The implementation process has been studied since the 1970's with the works of Donald Van Meter and Carl Van Horn (1975) and Sabatier and Mazmanian (1980), as well as others. These works identified the implementation process from a top-down approach which starts with formal government actions towards implementing a specific goal. Once a central government decision is in place in the form of a statute or policy decision, an implementing agency(s) is given the legal authority to take action (Sabatier & Mazmanian, 1980). There are a number of factors for implementation within the top-down approach including organization and structure (structure of bureaucracies/administrative agencies) (Howlett & Ramesh, 2003) clear legislation (law, administrative agency rule) (Jenkins-Smith & Sabatier, 1994) and economic mechanisms (i.e. subsidies, financial incentives, feed-in tariffs). The extent to which these mechanisms manage political and market opposition will determine the outcome of the implementation process.

Criticisms arose that top-down models include neglecting to identify strategic initiatives from the private sector, street-level bureaucrats, and policy subsystems. From these criticisms a bottom-up approach was developed and started by identifying the network of actors involved in a policy outcome and their goals, strategies, activities, and contacts (Lester & Stewart, 2000). This network includes lower level or 'street level' actors who work within a more specific area of policy and have more expertise, skill, and proximity to the policy area involved (Anderson, 2003). These may be companies, non-governmental organizations, and societal interests. The main focus of the bottom-up approach is the networks and coalitions involved, and how they interact with each other and with government. The emergence of these different networks, their composition, and effectiveness can create conflict, inter-market competition, and public resistance which in turn can influence the outcome of policy implementation.

The study of political institutions is pointed towards the rules, procedures, and formal organizations of the political system. The institutional approach is the dominant theoretical framework used in new technology introduction literature. In the new technology introduction literature, the institutional approach concerns the interaction of formal government agencies along with coalitions opposing or supporting a technology. As described in Marsh and Stoker (2002), "the institutional approach is: a subject matter covering the rules, procedures and formal organizations of government, which employs the tools of the lawyer and the historian to explain the constraints on both political behavior and democratic effectiveness, and fostering liberal democracy, especially the Westminster model of representative democracy" (Rhodes, 1995). The study of implementation successes and failures mostly uses an institutional approach which describes certain variables affecting the outcome. Bergek et al. (2008) use an institutional framework to identify innovation system failures and weaknesses. On the other hand, Wolsink (1996; 2000) takes a behavioral approach by saying that pre-existing attitudes from individuals and society towards developers and politicians is what shapes the opposition to wind farms. The top-down and bottom-up approaches are used in a variety of contexts such as science policy, education, social well-being, and law. For example, Headey et al. (1990) discuss the top-down and bottom-up theories of subjective well-being and Power (1992) discusses the top-down and bottom-up forces on food web ecology. This thesis will look at the importance of new technology introduction through the top-down and bottom-up approaches to policy implementation.

The Donald Van Meter and Carl Van Horn model points out six variables thought to influence the relationship between policy and performance: (1) policy standards and objectives; (2) policy resources (e.g. funds and other incentives); (3) inter-organizational communication and enforcement activities; (4) characteristics of implementing agencies (e.g. staff size, degree of hierarchical control, organizational vitality); (5) economic, social, and political conditions (e.g. economic resources within implementing jurisdiction, public opinion, interest-group support); and (6) the disposition of the

implementers (Van Meter and Van Horn, 1975). Sabatier & Mazmanian along with Edwards have developed top-down models as well (Edwards, 1980; Mazmanian & Sabatier, 1983).

The top-down approach uses social, legal, and economic mechanisms which affect the behaviour of groups or individuals involved in the implementation process (Lesbirel, 1990). A study by Richard Elmore describes the top-down approach to implementation analysis as forward mapping. Forward mapping is a strategy that begins at the top of the process, with clear intent described, and proceeds through levels of more specific expertise to define what is expected of the implementers at each level (Elmore, 1979). A study by Fromhold-Eisebith & Eisebith (2005) uses cluster promotion (coordinated set of measures that supports the development of a regional industrial collection of ideals towards a set of related industries) to describe the top-down approach. This study will use the top-down approach as a framework for studying the policy implementation process for wind energy in the United States and Australia. Within new technology introduction literature, there are several variables that are deemed important to the top-down process: bureaucratic organization, legislation, and economic mechanisms.

The top-down approach starts with government actions and tends to down play the role of society. However, the bottom-up approach starts with a focus on societal actions and tends to down play government. The bottom-up approach looks at the network of actors involved in a policy and political system and analyses their behavior to reach a certain outcome. This network includes lower actors or 'street level' actors who work within a more specific policy area and have more expertise, skill, and proximity to the policy area involved. These may be companies, advocacy coalitions, non-governmental organizations, and the general public. For example, several countries have organizations that focus on specific aspects of the wind industry, such as research and development. Responsibilities that require special expertise and proximity to a problem are pushed down in the institutional set-up, leaving more generalized responsibilities at the top (Elmore, 1979).

"Bottom-up urged analysts to begin with all the public and private actors involved in implementing programs and systematically examine through interviews and survey research their personal and organizational goals, their implementation strategies, and the network of contacts they build. Studies conducted in the bottom-up fashion have shown that the success or failure of many programs often depends on the commitment and skills of the actors directly involved in implementing programs" (Lipsky, 1980).

Measured from the original goal of the legislation, one states what an adequate outcome would be (Elmore, 1979). Thus the size of the network of actors and how efficiently they interact to get an intended outcome is important. The literature focuses on the interactions between actors and networks that have informal authority and influence within the implementation process and believes this to have more of an impact over formal political structures. Gregersen & Johnson (2010) describe the policy process as a combination of both approaches because national energy plans (top-down

approach) would not have been implemented if not for advocacy coalitions and private and public actors pushing for the plan (Hvelplund, 2000).

A question that did come up in this research was where to place state level[1] involvement in the theoretical framework. Are states involved in policy implementation and if so are they considered to be part of the top-down or bottom-up approach. In many cases this depends on how the reader defines these two approaches in the literature. The top-down approach according to Sabatier and Mazmanian often starts with a policy decision made by governmental officials (in most cases central government). Sabatier (1986) does not specifically describe the top-down approach as policy decisions be made and implemented by federal government officials although they do say in most cases decisions are made by the central government. In other cases, governmental officials could be considered those working for a state government. For lack of clarification within the literature, this thesis has included the states to be part of the top-down approach because of their strong involvement in the policy development and deployment within the United States. In addition, the formal government has the power to introduce policy on wind energy either at the federal or state level. Top-down mechanisms such as legislation and economic mechanisms apply to both federal and state level governments. State government influence in some countries would seem to fit as an actor in the bottom-up approach, however for consistency of this thesis, this will be discussed in Chapter 3 keeping the states as a part of the top-down approach.

Institutions are captured in the literature as a strong part of the implementation process [Hall and Taylor, 1996; Thelen, 1999; Scharpf, 1997; Mahoney, 2000; Healey et al., 2003]. The interactions between actors, networks, and institutions within the institutional framework are the most studied aspect of implementation and innovation of a new technology. As described in much of the literature on innovation technology, institutions are important not only for a specific path a technology takes on a larger level, but also for the growth of individual firms (Johnson & Jacobsson, 2001; Johnson, 1997; Porter, 1998). Firms in competing technological systems not only compete in the market for goods and services, but to gain influence over the institutional framework. Proponents of the established system often try and block the diffusion of renewables by influencing the institutional framework so that it continues to be to their advantage. Blocking the implementation of a policy is one of the tools used to influence and perhaps gain control over other actors involved in the implementation process. (Jacobsson & Bergek, 2004; Jacobsson & Lauber, 2006).

The analytical framework recognizes how the data is organized within the literature. There are numerous analytical frameworks used within new technology introduction literature. A *neoclassical economic perspective* focuses on changes that are influenced on market prices. A *policy learning approach* describes the policy making process as a learning process and includes technological, organizational, and institutional learning as an integrated part of the learning economy

[1] For this paper low case "state" shall be referred to for state governments and upper case "State" shall refer to federal level state.

(Gregersen & Johnson, 2010). The *entrepreneurial perspective* focuses on individual firms instead of collective action which follows a rational choice approach. Agterbosch et al. (2004) use the entrepreneurial perspective when describing the implementation of wind energy in the Netherlands. Johnson and Jacobsson (2001) describe the neoclassical and entrepreneurial perspectives, yet use a technology specific approach themselves. A *technological innovation system approach* is defined by Carlsson & Stankiewicz (1991) as "a dynamic network of agents interacting in a specific economic/industrial area under a particular infrastructure and involved in the generation, diffusion and utilization of technology." A particular benefit to a technology-specific framework is that it is useful when considering competition between various technologies, and is strongly used in energy specific technologies. A *historical-institutionalist approach* which rejects the idea that the same forces will result in similar results in different places at different times, thus separating the study into a time series. Breukers & Wolsink (2007) compare wind power implementation in changing institutional landscapes in the Netherlands, England, and the German state of North Rhine Westphalia. Agterbosch et al. (2004) use a time period approach which describes the three successive market periods (monopoly powers [1989-1995]; Interbellum [1996-1997]; Free market [1998-2002]) in the Dutch history for the implementation of wind power. An article by Bergek et al. (2008) describes two bases for assessment: the phases of development (Agterbosch et al., 2004; Jacobsson & Bergek, 2004), and system comparisons. Literature on product/industry life cycles is plentiful [Bonaccorsi & Giuri, 2000; Klepper, 1997; Tushman, Anderson, & O'Reilly, 1997; Utterback & O'Neill, 1994; Utterback & Abernathy, 1975; and Van de Ven & Garud, 1989].

The analytical frameworks used in the literature vary; the two most popular are organizing the data into a time series or a specific technology innovation system which focuses on the interactions of the actors and not so much the differences between stages of development. Most of the literature accepts that the interactions within the 'network of agents' for policy implementation of a technology is the key motivator (thus supporting the bottom-up theoretical approach). Approaches that are not commonly used in new technology introduction literature are the top-down and bottom-up approaches to political science.

Analyzing the Speed of Implementation

The two different literatures, new technology introduction/innovation literature and policy implementation literature generate numerous variables sought to facilitate or impede a technology from being introduced into a country's market. New technology literature looks at a wide array of variables sought to have an effect on new technologies development and growth. However, political science categorizes these variables into the top-down and bottom-up approaches and makes studies more explicit. Drawing on the two literatures, this thesis developed a model for analyzing the speed of implementation. The variables found important to the wind industry from the new technology literature

are placed into the political science top-down and bottom-up approaches to make the study more explicit.

Bureaucratic organization, the existence and nature of the legislation, and economic mechanisms are likely to be important in having an influence on the implementation of a new technology. These variables are identified in the top-down approach and are studied in depth in this research.

Top-Down Variables

Bureaucratic Organization

Administrative agencies begin the process of implementation and use their own discretion in carrying out public policies (Lester & Stewart, 2000). One variable the top-down approach looks at is bureaucratic organization and structure. Bureaucracies are endemic to the top-down approach, and are a significant determinant of policy implementation (Howlett & Ramesh, 2003). Saeki & Shull (2003) state that agency status and policy content are factors within the top-down approach and influence the structure and interests involved to determine which political arenas make the decisions. A study by Heiman & Solomon (2004) links the ineffectiveness of policy with the organization of government institutions. A flaw that occurs because of ineffective bureaucratic structure are: cyclical and ineffective nature of policy which is linked to the weak institutional framework. Policy-making can be cyclical and ineffective because decision-making tends to be event or crisis driven. For example, the 1973 Arab oil embargo and the price rise from OPEC had an effect on energy markets and thus future policy decisions around the world (Goodwin, 1981). In other studies, strong commitment to the policy-making process from top officials has aided in the implementation stage. For example, in Northern Rhine Westphalia, the success of wind power implementation was praised and associated with a strong political commitment in German society and politics (Breukers & Wolsink, 2007).

The organization of bureaucracies has been seen in many countries to aid in the implementation of policy. Appropriate organization between agencies leads to fluent communication of goals and strategies as well as reducing redundancy of action. The hypothesis is that the adoption speed of a new technology is likely to be quicker in a country where there is clear structure, organization, and commitment among bureaucracies to facilitate the introduction of that new technology. This study will investigate the federal and state agencies involved in implementing wind energy in the United States and Australia. Specifics about these agencies which are investigated are: how many are involved; what roles do they have and is this clear; executive commitments and setting goals for these agencies to act upon; and how efficient are these agencies in facilitating the implementation process. Past studies show that the United States has inefficient organization and weak commitment compared to Northern Rhine Westphalia where the bureaucratic organization is what caused the success of the wind industry within the country. For example, Heiman & Solomon (2004) uses the United States as an example of where the cyclical nature of energy policy is ineffective within the institutional setting. Major changes to energy policies in the US are event

driven, such as the Arab oil embargo, which is the cause of the cyclical nature and weak commitment to energy policy. North Rhine Westphalia has made energy policy a commitment and not a reaction to other events, and thus have seen success.

Nature of Legislation & Economic Mechanisms

According to Howlett & Ramesh (2003), the top-down approach assumes that the policy process can be viewed as a series of chains of command where political leaders articulate a clear policy preference which is then carried out at increasing levels of specificity as it goes through the administrative machinery that serves the government. Legislation with clear objectives, makes it easier for agencies to work towards the same goal because there will be no misconceptions of goals. Forward mapping, as Elmore describes the top-down approach, of a federal policy might begin with a statement of congressional intent, then outlining federal agency regulations and administrative actions consist with that intent. Then responsibilities for implementing policy would be divided between central and regional offices of the federal government (federal, state, and local administrators). Lastly it would state an outcome that would hopefully be consistent with the initial purpose of the policy makers (Elmore, 1979). Elmore describes the importance of clear objectives through legislation for effective implementation of a policy through all the different levels of agencies who are responsible for an outcome.

Legislation with clear intent and detail usually finds an easier way in achieving the goals it was meant to achieve. The hypothesis is that the adoption speed of new technology is likely to be quicker in a country where the state has a clear and strong policy commitment, framework, and legislation to facilitate the introduction of that new technology.

Economic mechanisms include subsidies, feed-in tariffs, grants, etc. all of which are the most studied variable within the top-down approach. Most economic mechanisms are managed by federal and state governments in order to increase market competition of the product and to make the product more attractive to the investor. Subsidies are one of the most common ways governments support renewable energy systems worldwide. Financial incentives, such as subsidies, are distributed by government agencies to companies in order to lower the price of their product and be more competitive in the market. Jacobsson & Bergek (2004) state, “appropriate financial incentives to invest in renewables need to be put into place to stimulate the formation of markets, with the purpose of providing guidance of the direction of search for a variety of firms towards the new field and stimulating the creation of new (application) knowledge and the formation of prime movers.” The goal is to have the incentives absorb some of the technological and economic risks for new consumers and producers and to stimulate lower actors to invest in the technology. Subsidies reduce the cost to consumers which makes the product more attractive.

Subsidies can go towards renewables indirectly such as through research and development. Jacobsson & Lauber (2006) described government funding towards research and development (R&D) of wind and solar programs in Germany is what enabled there to be institutional change in favor of

these technologies. Institutional change means that there was a shift in power to actors in favor of renewables and allowed for other organizations to be set up in order to strengthen the renewable energy market. As a result of R&D funding in firms and universities, a range of other organizations were set up which later became key actors (this included conventional industry associations and environmental organizations) in advocacy coalitions for wind and solar power (Jacobsson & Lauber, 2006). Although there was not direct funding to the industries for their development, financial incentives in the form of R&D and education is seen in the literature as a powerful government incentive. Economic mechanisms distributed for research and development will allow for the technology to become competitive in the market by making the technology more efficient and perhaps cheaper.

Breukers & Wolsink (2007) describe knowledge resources to be important in the mobilization of wind energy. Relevant knowledge resources include technical, environmental, local, experimental, and tacit knowledge (Breukers & Wolsink, 2007). Johnson & Jacobsson (2001) state that the amount spent on R&D seems to have little relevance, but how it is spent is far more important. They use the case of Sweden where more money was spent on R&D then either Germany or the Netherlands and Sweden failed where the others were successful because they generated a self-sustaining process from the resources. Loiter & Norberg-Bohm (1999) suggest that policy should be designed to provide the minimal public subsidies needed to make wind energy attractive and decrease the subsidies as the technology improves. Also, policies should incorporate incentives that encourage production of electricity by renewables rather than simply investing in renewable energy capital (Loiter & Norberg-Bohm, 1999).

The way a federal government allocates subsidies and financial incentives to bureaucrats and implementing agencies can affect the policy outcome. Distributing and extending subsidies based on generation rather than retail rates have shown to be a successful strategy (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, 2000).[2] How subsidies are used is very important because if used correctly, an industry would be able to grow and gradually become less dependent on the subsidies until they can be taken away.[3] Both these measures were important in the development of the wind industry. The European wind market has boomed because their policies have been relatively stable for at least a decade.

Subsidies to fossil fuels can cause severe disruption and difficulty for renewable technologies to become competitive in the market compared to fossil fuels.[4] Jacobsson & Bergek (2004) state the same thing by saying that incumbent technologies are subsidized directly or indirectly which puts the

[2] Wind farms in Germany were in the hands of thousands of individual investors and landowners unlike the United States where subsidiaries of large corporations often owned extensive wind farms (Heiman and Solomon, 2004).

[3] In Denmark, there was a utility obligation to buy wind power at 85 percent of its retail price and a 30 percent subsidy invested in new wind turbines in 1979 which was reduced gradually over ten years (Gregersen and Johnson, 2010).

[4] Britain, Germany, Denmark, Norway, and several other member states of the European Union, aim to privatize pre-existing monopoly public utility systems and eliminate national subsidies for coal mining, nuclear power, and other barriers to competitive energy markets (Heiman and Solomon, 2004).

new technologies often at a cost disadvantage. Giving funding to fossil fuels and renewable energies is a contradictory approach for governments although if government funding halts for one industry while another gains support, there could be severe conflict and resistance towards the government for making these changes. Conventional industries have a large influence in the market and therefore in the political environment as well, disrupting funds or policy support may cause lack of support and conflict which top officials in the government usually try to avoid. However, the allocation of subsidies to the different energy sectors shows the strength of commitment by government. A government that is allocating more financial aid to fossil fuels is not as committed to renewable technologies.

Feed-in tariffs are a form of financial incentive given by a government for encouraging mobilization of capital and support for renewable energy. In an article by Breukers & Wolsink (2007), the feed-in system in North Rhine Westphalia was very effective, but it was most effective in combination with other support programs that enabled a diversity of actors to become involved in the development of projects. Another example was in Germany when the electricity feed-in law (EFL) was passed in 1991. The EFL gave a large amount of incentive for wind turbine owners which resulted in substantial market growth for the first half of the 1990's (Jacobsson & Bergek, 2004).

The literature shows that economic mechanisms such as subsidies are necessary for the introduction of a new technology in the market. There is much research done on different economic mechanisms used in Europe and the United States. Based on the literature, the hypothesis formulated is that the adoption speed of a new technology is likely to be quicker in a country where there are effective market mechanisms to facilitate the introduction of that new technology. This hypothesis comes from the success of economic mechanisms used to promote wind energy in the past such as in Germany and Denmark, although the debate comes in the literature as to what kinds of mechanisms are the most successful and how they are used. Both countries have mechanisms used to support wind energy, however, the nature of the mechanisms is important to understand which ones work better to adopt more wind energy.

It is seen in new technology introduction literature that the network of actors working towards implementing policy is just as important, if not more, than the bureaucracies and agencies in charge of implementation. Advocacy coalitions are an important factor within the network of actors. These coalitions can be in support or opposed to wind energy. In addition to coalitions, the general public has control over wind development in local and regional settings. The interactions of all actors involved in the market and political arena can be seen through competition and public resistance, all of which will be covered in this study. However, being that this study is purely qualitative, many of these factors such as public resistance can only be spoken of on general terms.

Bottom-Up Variables

Advocacy Coalitions

Advocacy coalitions have societal interests towards a technology and it is the power that these coalitions have in order to influence policy that is important (Jacobsson & Bergek, 2004). Advocacy coalitions are various groups of players joined together by a similar set of values and are usually not part of the formal political system. Advocacy coalitions are one of the most influential thus powerful actors with informal authority. An advocacy coalition that can successfully influence agency action and may have substantial effect on the course and impact of public policy (Anderson, 2003). There is literature that solely studies advocacy coalitions in the forming of policy. Sabatier specifically studies the advocacy coalition framework to understand individual and collective behavior in order to influence policy. Jenkins-Smith & Sabatier (1994) argues that "policy making takes place in a context where advocacy coalitions, made up of a range of actors sharing a set of beliefs, compete in influencing policy in line with those beliefs". Jacobsson & Lauber (2006) conclude that four features were present which allowed for the diffusion of the new technology: institutional change in the form of energy R&D policy, the formation of markets in the form of protected niches, entry of firms, and establishment of some of the elements of advocacy coalitions. Unruh (2000) in Jacobsson and Lauber's article says that institutions and coalitions create non-market forces over time. Through coalition building, voluntary associations and the emergence of societal norms and customs creates powerful political forces to lobby on behalf of the technological system. Breukers & Wolsink (2007) use the term 'policy community' which has been interpreted to be an advocacy coalition in some cases. A policy community gathers actors and knowledge resources around an issue. In their study, communities have been able to mobilize support for wind power implementation by influencing national policy and at the level of implementation (Breukers & Wolsink, 2007). They conclude how interactions between various stakeholders, within changing institutional contexts have resulted in a process of institutional capacity building for wind power implementation. Jacobsson & Bergek (2004) conclude that for a new technology to expand, technology specific coalitions need to be formed and to engage themselves in the wider political debates in order to gain influence over institutions and in the political environment. Their study shows that the interaction of the top-down and bottom-up approaches is important because coalitions that engage themselves in the political debates often gain more support. Informal actors (in these studies mostly technology specific advocacy coalitions) who allowed for the successful implementation of wind energy are crucial. All the literature that discusses advocacy coalitions for renewable technologies shows that they play a vital role in the development of wind power within a country.

In a study by Agterbosch, Vermeluen, and Glasbergen (2004), they research the interactions between different entrepreneurial groups including small private investors, the electricity sector, wind cooperatives, and new independent wind power producers. These groups are interdependent with many technical, economic, institutional, and social conditions for the development of the wind energy

market in the Netherlands. They discuss the changes in the formation of systematic conditions and how this change caused the increased importance and emergence of different categories of wind power entrepreneurs on the Dutch wind power supply market. Over the years as small private investors increased, the role of the electricity sector decreased. They state that policy is not held within a vacuum but shaped in interactions between stakeholders. Regulations to give effect to these general principles in specific circumstances are then prepared by civil servants employed by administrative agencies, often in conjunction with target groups (Winter, 2003). Target groups (groups whose behavior is intended or expected to be altered by government action) play a major role directly and indirectly in the implementation process.

Advocacy coalitions are the most important variable to influence the implementation process. Much of the existing literature discusses the positive influence that coalitions have on the wind industry. The hypothesis is that the adoption speed of new technology is likely to be quicker in a country where the network of actors, including advocacy coalitions, supporting that new technology are able to acquire and exert more political power in policy implementation relative to other economic and social interests opposing that new technology.

Inter-market Competition

Companies and stakeholders will interact through inter- market competition to gain influence in the market and hence in the political environment which is concentrated heavily on economic forces. Several studies centre on market competition which if obtained, helps the new technology to grow quicker within the market and is seen as more favorable in the political environment. In the National Renewable Energy Laboratory (NREL) report, it was said that competition was favored and contributed to the success of the consumer market for green power in the United States. The principal promise of market reform in the US, as defended by Enron, Dynergy, and other large energy traders, was that competition would result in lower prices for consumers. Heiman & Solomon (2004) conclude that in Germany and Denmark, initial market penetration for wind energy is more secure due to local ownership of distributed resources thereby building a strong political base for renewable energy. Local ownership allowed for the wind energy to have a stable market and become more competitive. Success of small ownership is not seen much in the US where small firms cannot strive in the competitive market where large wind farms are the norm right from the start, as in California (Heiman & Solomon, 2004). Market competition is difficult for renewable energies because they are more diffused and unable to compete with strong conventional energy companies. Although government agencies can allow for renewables to become more competitive through financial mechanisms (subsidies, incentives, feed-in tariffs), however there are other market actors such as companies, advocacy coalitions, and stakeholders who dominate the market and cause competition. Government would find a lot of conflict and resistance if they were to interfere with the market economy.

Competition is thought to be a healthy obstacle for a new technology, although, if a new technology cannot become competitive in relation to other industries, it will not find success in the market. Competition comes from political strength and cost relative to other industries. Where both of these can be in favor of the wind industry over other industries is when the wind industry is likely to be adopted more quickly.

Public Resistance

Public participation, resistance and support is a social condition that can have a major effect on the outcome of a policy. If the policy is strongly supported by the general public, then it is expected to have an easier time being implemented. Public resistance causes a difficult time for policy to successfully complete implementation. Breukers & Wolsink (2007) discuss the importance of local planning, social acceptance, and local public resistance. Breukers & Wolsink (2007) look at a more local level of implementation. They describe how projects are increasingly confronted by local opposition which delay or block implementation (Walker, 1995). In North Rhine Westphalia, wind power policies support a practice of locally based project planning which was more successful than in England and the Netherlands it was not present (Breukers & Wolsink, 2007).

A more specific topic to public resistance is the 'not in my backyard' phenomenon (NIMBY), commonly present in the literature in regards to the siting of nuclear power plants and wind turbines. Wind farms face NIMBY protests and issues over species conservation, aesthetics, and noise (Pasqualetti, 2000). "Nimbyism" has been mentioned in several studies which address the gap between positive public attitudes and negative behavior towards specific projects (Bell et al., 2005; Devine-Wright, 2005; Ek, 2005; Wolsink, 2006; 2007). Lagging implementation due to resistance to wind turbine siting has been explained by the NIMBY argument and is also mentioned in some studies the difficulty of obtaining building permits (Jacobsson & Bergek, 2004; Krohn & Damborg, 1999).

