

THESIS

SUB-FEDERAL ECOLOGICAL MODERNIZATION: A CASE STUDY OF COLORADO'S  
NEW ENERGY ECONOMY

Submitted by

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## ABSTRACT

### SUB-FEDERAL ECOLOGICAL MODERNIZATION: A CASE STUDY OF COLORADO'S NEW ENERGY ECONOMY

European nations have often employed policies of explicit government intervention as a preferred means of addressing environmental and economic challenges. These policies have ranged from grey industrial policies focused solely on industrial growth, competitiveness and innovation to policies of stronger ecological modernization, which seek to align industrial interests with environmental protection. In recent years these policies have been mobilized to address the threat of climate change and promote environmental innovation. While some US Administrations have similarly recognized the need to address these challenges, the particular historical and political institutional dynamics of the US have meant that explicit government intervention has been eschewed in favor of more indirect strategies when dealing with economic and environmental challenges. This is evident in the rise of sub-federal policies at the level of US states. Supported by federal laboratories and public research, US states have adopted policies that look very much like sub-federal versions of industrial or ecological modernization policy.

This thesis uses the Colorado case to highlight the importance of sub-federal institutions in addressing environmental and economic challenges in the US and explore its similarities to, and differences from, European approaches. To achieve this goal it first develops an analytical scheme within which to place policy initiatives on a continuum from grey industrial policy to strong ecological modernization policy by identifying key institutions that are influential in each policy type. This analytical scheme is then applied to the transitional renewable energy policy

period from 2004-2012 in the state of Colorado. This period starts with the adoption of a renewable energy portfolio in 2004 and includes the ‘new energy economy’ period from 2007-2010 as well as the years since. Looking at three key turning points this paper interprets the ‘new energy economy’ strategy using the analytical scheme developed and identifies the political and social institutions that frame this transition. Drawing upon these findings, the paper analyses the implications of the Colorado case for understanding sub-federal initiatives in the US and concludes with a summary of the broader comparative institutional lessons.

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## Introduction

“Instead of using their vastly increased material and technical resources to build a wonder city, the men of the nineteenth century built slums...[which] on the test of private enterprise, 'paid,' whereas the wonder city would, they thought, have been an act of foolish extravagance, which would, in the imbecile idiom of the financial fashion, have 'mortgaged the future'... though how the construction to-day of great and glorious works can impoverish the future, no man can see until his mind is beset by false analogies from an irrelevant accountancy... The same rule of self-destructive calculation governs every walk of life. We destroy the beauty of the countryside because the unappropriated splendors of nature have no economic value. We are capable of shutting off the sun and the stars because they do not pay a dividend... But once we allow ourselves to be disobedient to the test of an accountant's profit, we have begun to change our civilization”  
John Maynard Keynes (1933, 760-763)

Is Colorado's New Energy Economy an example of ecological modernization American style?

In the last decade there has been a strong recognition in the U.S. that industry has an important, proactive role to play in environmental protection. Many scholars and policymakers have argued that this approach closely resembles the arguments made by proponents of ecological modernization (EM) theory. Although ecological modernization theory has grown up in a European context, its American proponents argue that the foundations of this theoretical perspective can travel well across the Atlantic, resulting in what is referred to as “ecological modernization American style”.

While differences in political organization and discourse have caused EM to operate at the sub-national rather than the federal level and within a neo-liberal rather than a corporatist paradigm, the core elements of EM theory remain intact in its American form. In 2007 Bill Ritter's administration is credited with coining the term “New Energy Economy” or NEE. The NEE provided a branding for the ensuing activities related to clean energy pursued by the Ritter administration during its tenure. On its surface, Ritter's NEE policies seem to be a manifestation of an American Style EM.

My thesis will ask: **Is Colorado's New Energy Economy an example of EM American style?** If not, what sort of policy framework would best describe this transition? I will answer these questions through a systematic investigation of the way in which policies were formed, starting with an historical look at Colorado's energy development and activities leading up to RES legislation in 2004 and then continuing to the present. In starting with an investigation of the processes of policy formulation, I will be able to highlight important shifts in the nature of the NEE as it has evolved over time leading to a richer understanding of the NEE as an evolving and contested policy. This research is important because it will ultimately contribute to further research that seeks to understand the implications of 'green' policies, particularly in the context of energy transitions from conventional to renewable energy. I believe that is important to undertake this research project because it will provide a more substantive understanding of the NEE and a framework with which to assess similar policies being implemented across the U.S.

### Theoretical Significance

As policymakers both at the national and sub-national level seek to capture the momentum of 'green' sentiment by creating policies with explicitly environmental language, it becomes necessary for scholars to have a consistent and objective means by which to interpret the content of these policies. While the unifying concept of the NEE has served as a politically important trademark, linking policy successes to the administration, it does not provide us with a clear impression of the characteristics that define the NEE in relation to existing broad-based policy approaches more easily understood and defined in the context of state-level policy. If the goal of this paper is to explain the nature of Colorado's energy transition, it will be important to first describe it either as either an axiological break from previous manifestations of state level

policies, an exact incarnation of a previously recognized policy type, or as a combination of different policy types leading to a hybrid policy formulation. By creating a set of criteria with which to assess new environmental policies as they emerge, I hope to help stakeholders move beyond policymaker's framings to a more functional understanding of what these policies entail. Additionally, as policies are contested and evolve, they can be described more precisely, from some combination of different theoretical approaches that may change over time. For this reason, it is important to understand what the NEE actually represents. It can be argued that this brand of ecologically-minded industrial development administered by the state is a form of 'ecological modernization', it is important to undertake systematic research that can provide an objective assessment of the policy.

My research draws from and contributes to two overlapping bodies of literature, primarily: industrial policy and ecological modernization theory. I feel that it is possible to unpack EM theory and industrial policy into their core components and draw upon other theories of political and economic organization as well in order to determine whether Colorado's clean energy transition is a case of EM or something else entirely. Although some researchers using ecological modernization theory have undertaken empirical cases that explore a similar set of interest groups in an economic/energy transition, the Dutch chemical industry (Mol, 1995), Vietnam (Frijns, J., P. T. Phuong, and A. P. J. Mol, 2000), the Thai pulp industry (Sonnenfeld, 1998), urban recycling in North America (Scheinberg, 2003), or Andersen (2002) on the experience of EM in Eastern Europe, I believe that the case study of Colorado's clean energy transition entails several unique characteristics that may require a hybrid theory. In many respects ecological modernization theory itself is a variation of European style industrial policy, for this reason I have allocated a great deal of time in Chapter 3 describing the features of

industrial policy (IP) and the forms it can take. Necessarily, a great deal of my focus on industrial policy takes place in a U.S. context, looking at its intellectual and practical history in US policymaking.

The evidence used in this thesis comes from a combination of academic literature and empirical research. The first part of this thesis seeks to explore the existing body of literature providing a systematic description of various approaches to ecological modernization and industrial policy in theory and in practice. At the end of each chapter on ecological modernization and industrial policy I have created a typology of dominant approaches for each (Typologies 2 & 3). The 5 approaches for EM are: Eco-Efficient EM, Treadmill-EM, Weak EM, Strong EM and Transformative EM. The 4 approaches for IP are: Grey Industrial Policy, Economic Development, Green Manufacturing and Green Industrial Policy. Each of the approaches for both chapters is evaluated based upon four categories that remain consistent for both EM and IP (Environment, Economy, Technology/Innovation and Decision-making). The categories used to evaluate the various approaches of EM and IP remain consistent in order to enable the creation of a master typology derived from a combination of the EM and IP charts that will provide a basis for the analysis of the empirical chapters in the second part of this thesis.

The second part of this thesis draws upon collaborative research conducted through a grant by the Colorado State University Energy Super cluster with my colleagues Jon Fisk, Samantha McGraw, Linse Anderson and Professors Dimitris Stevis and Michele Betsill. We have relied upon 17 interviews, numerous publications and hours of research meetings and reports resulting from the project in creating an empirical case study of Colorado's New Energy Economy from 2004-2011. Together, the literature review and Colorado case study provide a great deal of evidence with which to create and apply an analytical scheme with which to

objectively assess Colorado's New Energy Economy. The typologies created in the first part of the thesis will be employed in assessing the empirical chapters. In the concluding chapter an analytical scheme in the form of a period chart will be employed to summarize the character of the NEE periods.

## Chapter Outline

In the introduction I will briefly define the Colorado clean energy transition both as a set of policies implemented by the Ritter administration and as part of a broader transition underway in Colorado. The purpose of this chapter is to provide context for a broader discussion of the nature of Colorado's development policies. In chapter 1 I will also explain my research design and methodologies for this thesis. This analytical scheme will be used in interpreting developments in the three major periods of transformation.

In chapters 2 and 3 I intend to propose theoretical perspectives that might provide a basis for describing Colorado's new energy economy. I will provide a literature review of ecological modernization policy and industrial policy. From this literature review I intend to delineate the defining characteristics for each policy, leading to an analytical scheme with which to assess the content of the NEE. The purpose of this chapter is to create the analytical basis for my assertions about the form and content of the NEE in my empirical evaluation. At the end of each of these chapters I will create a typology of approaches for EM and IP respectively.

Chapters 4, 5 and 6 are empirical chapters. In the fourth chapter I will briefly discuss the recent history of Colorado's energy development leading up to and including amendment 37 through Bill Ritter's campaign for Governor. This period of time will be evaluated using the analytical scheme developed in chapter 2. The purpose of this chapter is to describe the form

and content of the NEE during this time period as a result of the passage of amendment 37 while providing context for the Ritter administrations future policies through the lens of the campaign. This period can be referred to as the “Origins Period”. In the fifth Chapter I will look at the period starting with Governor Ritter’s inauguration. This period of time includes early policies and legislative acts of the administration including measures of economic development leading to the attraction of Vestas Wind manufacturing and the funding of Abound Solar. The purpose of this chapter is to highlight the role of Ritter’s administration in the clean energy transition in Colorado. This period can be referred to as the “NEE Period”. In the sixth chapter I will focus on the legislative and policy actions involving natural gas. I have chosen to highlight this particular period in which the clean air clean jobs act (Colorado House Bill 10-1365) was passed because I will argue that it is a transformational period in the development of the NEE. This chapter will also look into the impact of the great recession and the American Recovery and Reinvestment Act (ARRA) upon the development of the NEE as well as the increase in the RES from 20 to 30 percent. This period can be referred to as the “Gas and Recession Period”.

In chapter 7 I will discuss empirical findings and present a conclusion. I intend to draw upon the empirical evidence provided in chapters 5, 6 and 7 to either affirm the NEE as an example of American style EM or to provide an alternative explanation based upon the empirical findings. This chapter will look at the clean energy transition after the inclusion of gas and the beginning of the Hickenlooper administration. The purpose of this chapter is to determine whether or not the nature and composition of the clean energy transition has changed with the departure of the Ritter administration and the ascendancy of natural gas in Colorado. I will also devote time in this chapter to conjecture and possible areas for further research arising from this project.

**The Trajectory Of The Transition:  
1977 - 2012**

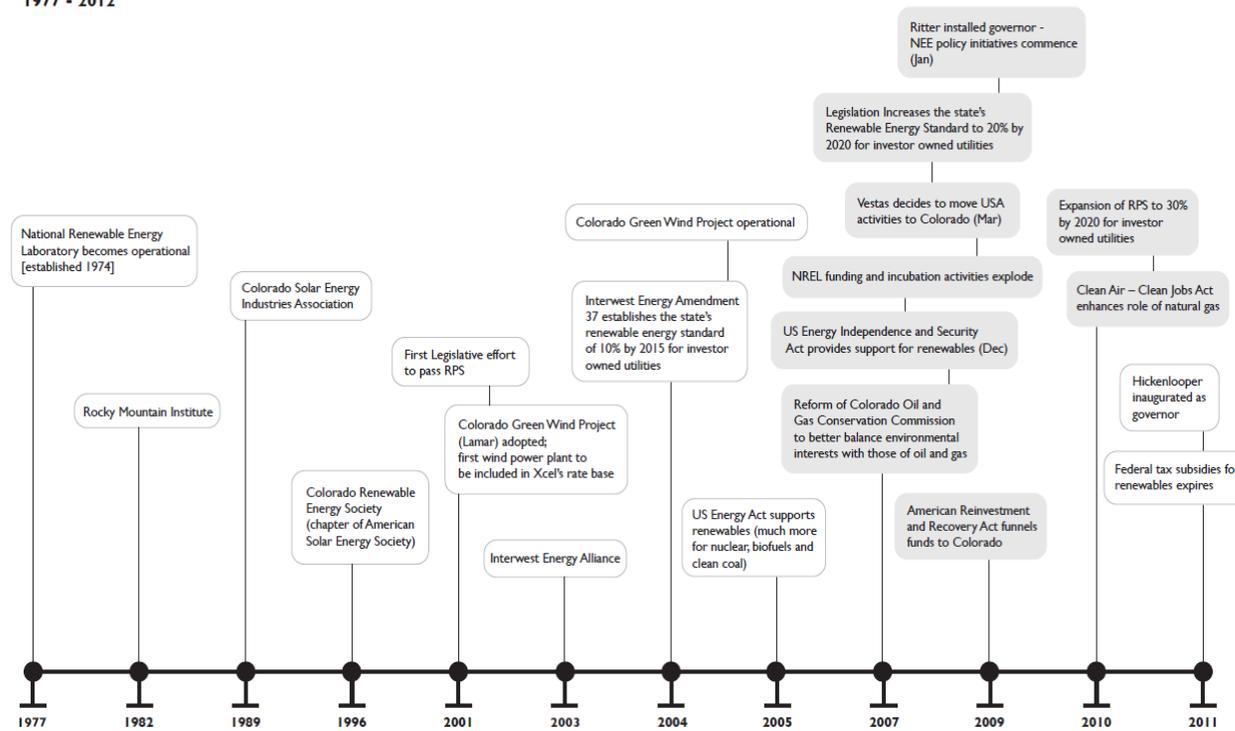


Figure 1. Colorado's Energy Transition Timeline

NEE Research Project (2012)