Public resistance is seen in the literature to slow the development process of building new wind farms. Public resistance can be overcome as it was in several countries by gaining social acceptance in making the public more involved in the process. The key hypothesis is that the adoption speed of new technology is likely to be quicker in a country where the groups behind a new technology are able to acquire and exert more political power in policy implementation relative to other social interests opposing that new technology.

Comparative Methodology

A great deal of the literature on technology introduction and policy implementation uses qualitative methods. The political environment is full of complex and intertwined relationships and a qualitative study is a better method to help understand these complex relationships. "When used along with quantitative methods, qualitative research can help us to interpret and better understand the complex reality of a given situation and the implications of quantitative data" (Family Health

International, 2010). Qualitative methods can be applied to a number of contexts but is generally defined as, "...a range of techniques including observation, participant observation, intensive individual interviews and focus group interviews which seek to understand the experiences and practices of key informants and to locate them firmly in context" (Devine et al., 2002). Marsh & Stoker's book titled *Theory and Methods in Political Science* covers all of the aspects of qualitative data collection. Devine, F., Marsh, D., Sanders, D., Ward, H., Hopkins, J., and Lowndes, V. (2002) go into detail on all aspects of qualitative methods and Rhodes, R. (1995) describes the institutional approach for qualitative studies. Some specific examples of studies where qualitative methodology is used would be Agterbosch et al. (2004) who describe the social-institutional setting of wind energy in the Netherlands and Breukers & Wolsink (2007) also use qualitative methodology in their study on changing institutional landscapes to wind power.

Data Collection

Throughout the period of data collecting for this thesis a number of experts were interviewed a range of people in the United States and Australia. The organizations in the United States include:

- Australian Embassy of the United States
- American Council on an Energy-Efficient Economy
- American Wind Energy Association
- American Council on Renewable Energy
- National Wildlife Federation
- Federal Energy Regulatory Commission
- Department of Energy.

Within Australia the organizations of people interviewed include:

- Institute for Sustainable Futures- Sydney
- University of New South Wales
    - Institute of Environmental Studies
    - School of Social Science and International Relations
- Australian National University
    - Climate Change Institute
    - School of Politics and International Relations
    - Fenner School of Environment and Society
- Department of Resources, Energy and Tourism
- Department of Climate Change and Energy Efficiency
- Australian Coal Association
- Australian Centre for Renewable Energy
- South Australian's Energy Regulators Office
- Essential Services Commission of South Australia
- Energy Division of the South Australian Government
- Greenpeace
- Parliament House.

There were several different types of organizations covered such as government, non-government, industry, and academia. These people were in organizations which were important because each of these organizations covered specific proponents relevant to the policy process. For example, Greenpeace in Australia was selected because they provided valuable information on the role advocacy coalitions play within the bottom-up process towards the implementation of wind energy. Below is the list of general interview questions that were used as a guideline during the interviews. Based on the direction of the interview, the questions may have changed slightly or not all may have been used.

Interview Questions

1.) What is your background in the field of renewable energy (wind energy) policy, specifically policy implementation?

2.) What has government done to implement wind energy policy?

3.) Who has the power to implement policy, specifically wind energy policy? Specific organizations and/or implementing agencies. Is it government or other implementing organization?

4.) Who do you think are the biggest players in the wind energy industry?

5.) What major interactions take place between actors in the political system to influence policy?

6.) What changes have taken place over the course of the last decade which influenced the policy implementation process?

7.) What do you feel are the major factors impacting implementation for wind energy in Australia/United States?

   a. Economic?

   b. Political?

   c. Social?

   d. Technical?

Bureaucratic organization

8.) Do you think the structure and organization of bureaucratic agencies has an impact on the implementation process of wind energy? If so how?

9.) Do you think this affects the communication and cooperation between interacting agencies?

Clear Legislation

10.) Do you think clear and consistent legislation within the decision-making stage plays a large role in the implementation stage of the policy cycle? Do you think that Australian government policy on this topic is clear?

Economic Mechanisms

11.) How are economic mechanisms such as subsidies and feed-in tariffs used for the promotion of wind energy and also towards existing technologies?

12.) Do such mechanisms work in enabling the adoption of a new technology? What factors are preventing them from working and are economic mechanisms enough relative to other energy suppliers (existing technologies)?

Advocacy Coalitions

13.) What are the nature of the coalitions that are involved in wind energy and in promoting and constraining the use of wind energy?

14.) What is their structure/composition? (number of members, regional coverage)

15.) What coalitions do you feel have the strongest influence on government decision making towards renewable and/or existing (conventional) technologies?

16.) What are their strategies?

17.) Do you feel there are stronger and more coalitions towards renewable or existing technologies?

Inter-market Competition

18.) Do you think it is difficult for new technologies to become competitive in the market? If so, why? What mechanisms and/or structures are making it difficult?

19.) Is wind energy competitive to other technologies and what are the views as to why it may not be?

20.) Why do you think it is or isn't competitive?

Public v Private Lands

21.) Who holds most valuable wind resource land in Australia?

22.) Is it harder to develop on public or private lands?

Public Resistance

23.) Do you feel public resistance is a big issue in Australia towards the development of wind farms/turbines?

24.) Besides NIMBY issues what other public resistance issues are seen to affect the development of wind farms?

25.) Compared to existing technologies is there more or less resistance to wind farms? Why do you think this is so?

26.) Are there other variables that you think are important that I have not considered?

27.) Would you like a copy of my thesis when I am finished?

28.) Are there any other people who you think might be useful to talk to about my thesis? If so, would you mind introducing me to them so I might have a talk with them?

29.) Any articles/reports/books do you think are a must read?

The interviews conducted provided valuable information and insights to the areas of renewable energy and public policy. They put the literature into practice and allowed for a full understanding of the policy implementation process relative to wind energy in the United States and Australia. In addition to then interviews, a large collection of information was compiled from secondary literary sources such as journal articles, newspaper articles, government documents, organization websites, etc.

Most studies on policy implementation of wind energy will put their study into a comparison between case studies or in a single country context. For example, Mabel & Fernandez (2008) study the growth trends of wind energy in India and Liu et al. (2002) analyzes the institutional setting for wind energy development in China. The comparative literature tends to be based on European countries. Breukers & Wolsink (2007) make explicit that local case studies can provide a rich account of local institutional capacity building. They use multiple case studies to qualify the processes through which wind power has developed in the Netherlands, England, and the German state of North Rhine Westphalia in order to generate a better understanding of how they historically evolved (Breukers & Wolsink, 2007). Studies by Johnson and Jacobsson (2001), Jacobsson & Bergek (2004), and Bergek et al. (2008) look at the wind turbine industries in Germany, the Netherlands and Sweden as growth industries. Most of the literature is based on collected data from secondary sources, policy documents, and stakeholder documents. Fieldwork data is gathered from interviews with conventional energy-sector branches, wind project developers, wind power sectors, environmental, nature protection and landscape preservation organizations, anti-wind power groups, research institutes and officials at different levels of government (Breukers & Wolsink, 2007).

Political scientists use the comparative method because it expands our awareness of the possibilities of politics. Alexis de Tocqueville describes that comparison is the methodological core of the humanistic and scientific methods and is the only way to fully understand our own political system (Almond et al, 2001). By examining politics in other societies allows us to view a wider range of political alternatives and shows the benefits and downfalls of our own political system. Comparison enhances the ability to describe and understand political processes in any country by offering concepts and reference points from a broader perspective. “Comparing the past and the present of our nation and comparing our experience with that of other nations deepens our understanding of our own institutions” (Almond et al, 2001). In this study, a comparative analysis of the implementation

process of wind energy policies in two separate States will show why some countries develop faster than others.

A comparative method will test the hypotheses and it will test the similarities and differences in the variables discussed. By comparing the variables equally, the difference in significance each variable holds to each country will be portrayed and from this it can be determined which variables cause quicker adoption of wind energy. By comparing countries, a different perspective is put on each in relation to the other, which in some cases like the United States, can be different depending on what country it is being compared to. Some hypotheses test countries in a comparative context to show the mechanisms, circumstances, and underpinnings that would be overlooked in a single country context.

It has been recognized in the literature the importance of international comparisons in regards to wind technology implementation. "A growing number of international comparative studies place the advance of wind power (industry, market, and technology) in a broader context of national political, economic, technological, and institutional developments, with a view of improving our understanding of the complexity of contextual factors that influence the uptake of wind power" (Breukers & Wolsink, 2007). International comparisons can show wind technology developments and compares the differences and similarities in policies further showing which policy mechanisms support and block implementation.

Country Coverage

The literature on technology implementation and innovation in wind power is mainly focused on European nations specifically Germany and the Netherlands. Europe has the strongest and oldest foundation of wind energy in the world. Most of the literature on wind power development features the various innovation and implementation contexts, providing case studies to describe and compare systems and how they function. In a study by Johnson & Jacobsson (2001), the focus was on the processes behind the performance of the wind industry in Germany, Holland, and Sweden. In another article by Jacobsson and Lauber (2006), there was in depth discussion of the reasons behind the rapid diffusion of wind and solar energy technologies in Germany. Most wind energy in Europe developed in the 1980s, before most of the other countries started to take advantage of the resource. Germany is a world leader in wind energy development, public interest turned to renewables after a strong anti-nuclear movement in the 1970's and a strong environmental movement in the 1980's (Jacobsson & Lauber, 2006).

Aside from Europe, research on the United States wind industry has been growing and there is now a considerable volume of literature on the topic. The US wind industry has been growing rapidly since the boom in California in the 1980s. Wind power in the US has received increased attention due to rising awareness and interest in environmental, supply, and security concerns. The resulting growing media attention has placed pressure on government to respond, which can be seen

from the Obama Administration of 2008.[5] A majority of the U.S. wind energy literature is made up of governmental and technical reports (the Department of Energy [DOE] provides many) on the growth of the country's wind power. A comparative analysis of the United States to Australia will help to unravel the puzzle as to why the United States is faster to implement wind energy than Australia.

Chapter 2- Conclusions

This thesis uses the top down and bottom up approaches in the context of institutionalism to analyze wind energy implementation among countries. The top-down approach starts with identifying formal government actions that affect the implementation process. From criticisms of the top-down approach, the bottom-up approach was formed. The bottom-up approach starts by identifying the informal network of actors involved and who influence the policy implementation process.

Drawing on new technology introduction and policy implementation literature, this thesis has identified the variables which were sought to affect the implementation process. From the top-down approach, bureaucratic organization and structure has been linked in some countries to ineffectiveness of government institutions to make proper policy decisions. In many other countries, effective bureaucratic structure has allowed for timely and committed policy decisions to be made. The hypothesis is that the adoption speed of a new technology is likely to be quicker in a country where there is clear structure, organization, and commitment among bureaucracies to facilitate the introduction of that new technology.

Also part of the top down approach is the nature of the legislation and economic mechanisms which can affect the policy implementation process. Some legislation creates incentives and strong policy to effectively implement a technology. The economic incentives created and how they are used is a common variable throughout the literature. Economic incentives need to be properly implemented and managed to see quick adoption rates of a technology. The hypothesis formulated is that the adoption speed of a new technology is likely to be quicker in a country where there are effective market mechanisms to facilitate the introduction of that new technology.

Advocacy coalitions, inter-market competition, and public resistance are the variables discussed within the bottom-up approach. Advocacy coalitions showing strong interests in a technology can gain support within government and thus gain support for the technology. Jacobsson & Bergek (2004) had an important point that coalitions need to engage in political debates in order to gain influence over institutions. This point is important because it shows that coalitions supporting a new technology interact with government institutions within the implementation process. In addition, if coalitions have a strong influence in the implementation process of a technology, then it is the coalitions who can take some credit in the creation of government incentives supporting that

[5] US President Obama in February of 2009 signed into law the Recovery and Reinvestment Act which is a $787 billion stimulus package of which $38 billion is going towards development of the renewable energy sector. Of that $38 billion, $20 billion is going towards tax incentives to be awarded over the next 10 years. Wind power was given a three year extension to the tax credit which would have expired in 2009 (LaMonica, 2009, Feb 17).

technology. Strong coalitions backed with government support can allow for that technology industry to be more competitive in the market. The interactions of society and government are important to the implementation process of a technology. The hypothesis is that the adoption speed of new technology is likely to be quicker in a country where the network of actors, including advocacy coalitions, supporting that new technology are able to acquire and exert more political power in policy implementation relative to other economic and social interests opposing that new technology.

Public resistance or support can have an effect on the implementation process. Large amounts of public resistance towards a technology will impede its development. However, a large amount of support can hasten the implementation process for the technology.

From the variables, a mix of economic and non-economic mechanisms were discussed. Non-economic mechanisms include political and legal mechanisms such as legislation and bureaucratic structure and coalition formation. These non-economic factors have as much influence on the policy implementation process as economic mechanisms and thus both are discussed.

A comparative methodology will show the similarities and differences among the variables and how they have an effect on the implementation process in each country. This will allow this thesis to address the puzzle. Within political science, a comparative methodology will expand the awareness of the strength and weaknesses of the political systems of different countries. This model can be used to explain why the United States is faster to adopt wind energy over Australia.

Chapter 3: Top-Down Approach in the US and Australia

This thesis will first use the top down approach to start to unravel the puzzle. Within the top down approach the three variables this thesis will be focusing on are bureaucratic organization, the nature of the legislation and economic mechanisms. The literature on policy implementation started with using the top-down approach. The Van Meter and Van Horn model along with the Sabatier and Mazmanian model for policy implementation proved many significant points which are still used in more recent studies. First, as stated in Van Horn and Van Meter's model: the characteristics and disposition of implementing agencies (Van Meter & Van Horn, 1975). "Characteristics" is a general term and can cover many things. This chapter will analyze the institutional goals and bureaucratic structure of implementing agencies and if this has an effect on the implementation of wind energy. The institutional goals are reflected in the political leadership towards the implementation of wind energy and if the objectives are clear it will be reflected in the legislation and easier for bureaucracies to follow. Studies such as Breukers & Wolsink (2007) have shown that clear bureaucratic organization and strong political commitment have aided the implementation process of wind energy in North Rhine Westphalia.

Van Meter and Van Horn also suggest policy standards and objectives, policy resources, and economic, social, and political conditions to influence the relationship between policy and performance (Van Meter & Van Horn, 1975). This chapter covers these conditions under the nature of the legislation and the economic mechanisms produced and used as a result of the legislation. Legislation with clear intent and a successful design should facilitate the development of a new technology. Elmore (1979) describes the importance of clear and consistent legislation for agencies responsible for its implementation. The nature of legislation can also create economic incentives towards the development of a new technology. Economic mechanisms such as subsidies were shown in the literature to be a successful mechanism if used effectively. Jacobsson & Lauber (2006) describe how effective financial funding has helped the development of wind and solar energy in Germany. Economic mechanisms, if unevenly distributed to other industries can inhibit the development of renewable technologies. Subsidies to fossil fuel industries will be interrogated in this chapter as well.

This chapter analyzes the empirical data on the top-down variables from the United States and Australia and compares them to discover the similarities and/or differences between them. Bureaucratic structure will be covered first and within this section will also be goals and authority/power in relation to wind energy. Then legislation and economic mechanisms will be discussed starting with the federal and then State level. Lastly, subsidies to fossil fuels within each country will be analyzed. The chapter will sum up with a comparative analysis of the top-down variables.

Bureaucratic Organization

As seen in Chapter 2, many previous studies have shown the positive correlation between strong government structure and commitment, and increased implementation of wind energy. Bureaucratic organization identifies government structure at the federal and state level. Authority is handed down to bureaucracies and administrative agencies to implement policy decisions from Congress or Parliament. There are four types of bureaucracies in a federal system: executive departments, independent regulatory commissions, government corporations, and independent agencies (Anderson, 2003). Institutional goals, structure of these agencies at a federal and state level, and the power and authority between federal and state governments directly affects the implementation of policy.

United States Goals

Institutional goals towards the implementation of renewable energy are the first step in what allows bureaucracies to work effectively. In the US, there are goals set by the President towards implementing wind energy although Congress has not passed any legislation for achieving a certain amount of renewable energy/wind energy by a certain time. President Obama dedicated $90 billion to clean energy technologies in his economic stimulus package. The main motivator for Congress and the President is to decrease greenhouse gas emissions thus increasing the use of alternative energy sources. President Obama pledged to achieve 80% reductions of carbon emissions below their 1990 levels by 2050 (Isbell, 2009). From a federal level, the Administration has set high standards for renewable energy, but has not followed through with detailing the organization of how it will be planned out long and short term (author interview, Dec. 2010). It is necessary to improve federal renewable standards and plans for transmission build outs in order to achieve the goal of 80% emissions reductions by 2050 (author interview, Dec. 2010). Reports by government agencies such as one by the Office of Energy Efficiency and Renewable Energy within the Department of Energy claims that 20% wind energy can be achieved in the US by 2030. In 2006, President Bush emphasized the need to diversify the United States energy supply and thus led to a collaborative effort to explore a 20% wind energy scenario. The report showed that this is feasible if the country is ambitious and challenges are overcome. Bureaucracies have shown commitment for facilitating the implementation of wind energy through extensive research and development, such as the EERE's report. In April 1977, President Carter revealed his plans for a new national energy plan that would reform America's electric utility system and hopefully move the United States to become more energy independent and secure. After much debate and revisions, the Senate broke the energy plan into several bills: the Natural Gas Policy Act, the Power Plant and Industrial Fuel Use Act, the National Energy Conservation Policy Act, the Energy Tax Act, and the Public Utility Regulatory Policies Act [PURPA] (Hirsh, 1999).

Australian Goals

In Australia, the federal government's commitment towards renewables is weak, and this is seen through the weak goals set through the MRET. The MRET is the main piece of legislation that promotes the development of wind energy. It was implemented with uncertainty from the federal government and with weak goals. In 2001, it was implemented with a 2% target by 2020 and then in 2009 this increased to 20% by 2020 (Freehills, 2009) (more on the targets and problems with the RET in the next section). The MRET was implemented in 2001 and not long after that was the government review titled the "Parer Inquiry" which suggested the termination of the MRET. Several years after was the Tambling Review which suggest several major changes to improve the MRET, all of which were rejected by government (Kelly, 2007).

Without a strong federal commitment towards renewables, the fossil fuel industry easily dominates the market. Greenhouse gas (GHG) emissions from Australia's coal-dominated electricity generating sector accounts for some 40% of the country's total emissions and this rose by 31% between 1990 and 1998 (Pugh, 2001). The goals set by the federal government through legislation have not portrayed to the full extent the severity of change that needs to take place in order for these emissions to be reduced. In November 1997, the Howard government announced it would commit to a policy mandating an incremental two percent increase in the use of renewable sources for electricity generation by 2010. At that time the government's Renewable Target Working Group (1999) calculated that approximately 10.5% of the country's electricity output came from renewable sources. However, renewable energy advocates argued that the government's commitment to this form of electricity generation is very weak and given the current increase in electricity consumption nationwide, renewables appear likely to represent only around 11 percent of overall electricity generation in 2010, thus barely improving by 0.5% of the 1997 figure (Australian EcoGeneration Association, 2001). In deciding the target of the MRET, there was debate between peak industry associations such as the Electricity Supply Association of Australia (ESAA) and the Australian Aluminum Council (AAC), and government and environmental groups, such as the Australian Greenhouse Office (AGO) and the Australian Conservation Foundation (ACF) as to whether there should be a fixed 9500Gwh target or a 2% increase by 2010. The fossil fuel industry associations thought the 2% target was too high and would cause dramatic price increases (Kent & Mercer, 2006). They advocated for the fixed target. In the end, they won and a fixed target was passed. Despite the government's own AGO acknowledging the inadequacy of the 9500Gwh target. The Committee, however, suggested no more than possible considerations and revisions in future reviews (Kent & Mercer, 2006). It was not until eight years later that the target was increased to what some think is still a considerably low target.

United States Structure

The regulatory setting in the United States is an intricate system. The United States has a very large and complex electricity market for bureaucracies to implement policy. The US electricity market is supplied by more than 3,000 utilities across the country. Approximately 200 investor-owned utilities (IOUs), 70 large municipal and federal or state systems, and 50 rural generation and transmission cooperatives supply power to over 3,000 local distribution companies. Each of the 50 states has its own schedule and rules for restructuring (Komor, 2004). Regulation is at the state, not federal level to a certain extent. State public utility commissions and the Federal Energy Regulatory Commission (FERC) oversee these utilities and specific energy markets (Department of Energy, 2009). "The Federal Energy Regulatory Commission, or FERC, is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects" (Federal Energy Regulatory Commission [FERC], 2011). The main job of FERC regarding wind power is regulating transmission and wholesale sales of electricity in interstate commerce. Since most wind farms in the US export their electricity to other states, FERC handles the regulation of this electricity between states (more in the next section). In trying to implement renewable energy into the existing electricity market, there are multiple US federal agencies involved and no one organization is in charge of implementation for renewable energy. Federal organizations are split into different areas affecting wind energy such as transmission, research and development (R&D), incentives, etc. Majority of these organizations have different goals that they are working towards. The DOE handles R&D of wind technology to make it more efficient and drive the costs down to make it a more competitive option for a baseload source. The Office of Electric Delivery and Energy Reliability handles the electric baseload of wind technology, grid integration, and variability of wind technologies.

Australian Structure

The Australian electricity market operates as a more unified system than in the US. There is one wholesale electricity market in Australia known as the National Electricity Market (NEM) which operates the wholesale use and distribution of electricity to retailers and end-users. The NEM links Victoria, New South Wales, Queensland, the Australian Capital Territory, and South Australia as well as recently welcoming Tasmania in 2005. Within the NEM, there are six regions represented by five states and each of these regions operates their own market for supply and demand of electricity. All regions of the NEM are connected by at least one interconnector which allows for electricity to be imported/exported between regions; this also makes it the largest interconnected system in the world. The NEM was the result of the structural electricity reform in the 1990's and was eventually established in 1998 (Australian Energy Market Operator [AEMO], 2010). The National Electricity Rules governs all aspects of the NEM and it is the job of the Australian Energy Regulator to enforce

these rules (NERA Economic Consulting, 2007). Australia has approximately 230 large electricity generators of which 180 are in the NEM. Large generators within the NEM sell their electricity through a central dispatch managed by the National Electricity Market Management Company (NEMMCO) (NERA Economic Consulting, 2007). The electricity industry has approximately 48GW of installed capacity, controls approx $100billion AUD in assets and employs around 30,000 people (Department of the Prime Minister and Cabinet, 2006). So the electricity market in Australia is rather large although not as complex as the United States electricity market.

Comparison of Bureaucratic Structure

Energy decision making in the United States is weak on the federal institutional level. The Department of Energy (DOE) is the main government body engaged in research and development (R&D) for renewable energy and is not a regulatory agency. While other regulatory agencies such as the Natural Resources Commission (NRC) and the Federal Regulatory Energy Commission (FERC) are not proactive or known to make policy. Energy laws in the United States are made through a mix of agencies and markets, and follow federal and state regulation. Geopolitical interests and interstate issues in energy concerns prevent these institutional failings from being readily fixed (Heiman & Solomon, 2004). Loiter & Norberg-Bohm (1999) describe a supply push and demand pull within public policy for the wind industry. The supply push was through research programs and the demand pull was through the Public Utilities Regulatory Policies Act (PURPA), avoided cost calculations, long-term purchase contracts, federal and state tax credits and wind resource assessments. The result of the research programs was the generation of technical knowledge and produced a few commercial turbines. The demand pull created a market for small power production, reduced uncertainty, financial feasibility, and advanced knowledge. They conclude that government policy is required to create both a pull and push in the case of wind turbines. To provide the strongest incentive for innovation, policies must provide a consistent and long-term market for wind energy.

Australia has tried to avoid overlapping roles among federal agencies by creating the Council of Australian Governments (COAG). The COAG is the intergovernmental forum in Australia comprising of the Prime Minister, State Premiers, Territory Chief Ministers, and the President of the Australian Local Government Association (ALGA). Through this organization, leaders of the federal and state governments can exchange ideas and allow for all state and the federal governments to be consistent in goals. The COAG covers a variety of issues and through them the Energy Reform Implementation Group (ERIG) was formed. The ERIG wrote a report that came up with several improvements for the energy sector in Australia such as: the Australian Energy Market Commission needs to be refocused and adequately funded; establishing a national energy market operator is a long term objective, and proposed changes to the governance of the National Electricity Market Management Company to be more market oriented (Energy Reform Implementation Group [ERIG], 2007).

Below is Table 1 which compares the bureaucracies in the United States and Australia and their goals:

Table 1- Comparison of the United States and Australian bureaucracies and their goals and duties

Goals	Bureaucracies	Australian Bureaucracies
Responsible for regulation and administration of the electricity market. This includes transmission and distribution planning. (FERC, 2011; Department of Resources, Energy and Tourism [DRET], 2011)	Federal Energy Regulatory Commission (FERC)	Australian Energy Regulator (AER)
Both provide policy development towards the energy sector of each country. The DOE in relation to wind energy handles more research and development. DRET more generally handles of sustainable energy and climate change policies (including the MRET). (National Renewable Energy Laboratory [NREL], 2008; DRET, 2011)	Department of Energy (DOE)	Department of Resources, Energy and Tourism (DRET)
The AGO and DOE are both dedicated to cutting greenhouse gas emissions through R&D and policy. (National Renewable Energy Laboratory [NREL], 2008; DRET, 2011)	Department of Energy	Department of Climate Change and Energy Efficiency (DCCEE) which was formerly the Australian Greenhouse Office (AGO)
These agencies are in charge of the environmental protection and biodiversity conservation within each country. This relates to wind energy in the siting of wind farms. (Department of Sustainability, Environment, Water, Population and Communities, 2011; NREL, 2008).	Environmental Protection Agency (EPA)	Department of Sustainability, Environment, Water, Population, and Communities
Both of these agencies are in charge of implementing policies for adapting to climate change. The DCCEE handles the policy issues for the MRET/RET which is the main piece of legislation for implementing wind energy in .	Environmental Protection Agency	Department of Climate Change and Energy Efficiency (DCCEE)

It can be seen that each country has a regulatory agency in charge of the electricity market. Both countries have agencies implementing climate change policies and environmental issues that might come up with developing wind farms. However, a noticeable difference is that Australia has one to two agencies working on the MRET, which is the main piece of legislation promoting wind energy. The United States does not have one agency working on the implementation of renewable energy. The main cause to this is because the United States has multiple pieces of legislation which all try to achieve different goals (more in the next section). Therefore it cannot be seen in this table that a specific agency that solely handles the implementation of wind energy in the US whereas in Australia it would be the DCCEE and the DRET. There are a few other agencies that handle different aspects of renewable energy in Australia that could not be directly compared to those of the United States.[6] For example, The Office of the Renewable Energy Regulator (ORER) is the federal government's principle body in charge of the regulation of renewable energy in Australia and oversaw the implementation of the MRET.