## Chapter 1

### Research Design and Methods

Methodologies  
Analytical Scheme

In Chapters 2 and 3 I have relied upon literature views of ecological modernization and industrial policy to develop typologies that describe the important features of categories for each respective policy. I have broken ecological modernization policy into five approaches including: eco-efficiency, treadmill EM, weak EM, Strong EM and transformative EM. I have designated four categories of assessment for the five approaches: environment, economic system, technology/innovation and decision-making. In chapter 3, I have broken industrial policy into four major approaches: grey industrial policy, treadmill industrial policy, green manufacturing, and green industrial policy. Each of these approaches is similarly subjected to the four categories of environment, economic system, technology/innovation and decision-making, the rationale for which I will discuss below.

#### Four Categories of Assessment

I have chosen the four categories that I will use to assess various approaches to ecological modernization and industrial policy. These categories are drawn from the literature review of EM theory. I have used EM theory as the basis for my categories as it directly responds to the central research question of this thesis. I argue that those authors discussing EM use the same four categories; environment, economy, technology/innovation and decision-making implicitly as a means of assessing EM. In the literature, the debate over the quality of EM revolves around the presence and balance of four categories. These categories are not made explicit in the existing literature, for this reason, part of the approach in answering my research question

depended upon defining the core elements of EM. As I will explain in subsequent chapters in this thesis, EM shares many characteristics with industrial policy, with an additional emphasis on environment. For this reason, I am able to employ the same four categories to my assessment of the approaches to IP arising from the literature review in chapter 3. Both literatures overlap in terms of their emphasis on economy, technology/innovation and decision-making as the key criteria for assessing the existence and quality of either EM or IP. The common categories of assessment allow me to combine different approaches to EM and IP in my analytical scheme in chapter 7. It is important to note that while the environmental category is important to all approaches to EM it is not present in all approaches to industrial policy.

After developing corresponding tables for ecological modernization and industrial policy I am able to draw parallels between the two based upon the criteria I have developed from the literature review of each major policy type and combine them into a master table. The purpose of combining the two tables into a master table is that it allows me to distill the criteria into broader categories of assessment. The analytical scheme introduced in chapter 7 focuses on four periods in the Colorado energy transition: 2004-2007 (RES Period), 2007-2009 (Ritter Administration), 2009-2011 (Gas) and 2011-Present (Hickenlooper). These periods have been created as a means creating bracketed periods for analysis; I leave my analysis of turning points for the findings and conclusion chapters.

## Typologies

By broadening and combining the characteristics of industrial policy and ecological modernization in the master chart, I am able to place each period of Colorado's energy transition on a continuum from the extremes of grey industrial policy to transformative ecological

modernization for each category. This analytical scheme reveals trends and changes over time that clarify the evolution and contestation in the policy composition of Colorado's NEE policies. By employing this scheme I am able to determine where Colorado's policies sit on a continuum and what direction, if any, these policies have taken over time. The approaches of both (Typology 1) and (Typology 2) are aggregated to create (Typology 3) based upon similarity so as to provide five major approaches. In the final chapter I will use the criteria from (Typology 3) along with the four periods to provide a final picture of the changing dynamics of the NEE over time.

This analytical scheme is not meant to describe each period in a definitive manner. Rather, it attempts to represent policy change over time that often involves overlapping characteristics that are not easily bracketed or categorized neatly. However, this approximation of broad policy types over time can be useful in telling a story about the evolution of Colorado's policies in a way that bracketed categories might not readily capture.

## Empirical Chapters

This phase of research will be used to develop an understanding of the NEE from an historical and institutional perspective relying upon Lofland's et al's (2006) discussion of sequences, tracing back and turning points (154). I have used this approach tracing forward largely from 2004 with the passage of the first RES through referendum, continuing through 2012 and the start of the Hickenlooper administration. I have used turning points to identify key actors and important events for further research. I have used public documents related to mandates, legislation, press releases, news media, public meetings and structured interviews of key actors to develop an understanding of the NEE. The vast majority of this data collection

took place as part of the Colorado State Clean Energy Super Cluster Grant to study the NEE. In gathering data from public documents we have focused on the Governors Energy Office (GEO), The Public Utilities Commission (PUC), and state databases of both the legislative and public meetings records. We have also relied upon information published on the web and archived print media to gather data regarding press releases and news media regarding the NEE. I will have used Corbetta's (2003) discussion of institutional documents in determining appropriate types of institutional documentation advantages and problems associated with this type of data collection.

## Interviews

Through structured interviews with key actors and identified stakeholders I have attempted to reconstruct the internal deliberation and rationalizations for the forms that public outreach and participation were executed.

1. Individuals explicitly involved in the passage of all legislation regarding the NEE, this includes legislators, aides, staffers and lobbyists where available.
2. Individuals in the Public Utilities Commission who are working or have worked on issues related to the NEE. This will include interviews with past employees as they are identified or are available.
3. Individuals in the Governors Energy Office past and present, as available.
4. Individuals representing the interests of environmental and labor groups

These four areas of interview data collection provide an expansive list of subjects it is necessary to limit the total number of proposed interviews for each area. For the purposes of this project I have used 17 interviews conducted by Jon Fisk, Samantha McGraw, Linse Anderson, Dr. Dimitris Stevis, Dr. Michele Betsill and Myself as part of the Energy Super Cluster research

grant. Interviews have been conducted using a combination of phone and face to face conversations. We have prepared flexible interview guides that will allow me to shift the line of questioning according to challenges we might face in the process of conducting interviews (see interview guide appendix 1). Analysis of participant interviews has been done per (Weiss, 1994).

My research design is based on a case study of Colorado's New Energy Economy (NEE) as an evolving set of policies. The design I have chosen for this research is an embedded single case design (Yin, 2009). This approach has been chosen to accommodate the study's multiple units of analysis. In this respect the case study of the NEE will look at both policymakers, and stakeholders as differentiable starting points of policy formulation. I have chosen to focus on the specific case of the NEE because it enables me to bring concreteness to the theoretical abstractions posed by ecological modernization and industrial policy. Additionally, this approach will allow me to gain a more immediate understanding of the way in which these policies are translated to an American context. The theoretical approaches of ecological modernization and industrial policy arise from a European context, but have been employed in an American context by several scholars in their attempt to describe different American policies.

This research has been done using a variety of qualitative methods of analysis including structured interviews and semi-structured interviews. In using a qualitative approach I have gathered information regarding the history, institutional structure and input from important actors in Colorado's energy transition. I have not framed my research as an entirely generalizable nor definitive study on the topic but as a point of departure for further studies (Weiss, 1994, 168). Using the four logical tests for establishing the soundness of a research design highlighted by Yin (2009), I focus on proof of internal validity as the most difficult aspect of my research. I have addressed this weakness by providing hypotheses that facilitate Yin's requirement for

pattern matching. By including a rival hypothesis I have opened my investigation to a wider range of data interpretation and collection. This approach of providing alternative hypothesis provides for greater objectivity in assessing the empirical data for findings and conclusions.

Employing the analytical Scheme I have created to assess the NEE I will decide which of the following possibilities best represents the transition:

1. Colorado's energy transition is an example of sub-federal ecological modernization American style
2. Colorado's energy transition is an example of sub-federal industrial policy American style
3. Colorado's energy transition has features of both sub-federal ecological modernization and sub-federal industrial policy and is therefore best described using a hybrid typology of the two.
4. Colorado's energy transition is not a case of either sub-federal ecological modernization American style or sub-federal industrial policy.

## Chapter 2

### Ecological Modernization

This chapter will introduce the concept of ecological modernization. In the first section of the chapter I will provide an overview of the core elements and meaning of ecological modernization theory. In the second section I will provide an historical narrative of its theoretical origins. In the third part of this chapter, I will discuss some of the key debates surrounding ecological modernization theory. The fourth section is a description of EM in an American context both at the federal and sub-federal level. The last part of this chapter is devoted creating a typology of EM including a description of five basic approaches of EM developed from the literature (Transformative, Eco-efficient, Treadmill, Strong and Weak) that will help to inform my empirical model (See Typology 2).

#### Meaning and Elements of Ecological Modernization

The core assumption of EM is that the environmental degradation caused by the industrialization of societies can be ‘solved’ through planning and economic regulation that spurs innovation while simultaneously reducing waste (Schlosberg, 2008). The views of the early theorists of ecological modernization, particularly Joseph Huber, were developed largely as a reaction to the anti-modernist stance of the fundamentalist wing of the German Green Party. In this regard, the theory of ecological modernization can be seen as a pragmatic theory seeking to balance the competing claims of environmentalists and industry:

[Ecological modernization] did not develop primarily from a pre-existing body of social-theoretical thought... Instead, ecological modernization thought has been more strongly driven by extra-theoretical challenges and concerns (e.g. about how to respond to radical environmentalism and how to conceptualize eco-efficiency improvements that are currently linked to new management practices and

technical-spatial restructuring of production). Ecological modernization has essentially been an environmental science and policy concept... (Buttel, 2000, p.64)

Implied in the framing of environmental protection and economic growth as a win-win scenario is the notion that employment is also likely to benefit from ecological modernization. When it is applied as a normative political program, ecological modernization policy assumes that solutions for environmental problems can be reconciled with the pursuit of other societal goals. Axel Marx argues that under certain conditions, which build on certain assumptions, ecological modernization can occur such that, “the trade-off between, for instance, environmental improvement and employment is minimal or non-existing or that the creation of employment and care for the environment can be reconciled” (Marx, 2000, 312). However, Marx cautions that this does not imply, “that every instance of environmental improvement can be reconciled with economic efficiency or the creation of employment” (322). Regardless of whether or not the creation of employment is in fact compatible with certain approaches to EM, the degree to which it figures into policy calculations can help to differentiate between different approaches to modernization.

According to Gouldson and Murphy (1997), “Ecological modernization proposes that structural change must occur at the macro-economic level through broad sectoral shifts in the economy and at the micro-economic level, through the use of new and clean technologies by individual firms”(74). Despite different language and definitions used, the distinguishing characteristic of EM is its state-centered approach to industrial policy. Although the role of the state is envisioned differently in various approaches to EM, as will be discussed later in the chapter, other than the technical understanding of EM proposed early on by Joseph Huber, all

approaches of EM envision a role for the state. For example, Boehmer-Christiansen (1994) indicates that because EM is predicated on the social economy, active government intervention and state subsidies, it is a kind of green Keynesianism. EM does not perceive the state to be in direct conflict with the interests of industry, but rather as a collaborator in a process of transformation to a more efficient use of resources and decreased pollution. Weale (1992) and Jänicke and Lindemann (2010) have argued that EM requires a strong state, supporting environmental policy and innovation, offering public investment and subsidies in order to achieve economic advantage.

The role of state involvement is often characterized by a less or more open approach to policymaking. With respect to forms of successful EM, John Barry (2004, 2007) suggests that state-policy elites act as brokers and prime movers in encouraging interest groups, trade unions industry, consumer groups, and sections of the environmental movement to accept an EM agenda. Implied in Barry's assertion is a difference in approaches to ecological modernization wherein the state is more or less influential in the policy process. Likewise, it is often the case that while a strong, centralized state, insulated from interest groups, may be best able to implement authoritative and coherent policies, in the case of environmental policies, state-society ties are crucial to achieving policy effectiveness (Jänicke, 1990). For this reason, Framing state involvement in terms of a 'weak' state 'strong' state continuum can help to differentiate those approaches that are top down, corporatist arrangements from those that are more bottom up, market-driven or civil society in orientation, but a strong/weak distinction has more to do with state-society relations and their effect on policies than as a pure measure of state power. In addition, it helps to employ the distinction between 'consumerist' and 'democratic processes' which tend to favor either the private sector's competitiveness or ethical issues of equity and

empowerment respectively (Ridley and Jones, 2002). These are important considerations for any conclusions that might be drawn from the empirical data gathered on particular case studies of ecological modernization.

According to Maarten Hajer (1995) ecological modernization can take two different forms: a ‘techno-corporatist’ ecological modernization and ‘reflexive’ ecological modernization. He characterizes the first form as a “techno-administrative affair” whereas the second involves practices of social learning, cultural politics and new industrial arrangements. In reflexive ecological modernization, Hajer envisions political and economic development advancing on the basis of critical self-awareness involving public scrutiny and democratic control. Hajer stresses the need for the existence and inclusion of social movements in decision-making and advocates for strong formal mechanisms for deliberation. In large part, many theorists of ecological modernization have differentiated themselves from other forms of ‘reflexive’ ecologism by not privileging environmental objectives over social objectives; judging reforms not only on their ecosystem contribution but on other-sometimes conflicting- social values (Mol and Spaargen, 2000).