The United States has a number of agencies of other agencies that handle different aspects of wind energy as well.[7] For example, offshore wind and some on-shore wind are regulated by the Dept. of Interior because they own the leasing grounds. The DOI deals with the permitting process and has the right to lease the inner or outer continental shelf. It depends where the electricity is being produced as to who owns it. The land is owned by the DOI if it is federal land, operated by Army Corps of Engineers, but the power is owned by the DOE. This is also how hydro power works in US (author interview, Dec. 2010). Australia does not have offshore wind and there are no wind projects on federal grounds so this is not an issue.

Authority and Power

Issues with transmission, siting, and planning processes can be looked at from different views such as technical, social and political. Authority and power over issues such as transmission and

[6] Additional agencies in Australia that are involved in the implementation process include (Dept. of Resources, Energy, and Tourism, 2011):
Electrical Regulatory Authorities Council (ERAC),
Council of Australian Government's (COAG): Energy Reform Implementation Group (ERIG),
And as stated in text the Office of the Renewable Energy Regulator (ORER).

[7] Additional implementing agencies in the United States include (National Renewable Energy Laboratory [NREL], 2008):
Department of Interior (DOI),
Department of Commerce (DOC),
Federal Aviation Administration (FAA),
Bureau of Land Management (BLM),
U.S. Army Corps of Engineers (USACE),
U.S. Fish and Wildlife Service (USFWS),
Minerals Management Service (MMS)- part of DOI,
U.S. Department of Agriculture
U.S. Forest Services (USFS),
U.S. Department of Defense (DOD).

siting is divided between federal and state level governments in both countries. Authority of the federal government acting over state governments in relation to transmission and siting is seen to aid the implementation of wind energy because it creates a national process and avoids conflict among state governments. In the United States, federal legislators and regulators believe stronger federal authority is necessary over siting of interstate electric transmission lines. "These federal policymakers argue that states have failed to adequately implement the new administration's goals, such as interconnecting new renewable power sources to the transmission grid" (Benedetti, 2010). They also argue that the federal government is institutionally preferable to states for siting decisions because of its procedural efficiency, its experience in siting projects, and its ability to balance federal and state needs (Benedetti, 2010). Within the United States and Australia there is a lack of mandatory national guidelines to act as a framework for wind energy developers. Most if not all of this responsibility is given to state governments or split between the two levels of government. According to the experts interviewed, this lack of authority from the federal government has impeded on the implementation process. A lack of top-down authority creates unclear goals and weak bureaucratic structure.

United States Authority and Power

In the US, state governments have just as much influence as the federal government in the facilitation and/or obstruction of implementing wind projects. States can control siting decisions by either decision-making bodies or an established set of rules for projects on state controlled land. Each state has its own jurisdiction on transmission lines so when a wind project wants to be developed and export electricity to other states, the developer has to get approval from each state being affected by the project. This is a tedious task that becomes troublesome when states do not agree and there is no federal legislation to take control. States in between projects and imports, in some cases, do not want the transmission lines being built in their state because they are not receiving any benefit from the project. Also, some states do not want to import power generation from renewable sources because 1.) imported energy from renewables may interfere with other industries of the state (potentially if the state is a large producer of fossil fuels. For example, West Virginia (WV) is coal state so they do not use green power which is produced in WV but is exported to other states along the northeast coast). 2.) when the manufacturing base and all the job benefits involved are going to another state. In the United States, most wind energy is generated in the Midwest and then exported to the East and West coastlines. If electricity is crossing state boundaries it is considered interstate commerce. FERC regulates state transmission as well as international boundaries. Recent legislation is attempting to give FERC power over states although this is not yet in effect. The Department of Defense, Federal Aviation Administration, and the Department of Interior are all in charge of handling siting policies (author interview, Dec. 2010).

In addition, state agencies such as wildlife agencies might establish guidelines for wind projects. Retail electricity service to end-use customers is regulated by state commissions in many states and jurisdictions. There are also multiple policies and incentives in which states can implement to promote wind energy (see Legislation and Economic Mechanisms section). The bureaucratic organization within the United States is not as efficient as it could be (author interview, Dec. 2010). The US has broken the electric industry into chunks for regulation purposes. There is the retail side which just sells power to customers- just at the state level. As a state official said, "Even if Congress were to say that there is a national renewable energy standard, the states are still going to ultimately decide how costs get allocated" (author interview, Dec. 2010). The generation and transmission side are dually jurisdictional at the state and federal level, and this sometimes can be an inhibitor to implementation. Even if there is a federal policy on transmission providing incentives for wind and socializing the cost of the transmission system to facilitate more wind, the federal and state governments will both have a role. So there is overlapping jurisdiction and there is no question that this creates issues in the US, but to what extent is unknown.

Australian Authority and Power

Like the United States, Australia is a federal country and responsibility of electricity is under state government jurisdiction (Mountain & Swier, 2003). Although, Australia has the National Electricity Market (NEM) which is regulated by the Australian Electricity Market Operator. Under the NEM there is the National Electricity Code which is responsible for electricity trade between states. However, there is no nationwide transmission planner and the development of transmission lines and siting is in the hands of state governments Mountain & Swier, 2003). A feasibility study was undertaken by a consortium in Australia led by Macquarie Capital to assess electricity transmission augmentation and unlock wind energy's potential on the Eyre peninsula on the west coast of South Australia (SA). The report showed that the economics were there to support the doubling of wind energy generation by expansion and selling the excess energy to other states. It showed, "A simple Federal regulatory change could unlock substantial investment to expand capacity and deliver large volumes of green power to the eastern states" (Australian Ecogeneration Association, 2001). The prospects for the Eyre Peninsula combined with the existing growth of the wind network could give SA the capacity to deliver 30 percent of the nation's renewable target.

There is more cross agency collaboration working on siting issues than anything else with wind energy (author interview, Dec. 2010). State governments in the US and Australia have a lot of influence with siting, transmission, and cost allocation. This is specifically important where the wind needs to be transmitted to the load. Someone has to pay for the transmission. So if a state is favorable to wind they will site those transmissions lines in a way that gets it to market and if they are not favorable they can impede this process. The issue of transmission is similar in both countries and does not impede one more so than the other. Texas was able to streamline the transmission

planning process because everything was kept within the state. Every other state that exports their wind power has to coordinate between states and go through the jurisdiction of every state affected.

Comparative Conclusions for Goals, Structure and Authority/ Power

The federal government of the United States has set targets for what they think the country could achieve. The goals are challenging and often hard to be implemented. In Australia, the goals set were weaker than those found in the US. The MRET was confronted by a lot of opposition from other industries and not much support from the federal government which was reflected in the outcome of weak goals. Bureaucratic structure between the United States and Australia is similar in that they each have agencies working on similar issues.

In addition, each country has similar issues with authority and power from federal governments over state governments in relation to transmission and siting of wind farms. State governments in each country control the transmission and siting processes with little interference from the federal government. This has caused several major problems which have slowed the implementation of wind energy. First, the implementation of wind energy is held up in the transmission phase due to the large amount of unresolved conflict among state governments to the development of transmission lines, siting of wind farms, and cost allocation. The lack of authority by the federal government in creating national transmission guidelines has impeded on the development of wind energy in both countries. Second, being that there is little federal control over state jurisdiction, the development of wind energy is largely in the hands of the political will of state governments. Thus states in favor of wind energy will try to make it easy for wind to be developed, whereas states against wind development can make it very difficult.

Returning to the hypothesis, bureaucratic structure between the United States and Australia is not seen to affect one country more than the other. The hypothesis is that the adoption speed of a new technology is likely to be quicker in a country where there is clear structure, organization, and commitment among bureaucracies to facilitate the introduction of that new technology. There is a difference in the institutional goals between countries and this could help to explain the different implementation speeds. The US federal government has set more ambitious goals than those of Australia and evidence suggests that this could be a reason why the US is faster to develop wind energy over Australia. Given all other things being equal, the hypothesis would not be supported. But given that all other things are not equal, there must be other factors that play a larger role in influencing the adoption speed in the United States to make it quicker than in Australia.

Nature of Legislation and Economic Mechanisms

The legislation and economic mechanisms are joined together because the nature of the legislation creates the incentives. It was shown in Chapter 2 the importance of legislation which can create effective incentives and a competitive market for renewables. The legislation in place and what it seeks to accomplish varies between countries and is thought to have an effect on the uptake of

renewable technologies. Some legislation creates economic incentives such as subsidies for renewable technologies. Economic mechanisms, in this study, are referred to as any form of financial incentive such as subsidies, feed-in tariffs, grants, etc. Different forms of economic mechanisms are distributed by government agencies to companies in order to lower the price of the product and be more competitive in the market. In the case of wind energy, wind project developers may receive some sort of financial incentive by a government to make the cost of their project cheaper.

The United States has three main Acts responsible for the implementation of wind energy. They are the Public Utilities Regulatory Policies Act 1978 which creates a competitive market for non-utilities, the Energy Policy Act which created the Production Tax Credit, and the Recovery and Reinvestment Act which created additional economic incentives. Australia has one Act, the Renewable Energy (Electricity) Act 2000 which encourages the use of renewable resources by creating the Mandatory Renewable Energy Target. The Energy Policy Act and the Renewable Energy (Electricity) Act could be directly compared along with legislation creating environmental standards in each country. Table 2 lists the legislation that can be directly compared between countries. It also shows the legislation that the United States has which is absent in Australia.

Each country has different incentives implemented through the legislation. Australia and the UK adopted a fixed quantity system. Fixed quantity systems involve a decision by governments on a targeted level of renewable energy to be produced by a certain time (Infigen Energy, 2011). The Mandatory Renewable Energy Target (MRET) or more recently known as the national Renewable Energy Target (RET) is Australia's fixed quantity system. The United States has a unique incentive system known as the Production Tax Credit (PTC). The PTC gives a tax credit to wind developers who have online production of wind energy. Over the past decade, the wind industry in the United States has seen boom-bust cycles of extensive wind energy development followed by periods of severe decline. The PTC has had years of expiration and extensions of 1-2 years constituting inconsistent policy support from the federal government which provides a hostile climate and uncertainty for a developing industry (Swisher & Porter, 2006). Although in the years that the incentives have been in place, the US wind industry has seen significant growth indicating that the PTCs are the backbone to the wind industry.

Table 2- Comparison of Federal Legislation relating to wind energy in Australia and the United States

Purpose of Legislation	United States	Australia
To ensure environmental protection and biodiversity conservation. Wind projects in both countries must have an environmental impact assessment conducted before the project is passed (Commonwealth of Australia, 2011; Bureau of Ocean, Regulation, and Enforcement, 2011).	National Environmental Policy Act (NEPA) 1969	Environmental Protection and Biodiversity Act 1999
Both required utilities to buy power from renewable sources. The U.S. legislation changed rate structures and made utilities buy from independent companies (Hirsh, 1996). Australian legislation required wholesale purchasers to buy a certain amount of renewable energy certificate's generated by renewable sources each year (Commonwealth of Australia, 2000).	Public Utilities Regulatory Policies Act (PURPA) 1978	Renewable Energy (Electricity) Act 2000
Increase the supply of renewable energy into the electricity mix. In the it does this by providing subsidies; created the Production Tax Credit and non-utility competition (Center for Climate and Energy Solutions, 2011).	Energy Policy Act 2005	N/A
Economic stimulus package, part of which went to the DOE for the research and development of new technologies and supported direct grants and rebates to renewable energy and energy efficient programs (Eber, 2009).	Recovery and Reinvestment Act 2009	N/A

Both the United States and Australia have environmental legislation which created mandatory environmental impact assessments to take place when a wind project was to be developed. The United States and Australia also have legislation requiring wholesale purchasers to buy electricity from renewable energy producers either directly or through renewable energy certificates; PURPA in the United States is similar to the Renewable Energy (Electricity) Act in Australia in this way. Australia's Renewable Energy (Electricity) Act was compared to PURPA in that it encouraged the use of renewable sources except Australia's legislation did not create tax credits or non-utility competition. Instead the Renewable Energy (Electricity) Act created the Mandatory Renewable Energy Target (MRET). The goal of the MRET was to make renewable sources competitive in the electricity market through the sale of renewable energy certificates. Outside of the Renewable Energy (Electricity) Act, Australia did not have any other legislation which promoted the development of wind energy from the mid-1990's until 2010. It can be seen from Table 2 that the United States has two other pieces of legislation related to wind energy that Australia does not. First, the Energy Policy Act eliminates barriers between utilities and non-utilities to compete and created the Production Tax Credit (PTC). The PTC was a financial incentive towards the development of wind farms among other renewable sources which gave a 30% tax credit for 10 years of production. Second, the Recovery and Reinvestment Act created an additional financial incentive called the 1603 Treasury Grant Program. This created a direct grant given to wind developers and was created as a response to the economic breakdown in 2008. Australia does not have legislation similar to the Energy Policy Act or the Recovery and Reinvestment Act.[8]

United States Legislation and Economic Mechanisms

The U.S. Public Utility Regulatory Policies Act 1978 (PURPA)

Nonutility generation had grown from 3.5% of total US electricity generation in 1973 to 11% in 1996 in large part due to PURPA (Energy Information Administration [EIA], 1996). Non-utility generation mainly comes from renewable sources. After the 1973 oil embargo, President Jimmy Carter saw how vulnerable the United States was to imported fuel. Imported petroleum reached 42% in 1976 up from 36% in 1973. Another name for PURPA was the "rate-reform bill" because much of it dealt with establishing new standards for utilities and state regulatory commissions so that rate structures would encourage the more efficient use of power by consumers. More important to

[8] The United States and Australia have some other pieces of legislation that relate to wind energy although do not play an essential role as those described in the text. In the United States there is also the Solar, Wind, Waste, and Geothermal Power Production Incentives Act 1994 which was an amendment to PURPA in that it removed size limitations placed on renewable energy facilities larger than 80MW to receive PURPA benefits (United States Congress, 1994). Within Australia there is also the Renewable Energy (Electricity) Charge Act 2000 which gave the right to charge retailers $40 per MWh shortfall of what was required under the Renewable Energy (Electricity) Act. The Act was amended in 2010 and raised to $65 per MWh (Commonwealth of Australia, 2011).

renewable energies, Section 210 of PURPA legislation ended monopoly control by regulated utilities by opening the electricity generation market to independent electricity power companies (Hirsh, 1999). The main goal President Carter had in mind for PURPA was conservation of America's energy and for Section 210 President Carter's desire was to increase the amount of electricity production from unconventional sources. The legislation was trying to change the rate structure from an average cost rate of electricity to a marginal cost rate. Average cost rate is the average cost of an item based on how many were manufactured. The marginal cost rate is the cost of producing a product taking into consideration all the costs inflicted for manufacturing one more item. The marginal cost is usually more expensive as it reflects the true cost of manufacturing a product (Cleveland & Morris, 2009). The average cost shows no price signals to customers that utilities incurred higher costs at different times of the day. Marginal cost pricing would allow for more efficient use of electricity by consumers and adjustment of consumption patterns based on different prices throughout the day (Hirsh, 1999). After years of debate and revisions, implementation of PURPA Section 210 began in 1980 by FERC.

After implementation, a new class of participants in the electric utility community known as 'qualifying facilities' (QFs) were formed, who produced electricity from biomass, waste, or renewable sources as a primary energy source. Under the new legislation, utilities were required to buy all the electricity sold to them by the new independents and in addition to that the law dictated that the rates paid for QF power should be relatively high. This allowed for QFs to have a guaranteed market and also for them to be paid a reasonable rate for their power. QF's have found most success in California. In 1990, a decade after FERC imposed rules regarding PURPA, QFs provided 9,412MW of the state's approximately 56,000MW capacity. In 1991, nonutility companies in California produced a third of the state's electrical energy, and they generated 21 percent of all energy offered by the nation's independent electricity suppliers. The California Public Utilities Commission (CPUC) had created the "interim Standard Offer 4" which was a contract that set payments to QFs based on predicted prices of fuel and capacity for the first decade of a fifteen to thirty year contract. There was a huge response and it was predicted that by the end of 1984, the SO4 contracts attracted offerings of about 10,000MW of power. Although this did not last forever when fuel prices were going down instead of the predicted increase, the CPUC had to reconvene and better determine long-run avoided costs. In the long-run, California exercised extremely favorable conditions for QFs to flourish, and from this constituted competition in the generation sector which was the first type of competition utility managers had to face since the erection of market-entry barriers at the beginning of the century (Hirsh, 1999). Since PURPA was implemented, non-utility companies were able to flourish from a more competitive market, as seen in California. This has increased the speed of implementation for wind energy which has become a more competitive source for electricity generation. PURPA took total control out of the utility manager's hands and opened it up to competition from independent power producers.

U.S. Energy Policy Act 1992

The Energy Policy Act's of 1992 (EPACT) major goals included energy efficiency, new regulatory options for electricity generation, licensing and fuel service changes to nuclear power, and a variety of tax incentives (Cleveland & Morris, 2009). EPACT opened up the electricity generation market for competition and established the exempt wholesale generator (EWG). EWG's were exempt from constraints put on nonutility electricity generators specified in the Public Utility Holding Company Act, which made it easier for them to be introduced and compete in the wholesale electricity market. EPACT also mandated the Federal Energy Regulatory Commission (FERC) to open up the national electricity transmission system to wholesale suppliers on a case by case basis (EIA, 2011b). This Act eliminated barriers between utility and nonutility power producers who wanted to compete to build new non-rate based power plants. EPACT 1992 replaced the National Energy Conservation Policy Act (NECPA) in addition to first establishing the Renewable Energy Production Tax Credit (Department of Energy, 2009). In addition it established a federal performance based incentive for renewable energy. The purpose was to give incentives for electricity generated and sold by new qualifying facilities (NQs) (Department of Energy, 2011b).

Investment Tax Credits (ITC) and Production Tax Credits (PTC)

As previously stated, the PTC and ITC were created through the Energy Policy Act. The ITC and PTC are not so much energy policies, but tax incentives. The Internal Revenue Service (IRS) and the Treasury are in charge of the allocation of these incentives and the DOE has been helping with the applications. Starting in the 1980's, investment tax credits were used for the support of wind energy although these credits were not used properly by companies so in 1992 the federal government passed the Production Tax Credit which was based on production and output rather than on investment. So once a project was online, the developer could apply for the 1.5 cent kWh production tax credit. This seemed to be more productive although the major policy problem was the short lifespan of the PTC (Figure 2). The US market has peaked in 2001 and 2003 then dipped per year between 1995 and 1998 and again in 2000 (Lewis & Wiser, 2005). The Energy Policy Act of 2005 moved the PTC to 2007. The American Wind Energy Association (AWEA) fought and got it extended to 2008. After that, the Bush Administration extended the PTC to 2009 through the Obama Administration. Then there was the financial crisis in 2008 which caused banks to close and there was no way to monetize the tax credits. A different policy approach was needed and thus came the Recovery and Reinvestment Act.

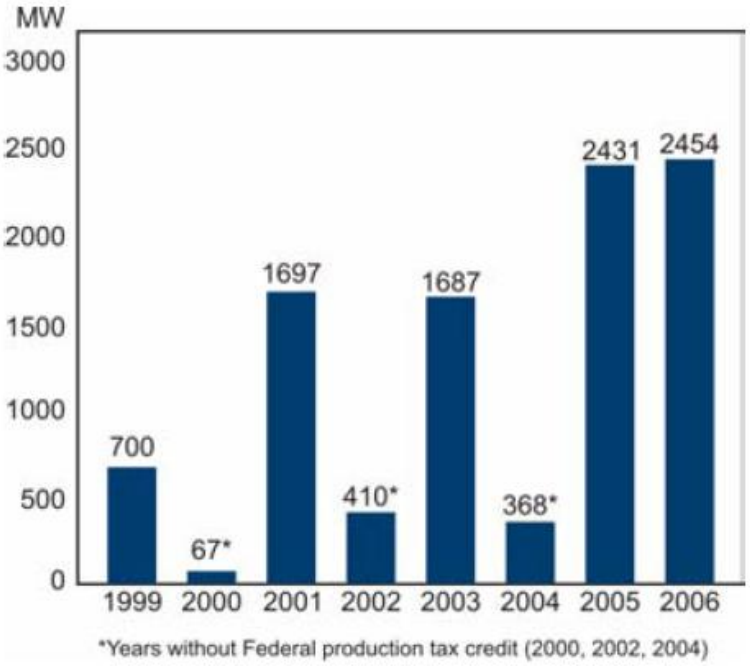


Figure 2 - US Wind Energy Capacity Growth (in megawatts [MW]) slowed in years when PTC expired. Source (Wiser et al., 2007)

Figure 2, 3, and 4 show how powerful the PTC is towards the growth of the wind industry. Figure 2 above shows the growth of wind energy in the US and the years when the PTC expired. The years when the PTC expired, there was a severe decline in the amount of wind energy installed. Figure 3 shows the areas of the United States where wind farm development would profit if receiving the PTC. It can be seen that it is quite a large portion of the US, mainly in the midwest. This also takes into account the cost of transmission. Figure 4 is the same map of the US although it shows the regions where wind farm development would be profitable when the PTC is taken away. The region decreases drastically where only a small region in the upper-midwest would still profit. The PTC, despite its inconsistent nature, has allowed wind energy to be a competitive option in the US and thus is a large determinant as to why the US wind industry has grown faster than in Australia.

Below is a comparison of the profitability and the usefulness of the PTC in the United States:

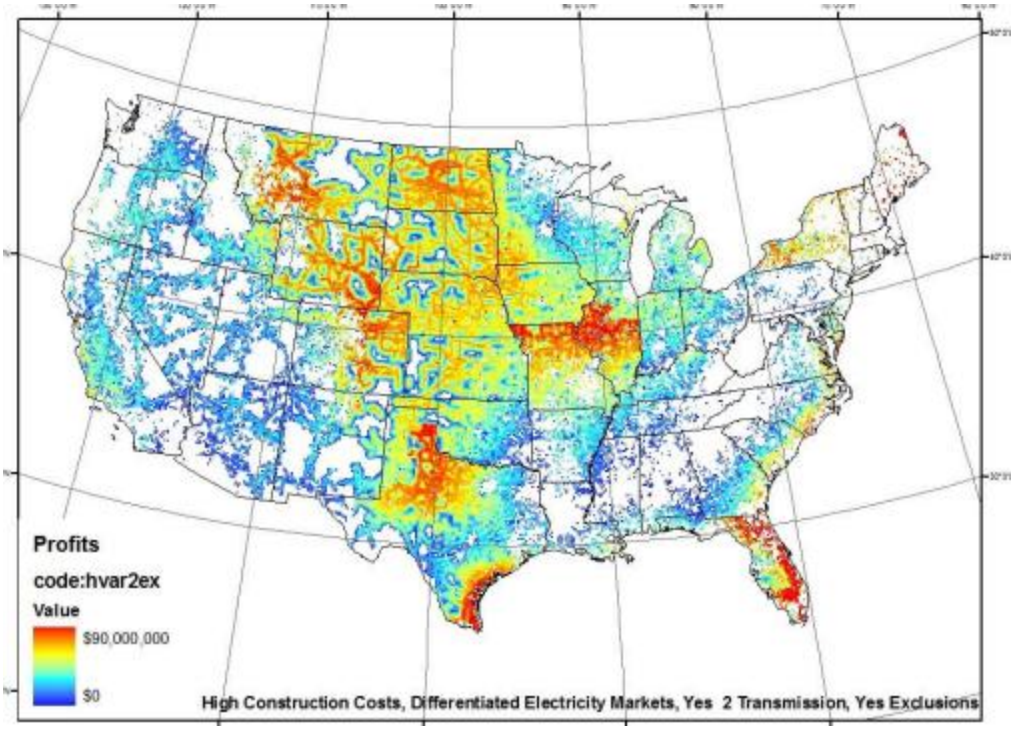


Figure 3 - Profitable Areas in the United States for wind farm construction taking into account the cost of transmission and forest exclusions. (Tchou, n.d.)

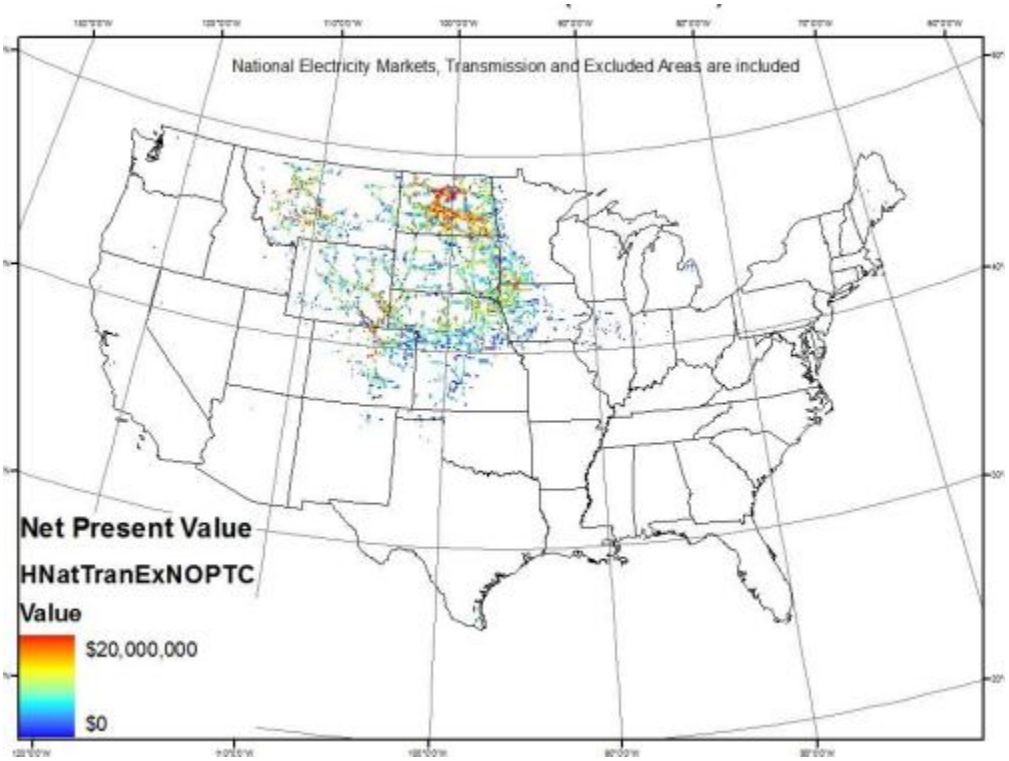


Figure 4- Profitable Areas in the United States for wind farms when the Production Tax Credit program is taken away and is under the same conditions as Figure 3. (Tchou, n.d.)