Peter Christoff (1996) builds upon Hajer’s call for social inclusion and deliberation in EM by creating a means of distinguishing different forms of EM using a continuum from ‘weak’ to ‘strong’ EM, also characterized by Christoff as technocratic/neo-corporatist/closed or deliberative democratic/open. EM in this weak/strong continuum views changes in the “environmental state” as, “going together logically with increasing activism among economic actors and with new roles for non-governmental organizations” (Fisher and Freudenburg, 2001, 702). In this conception, EM theory is seen as a “theory of political modernization” with new

and different coalitions of political actors making environmental protection politically feasible (Leroy and van Tatenhove, 2000).

### Historical Development of Ecological Modernization

In the initial period following the Second World War, societies around the globe saw the emergence of strong state governments that were able to regulate and set industrial policies without much contestation by other actors. This does not imply that the interests of industry and those of the state were often in conflict, but rather that the means of policymaking emanated from the explicit authority of the state, albeit with the prodding and approbation of business and industrial interests. However, as social and economic circumstances began to shift in the ensuing decades, corporate influence re-emerged as a countervailing power to the state in terms of policymaking prowess once again (Galbraith, 1967). During this same period of time, popular concern for the environment rose in tandem with the rise of industrial development, culminating in the publication of Rachel Carson's *Silent Spring* in 1962. Carson's publication gave substance to concerns over the devastating impacts of an unexamined wave of industrial development upon the environment, setting the stage for a decade of environmental debate that would lead to the Club of Rome Report (Meadows *et al.*, 1972) and the 1972 Stockholm conference. The understanding conveyed by both the report and the conference was that economic growth and environmental protection were mutually exclusive policy paths. In other words, the pursuit of policies that sought to limit or reverse environmental degradation would come at the cost of employment and economic growth.

In response to the popular pressure of the 1960's and the environmental consensus of the 1970's governments enacted a series of environmental pollution control policies upon industry.

While this period of time saw a mix of success and some failure in environmental policies, industry was eager to re-frame the debate to its advantage. With mounting pressure to address environmental concerns and a strong societal mandate for strong unilateral environmental regulation by the state, a new symbiosis between state and industry began to emerge. In large part, changes to the environmental regulatory regime in the 1980's involved an attempt move industry from 'end of pipe' approaches toward precautionary approaches. According to Christoff (1996), this change in regulation was accompanied by a change from regulatory approaches that involved 'technological forcing' to, "more co-operative and voluntary arrangements between government and industry"(487). For political reasons, this state-industrial relationship of environmental concern emerged quickly in Europe and slowly in the United States (Dryzek, 2008). According to Anderson and Massa (2000), this re-framing of environmental problems emerged from the German environmental debate, hinging upon the German classical virtues of *Vorsorge* (prevention rather than cure) and *Vorsprung durch Technik* (advancement through technology). At the same time, it was all but apparent that any counter productivity movement that might have resulted from environmental concern in the preceding decades had moved to the periphery of the environmental debate surrounding industrialization. In effect, what remains is a theory of development that provides for an uneasy truce between environmentalists, industry and the state, that has acknowledged a future role for industrial growth in the scope and strategies for human development. By the early eighties European theorists began to describe the process before them as an 'ecological modernization'. Thus the zero-sum notion of, "environment versus economic growth was replaced by a perspective of the possible harmonization of industry with ecology" (Anderson and Massa, 2000). The concept of ecological modernization (EM) was first formally presented by Huber (1982, 1985, 1991) and

Jänicke (1985). Huber promoted the notion of the ability of industry to transform itself, as he saw it, 'the dirty and ugly industrial caterpillar transforms into an ecological butterfly' (Huber, 1982). However, despite a broad acceptance of EM theory over the past two decades, critics have argued that it falls short of meaningful environmental reform.

### Key Debates of Ecological Modernization

Critics of EM argue that it is unaware of the limitations of modernization theory and that it expresses an uncompromising sense of technological optimism (Wehling, 1992). Wehling evaluates early theories of EM as being insufficiently 'reflexive' in dealing with the role of science and technology. Rosalind Warner (2010) contends that democratic deliberation and political conflict are irrelevant to the establishment of environmental reform under EM. Likewise, Blowers (2003) argues that the 'de-materialization' thesis of EM favors a doctrine of political consensus and consultation over democratic process and purports to include a variety of interests, but is actually exclusive, elitist and unrepresentative. Prominent theorists have attempted to address these criticisms by invoking language that seeks to create a more inclusive and democratic EM. However, despite these attempts to incorporate criticisms of EM by broadening its social and theoretical reach, deeper concerns about its political ecology and democratic capacity have yet to be addressed. Thus far, scholars have responded to the need for democratization of EM, but have not developed and applied these criteria to existing cases nor operationalized the language of 'democracy' or 'participation'. Another strong criticism of EM is that it is a theory of European industrial society and therefore has little to offer as a larger theory of international development. For this reason, ecological modernization has been distinguished from sustainable development precisely for its western focus and its silence

regarding issues of equity (Langhelle, 2000). Likewise, Ulrich Beck's (1992) writing on the 'risk society' is often characterized as the foil to Ecological Modernization theory. Beck argues against the dark side of the technological optimism embraced by EM proponents. He argues that exclusion from by the techno-scientific process has the effect of mobilizing 'sub political activities' that challenge the direction society is heading. Others have argued that although ecological modernization theory can be helpful in creating a conceptual framework with which to approach changes in economic and political structures, it has a more difficult time identifying the social processes involved through notions of situative contexts and local actors (Gibbs, 2000).

As discussed previously, early formulations of EM approached industrial modernization through a state-industry perspective. Thus, most of the empirical research on EM looks at large industry as the unit of analysis, with pressure for modernization emanating largely from the state and to a lesser extent from civil society. Conversely, 'Identity' EM tends to see modernization, particularly in the energy structure, as emanating from social movements that have the ability to create counter-hegemonic movements that force modernization upon the energy structure by creating competing structures of technological modernization. While 'identity' EM is best applied to cases of competing technological advance, it does little to inform the role of social movements in state policy-making regarding the development of counter-hegemonic forms of EM. In this respect, the political organization of the state matters. In effect, the form of state government has a profound influence not only explicitly on the degree of democratic participation in the modernization of industry, but also upon formation and efficacy of social movements and by extension the formation of counter-hegemonic technological regimes.

Although ecological modernization theory has emerged as a popular framework with which to reconcile industrial expansion and ecological degradation, it remains largely ambiguous,

facing similar criticisms to the concept of sustainable development. In particular, EM's original focus on 'efficiency' in resource throughput in industrial production has not made it readily amenable to incorporation of social concerns related to equity, democratic participation and social movements. In an attempt to address criticisms EM, theorists have attempted to speak to participatory process and stakeholder inclusion, but in attempting to do so risk digressing into a sort of nebulous catch all for environmental issues. If EM is stretched conceptually to become a skeletal framework with which to approach all processes of environmental modernization then it risks losing its theoretical purpose.

A case can be made that further development of EM theory should explore Toke's presentation of 'identity' EM as well as incorporate Bulkeley's (2006) discussion of the 'social niche'. In taking this direction in their research EM theorists can address questions of social participation and pressure external to the state-industrial relationship in a way that is more organic and oriented around the original theoretical focus. An approach that centers on social movements and counter-hegemonic regimes can more seamlessly investigate the forces of industrial modernization implicitly without digressing into the murky waters of participation, justice and equity. In this context, social movements and counter-hegemonic regimes can be observed as agents of an ecological modernization with a certain degree of theoretical passivity.

It is important however, to consider EM as variant across different industries and political arrangements. The historic origins and development of each particular industry matters to any analysis in the context of EM theory. In this respect, Toke (2011) criticizes Mol's (1995) attempt to extend empirical study of the Dutch chemical industry to generalizable understandings of EM on the grounds that the renewable energy industry has evolved in precisely such a counter-hegemonic fashion. Moving forward in a way that addresses both 'bottom up' and 'top

down' theoretical approaches to EM, it is imperative that the processes of participation in EM be defined with an understanding of both the influence of counter-hegemonic technological development as a less explicit form of societal influence on EM and explicit participatory processes of engagement between the state-industrial structure and social interest groups. In this respect, it is becoming apparent that the success of the EM transition will depend greatly upon the involvement and acquiescence of society with the modernizing process and the perception of risk (Weiland, 2007). Case studies highlighting wind project development in Spain have pointed out this deficit in deliberative arrangements in consultation at the local level have not analyzed these processes for their participatory content but rather for their larger structural flaws from a neo-Marxist or eco-political perspective (Zografos and Martinez-Alier, 2009).

It is important to recognize that those industries that have developed as counter-hegemonic regimes, specifically in response to the ecological failings of current industrial practices, have to be considered in a different light than those industries that are seen as going through a process of modernization. Likewise, in observing the state-industrial relationship in ecological modernization, the historic developments of the political state and its typology should be used to understand the limitations of approaches that focus on social movements. In this respect, Beck's *Risk Society* may actually provide a useful critique of EM in that it is oppositional to EM but not modernity.

## Ecological Modernization American Style

### Federal Level Ecological Modernization

While ecological modernization theory has been embraced by European governments, industry and environmental groups, the United States has been a bit more reticent in explicitly

adopting the language and policies of ecological modernization (Schlosberg and Dryzek, 2002). This reticence can be attributed in part to differences arising from the neo-corporatist arrangements of Northern Europeans and the prevailing neo-liberal approaches preferred, at least in rhetoric, by their American counterparts. While most of the original theorists of EM use a state-industrial approach developed through observations of Western European politics, other conceptions have emerged from the ‘global south’ in particular that conceive of EM as a response by a participatory civil society responding to neoliberal policy and placing pressure upon industry to reform (Young, 2000). Jepson et al. (2005) characterize ecological modernization in the Brazilian experience as a process of “highly contested power relations” resulting from increased democratization, influencing institutional change. In this conception, EM can be seen as a democratic response to globalization rather than a state-based industrial policy. Yet, much of the literature on democratic participation suggests that democratic process does not always correspond to effective policy-making and that corporatist reforms are most often the best drivers of environmental reform (Dryzek, 1997; Young, 2000).

An argument can also be made that Europe’s geographic, population and resource constraints have made the acceptance of the basic tenets of ecological modernization less controversial. Conversely, the vast resource pool, especially in terms of domestic fossil fuels, as well as the perceived ‘emptiness’ of the US interior, have removed the sense of urgency surrounding environmental reform felt by Northern European populations. Likewise, important historical drivers have resulted in different approaches to environmental protection between European and American environmental interest groups (Hunold and Dryzek, 2005). Finding cause in concern for wildlife and landscape protection, American environmental organizations, that would be natural champions of ecological modernization, have long been suspicious of

innovation driven policies and have done little to champion anti-pollution policies (Cohen, 2006). Many American environmentalists have benefitted from the de-materialization approaches emerging from the 70's. For example, in his (1977) book *Soft Energy paths: Toward a Durable Peace*, Amory Lovins argues that it is the 'hard' path of technological advance that will necessitate an "elitist technocracy whose exercise erodes the legitimacy of democratic government" that is inimical to equitable distribution within and among nations and leads to the decline of federalism (418). Lovins does not so much see the need for EM to become more democratic as a need to turn toward what he calls a 'soft' development path envisioned by E. F. Schumacher, (1973). Following the energy shocks under the Carter administration Orr (1979) argued that energy policy and technological choices were more a problem for our political creativity than our technical genius. He goes on to argue that it is the relationship between technology and theories of democracy that is more important than the technological transition from a technical problem. Orr states that technological choices do not follow from a "Darwinian process of natural selection" but rather are "profoundly political, affecting the "authoritative allocation of values" or "who gets what, when, and how"" (1052-1053).

According to Dryzek, explicit adoption of EM has been resisted largely as a result of an adversarial culture in the US wherein policy discourse is, "stuck in an old-fashioned standoff between supporters and opponents of the environmental policy regime established around 1970, and barely updated since" (Dryzek, 2005, 14). While business interests have succeeded in framing environmental policymaking as a trade-off with economic growth, successive US administrations have done little to counter this framing. In cases where the federal government has proposed policies meant to tackle environmental problems, these policies have not followed a model of collaboration broadly seen in a European context. In fact, business interests have

appealed repeatedly to neo liberal discourses of ‘free markets’ and ‘non-government intervention’ as an argument against government action wherever more coherent federal policies might benefit the development of environmental technologies. Where conventional industry finds it advantageous, arguments are made regarding ‘market distortions’ arising from government subsidies and that danger of government ‘picking winners’ in the marketplace.

### Sub-Federal Ecological Modernization

Schlosberg and Rinfret (2008) argue that in most cases where industry has worked with the government to create new legislation, it has not taken the form of a more inclusive corporatist arrangement where environmental voices have a seat at the table. While Anne Scheinberg (2003) and Pellow et al. (2000) have argued that the modernization of waste management practices in North America constitutes an example of EM in practice, she argues that this evidence is not located at the level of the nation state, but rather is, “‘down’ from the level of the nation state to that of state, province, county and municipality.” In Scheinberg’s estimation, “It is the aggregation of all the small- and medium-scale efforts that gives the picture of ecological modernization North American Style... in the North American context it is not industry-nation state relationships that are changed, but the relationships between industry and government, which, in US context, means state, county and local government (72).