The PTC is a valuable incentive to the wind industry in the US. It provides strong support and allows the industry to meet the goals set by top authorities. The PTC is a major reason why the wind industry is growing faster in the US than Australia. It can be seen from the figures that over the past

decade, the wind industry has had significant growth as a cause of the PTC. From the evidence above, in Figure 3 it can be seen that over the past decade the years with the largest increase of installed wind capacity have been those when the PTC was in effect. In addition, comparing Figures 3 and 4, it can be seen that the regions that wind would still profit without the PTC are drastically decreased to only a small portion of the Midwest in the United States. The PTC has allowed the wind industry to profit in majority of the United States.

Incentives that work properly are valuable to the wind industry because they allow for wind energy to be cost competitive with other energy sources. Cost is a major factor that leads competition, and is the main advantage for fossil fuel companies who can deliver products at a low cost to the consumer. Competitive cost seems to be the major indicator as to the success of the wind industry in the United States. The cost of generation is different in various regions of the US. It can be seen that the places where wind energy costs are lower than the average wholesale of electricity are the same regions where wind energy development is at its highest, such as Texas, the mid and northwest, as seen below in Figure 5. Figure 5 shows the location of majority of the wind farms in the US to be in these regions with lower prices for wind projects.

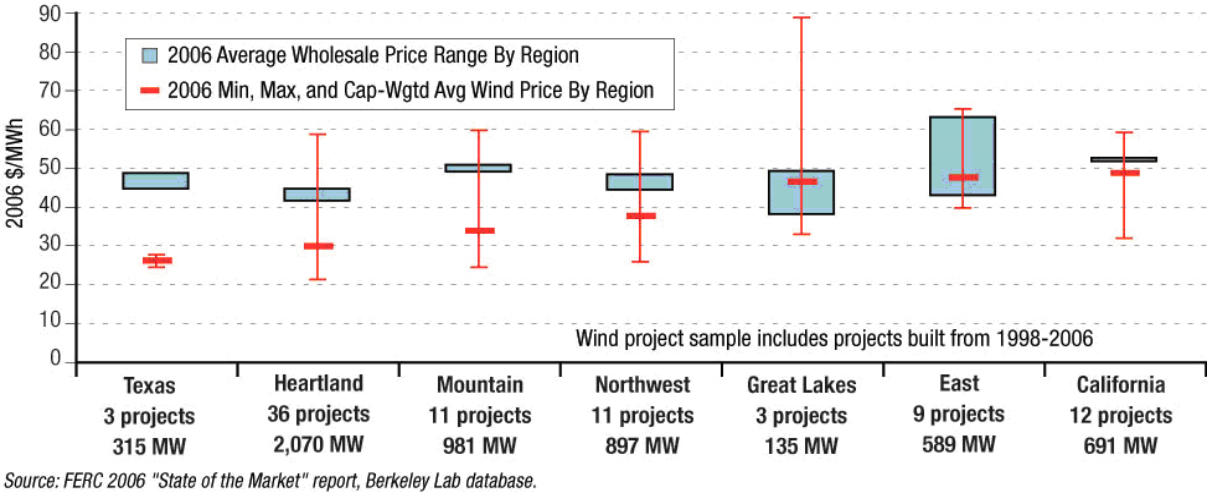


Figure 5- Prices of wind power in different regions of the United States in comparison to the average wholesale price range of electricity by region. (DOE: EERE, 2007).

Wind power is the cheapest or second cheapest (to natural gas) form of power generation if it were compared on an even scale to all other forms of electricity (author interview, Dec. 2010). Most people look at wind power as expensive compared to traditional fuels, which is only the case because wind power consists of new wind farms and transmission lines which have to be built. Conventional plants have already been built and in production for years and most plants are old and depreciated. If one were to compare building a new fossil fuel plant compared to a new wind farm, the wind farm would be far less expensive. This is even the case with new coal and possibly new gas plants. Presently in the US, 85% of everything being developed is new and of this 40% is wind and 40% is gas (author interview, Dec. 2010).

Recovery and Reinvestment Act 2009

The Recovery and Reinvestment Act is the most recent piece of legislation in the United States that has aided in the implementation of wind energy. The Act has helped wind energy continue to grow in the country because of its extension and expansion of the Production Tax Credit (PTC) and the Treasury Grant Program. The Act was passed in February 2009 under President Obama, and was a direct response to the economic crisis. It was implemented to create new jobs, spur economic activity, and show accountability on government spending. Relating to wind energy, $346 million went to the 1603 Treasury Grant Program. The program was a response to the impact the crisis had on the Production Tax Credit. The wind industry has seen the greatest year of growth in 2009 in large part due to the Treasury Grant Program (author interview, Dec. 2010). "Since enactment, this program has leveraged more than $22.8 billion in private sector investment for 22,000 projects across the clean energy industry including solar, wind, biomass, fuel cells, combined heat-and-power, and hydro, in all 50 states" (Ardle, 2011). The grant program saved the renewable energy industry when the economy crashed and it proved to be the most successful policy mechanism for the wind industry in the United States.

1603 Treasury Grant Program

As stated previously, the Treasury Grant Program was a result of the financial crisis in 2008. It was implemented under the Reinvestment and Recovery Act of 2009 (Section 1603). It did not replace the PTC although acted as an additional path developers could follow in implementing their wind proposals. The Recovery and Reinvestment Act also provided $2.3 billion in Advanced Energy Manufacturing Tax Credits which allows investment for the manufacturing of renewable energy equipment in the United States. Many policy experts interviewed called it one of the most successful economic drivers for wind energy has been the more recently developed 1603 Treasury Grant Program. The 1603 program provided commercial solar and wind installations with a cash grant in lieu of the 30 percent tax credit for all projects in construction before Dec. 31 2012. It consists of the same dollar value as the PTC, but gave the equivalent value from the treasury. When a project is online and has a third party engineering certificate, the developers can apply to the Treasury and by law the Treasury must return the grant to the developer within 60 days. For a project to be eligible, the electricity generated must be used for commercial purposes only, not residential. The 1603 grant program circumvented the whole tax part of the PTC and directly gave investors the money. Investors have three options: the PTC for 10 years, the ITC, or to convert 30% of the tax credit into a grant (author interview, Dec. 2010). Experts have said that almost everyone who has applied has taken the grant over the PTC and ITC. The US House of Representatives approved a one year extension to the tax bill for the year 2011 with groups such as the American Wind Energy Association (AWEA) and the Solar Energy Industries Association (SEIA) strongly advocating for the extension of the program due to its success (Morris, 2010). Experts believe that it is an amazing program that has

lead to the success of 10,000MW installed wind power in 2009. Presently, the market is not fully recovered from the crisis so now AWEA along with other wind advocates want to have Congress extend the program and they are asking for a year extension. Wind lobbyists believe that this program is important to get extended for the wind industries to be able to move forward.

Despite constant reapplying and extensions towards the PTC and more recently the 1603 treasury grant program, the wind industry has seen significant growth over the past decade. Although since there has been a subsidy, there has also been a build to move wind closer to being competitive with other industries. FERC did a role-making driven by the fact that there is now enough wind in the system that some of the operational issues are becoming prominent. So FERC has had to regulate the entire market in a different way to facilitate wind. Had there not been subsidies, technological advances along with operational changes would just be pushed to the future instead of invested in and sorted out sooner. Table 3 shows the timeline of the main US incentives more clearly.

Table 3- US Incentive Time Chart for Wind Energy

Program	Time period	Summary
Investment Tax Credit (ITC)	1980s	
Production Tax Credit (PTC)	1992 Late 1990s	Expired 2000; 2002; 2004 25 states and District of Columbia have RPS programs in place.
Renewable Portfolio Standards (RPS)		
1603 Treasury Grant Program	2008	Part of the American Recovery and Reinvestment Act stimulus package. Introduced after the financial crisis of 2008. Provides a direct grant to wind projects in construction by Dec. 2012.

Overall the United States has three main pieces of legislation which created competition through various means and two significant incentives towards wind energy. PURPA required utilities to buy all electricity sold to them by qualifying facilities who produced electricity from renewable sources. It also required utilities to buy their electricity at a reasonable rate which guaranteed a market for the qualifying facilities which was shown to be successful especially in California. The Energy Policy Act created the Production Tax Credit which is the largest support towards the wind industry in the United States. As shown in Figure 2 the years where wind development was at its highest were those where the PTC was extended. In addition, a comparison of maps of the United States shows two scenarios; areas that would profit if the PTC was in place and areas that would profit when the PTC was not in place. It could be seen from Figures 3 and 4 that the regions in the United States that wind energy would profit without the PTC is very small and was reduced drastically from when the PTC was in place which was majority of the United States that would profit. The Energy Policy Act also created the exempt wholesale generator and exempted them from the constraints put on non-utility electricity generators. This made it easier for non-utilities which were

usually renewable energy sources to enter and compete in the wholesale electricity market. The third piece of legislation is the Recovery and Reinvestment Act which was a response to the economic crisis of 2008 and provided government incentives to create new jobs, and spur economic growth. The Act created the Treasury Grant Program which provided $346 million to renewable technologies, wind energy taking the most advantage from the program. The Treasury Grant Program lead to 10,000MW of wind energy being installed in 2009, the largest in the United States wind industry's history.

The Public Utilities Regulatory Policies Act, the Energy Policy Act, and the Recovery and Reinvestment Act together have encouraged the development of wind energy and have been successful enough to make the United States a world leader of the industry. The legislation has structured the electricity market for wind energy amongst other renewables to be easily introduced and compete with other conventional industries. The creation of qualifying facilities and exempt wholesale generators allowed for easy introduction and competition for renewables. In addition, the incentives created including the PTC and the Treasury Grant Program have held exceptional importance for the growth of the United States wind industry. With all three Acts in place, the wind industry has grown exceptionally from the mid-1990s until 2010.

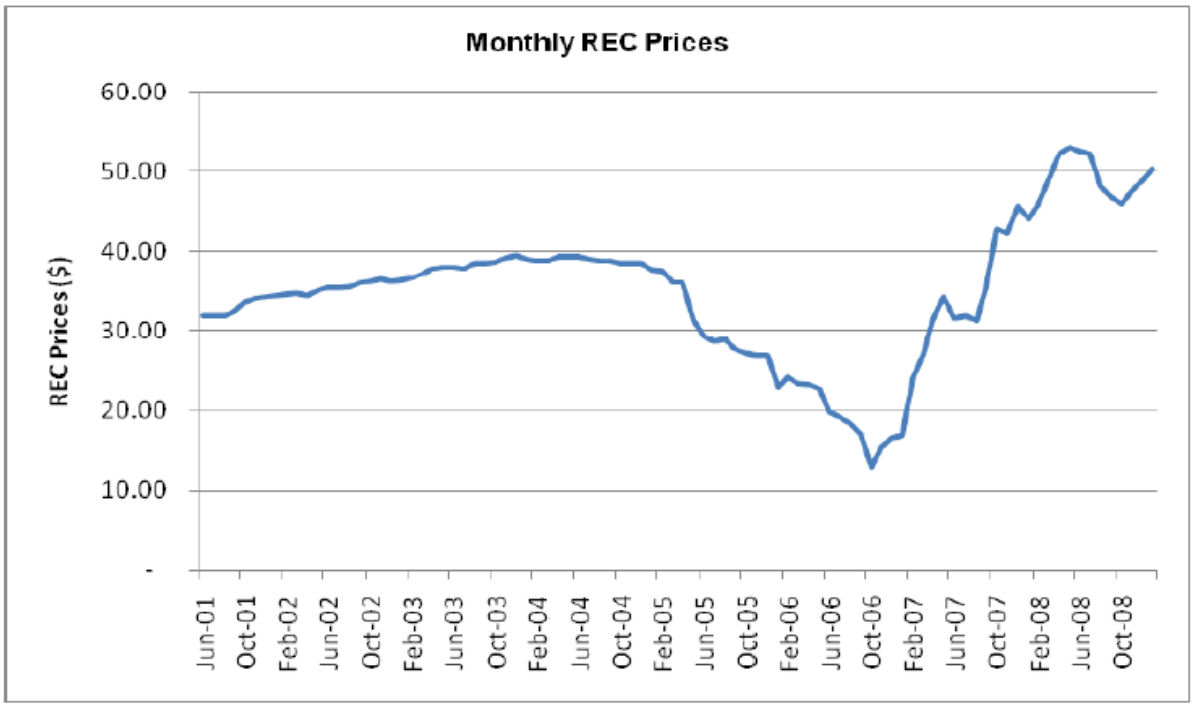
Australian Mandatory Renewable Energy Target (MRET)

As stated before, Australia chose to follow a fixed quantity system which means they set a percentage goal for a certain amount of renewable energy to be in production by a certain time. Australia originated this idea in 2001 with the implementation of the Mandatory Renewable Energy Target with a 2% target by 2010. The MRET was implemented in April 2001 and established under the Renewable Energy (Electricity) Act 2000 (Cth). The Renewable Energy (Electricity) Act 2000 encourages electricity generation from renewable sources by placing a legal liability on the wholesale purchasers of electricity. As stated previously this Act is similar to PURPA in that it requires utilities to buy electricity from "qualifying facilities" in the US or accredited renewable technologies in Australia. However, PURPA went a step further restructure the electricity market to make prices more suitable for other industries besides conventional fuels.

Under the Renewable Energy (Electricity) Act, liable participants must surrender a certain quota of Renewable Energy Certificate's (RECs) each year in order to comply with the Act and the Mandatory Renewable Energy Target (MRET). One REC is created by accredited renewable energy generators for each MWh generated from renewable sources. Each year all participants held liable must have a certain number of RECs to demonstrate compliance with the MRET. If the participant fails to acquire the required amount of RECs, then a fine of $65 per MWh must be paid. This Act set the framework for the MRET and is supported by the Renewable Energy (Electricity) Regulations 2001 which gives complete detail of all the rules supported under the Act (Commonwealth of Australia, 2000).

The MRET was first introduced by the Howard government in November 1997 and implemented in 2001. The MRET's initial goal was for electricity retailers and large electricity producers to contribute towards a goal of 2% of renewable energy by 2010. The Rudd government expanded the MRET, which is now referred to as the Renewable Energy Target (RET), in 2010 to source an additional 20% of energy from renewable sources by 2020. This expansion increased the target from 9500GWh to 12,500GWh and increases each year, reaching a maximum of 45,850 GWh in 2020. The RET will then decrease in 2021 until it ceases operation in 2030. Under this amending bill there is a limited inclusion of Waste Coal Mine Gas as an eligible energy source that can generate Renewable Energy Certificates (RECs) for only a certain amount of time. Another provision under the expanded RET is that the federal government wants the RET to run on a national level. In order for a nationally run RET, the Amending Bill contains transitional provisions to override existing or proposed state-based schemes. In particular, a provision that will come into play on July 1, 2011 will exempt corporations from the need to comply with state RET legislation that corresponds to the Federal legislation of the RET such as the Victorian RET and the proposed legislation for the NSW RET (Freehills, 2009).

Through the sale of renewable energy certificates is how the MRET acts as a financial mechanism. There is no other legislation to create incentives for wind energy. And beyond this wind energy receives little funding for production and none for research and development. Government sees wind energy as a developed industry and therefore does not need R&D funding (author interview, July 2011). The sale of the RECs under the MRET/RET works purely as a market mechanism, meaning that the price of the REC's on the spot market depends on the Australian Energy Market Operator and how much electricity is needed in the grid at certain times of the day, month, or year. When electricity there is too much electricity being pumped into the grid, the price drops and thus the price of the REC drops. For wind to become competitive, the price of the REC must be between $50-70 whereas of May 2009, the price of the REC has fallen to around $30-40 (personal communication, July 2011). The highest REC price was achieved in April 2009 at $53.50 (Clean Energy Council, 2009a). Figure 6 below shows the monthly prices of the REC's from 2001-2009.



Source TFS Brokers

Figure 6- Monthly REC prices- Australia. (CEC, 2009b).

Renewable technologies struggle to become competitive in the Australian energy market because its electricity prices are among the lowest in the industrialized world (Australian Greenhouse Office [AGO], 2004). In addition to the price cap, Australia's energy system is dominated by fossil fuels. Both of these factors means that competition is exceptionally high and the prices must be kept quite low (AGO, 2004). This instability in the prices of the REC's causes an unsure market for wind developers. Wind developers are also more cautious than those in the United States to invest in wind projects because of the unsure market price which in turn is their only incentive for development.

Evaluating the RET

Several years after the MRET, a review showed that there was believed to be a 'business-as-usual' attitude towards the development of renewable energy in Australia who has a fossil fuel dominated energy sector as stated previously in the Bureaucratic Organization section when discussing Australia's commitment to renewable by the federal government (Kent & Mercer, 2006). The fixed target of 9500GWh generation in reality represented a projected level of 0.2% in 2010. The review showed that Australia is a country much more reluctant to participate in programs and strategies aimed at emissions reductions. The Tambling Review was made two years after operation, and made a number of recommendations, all of which were rejected by the federal government (AGO, 2004). A major flaw to the scheme was that it did not exclude existing hydro generators or other small renewable sources such as individual solar heat pumps. In the first three years of the scheme, some 53% of eligible generation came from hydro (Rossiter & Wass, 2004). Most of these

hydro plants were already there so the generators sold the REC's easily and all at once, flooding the market with REC's. It was possible that for nearly one quarter of the total MRET demand was provided by existing hydro plants without any additional capacity, this was in part of a "business as usual" basis (Kelly, 2007). This was similar to individual solar heating pumps which were easy to install and there were a large amount of them in Australia. Thus these individual solar heat pumps and pre-existing hydro plants flooded the market with REC's thus decreasing their value. This impacted on the wind industry who needed to sell these REC's at a competitive price for the industry to profit. By including these sources, the RET did not create much demand for building new industries.

The RET over the past decade has failed to make the Australian wind industry grow enough to become a powerful component of the electricity generation mix, and this is for several reasons. In Dec. 2008, the Rudd government added a multiplier to the RET for solar credits and introduced the solar credit scheme. An expert interviewed, said that government intentions are to become a world leader in solar energy (author interview, July 2010).Yet by creating a multiplier for solar energy, other industries such as wind suffered. This multiplier, among other things, created a surplus of REC's. In 2008, approximately 8.7 million RECs were created and 8.8 million were surrendered. In 2009, 16.5 million RECs were created and only 10.5 million were surrendered. At the end of 2008 there were already approximately 6 million REC's banked in addition to the ones banked in 2009, the surplus exceeded the requirements for all REC's needed to be surrendered in 2010. In addition to the surplus was the drastic increase in solar hot water RECs which doubled in 2007-08 and 2008-09. The solar credit scheme, introduced by the federal government, created the supply increase of RECs and pushed the price of the REC down to where other technologies, such as wind, cannot compete. An unanticipated consequence of the current scheme design has made large scale generation undeployable because the RET scheme is sufficiently skewed in favor of household scale technologies (AGO, 2004).

Comparison of the United States and Australian Legislation and Economic Mechanisms

Australia has one piece of legislation that affects wind energy and created an incentive for renewables. However, being that there was only one mechanism for the promotion of wind energy, if it were to fail at aiding the development of the industry, there is nothing else for the wind industry to fall back on. This is the problem Australia has. Lack of other initiatives to compensate for the problems of the RET has slowed the growth of the wind industry. REC prices are not high enough to make the wind industry competitive and are not enough of an incentive for wind developers to implement more projects.

The legislation in the United States relating to wind energy establishes market mechanisms and structures the market to allow for renewables to be easily introduced. Australia's legislation creates goals to implement a certain amount of renewable energy by a certain time. The Energy

Policy Act first provided incentives to wind energy by creating the Production Tax Credit and later the Recovery and Reinvestment Act created the Treasury Grant Program. PURPA restructured the electricity market to allow for more competition from renewable sources. PURPA ended the monopoly of utilities which allowed for independent and smaller non-utilities to enter the market. Even if the United States is unstructured in how they are implementing renewable technologies, they have strong incentives in place. Furthermore, there are multiple pieces of legislation in the United States that applies to wind energy, so if one were to fail the wind industry has other options. The government created the Treasury Grant Program because of the economic crisis which caused the PTC to fail. Thus the industry in the United States is thriving and growing faster than ever, despite economic turmoil.

The main piece of legislation in Australia in regards to wind energy is the RET which sets goals and standards in which the federal and state governments work toward. Australia is attempting to achieve 20% renewable energy by 2020. So Australia has the targets set in place and are more structured in how they are attempting to implement renewable technologies. However, the incentives under the RET are weak and are not allowing the wind industry to grow. Wind developers in Australia do not have other optional incentives to take advantage of if the RET was not enough. Therefore the developers are cautious to develop more wind and the prices of the REC's are supposed to make wind energy competitive, are not high enough to allow for this to happen.

From comparing the federal legislation and their incentives, it can be seen that the United States has much stronger incentives in place for the wind industry to grow. In addition to the federal incentives, there are also state policies in each country.

United States State Incentives

State governments in addition to federal governments can implement their own policies for renewable technologies. Australia and the United States are very different in the state incentives they have towards the wind industry.

The United States has numerous state policies that promote the development of wind energy. State governments in the US play a large role in policy development for renewable technologies. Each state has their own policies and ambitions. Table 4 below lists the major policies for promoting renewable energy at the state level in the US, most of which wind can take advantage of.

Table 4 - State Policies and Incentives in the US Promoting Wind Energy

Policy	# of States where Implemented
3rd Party Solar PPA Policies	At least 19 states and Puerto Rico (PR)
Grant Programs for Renewables	21 states
Interconnection Policies	41 states plus the District of Columbia (DC) and PR
Loan Programs for Renewables	34 states

Net Metering Policies	43 states plus DC and PR
PACE (Property Assessed Clean Energy) Financing Policies	24 states plus DC
Property Tax Incentives for Renewables	34 states plus PR
Public Benefits Funds for Renewables	18 states plus DC
Rebate Programs for Renewables	23 states plus DC and PR
RPS Policies	29 states plus DC and PR
RPS Policies with Solar/DG Provisions	16 states plus DC
Sales Tax Incentives for Renewables	27 states plus PR
Tax Credits for Renewables	23 states

Source: (Department of Energy, 2011a)

It can be seen that most of these policies are implemented by at least half the states in the US. There are a number of different policy methods used at the state level for promoting wind energy. The most popular and effective policy mechanism used at the state level in the US is the Renewable Portfolio Standards (RPS) programs.

Renewable Portfolio Standards (RPSs)

A renewable portfolio standard is a policy that puts an obligation on retail electricity suppliers to have a specific minimum amount of renewable sources within their electricity supply mix (Wiser et al., 2004). Long term wind power contracts have averaged approximately 3 cents per kWh equivalent to or below the cost of conventional power (Wiser et al., 2004). RPS policies in the US are still relatively new to judge their effectiveness. As of the beginning of 2008, 29 states plus Washington DC have adopted RPS policies and four additional states have non-binding goals. Although brought to the House and the Senate, a Federal RPS policy has not yet been signed into law. An RPS requires retail electricity suppliers to produce a certain minimum quantity of eligible renewable energy. "An RPS establishes numeric targets for renewable energy supply, applies those targets to retail electricity suppliers, and seeks to encourage competition among renewable developers in a least-cost fashion" (Wiser & Barbose, 2007). RPS policies include trading of Renewable Energy Certificate's (RECs). A REC is created when a megawatt-hour (MWh) of electricity is produced. These certificates can be purchased to allow retail suppliers to demonstrate compliance with an RPS program and not directly purchase renewable energy. This is similar to how the RET works in Australia. Figure 7 shows the states that have adapted RPS programs and their goals.

Most states have implemented the RPS programs differently so there is a good mix of policy designs. Texas has been the most successful with its RPS policies with over 900MW in 2001 and 204 additional MW installed in 2003 (Wiser, et al., 2004). Many benefits are coming from state RPS programs. Electricity rate increases associated with RPS policies in some states have shown renewable sources to be competitively priced with fossil fuel generation. In addition, states are recognizing the lack of investment towards transmission and noting this as a key barrier to achieving

RPS targets, thus many states are beginning or have already started to take steps to mitigate this barrier (Wiser et al., 2004). Over 50% of the non-hydro renewable energy additions in the US from 1998-2007 occurred in states with RPS programs (~8,900MW); 93% from wind (Wiser & Barbose, 2007).

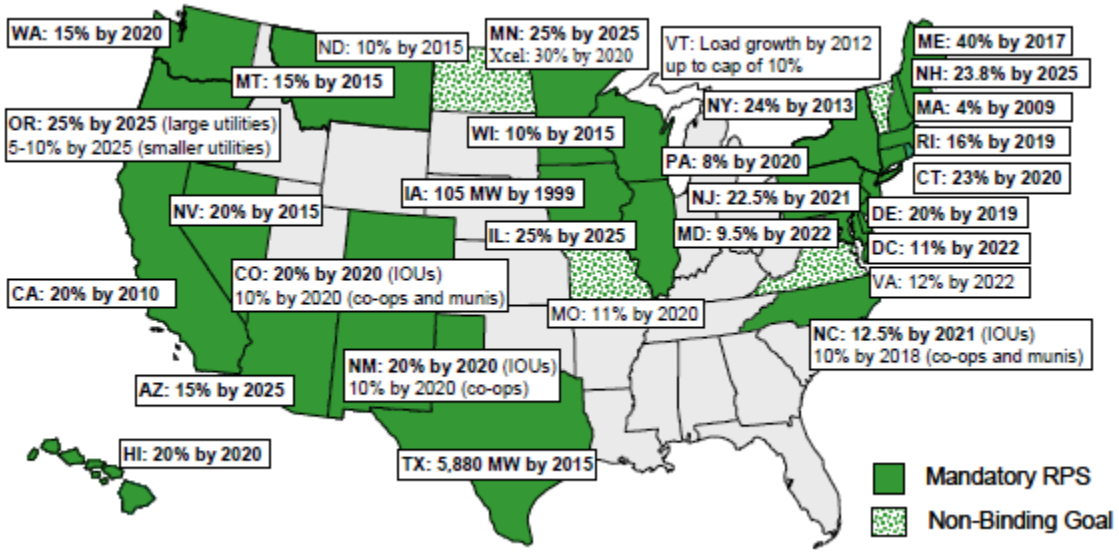


Figure 7*:* State RPS policies and Non-Binding Renewable Energy Goals in the United States. (Wiser & Barbose, 2008)

The RPS programs are in addition to the federal incentives previously discussed such as the Treasury Grant Program. State incentives in conjunction with federal programs speed up the implementation of the wind industry extremely. Most of the success of renewable energy is in states with good wind resources and RPS programs. There is more success at a state level in the uptake of wind energy perhaps because they have a direct impact from the industry thus being a driver (author interview, Dec. 2010). With both the federal Treasury Grant program and state RPS programs, a wind developer can receive a direct grant from the federal government in addition to being advantageous to the state for trading REC's, and the electricity produced can be purchased at a more desirable rate.

Australian Sub-national state Incentives

The incentives at a state level in Australia are rarely given to wind energy. State initiatives are listed in Table 5. Feed-in tariffs, although present in Australia, mainly apply to solar projects. As seen in Table 5, some states have RET schemes which works again as a financial incentive through the sale of renewable energy certificates.

Australia has state incentives although little to none of them significantly impact Australia's wind industry. The federal MRET in Australia is the only RPS program and according to adopting legislation, overrides all state RET schemes instead of in addition (as stated previously).

Table 5 - State Renewable Energy Initiatives within Australia

Joint Initiative: ACT, NSW, SA, QLD, VIC, and WA	GreenPower Scheme	Encourage use of RE to reduce GHG emissions		Commenced in NSW in April 1997 then expanded to other states in 2000
Queensland	QLD Energy Policy: A Cleaner Energy Strategy (International Energy Agency, 2012).	Accelerate growth of Re sector. Contribute 2500MW or 20% of the MRET's goal.	One wind farm: Windy Hills in the Atherton Tablelands.	
	Queensland Renewable Energy Fund	Support development and deployment of RE. $50mil grant program.		Announced 2007
	Queensland Sustainable Energy Innovation Fund	Assist in development of sustainable technologies. $8.9mil for over 77 projects already granted.		Commenced 1999
Victoria	Victorian Renewable Energy Target (VRET) implemented through the Victorian Renewable Energy Act 2006 (Essential Services Commission, 2010). (Sustainability Victoria, 2011)	VRET was to establish 10% electricity from renewable sources by 2016. Now the VRET is transitioning for participants to follow the RET.	Currently 8 operating wind farms in VIC generating 428MX of electricity. (Sustainability Victoria, 2012).	
	Energy Technology Innovation Strategy	Support development of large scale, pre-commercial demonstrations of sustainable energy technologies. $72mil grant programs.		Est. April 2008
	Sustainability Fund	Support projects which help VIC to reduce environmental footprint. Competitive grant program.		Est. 2002

Table 6 (cont'd) - State Renewable Energy Initiatives within Australia

	Renewable Energy Fund	R&D of renewable technologies. $20mil over two years.		Est. June 2009. Expires June 2011
	Payroll Tax Rebate	Attract more investment in renewable technologies. Rebate for construction of RE plant.		July 1, 2010 until June 30, 2014
Western Australia	Government of Western Australia: Office of Energy. Energy2031 Initiative Paper (Government of Western Australia, 2011).	No set targets could be found although in March 2011 there was an Energy2031: Strategic Energy Initiative Directions Paper released for smart energy planning in Western Australia. Dedication to wind energy is driven by Federal government's RET.	12 wind farms equaling 198MW of total installed generation capacity, accounting for 63% of WA's electricity produced from renewable energy sources. Renewable energy accounts for 2.9% of electricity consumed in WA.	
	Low Emissions Energy Development Fund	Develop low emissions technologies to reduce GHG emissions. Competitive grant program		Launched 2007
Australian Capital Territory (ACT)	ACT Government: Department of the Environment, Climate Change, Energy and Water (Australian Capital Territory Government, 2011).	Canberra's renewable energy targets are 15% of energy from renewable sources by 2012 and 25% by 2020. ACT government has adopted a territory-wide target of zero net GHG emissions by 2060.	Capitol Hill wind farm	
	Greenhouse Gas Abatement Scheme-ACT Scheme	Reduce GHG emissions by mandatory GHG emissions trading scheme.		Commenced Jan. 1, 2005

Table 7 (cont'd) - State Renewable Energy Initiatives within Australia

Northern Territory	Northern Territory Government: Department of Resources: Minerals and Energy. Northern Territory Climate Change Policy 2009 (Northern Territory Government, 2009).	Aspirational goal- 60% carbon emissions reduction by 2050, compared to 2007 emissions. By 2020, wholesale electricity purchasers in NT will meet national 20% RET.	No wind farms on the grid in Northern Territory. May have a small amount independently owned. Majority of renewable sources comes from solar.		

Source: (Clean Energy Council, 2010). In addition to numerous other state government sites listed in chart.

The point of Table 5 was to show that there are some grant programs and schemes that wind energy could take advantage of at the state level in Australia. The Renewable Energy Targets set at the state level are overridden by the national RET, thus they are not an additional source of aid to the

wind industry like in the US. Victoria established a Victorian Renewable Energy Target (VRET) scheme which was implemented under the Victorian Renewable Energy Act 2006. Under the Act, the VRET scheme mandates that Victoria's consumption of electricity generated from renewable sources be increased to 10% by 2016. The main purpose of this Act was to promote the development of renewable energy generation through the creation of Renewable Energy Certificate's. The VRET operates mainly the same way as the national RET through the creation and surrendering of Renewable Energy Certificate's (RECs). The Essential Services Commission (ESC) is Victoria's independent economic regulator of essential services and in charge of administering the VRET, and validating the REC's as well as having the RECs surrendered to the commission. As of 2011, the RET will override state RET programs thus the Victorian government has established the Victorian Renewable Energy Amendment Act 2009 to help transition participants in the VRET scheme to shift to the national RET scheme (Essential Services Commission, 2010).

Many of these programs are to fund the research and development of sustainable technologies; as stated before, wind energy is not considered to need R&D funding as it is considered an established industry. Many other schemes are aimed at helping the implementation of solar energy which is of more interest to governments at the federal and state level in Australia. Overall there are some grant programs but not much in Australia. In comparison to the United States, Australia has weak state level incentives for the implementation of wind energy. The wind industry in the US is the main industry taking advantage of most of the state policies where in Australia there are few state policies pertaining to wind energy.

Another major point to make about state involvement and legislation is the role state governments choose to play in either facilitating or inhibiting wind energy's development. Aside from good wind resources and close grid connection, South Australia also has a very supportive state government. This can be seen through the implementation of RenewablesSA which is an initiative by the South Australian government to further the growth of the renewable energy industry within the state. In mid-2009 RenewablesSA was created along with the Commissioner for Renewable Energy who are working towards the state's goal of 33% renewable energy production by 2020. RenewablesSA oversees the implementation of state strategies for promoting renewable energy development in the state (RenewablesSA, 2011). Victoria's government is an inhibitor to wind energy's growth through their rigorous planning assessments and some uncooperative government personnel. Their planning policies, "make it harder for a wind farm to be built in Victoria than a new coal-fired power station" (Maries & Richards, 2010). The previous NSW government tried to be supportive with their renewable energy scheme, although the new current NSW government is not nearly as supportive and imposed some of the hardest planning assessments in Australia (Nolan, 2011, Dec. 23). Hence, planning processes (as stated before) are influenced largely by state action and largely affects the rate of implementation (author interview, July 2011).

State goals and legislation vary significantly from extraordinary goals and achievements such as in South Australia to the almost non-existence of wind energy in the North Territory. Part of this is due to the resources available within each state. Wind resources are strongest in the southern parts of the country and there it is seen state government's largest efforts towards implementing wind energy. All states will contribute in some form to the national Renewable Energy Target whether it be through wind energy development or other forms of renewable energy. Although this is not specified in the legislation what each state must contribute to the target. The states that have been found to have the strongest renewable energy targets including the development of wind energy are: Victoria, New South Wales, and South Australia.

The only initiative that covers various states is the GreenPower Scheme. The Green Power Accreditation Program started in NSW in April 1997 by the Sustainable Energy Development Authority (SEDA). The Scheme enables electricity consumers to pay a premium for a certain amount of their electricity to be generated from renewable sources. The aim is reaching out to the consumer by increasing confidence in GreenPower products. Currently in Australia, 96% of Australian consumers have access to GreenPower products, although less than 1% of eligible customers have signed on to GreenPower (Passey & Watt, 2002).

In addition to the initiatives listen in Table 7, another form of financial incentive is the feed-in tariff. Feed-in tariffs (FiT) are form of financial incentive given by a government for encouraging mobilization of capital and support for renewable energy. It is a premium rate paid for electricity fed back into the electricity grid from a renewable energy source such as solar rooftop or wind turbine (Energy Matters, 2009, June 9). Feed-in tariffs are a way to subsidize renewable energy. There is gross and net feed-in tariffs; gross will pay for all electricity produced by renewable sources from a specific source such as a household while a net feed-in tariff will only pay for the extra electricity the household does not use which goes back into the grid. Within Australia there is no nationalized feed-in tariff program, only state schemes. Majority of these feed-in tariffs are used to support solar rooftop programs although they are used for wind farms as well such as in Western Australia. Table 6 below shows the feed-in tariffs within each state. The extent of how helpful the feed-in tariff is to the wind industry in Australia is unknown based on how sparsely they are used for wind energy development. There is no evidence proving that feed-in tariffs are a significant aid to the wind industry.

Table 8- State Feed-In Tariff Programs in Australia

State	Current status	Max Size	Rate Paid	Program Duration	Model
VIC	Commenced November 2009	5 kW	60c **(credit/cash)**	15 years	Net
SA	Commenced July 2008	30kW (10kW per phase)	44c+/54c+*	20 years	Net
ACT	Commenced March 2009	200kW**	45.7c	20 years	Gross
TAS	Commenced	tbc	20c	tbc	Net
NT	Commenced	tbc	Same as consumption rate	tbc	Gross
WA	Commenced August 1, 2010	See Western Australia notes below***	40c/kWh	10 years	Net
QLD	Commenced July 2008	30 kW (10kW per phase)	44c+	20 years	Net
NSW	Commenced	10 kW	60c/kWh & 20c/kWh	7 years	Gross

Source: Energy Matters: Feed-in Tariff for grid- connected solar power systems (Energy Matters, 2011).

Within the United States there are no state feed-in tariffs because they are preempted by federal law (Hempling et al., 2010). There is 'net metering' in certain states, such as California, which allows anyone to sell excess electricity back to the grid thus reducing their electric bill (EIA, 2011d). Net metering policies can be seen in Table 4.

At the state level, the United States has multiple policies and the wind industry takes advantage of most of them. There are strong incentives and state play an active role in policy development towards renewable technologies. It can be seen from Table 4 that majority of the 50 states have taken some sort of action towards the promotion of renewable and from Figure 7, most state has vigorous RPS programs for the implementation of renewable technologies. When speaking to experts, they all said that wind energy is the main renewable energy source taking advantage of all these state programs. In comparison, state governments in Australia have weak incentives towards wind energy. Table 5 lists state initiatives in Australia, yet only a few pertain to wind energy. Some states, however, have pushed for the implementation of wind energy through easier transmission and planning assessments, such as South Australia.

United States Subsidies to Fossil Fuels

Despite subsidies being given to renewables, most governments subsidize fossil fuels and other energy sources as well either directly or indirectly. In 2007, the United States federal government spent a total of $16.6 billion USD on energy-specific subsidies (EIA, 2007). Within the

United States, the Energy Information Administration (EIA) holds official energy statistics from the US government. In 2007, the EIA conducted a report titled “Federal Financial Interventions and Subsidies in Energy Markets 2007”. The report focused on federal energy subsidies towards electricity production. These subsidies took four principal forms: direct expenditures, tax expenditures, research and development (R&D), and specific electricity programs in several regions of the country such as the Tennessee Valley Authority (TVA), and Power Marketing Administrations (PMA’s).

The Environmental Law Institute (ELI) conducted a study on fossil fuel and energy subsidies from the US fiscal years 2002-2008. Within this time, fossil fuels received $72 billion over the seven year period and renewable energies received $29 billion. More than half the subsidies for renewable went to corn based ethanol. Most of the larger subsidies to fossil fuels were written into the U.S. Tax Code as a permanent provision where renewable subsidies are time limited initiatives implemented through energy bills, and expire over a few years (Environmental Law Institute, 2009).

Within the United States, subsidies are skewed in favor of fossil fuels. In a study by Heiman & Solomon (2004), they concluded that in the US in 1999, renewable energy (for all uses) received only 1 percent, or $19 million USD, in direct federal expenditure or forfeited tax incentives for energy production, while natural gas received over $1 billion USD, largely through the Alternative Fuel Production Credit designed to reduce dependence on foreign oil (Herzog et al., 2001; McVeigh et al., 1999). Heiman & Solomon (2004) state that such is the same for nuclear power where during the first 15 years of commercial production, nuclear (1947) and wind (1975-1990) power sources generated approximately the same amount of electricity, but nuclear received more than 30 times as much federal support per kW generated (Goldberg, 2000).

There is more information that can be found on the allocation of energy subsidies in the United States than Australia. Table 7 below shows the allocation of subsidies to different fuel types in Australia and the United States. Hard figures could be found for 2007 in the United States whereas the only information giving figures for Australia were in 2005-06 and these are estimates from another study (Riedy, 2007). It is noted overall that the United States spends much more money on subsidizing the energy sector than Australia. The only figure where Australia spends more money is towards the coal industry. The United States spends almost forty times more money on renewable energy than in Australia (if comparing the 2007 figures with 2005-06; perhaps might have changed slightly in 2007 within both countries) as can be seen in Table 7.

Table 9- Fossil Fuel Subsidies for Electricity in the US and Australia ($m USD)

Fuel Type	2007 (US)	2005-06 (Australia)
Oil		$3
Natural Gas and Petroleum liquids	2,149	$120
Coal	932	$1091-1866
Refined Coal	2,370	
Nuclear	1,267	NIL
Renewables	4,875	$110-119
End Use	2,828	
Conservation	926	
Electricity (not fuel specific)	1,235	
Federal Electricity Programs	0	

Energy and transport subsidies in Australia: 2007 update' Institute for Sustainable Futures, Sydney. (EIA, 2007; Riedy, 2007).

Table 7 shows that in 2007 the United States spent $4.8 billion USD on renewable energy where Australia spent $110-119 million USD. The US spends a significantly larger amount on renewable technologies than Australia, however it can be seen that the US spends a lot more on all other technologies as well. It can also be seen from Table 9 that Australia spends a great deal more on the coal industry than any other.

The United States subsidizes its electricity market much more than Australia. From 1999 to 2007 tax expenditures have more than tripled. Subsidies for renewables increased from 17% of total subsidies in 1999 to 29% in 2007 in the US. Natural gas and petroleum related subsidies declined as a result of the expiration of the Alternative Fuels Production Tax Credit which subsidized the production of unconventional natural gas in 1999. Coal subsidies have declined from 7% in 1999 to 6% in 2007 in the US (EIA, 2007). Renewable technologies in the United States have to compete with nuclear power whereas it is nonexistent in Australia (discussed further in Chapter 4). Reflecting the direction of change for subsidies in the US, priority is changing from fossil fuels towards renewable energy.

Australian Subsidies to Fossil Fuels

The energy and transport sector in Australia are responsible for almost 70% greenhouse gas emissions and growing rapidly (Riedy, 2007). This percentage is so high because of the extensive use of fossil fuels such as oil, coal, and natural gas. The federal government has made the playing ground for renewable energies even more uneven by providing substantial financial support to fossil fuels through direct payments, tax expenditures, and other actions.

Attempting to identify subsidies in the energy sector and their specific uses is questionable. Most studies produced estimates instead of hard figures in Australia. The United States has the Energy Information Agency (EIA) whose job is to make available databases of energy information and statistics. Australia's information on financial incentives towards the energy sector is diffused and hard to come by. A study by the National Institute of Economic and Industry Research (NIEIR) in 1996 tried to examine subsidies for natural resources but encountered "conceptual as well as practical difficulties in getting the data" (Riedy, 2003). As a result, the report gave more of an estimate for discussion. The NIEIR estimated that $1.995 billion in financial subsidies went to the Australian energy sector. In November 2000, the Senate Environment, Communications, Information Technology, and the Arts References Committee (ECITA) released a final report which estimated direct fossil fuel subsidies at $2billion per year, and found an additional $4billion in indirect subsidies such as tax incentives (Riedy, 2003)

A more recent report in 2007 was conducted by Chris Riedy from the Institute for Sustainable Futures (University of Technology Sydney).[9] The report identified the total energy and transport subsidies for 2005-06 of between $9.3billion and $10.1billion. The allocation of the money between different energy sources can be seen in Table 9. More than 96% of the total subsidies supported fossil fuel production and consumption. While less than 4% went to renewable energy and energy efficiency (Riedy, 2007). Coal received approximately 17% ($1.7billion) while renewables received 3% ($326million), and the largest subsidized fuel being oil receiving 76% ($7.4billion) in 2005-06. Coal fired power plants received between $450million to $1.1billion in subsidies for 2005-06. "In 2005-06, coal was used to generate 78.9% of Australia's electricity, oil supplied 1.4%, natural gas supplied 14.9% and renewable energy supplied 4.8%" (Riedy, 2007).

It was found that electricity generation costs for coal utilities in Australia were significantly less than international costs (Riedy, 2007). A study found that the total weighted average generation cost from four utilities (Macquarie Generation, Delta Energy, CS Energy, and Stanwell) was 1.36 cents/kWh. In the United States, coal dominated utilities paid 1.37-2.44 cents/kWh for fuel alone in 2002, which accounts for only about 40-50% of their total costs. Coal-fired electricity generators in Australia pay much less for their coal than the international market rate, and coal-fired generators do not reveal their fuel costs (Riedy, 2007).

Whatever the actual size of the subsidy, it appears to have significant impact on the profitability of the coal industry. Furthermore, the distribution of subsidies by fuel type for electricity generation (mainly between coal and renewable energy in Australia) reflects the priorities of the

[9] The report gave more information on subsidies to different energy sectors in Australia but still noted that a lot of it was estimates because there are no consolidating reports of subsidies in the energy and transport sectors. This study has attempted to find out more information on subsidy allocations from the interviews conducted, however this proved to be unsuccessful as majority of experts did not know or gave significantly various figures. As a result, most Australians have little knowledge of how much the federal government is supporting the use of fossil fuels. The following information has been extracted from the report to form a picture of the federal government's financial incentives within the energy sector of Australia.

federal government. Fossil fuels are heavily subsidized and many of these subsidies cannot be calculated. These subsidies show the strong political power behind the coal industry in Australia. The Federal Labor party in 2007 drove their campaign on the enthusiasm for "clean coal technologies" and sought to establish a National Clean Coal Fund which would increase subsidization and R&D towards coal technologies instead of renewable technologies.

Overall, each country is spending more money on the coal industry. However, the wind industry is still growing in each country, from a rapid rate in the United States to a slower rate in Australia. To help explain this, it can be seen from the federal and state policies towards wind energy in the US are unstructured in goals yet strong in their incentives. The legislation has created an energy market where wind energy can easily be introduced and compete, despite coal industries receiving more funding. The market is structured to end monopoly control from large utilities such as coal power plants. Also, wind energy can receive federal funding which has proved to be very effective in addition to state level policies which provide incentives on top of federal ones. Thus there is a strong commitment and foundation for wind energy to build upon in the US despite the coal industry receiving more funding. Within Australia, there is a strong federal target set yet the incentives are weak. There are many flaws with the RET that are inhibiting the growth of the wind industry, such as the flooding of the market with RECs from smaller scale technologies and hydropower. Also, state level policies rarely pertain to wind energy and there is no legislation to end monopoly control as in the US. Thus there are few other mechanisms that the wind industry can rely on so the fact that the fossil fuel industry receives more funding is much more substantial and has a much larger effect on the wind industry than in the US.

Chapter 3- Conclusions

This chapter has explored the top down mechanisms holding significance to the speed of implementation of wind energy in the United States and Australia. The mechanisms explored in this chapter were: bureaucratic structure of federal agencies; the federal legislation and incentives; state policies; and incentives to fossil fuels industries in each country.

The bureaucratic structure of the United States compared to Australia was similar in that the main federal agencies in charge of wind energy implementation could be directly compared. Thus the evidence provided suggests that bureaucratic structure does not explain the difference in implementation rates between the two countries. The goals set by the federal governments of each country were different and can help to explain the different implementation speeds. The United States federal government has stronger goals to help the development of the wind industry.

The nature of the legislation and incentives compared between countries has shown to be the major mechanisms explaining the different implementation rates. There was more comprehensive legislation with a series of incentives which were able to facilitate the development of wind power in the United States. The legislation included the Public Utilities Regulatory Policies Act (PURPA), the

Energy Policy Act, and the Recovery and Reinvestment Act. This legislation has created two major incentives: the Production Tax Credit (PTC) and the Treasury Grant Program. These policies have created incentives and regulation which from the evidence provided has suggested to be a huge facilitator towards the growth of the wind industry. The nature of the legislation and the incentives in Australia were ineffective and did not facilitate the development of the wind industry. The Renewable Energy (Electricity) Act 2000 created the Mandatory Renewable Energy Target which was the major legislative and economic mechanism for the promotion of renewable technologies in Australia. The MRET works as a financial incentive through the sales of renewable energy certificates. However, the MRET has come across major problems in its implementation. It included small scale technologies such as solar water pumps and pre-existing technologies such as hydropower. Since these technologies were easy to establish or already established, they could sell RECs fairly easily and in large numbers. In addition, solar technology had a 5x multiplier on it so one Mwh equaled five RECs. This flooded the market with RECs which decreased the price. This had an effect on the wind industry who needed these RECs in order to become competitive in the electricity market. All renewable technologies share in the RET so technologies such as wind suffer as a result. The price of the RECs fluctuated and over the past decade have rarely been high enough to make wind energy a competitor in the electricity market. Unlike the United States, Australia's major mechanism for the promotion of wind energy has not worked effectively, and there is a lack of other alternative mechanisms for wind developers to utilize. Whereas in the United States, when the PTC was not viable after the economic crisis in 2008, wind developers had the Treasury Grant Program. Australia's major mechanism does not work effectively which helps to explain why the US is faster to implement wind energy.

State policies have also shown to be significantly different in each country. The United States has numerous state policies and incentives towards the development of wind energy, whereas Australia has very few. The evidence provided suggests that state policies in the United States such as Renewable Portfolio Standards (RPS) were knowingly a large contributor to the growth of the wind industry. It was shown that state with strong RPS programs were the ones with the largest amount of wind development. Furthermore, these state policies were in addition to the federal policies. Thus wind developers had federal subsidies as well as state policies to rely on. Australia has very little state policies towards the promotion of wind energy. All state RET schemes are overridden by the federal RET so they could not act as an additional source of help. Wind developers solely relied on the federal RET, which was said before to have weak goals and poorly implemented.

Lastly, subsidies going to other energy sectors such as fossil fuels were different in each country. The United States spends a lot more funding on renewable technologies than Australia. It was shown that in similar years, the United States spent forty times the amount of funding on renewable technologies as Australia. However, both countries spent a lot more on subsidizing fossil fuels over renewables. Despite this, wind energy is growing significantly faster in the US than in

Australia and this is from the strong federal and state legislation and incentives. The federal legislation in the United States has structured the electricity market to end monopoly control of utilities, such as coal fired power plants. Federal and state incentives have allowed wind energy to become price competitive with fossil fuels despite fossil fuels receiving more funding. The evidence provided suggests that the coal industry dominates the electricity market in Australia. The lack of effective legislation and incentives for the promotion of the wind industry in Australia combined with the coal industry receiving a proportionally larger amount of funding over renewables has further slowed the development of the wind industry.

The hypothesis is that the adoption speed of a new technology is likely to be quicker in a country where the state has a clear and strong policy commitment, framework, legislation and market mechanisms to facilitate the introduction of that new technology. The bureaucratic structure between the United States and Australia is fairly similar and thus does not explain the difference in implementation rates. The United States has legislation and incentives by the evidence provided have shown to facilitate the introduction of the wind industry. The nature of that legislation in Australia does not work effectively to allow the wind industry to grow in Australia. The nature of the legislation and incentives in each country and how it affects the wind industry proves to be a significant factor in the different implementation rates. The hypothesis has shown to be correct in that the United States has strong policy design and framework which has created legislation and incentives to facilitate the introduction of wind energy.