More recently, a perceived shift is occurring with EM-influenced discourse becoming more mainstream promoting efficiency, developing new technologies and defining economic growth and environmental quality as a win-win scenario (Schlosberg and Rinfret, 2008). Given the federal government’s reluctance to incorporate EM into federal policy, the task of implementing EM policy has fallen largely to private companies and individual states (259).

This has resulted in a more ad hoc adoption of EM in a less coherent and decentralized manner, which in effect lacks the efficacy of European inclusive corporatist approaches formed at the federal level. While Gibbs (2000) argues that ecological modernization takes place at the sub-national scale, especially in concert with strategies of economic development, he concedes that devolution of policy to lower levels is not a problem-free process. In practice, this American style adoption of EM has manifested itself in the form of state-level policies related to carbon emissions and renewable portfolio standards (RES) as well as more integrated approaches by state governments that look at the promotion of ‘clean energy economies’ as seen in the attempt by the state of Colorado to create a comprehensive state level policy that addresses economic and environmental concerns simultaneously.

### Towards A Typology of EM

Differing conceptions of ecological modernization have arisen from its original emergence in the early eighties. In particular, what do we privilege when we consider different approaches to ecological modernization? This is an important question if, for example, we understand the limitation placed upon the rate of adoption of progressive ecological technologies and processes to be an economic one. In an approach characterized by an economic imperative, preference in technological choice may be given to renewables that provide short-run economic benefits, without consideration for long-term trajectories or ecological impacts being internalized in the decision-making process. Likewise, investments in technologies with uncertain outcomes or long development horizons may not be politically feasible in the context of a strong economic imperative. Ecological modernization as described by its early theorists, attempts to reconcile an increasingly threatened state of ecological affairs under a continuing economic imperative.

While Mol and Spaargen (2005) argues that economic and ecological rationalities should be balanced, it is hard to say how this approach would be put into practice. It is however possible to argue that conceptions of ecological modernization should be differentiated based upon the degree to which they privilege either economic or ecological rationalities in practice. For example, stronger environmental approaches might explicitly privilege ecological concerns.

Mitchell (2008, 206) argues that such solutions will require:

A shift of the political paradigm to one where the value of economic dominance is diluted so that, in matters of climate change, the environmental options takes precedent. That means that as far as possible, when designing a policy, that the part of the economic dimension which slows the process down or limits innovation or change, should be bypassed (or replaced by 'just do it').

Conversely, Keil and Desfor (2003) argue that a preponderance of theorists see ecological modernization as a means for capitalism to green itself

Eco-modernised capitalism, it is claimed, can be counted on to take good care of our planet. In this sense, ecological modernization is part of an overall approach towards sustainability, and more particularly, about nature under capitalism. Keil and Desfor, 2003, 30).

It is important to note that identifying an approach as having an ecological imperative rather than an economic imperative does not imply more as opposed to less of a values-based judgment or vice versa. It does however make values explicit, aiding attempts to distinguish between the approaches to ecological modernization. As Toke (2011) points out, “arguments about the future (and often even current) costs and resources of different energy technologies will be heavily conditioned by the values underpinning the paradigms to which a given actor/interest group is affiliated.”

The extent to which differing approaches to ecological modernization privilege ecological or economic rationalities can be uncovered by looking more closely at their rationale for ecological preservation. Here again, there is a continuum of thought on the environment which, on one end, starts with an understanding of the environment as a limiting resource, requiring a technologically nimble form of industry, one able to constantly substitute and reconfigure itself in order to accomplish objectives of ever increasing productivity. On the other end of the continuum is an approach that seeks to reconfigure industry in a transformative way so as to reflect a focus on ecological balance and environmental protection. In general, different approaches to EM can be separated into five categories drawing upon the preceding discussion of ecological modernization. These five categories follow below and are complemented by Typology 1 at the end of this chapter.

## Typology 1

. Approaches to Ecological Modernization (adapted from Baker et al., *The Politics of Sustainable Development*, Table .1, pg. 9).

Approach to Ecological Modernization	Environment	Economy	Technology/Innovation	Decision-making
Transformative EM	Strong Bio-ethic Invokes Precautionary Principle Bioregional/International	Steady-State Economy Socio-Economic Reorganization Changes to Patterns of Production/Consumption A-Growth/De-Growth	Appropriate Technology Closed Loop Reflective Innovation	Decentralized/Grassroots Privileges Social Goals Strong State Involvement Institutional Transformation
Strong EM	Environmental Protection Environmental Caps International Focus	Regulated Market Changes to Patterns of Production	Clean Technologies Product Life-Cycle Analysis Green Process/Products	Participatory/Open-Ended Process Strong State Involvement Strong Institutional Change
Weak EM	Sustenance Base Concerns Environmental Management Capital/Resource Substitution National/Regional	Market Driven Policies Monetization of Environment	End of Pipe Low Cost Adoption Inertial	Weak Institutional Change Technocratic/Closed Strong State Involvement Meso-Corporatist
Treadmill-EM	Resource Extraction Capital/Resource Substitution Market-Level Focus Sustenance Base Concerns	Exponential growth	End of Pipe Low Cost Adoption Inertial	Technocratic/Closed Weak State Involvement Industry-Driven Weak Institutional Change
Eco-efficient EM	Capital/Resource Substitution Throughput Reduction Market-Level Focus	Market-Driven Policies Firm-level Considerations	Efficiency Process/Product	Technocratic/Closed No State Involvement Managerial

## Transformative EM

At one end of the ecological modernization environmental continuum lies an approach to ecological modernization that considers the environment to have an intrinsic worth that transcends its instrumental value. In this approach great consideration for the environment takes the form of a strong bio-ethic which allows for ecological imperatives to subjugate economic imperatives where they come into conflict. A 'transformative' ecological modernization of this sort would be able to encompass a scope and scale that is at least international in nature with bioregional rather than political boundaries but still able to focus on sub-national areas traditionally neglected by EM theorists (Gibbs, 2000). In practice, such a shift would be evidenced by a strong version of the precautionary principle wherein ecological protection becomes the determining criteria for decision-makers. Additionally a 'transformative' EM allows for the highest degree of public participation in the decision-making process. This would require a reshaping of institutions allowing for stronger public engagement. For example, in assessing the rising influence of the renewable energy sector, Toke (2011) argues that the foundation of EM lies in participation and support of the public and more broadly within social movements.