The top-down approach has helped this study to identify why effective legislation and incentives are important to facilitate the introduction and implementation of a new technology. Formal government actions, as part of the top down approach, are extremely important and have a strong influence on the growth of renewable technologies. While the top down approach has helped to partially explain the puzzle, it does not take into account informal actors within the implementation process such as societal interests. Therefore the next chapter will go a step further and explore the bottom up approach and the mechanisms within.

Chapter 4: Bottom-Up Approach in US and Australia

Now this chapter will analyze the bottom up approach to completely unravel the puzzle. The bottom up approach starts to identify all the informal actors who have an influence on the policy implementation process. The top down approach solely focused on government actions, while there are a lot of other societal interests in the implementation of wind energy as well. This chapter will focus on three variables which are the network of actors, inter-market competition, and public resistance. It will compare these factors between countries and from that hope to completely unravel the puzzle as to why the US is faster to implement wind energy over Australia.

A network of actors is sometime known as "ground level" actors which can include advocacy coalitions, interest groups, and local communities. Within this thesis, the largest and most important actors are advocacy coalitions. Jacobsson & Bergek (2004) describe that advocacy coalitions with societal interests towards a technology can have significant influence and power within the policy implementation process. Coalitions are considered part of the bottom up approach because they are not formal government actors, yet their interactions with government is how they gain political influence.

If coalitions for a technology are able to gain political influence, they would allow there to be more inter-market competition with other technology industries. The National Renewable Energy Laboratory (NREL) said that competition was favored. Renewable technologies must compete with fossil fuel industries over price and political support.

Public resistance is a social condition that can inhibit the implementation of a technology. There are several reasons why communities engage in public resistance against wind farms such as noise, aesthetics, health & safety, as well as the Not In My Back Yard (NIMBY) phenomenon where people may not be opposed to wind farms however they are opposed to them being close to their homes. Walker (1995) describes how wind projects are halted because of local opposition which slows the speed of implementation.

This chapter analyzes the empirical data on the bottom-up variables from the United States and Australia and compares them to discover the similarities and/or differences between them. The chapter starts by analyzing the network of actors in both countries then goes on to identify the inter-market competition in both countries. Lastly, the chapter explores the amount of public resistance there is in each country in relation to wind energy. The chapter ends with a comparative analysis of these bottom-up factors and how they affect the policy implementation process.

Network of Actors

A network of actors is the informal actors outside of government who have a significant influence on the implementation of policy, in this case the implementation of wind energy. Technology- specific advocacy coalitions are organizations such as trade associations in support of and represent a technology and its industry. Coalitions form through an array of events and

campaigns aimed at a particular goal. Overtime these interests turn into organizations which create a new institutional presence and generate opportunities to influence government and other coalitions in economic and political debates (Turner, 2006). For example, in the United States, the Apollo Alliance which is a group aiding the development of clean energy and job creation was formed through the coalition building between the US Steelworkers and environmental groups such as the Sierra Club in 1998-1999. In 2003, the Apollo Alliance's goal was to promote a 10-year $300 USD billion energy research and development plan to enhance American manufacturing of advanced environmental technologies including hydrogen fuel cells, wind, biomass, and solar (Turner, 2006).

United States Network of Actors

The network of actors in the US is large, strong, and complex in its arrangement of both supporters and those opposed to renewable technology. As can be seen from the example above, support groups can be formed from people with other interest besides renewable or wind energy. The US Steelworkers wished to keep manufacturing domestically and hence saw an opportunity through the development of clean technologies. Both those supporting and opposing wind energy consists of hundreds of groups at the local, regional, and national level in the US. It was hard to find a definite number for these groups as many of them are small and local yet powerful within their communities.

The strongest wind energy coalition in the United States is the American Wind Energy Association (AWEA). It's the largest national trade association for wind power in the United States with over 2,500 members. They represent wind power project developers, equipment suppliers, services providers, parts manufacturers, utilities, researchers, and others involved in the wind industry (American Wind Energy Association [AWEA], 2011a). Many experts interviewed including government personnel believe AWEA has several strategies for promoting wind energy and are very aggressive and effective (author interview, Dec. 2010). Their legislative efforts include having staff work with Congress to ensure that the wind industries' interests are attended to in renewable energy legislation. WindPAC is the political action committee of AWEA. Their purpose is to help elect candidates to public office who support policies that will promote the growth of wind power in America (AWEA, 2012). WindPAC makes political contributions to candidates for public office using personal, non-corporate funds contributed by employees of member companies (AWEA, 2012).

There is also the Governors Wind Energy Coalition which includes governors and representatives from twenty-four states who support wind energy. This coalition tries to influence other members of the political office to support wind developments in their state. They also support policies as well as AWEA that advance wind energy and slow climate change including: the extension of the PTC, further establishment of RPS programs, continuation of federal R&D, and to encourage international research development. Their education and communication efforts provide statistics and information to international and domestic industry interests, the general public, and the media by

holding conferences and produce wind energy publications (AWEA, 2011a). AWEA's strength is seen through the constant extension of the PTC over the past 20 years since implemented. As mentioned briefly in the previous chapter, AWEA keeps going back to Congress to get the PTC extended since it only lasts in 1-2 year increments. More recently, AWEA has been pushing for the extension of the Treasury Grant Program after seeing its success. The President of the Solar Energy Industry Association and the American Wind Energy Association held a press conference urging Congress to extend the Treasury Grant Program; their main reason being job creation. U.S. Representative of Oregon, Earl Blumenauer, made a joint effort in the extension with his letter that had 81 signatures supporting the grants, and a letter circulating in the Senate had 17 to 18 signatures a day after the press conference was held (Meehan, 2010). The PTC would not have lasted, especially through times of economic hardship if it were not for AWEA. AWEA has been pushing for the PTC extension for over ten years. AWEA's chief executive, Denise Bode, states, ""…We have made the PTC a front burner issue for Congress and we, as an industry, are well positioned to get this extension done in the next legislative vehicle that is available…We are confident that extending the PTC is a question of when, not if, at this point" (Romano, 2012).

AWEA represents the industry and collaborates with Congress and other bureaucracies. AWEA collaborates with other wind coalitions and industries across the country in order to most accurately represent the industries' needs. An important method for getting wind industry sponsors and professionals together in one spot are conferences and exhibitions. Conferences are important because they are a collaboration tool for wind industries, coalitions, and experts around the country to share information and ideas on how to expand the industry. AWEA holds the largest series of wind energy conferences in the country every year, the main one being WINDPOWER 2011, 2012, etc. The conference educates, exhibits, and allows for networking of wind professionals, industry decision-makers, and generates high quality business leads (AWEA, 2011b). The conference also allows those who are interested in careers in wind energy to find jobs to support the industry. In 2010, there were over twenty thousand attendees and 1,300 exhibitors. The largest percentage of participants comes from component suppliers at 20%. Government agencies compose 3% of attendees. This is not a major percentage but does show the interest government agencies have in learning about wind energy. For example, during the WINDPOWER 2011 conference Governor Mary Fallin of Oklahoma joined executives from Siemens Energy to announce the opening of a US wind service distribution center in Woodward, OK (Stillwater NewsPress, 2011, May 23).[10]

[10] Other conferences and workshops that AWEA organizes include:

- AWEA Offshore WINDPOWER
- AWEA Wind Energy Fall Symposium
- AWEA Wind Resource and Project Energy Assessment
- AWEA Wind Power Health and Safety Workshop
- AWEA Wind Project Performance and Reliability Workshop
- AWEA Wind Power Project Siting Workshop

AWEA targets all the areas of concern about the wind industry. In addition, the conferences are aimed at a variety of audiences such as the Small Community and Wind Power. AWEA provides policies to promote small wind turbines including recommended policies for state and local governments. Some of these recommendations include: public education and outreach programs, installing small wind turbines on government property, enact renewable electricity standards, and supporting utility green pricing programs. Many of these recommendations are already in place in numerous states across the US. Ten thousand small wind turbines are sold in the US annually and the demand is rising (AWEA, 2011b). AWEA is focusing not only on large commercial size wind turbines, but also smaller and individual units. AWEA also holds career summits, fundraising events, and smaller conferences.

The wind coalitions have a very clear message about the benefits of wind energy and why they support it which has moved the debate along (author interview, Dec. 2010). Wind is very strong in its lobbying organization compared to other emerging technologies that do not have that type of strong national trade organization or coalition building. "From a regulators perspective it's easy to go to the national coalition and ask them what their wind position is and get a decent answer. It becomes hard when an industry does not have a strong trade organization, such as AWEA, and regulators cannot get the information because the coalitions are dispersed and individualized among the country or region" (author interview, Dec. 2010).

Two other national coalitions that support wind energy are the National Wildlife Federation (NWF) and the American Council on Renewable Energy (ACORE). The National Wildlife Federation is the United States largest conservation organization with over four million members and affiliated organizations in 46 states. Their main goal is protecting wildlife and habitats. Over the past decade they have shifted their attention more to climate change and how this affects wildlife and habitat impacts. It is a dual mission to help habitats, but also to address emissions. One of the ways this is done is to properly site areas for renewable energy projects such as wind and solar. The American Council on Renewable Energy is a "non-profit organization based in Washington, D.C. with paying members from every aspect and sector of the renewable energy industries and their trade associations, including wind, solar, geothermal, biomass and biofuels, hydropower tidal/current energy and waste energy. The scope of ACORE's membership also spans – among others – financial institutions, government leaders, educators, end-users, professional service providers and allied non-profit groups" (American Council on Renewable Energy [ACORE], 2011). ACORE does most of its lobbying through publishing collaborative research through the leaders of each of these sectors, and also facilitating communication among members, their stakeholders, and the media. ACORE has a

- AWEA Wind Power on Capitol Hill
- AWEA Small Community and Windpower

Leadership Council which channels leaders in the field to give expert advice on appropriate public policy for the development of renewable technologies.

As stated before, there are hundreds of groups in the US from national to local level and all of these are non-profit trade associations looking out for the welfare of the wind industry. Some groups have broad interests and others with more specific interests for wind energy. Yet despite the abundant amount of support through coalitions for wind energy, there are even more coalitions in support of other technologies.

Australia's Network of Actors

In Australia, the Clean Energy Council (CEC) is the representing body for wind energy along with all other clean energy technologies including natural gas; this is similar to ACORE in the US. There is no coalition solely dedicated to promoting wind energy in Australia whereas the US has AWEA. As stated in Chapter 1, there was a wind association in the past in Australia started from the Australasian Wind Energy Association to AusWIND. However, their efforts were not as strong as AWEA and instead of AusWIND growing to be a powerful representative for the industry it merged with the Business Council for Sustainable Energy. Wind energy is represented alongside all the other renewable sources, many of which are much more supported in Australia such as solar. As previously mentioned in the Goals section of this thesis, Australia has put more emphasis to be the world leader of solar energy over wind. So wind is competing for support against other renewable technologies as well.

However, it must be noted that when AusWIND was in place, they did a lot of lobbying to get the MRET implemented. Although since 2001 when the MRET was established, little has been done for effectively implementing the policy thus there are many flaws with it and government is taking its time to fix them.

There are a couple large coalitions in support of renewable/wind energy in Australia although they are not as plentiful as in the United States. Greenpeace Australia-Pacific is one of the national level coalitions in support of developing renewable energy. Initially founded in 1977, Greenpeace has gained over 70,000 financial supporters (Greenpeace, 2011). The organization advocates through independent campaigning and climate/energy is one of the areas of interest. The group tries to find solutions to global environmental problems. There is also the Alternative Technology Association (ATA) who mainly promotes sustainable technologies and conservation at the household level, but also advocates for renewable technologies (Alternative Technology Association, 2012). In addition, the Energy Supply Association of Australia (ESAA) advocates for open and competitive energy markets free from distortions (Energy Supply Association of Australia, 2012). So although the ESAA does not lobby in direct support of wind energy, the organization is helping renewable technologies by advocating for a fairer and more equal energy market. Lobbying is done more by companies than coalitions. For example, Pacific Hydro is effective at getting their message across to government

(author interview, July 2011). Pacific Hydro is a leading renewable energy company in Australia. The company started in 1992 mainly focusing on hydro project development and in 2001 expanded to wind projects where they developed the first privately developed wind farm in southwest Victoria (Pacific Hydro, 2011). Another large company is Australian Gas Light Company (AGL) who is the biggest wind farm developer even though when founded in 1837 was initially a gas supplier. There is also Transfield and Vestas (Danish wind company) who are trying to develop wind projects in Australia. Many of these companies have invested in renewable energy because they see the market shifting towards these technologies.

Comparison of the United States and Australia's Network of Actors

When comparing the CEC with AWEA, there are several major differences that show stronger coalition support for wind energy in the United States. AWEA is doing this by holding a series of conferences annually for different audiences. The CEC supports the wind industry when it is in need of defending against opposition groups although there is little work being done to push beyond the scope of general support and take initiative in making the Australian wind industry a global leader. This claim is supported by the lack of conference series, education programs, and pressure for research and development funding; all of which are important to make the wind industry grow. Also, the CEC represents all clean technologies whereas AWEA solely represents wind energy. This is problematic because it causes wind energy not only to compete with fossil fuel industries, but for representation over other renewable technologies as well. The size and placement of the organizations are also noticeably difference. AWEA has 2500 members and advocates along with representing all the wind developers, equipment manufacturers, service suppliers, utilities, researchers and others involved in the wind industry along with hundreds of member companies internationally. The CEC has 500 member companies and that is for all clean technologies and energy efficiency; only a portion of these members are dedicated to wind energy. So the size of the member base between the two coalitions is significantly different. In addition, AWEA is located in the heart of the nation's capitol alongside Congress. The CEC is located in Melbourne away from Parliament as stated before. Table 8 below compares coalitions in Australia and the United States for different energy sectors. The United States also has a few more that could not be compared with Australia.[11]

[11] Additional coalitions in the US include:
American Coal Ash Association,
American Natural Gas Alliance (ANGA,2011), and the
American Petroleum Institute (API, 2011).

Table 10- Comparison of Coalitions for different energy sectors in the US and Australia.

United States			Australia		
Coalition	Size	Other	Coalition	Size	Other
American Wind Energy Association (1974)	2500 members	Coalition devoted to promoting wind energy. Based in Washington, D.C.	Clean Energy Council (2007)	500 member companies and operates under a 12 person board.	Based in Melbourne. Represents all clean technologies.
American Coal Council (1982)	Over 170 member companies		Australian Coal Association	Industry body whose member companies are black coal producers. Industry has 40,000 ppl employed directly and 100,000 employed indirectly.	Located in Canberra and performs advocacy role at the national level. Black coal supplies 56% of grid connected electricity, largest commodity in Australia, and worth more than $50bil annul (ACA, 2008).
American Nuclear Society (1954)	11,000 members from over 1600 corporations, institutions, and government agencies.	Represents nuclear power in the US.	Australian Nuclear Association (1983)	Independent incorporated scientific institution consisting of professions, business, government, and academics interested in nuclear topics.	Hosts national and international conferences annually since early 1990's (ANA, 2011).
Independent Petroleum Association of America (1929)	National association represents thousands of independent oil and gas producers and service companies across the US	Independent producers develop 90% of domestic oil and gas wells; 68% of domestic oil and 82% of domestic natural gas. Collaborates with 44 unaffiliated national, state, and regional associations (IPAA, 2011).	Australian Petroleum Production and Exploration Association (1959)	+80 member companies and +220 associate member companies. Account for 98% of nation's petroleum production.	Peak national body representing Australian oil and gas exploration and production industry. Secretariat in Canberra (APPEA).
American Gas Association (1918)	Represents 199 local energy companies. Approx. 91% of these 70 million customers who receive natural gas get it from AGA members (AGA, 2009).	Acts as a voice and facilitator for promoting natural gas to over 64 million customers.	Australian Gas Association (1936)		NGO who represents natural gas industry and non gas sectors covered in AGA Certification Scheme such as electrical and plumbing (AGA, 2011).

Each of these groups represents a different interest within the energy sector of the United States and Australia. Many of them can be equally compared between the two countries. Given the information found it can be seen that the coalitions supporting fossil fuels compared to the wind energy coalitions are have a much larger member base with a lot of influence on the economy. For

example, the Australian Coal Association advocates at the national level for an industry that supplies over half of the grid connected electricity. This is similar to the natural gas and petroleum industries in the United States. Most of these coalitions are much larger in membership and have been founded much earlier than AWEA or the CEC. Despite how strong the wind trade organizations are in the United States and Australia, the coalitions for traditional technologies have a longer history and larger base of members. The earlier establishment of traditional technology coalitions allowed them to develop closer ties with government over time in addition to gaining larger membership who possibly hold more political influence. AWEA has 2500 members whereas the nuclear association alone has over triple the amount of members. In recent years, this does not seem to have as much of an influence which is shown through the growing support towards wind energy although the fact remains that opposing technology coalitions have significant strength in numbers. This is similar in Australia with other industry coalitions. Thus coalitions for other industries are both larger and have more economic influence then the wind coalitions in both countries.

Traditional fuel coalitions have a stronger influence over Congress than renewable energies, but there are national constituencies for both groups (author interview, Dec.2010). Traditional energy groups will argue cost changes and higher prices of renewables which carries a lot of weight. An example of how opposition groups have an influence in politics is with the American Petroleum Institute. The American Petroleum Institute (API) praised bipartisan support from members of Congress who voted to stop the EPA from regulating greenhouse gases under the Clean Air Act. The API along with other coalitions argued that regulation will raise energy bills across the country and cost thousands of jobs. The economy has the largest influence when it comes to decision making in Congress. There was a clear support from a majority of senators, including 17 democrats, to keep the EPA from regulating GHG for these reasons (Carroll, 2011). Stronger support for these coalitions from Congress makes it difficult for renewable energy coalitions to inspire change.

Coalitions in Australia supporting of fossil fuels have a larger member base and more financial support than wind. Most of these coalitions are located in Canberra alongside government and lobby actively. The Clean Energy Council is located in Melbourne away from Parliament. The Australian Petroleum Production and Exploration Association (APPEA) in 2006 joined with the federal government to launch a strategic plan to boost Australian indigenous production of oil (Australian Petroleum Production and Exploration Association, 2011). They also host several conferences a year so member companies can join and collaborate about policy issues related to the industry. This is much the same as what AWEA is doing in the US for the wind industry. The associations represent a majority of the nation's energy supply thus they are very powerful. For example, black coal supplies over half the electricity needs of the nation and is worth more than $50 billion each year (Australian Coal Association [ACA], 2008). Australia has 24.1% of the world's economically viable brown coal reserves along with 5.4% of black coal and together brown and black coal account for approximately 80% Australia's electricity generation (Australian Bureau of Agriculture and Resource Economics

[ABARE], 2009; ABARE, 2010). Thus the industry dominates Australia's electricity mix and has a huge economic impact and subsequently coalitions representing the industry have large political influence. This is similar to the situation in the United States however the coal industry does not have as large an impact on the economy. The US economy is largely dependent on oil, nuclear and a mix of resources.

Renewable energy coalitions have been winning a lot of debates over the past few years and this is because the population is seeing the benefits more frequently through media, lobbying, legislative talk, etc. (author interview, Dec. 2010). The renewable energy sector is looking more like the growth sector now and China has had an influence in this in that they are taking advantage of an opportunity to get ahead and the American economy wants this as well. The main motivator that coalitions are using in support of wind energy is job creation. In California people saw the jobs that could be created by the industry and thus it became more accepted. AWEA uses job creation in order to keep these tax credits going. "We have people being laid off right now, and we expect to see more without fast action on the tax extenders now being negotiated," said Denise Bode, CEO of AWEA. "The 1603 tax credit extension would help bring them back as soon as possible." According to the trade group's research, there are over 15,000 jobs in the manufacturing pipeline alone. "We are risking those jobs by not sending a clear signal that America remains open for business in wind energy," Denise Bode, CEO of AWEA, said. The wind industry in the US employs 85,000 people and is growing as installed capacity has grown 40% in each of the past two years. In Iowa, wind generates 20% of electricity and 25% generation in Texas (AWEA, 2010, Dec. 7). Resolving climate change, and obtaining energy independence and security may be the ultimate goal of the people supporting wind energy, but it cannot be the starting point of the debate.

Overall, the network of actors supporting wind energy in the United States is larger and stronger than in Australia. There is more support from the ground level to aid in the implementation of policies for wind energy in the United States. Support is shown through coalition's dedication through conferences, education programs, lobbying to Congress and local communities, industry support networks. Having an industry trade association solely dedicated to wind energy is a huge facilitator for the industry because it allows government to have a direct link to the representation of the industry which allows policy issues to be addressed much more easily. In addition, AWEA constantly addresses policy issues and focuses on the wind industry and does not have to diffuse time and resources to other industries such as the CEC. It was hypothesized that the adoption speed of new technology is likely to be quicker in a country where the network of actors, including advocacy coalitions, supporting that new technology are able to acquire and exert more political power in policy implementation relative to other economic and social interests opposing that new technology. Neither country has a network of actors supporting wind energy that is stronger than those supporting fossil fuels. However, the wind industry is represented much more strongly in the United States over Australia. This provides a number of benefits to allow for easier and quicker implementation of

policies to support the wind industry than in Australia where there is significant representation of fossil fuel industries and no coalition dedicated to wind energy alone. This is also seen in the next section on inter-market competition. Thus the hypothesis can be supported because the network of actors in the US exert enough power to overcome opposing interests enough that the US is a global leader in wind energy. Australia's network of actors is not strong enough to acquire enough political power over other industries to allow the wind industry to grow significantly. The network of actors proves to be an important variable within the bottom-up approach that does have a significant effect on the adoption speed of wind energy in this study. It is also found that because the network of actors in both countries (although stronger effort in the US) lobbied for the PTC and MRET that these top down mechanisms were implemented. The integration of the top-down and bottom-up approaches has shown to be important through the way coalitions advocate for the introduction and implementation of policies to promote the wind industry. For example, AWEA lobbies very strongly for the extension of the PTC and the Treasury Grant Program. The PTC would not have last for over a decade if it were not for AWEA along with other coalitions lobbying on its behalf.

Inter-market Competition

The wind industry in Australia is having a hard time becoming competitive in the market compared to the United States. Australia has a lack of ground level actors promoting policy support for the industry and the market is more centralized around fossil fuels which make it harder for renewable technologies to enter. By looking at the electricity generation mix and the primary consumption of energy in each country, it can be seen which energy sources hold the most strength and are the most economically competitive in the market. In addition, the energy sources that have the largest percentage in the electricity mix will hold the most political influence because of their importance to the countries energy supply. As stated in the previous section, the coal industry holds significant political power because it is approximately 80% of the electricity mix in Australia (Valentine, 2010). Figure 8 shows a comparison of the primary energy consumption in 2008 for Australia and the United States. One main difference is that the United States has nuclear power in their mix and Australia does not. This disperses interests among an additional energy industry which demonopolizes the United States market a bit more than the Australian market. The second major difference is that Australia consumes 40% of their energy from coal compared to the 23% that the US consumes. The Australian coal industry is not only powerful from its large export market and income, but in the domestic market of coal for energy supply. Although Figure 8 shows the energy consumption for all energy markets not just the electricity market. Therefore, Figure 9 is important to look at as they look at the electricity generation mix in each country.

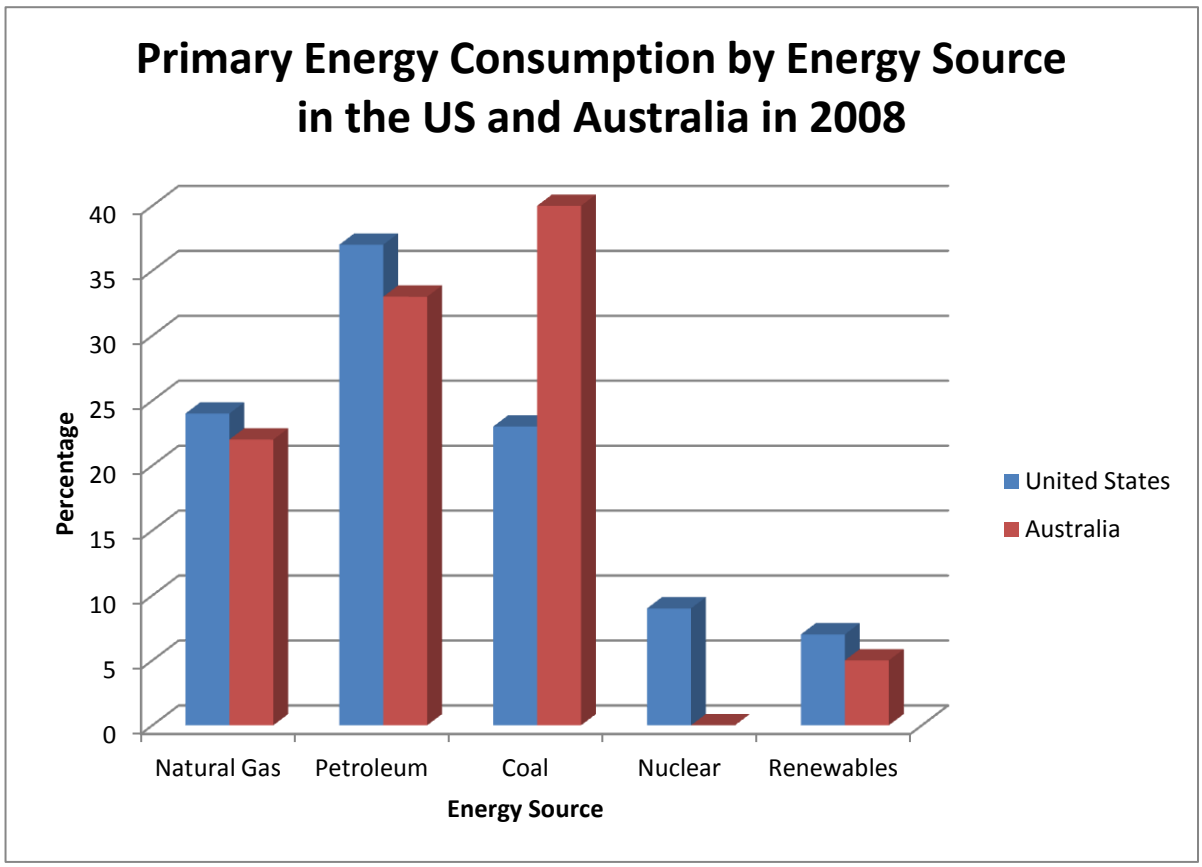


Figure 8- Primary Energy Consumption by energy source in the US and Australia in 2008.

Source- (ABARE, 2009; EIA, 2011a)

Within Australia, competition comes mainly from existing fossil fuel generators, coal being the largest export of Australia. This is much the same as the United States although Australia's coal industry is believed to be even more powerful because they hold a much larger portion of the electricity mix. In Victoria, the state is looking to forge a niche market for its 'green' energy. The state has the most greenhouse intensive energy in Australia, and 95% of electricity production comes from the brown coal deposits located in the Latrobe Valley (Mercer, 2003). In Victoria, coal has been the dominant force of energy production, is accepted by the majority of the public, and is cheap. It is very difficult to introduce a new form of energy technology which has none of these benefits. At current consumption rates, supplies from the Latrobe Valley have been estimated to last another 500 years and energy companies have stated that power stations built in the 1960s will not cease production until they have been functioning for eighty years (Mercer, 2003). Gas-fired electricity is also strongly favored in Australia. Within Victoria, there is over 1500MW of new capacity planned to come online by 2005 (Mercer, 2003). For these reasons, financial incentives are necessary to bring the cost of wind power down to a rate that would make it competitive with other energy sources.

Figure 9 compares the electricity generation mix in Australia and the United States. Since the information could not be found for the same years for each country, this compares the information available looking at the US in 2009 and Australia in 2007-08. There are several major differences

when comparing the two graphs. It can be seen that there is more non-hydro renewables in the US with 4% compared to the 2.4% in Australia. The US has 20% of its generation coming from nuclear power whereas Australia does not have any. In addition, coal only makes up 45% of the United States electricity generation whereas in Australia the generation mix consists of 76.3%. There is 31.3% more coal being generated in Australia for electricity supply over the US. With the coal industry generating over three quarters of the generated electricity in Australia, it dominates the electricity market and has significant political power. Coal is a major part of the US electricity market as well, but is not as concentrated and is more decentralized in that nuclear is part of the mix along with a larger sector of renewables.

A major difference between the US and Australia is that the US has nuclear power which generates a large percentage of electricity. There is no nuclear power generation in Australia where as in the United States it consists of 20% of the total electrical output. The US is the world's largest producer of nuclear power with 104 reactors producing 799 billion kWh in 2009 (World Nuclear Association, 2011). A nuclear power plant has not been built since 1996 (Parker & Holt, 2007), although recently one plant has received a loan guarantee of $8.5 billion in Georgia (author interview, Dec 2010). Nuclear power has a strong foundation in the United States. Nuclear has not been growing over the past decade due to the technology being so expensive and the problem with finding suitable waste disposal sites (author interview, Dec.2010). Nuclear is extremely political and a highly divided argument, and out of all technologies nuclear is the one that is the most disputed. Having nuclear in the US is positive in one sense because it disperses political power to one more actor away from coal and other dominant sources, however at the same time it is negative because it is another source that wind energy has to compete with.

Nuclear energy in Australia has always been a disputed topic. In 2006, Prime Minister John Howard requested a full debate on whether to introduce nuclear power generation to Australia. His idea was based around the argument that since Australia has the world's largest uranium reserves, the country should not just export the mineral but use it (Howard, 2006). In 2006, a Newspoll survey found that 51% of Australians were opposed to the development of nuclear power in Australia while 38% were supportive (Macintosh, 2007). Nuclear might help the wind industry in the US because it could have an effect to disperse political power whereas not having nuclear in Australia could act as an inhibitor to the wind industry because then the coal industry is the dominant industry.

Renewable energy industries may find it easier to become competitive in the market in the US because it is more decentralized. As seen in Figure 10, electricity generation in the US is more evenly spread among energy sources whereas in Australia coal is easily the dominant industry. In addition, there is legislation which helps demonopolize and decentralize the energy market in the US. Australia does not have legislation with the same goals and hence coal is the dominant power.

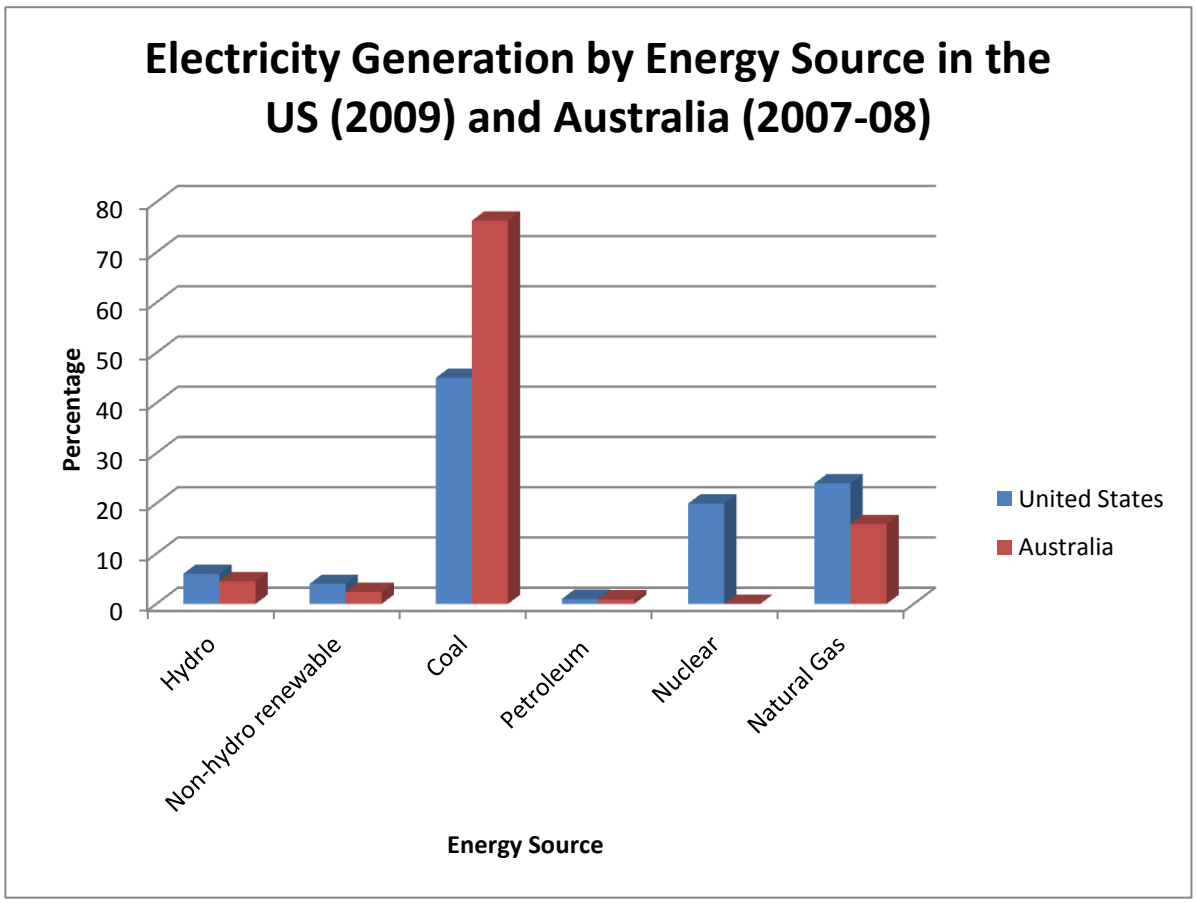


Figure 9- Electricity Generation by energy source in the US and Australia. Source-(ABARE, 2010; EIA, 2011a)

Renewables are faced with much competition for political support given the strong economic influence of fossil fuels in Australia. Support for fossil fuels is seen on a national level from the Australian government heavily subsidizing them through indirect means such as exempting the cost of externalities such as air pollution and showing support through funding for research and development. By investing money in clean coal technologies along with other methods, keeps the production of fossil fuels online. "Finally, there is entrenched political support for Australia's fossil fuel industry and this support manifests itself through political initiatives to support carbon capture and sequestration research, the maintenance of robust fossil fuel support schemes and political resistance to the carbon dioxide cap and trade schemes" (Valentine, 2010). In October 2001, the Australian federal government announced that it would be committing an additional $11.13 million to research aimed at reducing the moisture content of brown coal which has the potential to reduce greenhouse gas emissions by at least 15%. On top of this is a previous federal government commitment of $26.5 million for clean coal technology (Mercer, 2003). In Victoria, the Bracks' Labor government has been committed to promoting the expansion of coal-fired electricity production within the state through the opening of an additional 764 sq. km coalfield (Dabkowski & Baker, 2001; and Pugh, 2001). It was noted earlier that giving funding to multiple energy sources is counterproductive. It seems that the Australian government wants to try every avenue to keep up the heavy production of

coal while trying to meet new international environmental standards because of the copious amount of coal reserves the country has and the pressure put on government by the large population of Australians whose livelihood depends on the industry. The coal industry holds enormous power in Australia supplying over three-quarters of the electricity generated (ACA, 2008). Black coal is Australia's single largest export commodity and is worth more than $50 billion AUD annually (ACA, 2008). The black coal industry has employed over 31,000 people directly in 2007 (ACA, 2008). The coal mining industry employs approximately 136,000 people in 2007 in Australia. In the United States, in 2006 approximately 82,000 people were employed in the coal mining industry and furthermore close to 174,000 people had jobs related to the coal industry in the US (Bureau of Labor Statistics, 2008). In comparison to the population sizes of each country, the coal sector in Australia is much larger.

Coal is a big industry in the United States but like the nuclear industry, has hit a roadblock in the past decade. "A hundred coal-fired power plants have been stopped in the last 18 months," Erin Glynn said (Georgia's organizer for the Sierra Club's national Beyond Coal Campaign). "It's mostly related to the uncertainties about investing in coal. In nearly every case, the investors have mentioned market uncertainties and the risk in investing in coal. It goes back to carbon dioxide, because we know we're going to have to pay for carbon very soon" (Cardinale, 2009). The US has a clean coal initiative however the wind industry does not see it as impinging on their market (White, 2011). The US market is showing a move forward to new energy technologies whereas Australia remains stagnant in comparison from the mid 1990's until 2010. Being that renewable are more competitive in the US market they are creating a sense of uncertainty for further development of fossil fuels. This transition has not yet occurred in Australia and will not if the government pushes for developing clean coal technologies over renewables.

Public Resistance

Public resistance is one of the social aspects that maybe have an effect on policy implementation. If a country or region is experiencing a large amount of public resistance towards wind farm project developments, then the wind industry will find it hard to grow. There are many different reasons for public resistance towards wind energy such as noise, health concerns, aesthetics, landscape value, migratory bird and bat species, and the phenomenon of NIMBY (not in my backyard). A study by J. Szarka clarifies the need to move beyond economic and technical concerns about wind power in policy implementation and to focus on the institutional dynamics of innovation processes and the fostering of societal engagement in implementation processes (Szarka, 2006).

Opinion polls show an overwhelming support for renewable energy, especially wind energy. Public support for renewable energy is high and stable generally especially for wind energy, in comparison with other energy sources (Devine-Wright, 2005). Over the past decade in Australia,

there has been constantly strong support for renewable energy. During the MRET campaign, opinion polls showed 95% support for renewables, 50% support for gas, and 21% support for coal (Renewable Energy Policy, 2010). In 2008, a public poll showed that 76% of respondents would prefer the federal government to subsidize renewable energy instead of fossil fuels, while 17% preferred fossil fuels (Murphy, 2008). Shortly after, a Newspoll commissioned by Greenpeace showed 90% of respondents thought renewable energy should get the same or more funding (Murphy, 2008). In late November 2010, Galaxy research conducted a series of polls on Oxfam's behalf and discovered that 93% of Australians surveyed, supported Australia investing more in renewable energy sources (Norton, 2010). Since 2001 in Australia, support for renewable energy has been high and stable which supports general, world-wide research.

Over the past decade, wind industries have invested significant resources in public relations in Australia to facilitate the adoption of wind power by the public (Mercer, 2003). However, for Australians the sight of wind farms is relatively foreign. "Australians, for generations, have become well-accustomed to the sight of large, coal-fired power stations…as well as numerous, small-scale- and relatively unobtrusive- wind turbines pumping up groundwater for stock on rural properties…However, by virtue of its enormous scale, Codrington-as well as its recent equivalents at Ravenshoe, Queensland, Toora in Victoria, and Albany in Western Australia- represents an entirely new form of "wind energy landscape" that hitherto has been totally foreign to most Australians" (Mercer, 2003). There is also doubt when it comes to developing wind power projects by the federal government. "Even though renewable energy is renewable, it does not necessarily mean it is environmentally benign. Like fossil fuels, renewable energy can also impose external costs on the community… the large-scale use of wind turbines may adversely affect landscapes, migrating bird species, and pristine wilderness areas. Additionally, it may result in noise and aesthetic pollution…" (Mercer, 2003). Groups such as the Landscape Guardians have been aggressive and successful in their efforts to inhibit wind farm development. In South Australia, public resistance has been able to stop the development of three wind farm projects, and South Australia is the state with one of the lowest amounts of public resistance (author interview, August 2011). It is seen that in places where the population is low, there is the best chance of wind farm developments being successful.

The United States has a similar case in that public opinion polls show significant support for renewable energy. In 2001 in the US, 91% of Americans favored investment in new sources of energy such as wind, solar, etc. (Gillespie, 2001, Nov. 27). In 2008, 70-80% of the American public seemed to embrace wind energy (Klick, 2008). Although, there has been a public shift in support for more production of fossil fuels in the US over priorities of environmental protection and conservation since 2007 (Saad, 2011, March 16). This shift is a result in rising concerns over the economy. Public interest in renewable energy is relatively high in both countries. The United States is seeing a bit more concern in energy security and supply over Australia in recent years, though there is still strong support in renewable energy. Figure 8 is a comparison of the opinion polls found in congruent years

for Australia and the United States on renewable energy popularity. The popularity of renewable energy in both countries has been fairly similar, thus in this study it cannot explain the different implementation speeds. Public resistance is not an inhibitor to one country more than the other.

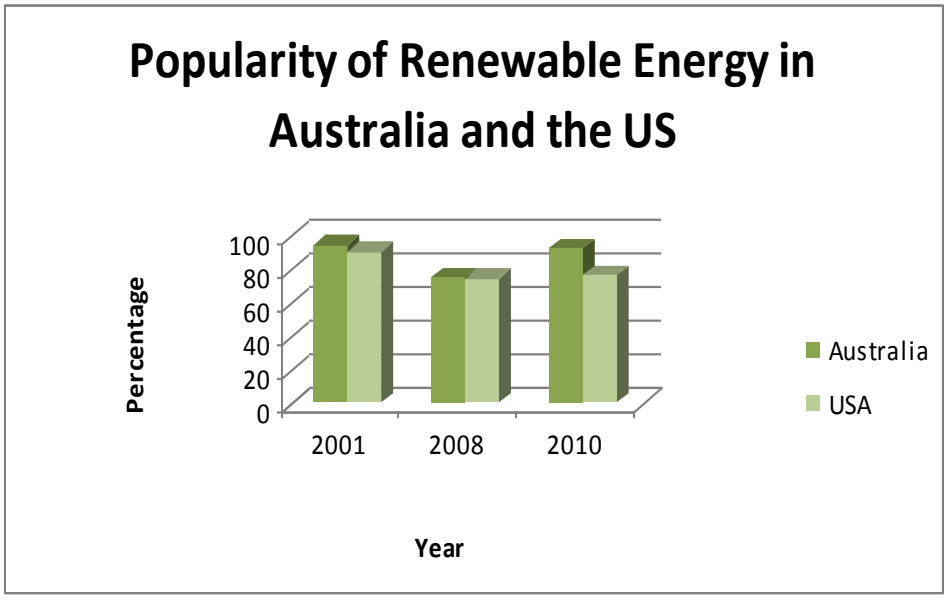


Figure 10- Popularity of renewable energy in the US and Australia from various public opinion polls from 2001-2010. Sources- (Renewable Energy Policy, 2010; Norton, 2010; Murphy, 2008; Gillespie, 2008, Nov.27; Klick, 2008; Saad, 2011, March 16).

Public resistance is mostly manageable in places where there is a good source of wind energy (author interview, Dec. 2010). Where there is a lot of wind potential, states view it often times as a job creation program. So environmental, conservation, NIMBY groups, etc will exist, but state authorities will argue that the jobs creation benefits have stronger weight than these groups and they are overcomeable. In states where there is not much potential for wind production, the opposing groups or the cost overtake the opportunity for wind more easily. For example, in New England the wind potential is not great, but there is the opportunity for offshore wind. Cape Wind in Nantucket Sound, Massachusetts was the first proposed offshore wind project and is a prime example of the difficulties of the NIMBY phenomenon. It took almost 10 years for the project to pass because 1.) there was no legislation in place at a state or federal level for offshore wind projects; 2.) there are all these opposing forces (mostly environmental groups and many members of the local communities in Nantucket Sound worked for fossil fuel industries (Williams and Whitcomb, 2007) who have brought on numerous pending lawsuits against the development so it can never get started. Yet Cape Wind's President Jim Gordon along with all the other supporters of Cape Wind stood behind their decision to go ahead with the project. There are great resources of wind energy off the Atlantic coast, and offshore wind farms would solve problems of transmission planning across state boundaries and local opposition due to the NIMBY phenomenon, especially if the project is located more than 300 miles offshore where it is in federal waters and cannot be seen by residents living along the shoreline. This

project took much longer than one would in the Midwest which makes resistance a regional issue. Public resistance is related to location both in the US and in Australia. An example of this would be the case of South Australia. South Australia is the largest producer of wind power in all of Australia with over 1000MW going online in 2010 (Energy Matters, 2010, April 6). There is little to no resistance against wind in the state compared to other states where there is not as much acceptance (author interview, July 2011). The Midwest in the United States is similar and does not see as much public resistance as there is along the Northeast coast.

Private v Public Lands

A large amount of the land with good wind resources is located on federal or federally managed lands in the US. Figure 11 shows the areas with good wind potential in relation to who owns the land. The gray and blue sections are federal lands with good wind potential.

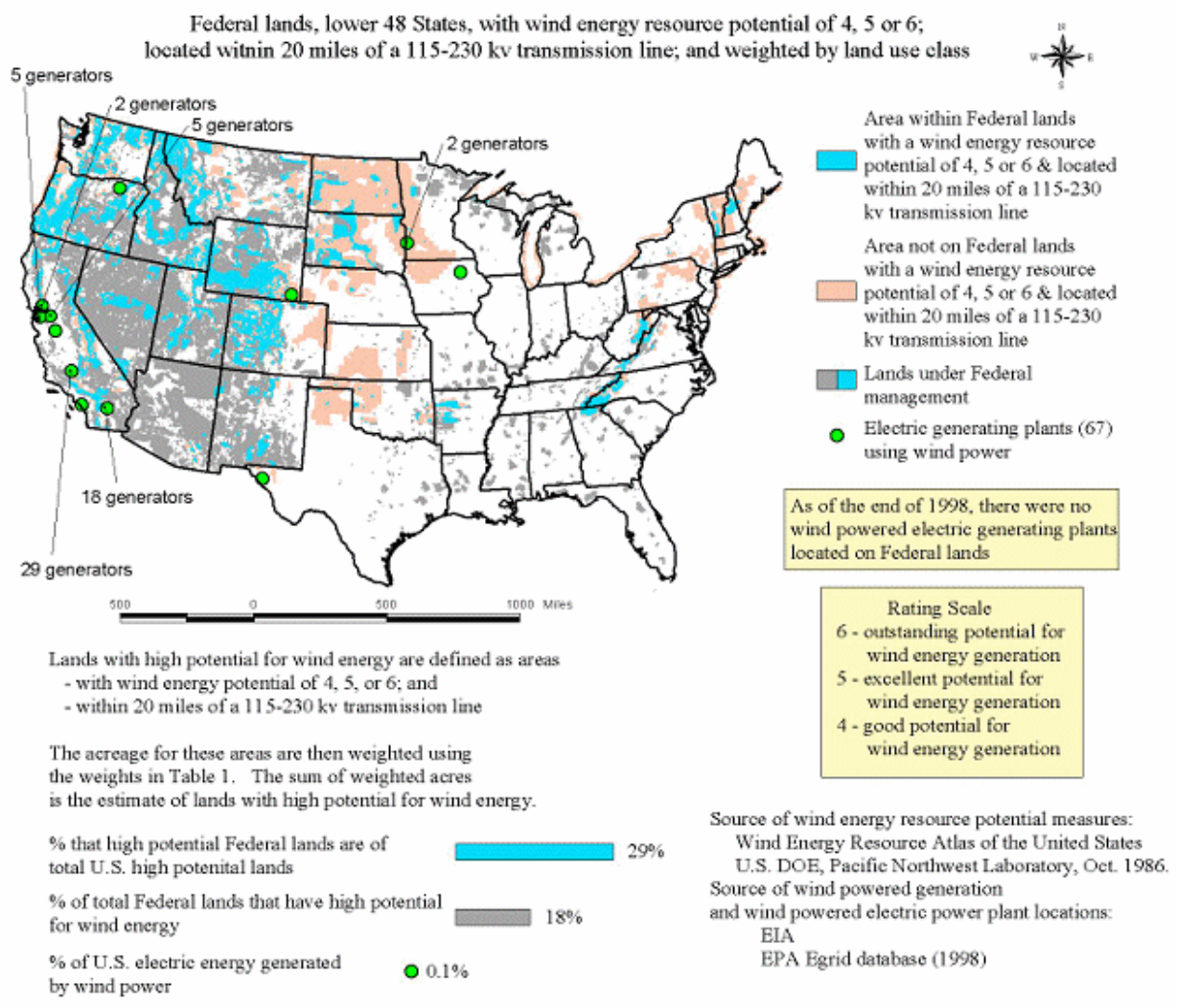


Figure 11- Federal lands in United States. Source: (EIA, 2011d)

Private v public land use for wind farm development affects the planning process and ultimately how much development takes place. There is much more federally owned land in the US that wind developers can take advantage of whereas all the wind development in Australia is on private land (author interview, July 2011). Siting on federal land is sometimes easier for developers than dealing with private landowners. Much of the available land along Australia's coast is now being bought by metropolitan- based purchasers for "lifestyle" reasons (Mercer, 2003). Many of these property owners have no need or desire to utilize their land for wind development. The debate is heavily divided between affected local communities and the green movement. Majority of the prime resource base sites in Australia are along the coasts and this land is mostly privately owned. Figure 12 below shows the wind farm sites in Australia. This is where a strong network of actors can help ease private owners to allow their land to be used for wind developments by educating them on all the benefits. In addition, from the top-down, state or federal government can offer some sort of subsidy or grant to these land owners for allowing the development of renewable energy projects.

Figure 12- Wind Farm Locations across Australia 2010. (Ecogeneration, 2011)

In the US, there is huge potential for wind development along the coasts, although majority is in the Midwest which consists mostly of agricultural land as shown in Figure 13. The use of public v private land tends to be regional, for example in the west there is a lot more public land (author interview, Dec. 2010). If siting is on public federal land then the DOI handles permitting if not on

public land then it would be utility and state regulatory agencies and commission that handle the permitting.

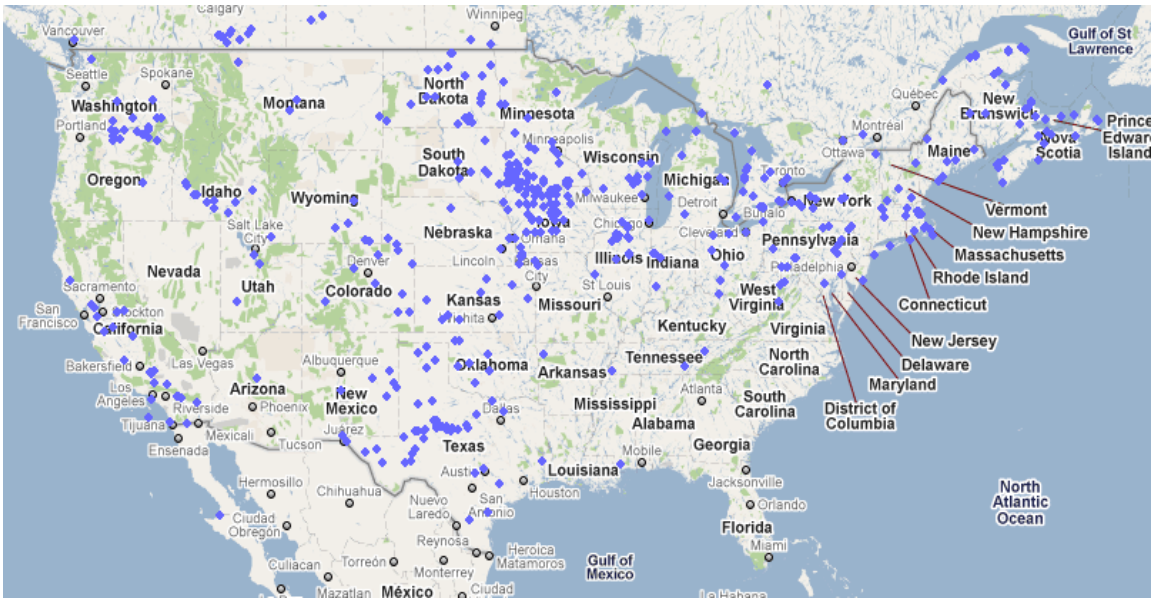


Figure 13- Location of Wind Farms in the United States 2010. (Department of Energy, 2011b)

Overall, public resistance is an issue in both countries and is not something that can be precisely measured in a qualitative study. The variable in isolation cannot explain the difference in implementation speeds of wind energy. From the information available, both countries have similar levels of support and both have localized opposition. The Australian wind industry has been around for relatively the same amount of time as the one in the United States. The only slight difference is with the planning stage. The US has both private and public lands for development of wind farms whereas in Australia there is only private land use which can make it more difficult for developments to be approved. However, this does not seem to affect one country more than the other and thus does not explain the difference in implementation speeds. The difference is that the industry in the US received government support much earlier (in the 1980's) to develop the wind industry whereas in Australia it was not until the MRET was formed in 2001 that the wind industry started to grow. During that 20 year time span in the US, the general population has become comfortable and familiar with wind technology and seeing wind farms where Australians became familiar with coal plants. Wind farms are still relatively foreign and even though there has been much research done on the negative impacts of wind farms and how to overcome them, Australia is still seeing much resistance in that regard and the federal and state governments are still learning how to overcome public resistance. In addition, the United States has many more coalitions in support of wind energy who are trying to educate the public in order to gain more support. Public opinion polls show that over the past decade, there is relatively the same amount of public support for renewable technologies within both countries. The key hypothesis is that the adoption speed of new technology is likely to be quicker in a country where the network of actors supporting that new technology are able to acquire and exert

more political power in policy implementation relative to other social interests opposing that new technology. In regards to public resistance, a conclusion cannot be made as to whether it significantly impedes one countries wind development over the other. Both countries have public resistance towards wind farms and it is just a matter of how the network of actors, such as coalitions, and the federal and state governments handle opposing groups.

Chapter 4- Conclusions

This chapter has given the empirical data on the bottom-up variables. The bottom-up approach identifies the informal network of actors who influence the policy implementation process. In this study, advocacy coalitions, inter-market competition, and public resistance were interrogated between the two countries and the similarities and differences were identified.

The network of actors between the two countries showed major differences in the power the coalitions hold in support of wind energy, and also relative to other industry coalitions. The United States has stronger coalition support towards the industry. The American Wind Energy Association (AWEA) is solely dedicated for the promotion and development of wind energy in the United States. They are the main representative trade organization for the wind industry in the United States. They do a number of different lobbying tactics which has shown to be very effective. AWEA also has WindPAC which represents the wind industry in its support and political contributions towards holders in public office who share the same ideals to help the development of the wind industry. There are other large coalitions like ACORE who contribute its efforts for the promotion of the industry through collaboration of data by experts in the field. Australia does not have a trade association solely dedicated to wind energy. There is the Clean Energy Council (CEC) whom represents all clean technologies and energy efficiency. Through the information that could be compared, AWEA represents the wind industry much more strongly than the CEC. In addition, more information could be found about AWEA collaborating with Congress and top authorities for wind promotion. Thus the difference in the network of actors explains the different implementation speeds.

The coalitions for fossil fuel industries are larger and have more political influence then renewable technology industries in both countries. However, the United States has a more leveled electricity generation mix which can be seen from Figure 10 and the coal industry does not have as much an influence on the economy as in Australia. The US also has nuclear power which helps the wind industry by dividing power of fossil fuels among one more energy sector. The coal industry clearly dominates the electricity market in Australia and from the evidence provided there are few industries that come close. In addition, the US from top down has legislation to help with regulating the electricity market so that non-utilities can become competitive. Australia's legislation does not achieve competition for the wind industry. The network of actors in the US is stronger than in Australia and has gained more political support to become competitive with other industries. Australia's network of actors is weak in comparison which made wind energy less competitive. Inter-

market competition is different between the two countries and is an inhibitor to the growth of the wind industry in Australia.

Public resistance can be a major inhibitor towards wind farm development. This study has analyzed public opinion polls showing the popularity of wind/renewable technologies in each country. It was found that popularity levels between the two countries were very similar and from the evidence available it cannot be suggested that public resistance slows the speed of implementation in one country more than the other. One difference however is that the United States has both private and public lands for wind farm development whereas Australia only has private land development. Public resistance, even though on similar levels in both countries, could potentially be a slightly larger inhibitor in Australia being that the process is more difficult for development on private lands. Overall, from the evidence available, public resistance does not affect one country more than the other and is not considered to be significant enough to account for the different implementation speeds.

Overall, the network of actors are significantly different in each country and account for the different implementation speeds in the US and Australia. Inter-market competition is different between the two countries as well. Competition in the US has allowed the actors to flourish. From the evidence provided, public resistance is similar in each country and thus cannot explain the difference in implementation speed. The hypothesis was that the adoption speed of a new technology is likely to be quicker in a country where the network of actors, including advocacy coalitions, supporting that new technology are able to acquire and exert more political power in policy implementation relative to other economic and social interests opposing that new technology. This hypothesis was shown to be correct. The United States has a network of actors that is supporting the wind industry enough to acquire political power to allow the industry to be competitive in the market. Thus this has unraveled the puzzle, showing that a strong network of actors is needed for quicker implementation speeds of a technology.

The bottom-up approach is important because it shows how actors outside of formal government actions do influence the implementation speeds of new technologies. This study has shown that coalitions are important to gain political support for the industry. It can be seen that it is a combination of a range of top-down and bottom-up variables that are different between the two countries and are more effective in the United States allowing for a faster adoption of wind energy. Chapter 5 will now conclude all the findings and give advice for future research and implications to government and industry personnel.

Chapter 5: Analysis and Conclusions

The focus of this thesis was to use a comparative methodology and the top-down and bottom-up theoretical approaches to see why the United States was faster to implement wind energy than Australia over the past ten years. The United States and Australia are very similar countries as they both have democratic and federal systems, approximately the same amount of available wind resources, and have industrialized, strong economies. The United States is one of the global leaders of wind generation. With growing concerns of energy supply, security and the environmental, such as climate change, renewable energy technologies are seen to be the future of energy supply. Of all renewable technologies, wind energy is the fastest growing due to it having the cheapest cost, is well established and researched, among many other reasons. Given that these countries have many similarities, there is a large difference in the uptake of wind energy among them, and given the many advantages of wind energy generation, a puzzle emerges. Why given the similarities between the US and Australia are there significant variations in the amount of wind capacity being generated between the two countries?

To answer this puzzle, this thesis has used the top-down and bottom-up theoretical approaches which developed the framework. The top-down approach focuses on formal government actions that have an effect on implementing policy. Contrary, the bottom-up approach looks at the network of actors at the ground level such as the interest groups who influence policy implementation decisions. The top-down and bottom-up approaches reinforce each other and it is the actions between them that has identified the key variables and explained the puzzle. The top-down variables discussed were bureaucratic structure and goals, nature of the legislation, and economic mechanisms. The bottom-up variables are the network of actors including advocacy coalitions, inter-market competition, and public resistance. These variables were then applied to the contexts of Australian and the United States political processes and compared.

Theory and Comparative Methodology

This thesis discovered that the integration of the top-down and bottom-up approaches is what really matters. While taking one approach would help, it would be an inadequate explanation. The integration of the top-down and bottom-up approaches is seen in the literature as well. The thesis supports Gregersen & Johnson (2010) in describing the policy process as a combination of both because national energy plans are a top-down approach but this policy would not have been implemented weren't it for advocacy coalitions and private and public actors pushing for the plan (Hvelplund, 2000). It was said the "Achilles' heel" of the Sabatier/Mazmanian model (top-down approach) was their neglect of other actors outside the central decision-makers such as the private sector (Sabatier, 1986). Richard Elmore (1979) argues in his research paper on 'forward and backward mapping' that policy makers need to consider "both the policy instruments and other resources at their disposal (forward mapping and the incentive structure of ultimate target groups

(backward mapping) because program success is contingent with meshing the two." In addition another article written by Paul Sabatier states that for adequately understanding the policy process, one is required to look at the intergovernmental policy community or subsystem composed of bureaucrats, legislative personnel, interest group leaders, researchers, and specialist reporters within a substantive policy area (Sabatier, 1991). Sabatier adds that the traditional focus of political scientists on single institutions or single levels of government will usually lead to an inadequate understanding of the policy process over any length of time (Sabatier, 1991). This study has shown the need for integration of the two approaches in addition to showing the variables with significant importance within each approach.

This study used a comparative methodology of the implementation processes of the United States and Australia which is unique because these two countries have not been compared in this context before. In addition, most studies on policy implementation look at case studies or in a single country context. This comparison between the United States and Australia has shown that Australia's wind industry is growing quite slowly and by outlining the similarities and differences between the key variables in each country, the puzzle could be answered effectively.

Top Down Approach

The first research question that was asked was: how are government structures and mechanisms including bureaucratic structure, the nature of the legislation and economic mechanisms used and do they facilitate or impede the implementation process? From the evidence, the bureaucratic structure in Australia and the US is fairly similar. There are a number of agencies in each country handling different aspects of renewable energy policy. Where the difference lies is with the policy goals set by government. The US President and Congress have set strong goals for wind energy among other renewable technologies. In Australia, the organization at the federal level was based around the Mandatory Renewable Energy Target (MRET) with poor policy goals.

Both countries have a lack of federal authority over state governments in relation to transmission and planning of wind development. There isn't a national mandatory transmission or planning guideline for wind energy in either country, therefore power is in the hands of the state governments. From the evidence, this has been a significant inhibitor to the industry in both countries. However, it does not show to affect one country more than the other.

The United States has legislation that is used to create regulation and incentives for renewable energy. For example, the Public Utilities Regulatory Policies Act (PURPA) 1978 aims to de-monopolize large companies in the market to allow for alternative energies to become competitive. The Energy Policy Act eliminated barriers between utilities and non-utilities in addition to creating the Production Tax Credit. The Production Tax Credit (PTC) is a financial mechanism to promote renewable energy production and was shown to be highly successful in the years when it was in place. More recently, the Treasury Grant Program under the Reinvestment and Recovery Act substituted the PTC after the economic collapse in 2008. The grant program gave a direct grant to

renewable energy producers instead of a tax credit since most banks were not able to support this mechanism at the time. It was shown to be the most successful policy mechanism in driving the wind industry to its peak growth in 2009, adding over 10,000MW in the US. Furthermore, at the state level, majority of states have a series of policies that either try to regulate the state market in favor of renewable energies or create financial incentives which can be used in addition to federal incentives. It is the combination of regulation and incentives at the state and federal level that is the backbone of the wind industry in the United States.

Within Australia, the Renewable Energy Target (RET) is the policy mechanism that acts as a target and incentive. The Renewable Energy Target is imposed under the Renewable Energy (Electricity) Act. The RET used in Australia sets a mandatory target for renewable energy generation from the federal government, and a majority of this target is thought to be fulfilled by wind energy. The United States does not have a mandatory target, but instead has a variety of policy mechanisms at the state and federal level for promoting renewable energy and in turn wind energy can take advantage of many of these. The RET has seen implementation problems over the years such as the degradation in the price of the REC's. The price of the REC's is solely based on the market so if there is an overflow, their value decreases. This happened several times throughout the past decade when small scale technologies such as solar hot water pumps and heating were included in the target which flooded the market with REC's and decreased their value. There have been several reviews of the MRET stating several design problems however the government has been slow to correct them. The RET does not provide adequate incentives compared to the US where there is a whole range of incentives wind energy can take advantage of.

In addition to federal legislation, states involvement in policy development has large differences between the two countries. States in the US are more active in policy development towards renewable energy. State involvement is seen through numerous schemes, rebate programs, and the most popular being the Renewable Portfolio Standards (RPS) programs adopted by over half the states in the US. The RPS programs are similar to the RET in that they set mandatory targets for renewable energy. Individual states set their own targets, some higher than others and try to achieve these targets through the sale of renewable energy certificates. Australian states are much less involved in policy development. Some states such as Victoria and NSW had their own RET schemes, however, changes to the federal RET scheme now overrides all state RET schemes instead of being an additional goal. There are numerous programs and schemes at the state level except very rarely do they apply to wind energy in Australia.

It is clear from the evidence that the bureaucratic structures are fairly similar between the two countries so this does not explain the difference in implementation speeds. The United States has a strong federal policy design and active state governments in policy development. Australia has an ineffective policy framework and incentives. Given all other things being equal, bureaucratic structure cannot explain the difference, however, the nature of the legislation and economic mechanisms does

show why there is a difference in implementation speeds. The legislation and incentives in the US have facilitated the growth of the wind industry, whereas the legislation and incentives in Australia are ineffective at allowing the wind industry to growth at the same pace. The hypothesis was correct in that the adoption speed of a new technology is likely to be quicker in a country where the State has a clear and strong policy framework, legislation, and effective market mechanisms to facilitate the introduction of that new technology.

A question that arose was do the different sized economies play any role? To answer this, a third country was taken into account, Germany. Comparing the size of the economies of Australia, the United States and Germany in 2004, which was in the midst of this study, showed that the United States had the largest followed by Australia and lastly Germany (Central Intelligence Agency, 2004). However, in 2004 Germany was the world leader of wind energy (Ragheb, 2012). The size of economies does not determine the average growth of the wind capacity for this study. The top-down approach only partially helps to explain the difference in implementation rates, the bottom-up approach must be analyzed as well.

Bottom-Up Approach

The second research question was: how does the network of actors including advocacy coalitions interact and manage, inter-market competition, and public resistance and does this facilitate or impede the implementation process? The bottom level network of actors in each country is another significant difference. A key hypothesis is that the adoption speed of new technology is likely to be quicker in a country where the network of actors, including advocacy coalitions, supporting that new technology are able to acquire and exert more political power in policy implementation relative to other social interests opposing that new technology. The United States has a trade association solely dedicated to supporting the wind industry called the American Wind Energy Association (AWEA). AWEA tries to gain close ties with Congress, educate the public about the benefits of wind energy, push for the promotion and extension of important policy mechanisms, and holds conferences which brings together government personnel, the public, industry and electricity retailers. One of the main lobbying efforts of AWEA is towards Congress to extend the PTC and more recently the Treasury Grant Program. These financial incentives are the backbone to the wind industry and if it were not for AWEA and other interest groups pushing for the PTC's extension, the wind industries' growth would have stagnated. There are hundreds of other regional support groups who lobby to state and local governments in the US. It is this joint effort that helped establish the wind industry into the American economy. The size of the non-governmental sector in the US is larger and has stronger links with bureaucracies and Congress than in Australia. Also, private and public land arrangements was discussed in Chapter 4 and was determined to not deter the implementation process in one country more than the other.

Australia does not have an interest group solely dedicated to wind energy at present. In July 2007 there was the amalgamation of Auswind (Australian Wind Energy Association) and the

Australian Business Council for Sustainable Energy (BCSE) to create the Clean Energy Council (CEC). The wind industry was then represented by the CEC among all clean energy technologies. This amalgamation thus shifted sole efforts from wind to all clean technologies. There is debate among experts as to the effectiveness of the Clean Energy Council, but in comparison to AWEA, the CEC is weak in its promotion of wind energy. Interest groups allow an industry to gain more political support and if the network is strong enough it may exert more political power relative to other opposing industries. AWEA constantly lobbies on behalf of wind developers to seek the extension of the PTC, Treasury Grant Program, and other schemes. As a result Congress gave the requested funding to those incentives instead of allocating them to other technologies. In addition, interest groups, by making their voices heard to Congress and the public, educate and thus make wind energy more accepted. The ground level actors in the United States exert more pressure on government than in Australia, and as a result there is a faster growing wind industry. From the bottom-up approach, the establishment and activity of the network of actors is stronger in the United States compared to Australia and explains the difference in the implementation of wind energy.

Inter-market competition between the two countries showed some differences that assist in explaining the difference in implementation speeds. It was seen that the electricity generation mix in the US had coal as the dominant industry although there were several other industries holding a large percentage of the generation mix, such as nuclear. Within Australia it was evidently clear that coal was the dominant industry with little competition. It helps that the United States has nuclear energy because it takes some of the political power away from coal. With stronger coalitions for wind energy, the wind industry had an easier time being implemented. The coal industry in Australia is extremely strong with much political and economic influence. Without a strong network of actors, the wind industry was not as successful at being developed as in the US. Poor inter-market competition is related to the weakness of wind lobbyists in Australia. A network of actors can gain influence over government to administer policies that would allow an industry to become more competitive. A strong network of actors, such as in the United States, has helped the wind industry to be competitive with other industries and as a result has raised the amount of inter-market competition. Actors can flourish with more competition and thus one variable relies on the other and their interactions are important.

Public resistance can be a huge impediment to policy implementation. Measuring public resistance qualitatively can be difficult and this study has used public opinion polls to determine the attitudes towards renewable energy in each country. The use of public opinion polls can show the general publics' attitudes towards renewable energy. Since 2001, support for renewable energy has stayed over 90% in both Australia and the United States showing strong support for renewable energy in both countries.

Although people like to support renewable energy, a lot of times they oppose development close to their homes. This phenomenon is known as the Not In My Back Yard (NIMBY) is localized

with wind development. However, in this thesis resistance does not seem to affect one country more so than the other. The best wind resources in the US are through the mid-west and northeast regions. The mid-west is mainly agricultural land in which the farmers see wind turbines as a second cash crop. There is more resistance in highly populated areas such as the northeast. Australia has a regional issue with resistance as well. There is little resistance in South Australia which has some of the best wind resources and the population, outside of Adelaide, is very low. In Victoria much more resistance is seen from local groups and communities.

Overall, both countries seem to have strong support by its citizens for renewable energy, although experience some public resistance towards wind turbines. It is not clear from the evidence that public resistance is more of an issue in one country over the other. Based on the same level of support for renewable energy and generally the same level of public resistance, the evidence suggests that public resistance does not affect the different adoption rates of wind energy between the US and Australia. From the bottom-up, the United States has a stronger network of actors supporting the wind industry and this is seen through the extension of important policy mechanisms over the last decade. Australia does not have a trade association solely representing the wind industry, and thus lobbying efforts are diffused among many technologies. This results in weaker promotion of the industry which is seen through more political power going to other industries and less time is taken to make sure there is effective implementation of the RET. The hypothesis was correct in that the adoption sped of a new technology is likely to be quicker in a country where the network of actors, including advocacy coalitions, supporting that new technology are able to acquire and exert more political power in policy implementation relative to other societal interests opposing that new technology. The United States actors were able to support wind energy enough to allow the industry to compete with opposing interests.

Both approaches have shown to have significant differences in the key variables which explain the different implementation speeds. From the top-down approach, the United States had more comprehensive legislation with a series of adequate incentives which were able to facilitate the development of wind power. Australia had ineffective legislation with inadequate incentives that have not allowed the wind industry to grow quickly compared to the US. The bottom-up approach has identified that the network of actors in the US is stronger compared to Australia. The actors in the US have been able to interact with government and push legislation for the promotion of wind energy. Below is Table 11 which displays the comparative conclusions for each of the variables discussed in the top down and bottom up approaches.

Table 11- Comparative Conclusions for the Top-Down and Bottom-Up Variables

Variables: Top Down	United States	Australia	Comparison
Bureaucratic Structure	-Large number of federal agencies handling different aspects of wind energy and dissipated.	-Fewer federal agencies, more unified.	-The United States has more agencies although many of them can be directly compared to those of Australia.
Goals	- Strong goals for wind energy set by executive branch.	-Weak policy goals at the federal level.	-Strong goals in United States for wind energy which facilitates the implementation process whereas Australia's goals are weaker and impede the process.
Authority and Power	- Lack of federal authority in many issues related to wind energy (e.g. transmission and planning)	-Lack of federal authority in many issues related to wind energy (e.g. transmission and planning)	-Authority and power are very similar in each country. The issue does slow the implementation process however it does not affect one country more than the other.
Federal and State legislation and economic mechanisms	- The US has effective legislation which creates regulation and incentives. -Strong state involvement in policy development for wind energy.	-Legislation does not create enough of an incentive to aid the wind industry. -Very little State policy development towards wind energy and some overridden by federal legislation.	-The US has effective legislation and economic mechanisms at the State and federal levels to allow the wind industry to grow whereas Australia does not.
Variables Bottom Up	**United States**	**Australia**	
Advocacy Coalitions	-A larger and more closely knit network of actors working towards implementing wind energy.	-Weaker network of actors working towards implementing wind energy.	- Network of actors in the US exerts more pressure on government than in Australia and as a result there is a faster growing wind industry.
Inter-market competition	-Electricity generation mix more evenly spread among energy sectors, including nuclear.	-Coal is clearly the dominant industry with little competition and resistance from coalitions supporting renewables.	-Strong network of actors in US has helped wind industry become competitive with other industries and raises amount of inter-market competition whereas coal is the dominant industry in Australia with little resistance.
Public Resistance and Participation	-Large public support for renewable technologies.	- Overall high public support for renewable technologies.	-Both countries have strong support by its citizens according to public opinion polls and thus does not have an effect on the growth of the wind industry.

The last research question that was asked was: how do these government mechanisms and structures, along with the network of actors interact to influence the adoption speed of wind energy policy, and what conclusions can be drawn about the implications for renewable energy policy more generally? There were several interactions that were highlighted to be important throughout this thesis. Within the top-down approach, the interaction between the legislation and incentives was important. In the United States the legislation has created incentives which significantly helped the development of the wind industry. The nature of the legislation has also created a competitive market for renewables through regulation and ending monopoly control by utilities. The interaction of the legislation and incentives between federal and state governments was important as well. The United States had federal legislation in addition to strong state policies. Wind developers could rely on both levels of government in the US. The federal legislation in Australia did not work with state incentives yet over rode them and this slowed the implementation of wind energy.

Within the bottom-up approach, the interaction of the actors and inter-market competition relies on one another. The network of actors can flourish with a competitive market. A stronger network of actors is able to gain more support and become more competitive with other industries. So this helps inter-market competition of renewable technologies with fossil fuels.

Lastly, the interaction of the network of actors with government is seen to be crucial. The strong network of actors in the United States has pushed for wind energy both to Congress and local communities. Advocacy coalitions in the US have lobbied for the creation and extension of policy mechanisms which have allowed the wind industry to grow. The US has shown that a strong network of actors has helped the growth of the wind industry through the constant extensions of the PTC and Treasury Grant Program. It is the integration and interaction of the variables in the top-down and bottom-up approaches which have allowed the wind industry in the US to grow rapidly compared to Australia. The weak network of actors in Australia has resulted in weaker targets and poor implementation.

Policy Implications

Based upon this research several policy implications could be made. Although the implementation literature says that bureaucratic organization is important (Heiman & Solomon, 2004; O'Toole & Montjoy, 1984), the evidence suggests that the structure and organization of the bureaucracies does not show to be a main factor in explaining the difference in growth rates of wind energy between both countries. The structures appear to be similar and thus cannot explain the difference in implementation speeds. Implications for government should be to get financial incentives and policy mechanisms with effective design and framework more so than how the bureaucracies are organized. It was shown in this study that the RET (previously MRET) has not made the wind industry a competitive option, so correct policy design and implementation is needed. Additional policy mechanisms beyond the RET would assist development as well so wind developers

have other incentives to rely on. This is supported in an article by Valentine (2010) stating, "Unfortunately it appears that the efficacy of the NRET will be undermined by program flaws such as inclusion of coal bed methane gas in the list of approved alternative energy sources, a multiplier mechanism which encourages development of solar thermal energy systems at the expense of wind power, the limited duration of the program which will discourage investment after 2020 and failure to pass complimentary legislation to enact a carbon emissions trading scheme."

Implications for the wind industry should be to heighten their lobbying activity as it has facilitated the growth of the wind industry in the United States significantly. Building a strong network of actors at the ground level can influence policy decisions made by government. It was shown that one association with political clout was a huge help to the development of the wind industry in the US. In addition, industry groups and non-government organizations (NGO's) can overcome opposing forces if they can influence government decisions more than their competition. Trade associations can gain influence in government and alter what policies are passed to support their industry interests. AWEA has gained much political support from Congressmen, etc. which has helped to prolong the PTC and other major incentives the wind industry needs to survive. If Australia seeks to develop wind energy vigorously, it will need to consider making more comprehensive legislation and incentives as well as considering a stronger network of actors which reinforce the legislative mechanisms.

Limitations of Study and Scope for Future Research

This thesis has made several findings which contribute to the policy implementation literature. It is unique in that it has compared the policy implementation processes in relation to wind energy between the US and Australia. Although there was a comparative limitation that this study has only included two countries. For future research, this study could be expanded by including a third country such as one in Europe. By adding a third country, the United States can be put into a more global context and compared as being slightly less significant in its implementation of wind energy policies than solely with Australia. An expanded scope of comparative research is needed to better understand the forces behind policy implementation which inhibit or facilitate the wind industry.

Another contribution made is with the variables deemed important to the top-down and bottom-up approaches. Within the top-down approach the legislation and economic mechanisms used by each country was significantly different and in favor of the United States. From the bottom-up approach, a strong network of actors in the US showed that there was more political support for the wind industry through policy decisions than in Australia. These conclusions support the theoretical literature on top-down and bottom-up approaches. This thesis has made these conclusions by solely comparing the growth of the wind industries between countries. It would be useful to see if these conclusions hold up comparatively when using other technologies such as solar. A limitation to this study was that it only analyzed wind energy. While useful conclusions were

developed, further studies on a range of technologies more generally would contribute to the literature.

While this thesis used the best data available, there were limitations especially in the amount of data found for the Australian context. For example, determining the relationship between government and industry groups, such as coal, was difficult. Some conclusions could be made by looking at the distribution of government funds to different energy sectors. For example, strong support for coal could be seen through indirect subsidies such as supporting research for carbon-capture and storage through the Clean Energy Initiative (Department of Education, Employment and Workplace Relations, 2011). In addition, finding rough data on subsidies allocated to different energy sectors in Australia was very limited, and what was found was fragmented and only estimates. General conclusions could be made, but further research on subsidies in Australia is needed in order to get a complete picture.

As noted in most policy implementation and technology introduction literature, more research is needed to understand the vast scope of mechanisms used among countries to introduce a certain energy technology into their mix. Renewable energy technologies are growing rapidly in the world today due to energy supply uncertainties, energy security, and environmental concerns such as climate change. It is necessary to understand how to effectively implement policies for adopting renewable technologies into an electricity market in order for a country to succeed in becoming a world leader of renewable energy generation. This study has sought to show some of the policy mechanisms which facilitate the growth of renewable energy by using wind energy as the chosen technology; a comparative and qualitative methodology; and the top-down and bottom-up theoretical approaches. The results shown in this thesis will hope to aid policy makers when thinking about implementation of new technologies.

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