According to Toke it is through strong grassroots mobilizations and public participation with renewable energy technologies that transformation in the renewable energy structure will occur. Toke uses Elizabeth Shove's (2006) allusion to a Jevon's paradox of efficiency to argue that a successful conception of EM must include an acknowledgement of the potential for a permanent disruption of 'normalized' consumption patterns on the basis of new, greener, technological identities. The extent to which recognition the role consumption plays in the ecologization of society is often viewed as a peripheral concern to the core EM focus on

efficiency. However, as EM proponents have attempted to respond to this criticism, they have begun to look more closely at the role of civil society in modernization. Anderson and Massa (2000) argue that ecological modernization theory should abandon its efficiency rhetoric entirely in acknowledging the limitations of its neoclassical economic paradigm and instead focus more acutely on issues of governance capacity. By elevating the role of the public in decision-making with regard to EM processes, alternative economic and social arrangements have a greater likelihood of being reflected in policy. Alternatives to pro-growth economic imperatives such as, steady state economies (Daly, 1996; Jackson, 2009) and A-Growth and De-Growth (Martinez-Allier, 2010; Kallis, 2010; van den Bergh, 2011) enable deep changes to patterns of production and consumption. Technologically, a ‘transformative’ EM would seek a pro-technological path that seeks to incorporate principles of appropriate technology, reflective innovation and completely closed loop processes of production (Lovins, 1977; Orr, 1979). Shifting the economic imperative to an ecological imperative enables a restructuring of technological/innovative processes.

### Strong EM

‘Strong’ ecological modernization is concerned with environmental protection and tends to incorporate environmental caps as a means of reaching explicit environmental goals. It would entail strong changes to society’s institutional and economic structure emanating from a strong state that is committed to certain environmental policies that are clearly defined, enforceable and binding. As such, markets for energy and environmental goods would have to be created and regulated with specific policy ends in mind. In terms of its focus, ‘strong’ EM is necessarily international in scope, relying upon state and regional networks to affirm environmental goals

amongst voluntary actors. In terms of political decision-making, 'strong' EM would seek to foster deliberative and open-ended democratic processes for decision-making with opportunities for participation (Dryzek, 1997, 147-148). As a result of its stronger focus on overall environmental goals and economic restructuring 'strong' EM would require a preference for technologies and innovations that look at processes that employ product life-cycle analysis and include green process in addition to green product foci. It is important to the international environmental focus of EM that entire product life-cycle and green process be employed in order to guarantee that global environmental concerns that extend beyond the firm or regional level be incorporated into industrial restructuring.

#### Weak EM

In the intervening area between the extreme ends of ecological modernization's environmental continuum lie conceptions of 'weak' and 'strong' ecological modernization (Christoff, 1996). 'Weak' ecological modernization tends to be concerned with environmental management, without explicit environmental goals. It is mostly national in scope without a capacity to encompass international environmental concerns, instead focusing on internal reform in industrialized nations (Christoff, 1996, 488). 'Weak' EM often echoes sustenance base concerns such as waste management, efficiency, emissions and resource substitution/management. This implies a preference for monetization of the environment as a resource for economic growth. Social needs and other values that are not easily commoditized or measured so they are left out of any calculations made under a 'weak' regime of ecological modernization. 'Weak' EM is characterized politically by a technocratic, corporatist approach wherein decision-making is largely the domain of the political class and industry. Christoff (1996,

488) argues that this form of EM, “may prove primarily a rhetorical device seeking to manage radical dissent and secure the legitimacy of existing policy while delivering limited, economically acceptable environmental improvements.” As such, ‘weak’ EM would seek to employ technologies and innovations that produce green products with some immediate end of pipe concerns. It would not have the capacity to think about larger life-cycle analysis in its entirety, extending beyond the production of the product at the regional or national level.

### Treadmill EM

This approach borrows from Allan Schnaiberg’s ‘treadmill of production’ framework combining it with early conceptions of ecological modernization to form a hybrid approach. Schnaiberg argued that the requirement of profit would fuel continuous technological advance driving an expansion of production and consumption. He argues that this would reinforce a cycle, or treadmill, of production and consumption with the complicity of the state, organized labor and industry, each dependent upon an ever-expanding regime of production and consumption. Thus, he argued that under such a system the environment would be continuously degraded as more resources were demanded and more pollution was generated, contending that any realistic attempt to achieve actual environmental balance would necessitate a restructuring of the political economy away from growth dependence (York, 2006).

Treadmill-EM can be considered to be a more comprehensive version of eco-efficient EM having a more macro focus with a capacity for state intervention. Treadmill-EM’s EM component is drawn from early conceptualizations of EM espoused by Joseph Huber (and later Arthur Mol) wherein the EM focus is still on the efficiency of industry, with an understanding that greater macro forces have some impact on the firm’s decision-making. In this approach

however, there are still no significant controls placed upon industry to force technological change in the form of strong environmental regulation or climate caps. Treadmill-EM is focused on macro efficiency of industry across several sectors without a greater appreciation for the political economy of growth dependence. For example, Mol (1995) argues for an ecological modernization of industry on the grounds that industry's future prosperity depends upon what he refers to as its 'sustenance base'. Mol argues for technological advances that support current levels of human population through the preservation of planet's ability to provide sustenance. In scope and scale, this approach to ecological modernization is preoccupied with firm-level consideration and only scales up to an international scale in so far as firms and industries interact to effect production. This approach to ecological modernization, that takes an instrumental view of nature limited to consideration of throughput, efficiency and maintenance, without considering the aggregate effects of growth and consumption risks moving from an industrial 'treadmill of production' to an ecological modernization 'treadmill of production'.

#### Eco-Efficient EM

This conception of EM takes an instrumental view of nature as subservient to the goals of industrial production. However, this view of the environment can be considered ecologically minded and thus distinct from simple industrial policy for the reason of its concern with efficiency of throughput and perhaps its professed attempt to model industry after ecology. Frosch and Gallopoulos (1989) formalized this approach to ecological modernization when they described it as 'industrial ecology' in their paper *Strategies for Manufacturing*. They argue that in order to sustain our way of living in the face of decreasing supplies and materials, as well as the attendant effects of waste and pollution that the industrial 'ecosystem' must be made to

“function as an analogue to biological ecosystems.”(p.144). This approach, which can be characterized as an eco-efficient ecological modernization, refers to the environment in the context of ‘supplies and materials’ while still arguing for an equivalency between industrial and biological systems. Decisions are made at the level of the firm, with an acknowledgement that various firms can potentially coordinate their resources and actions in a larger eco-system. Theoretically, there is not a capacity for state involvement in the decision-making processes of the eco-efficient firm.

## Conclusion

Adapted from Christoff’s (1996) continuum ‘weak’ and ‘strong’ approaches tend to lie in the middle of my typology, in so far as they have varying abilities and strategies to meet similar environmental goals but have more capacity for environmental concern than ‘treadmill’ or ‘eco-efficient’ ecological modernization, but fall short of privileging the environment over economic rationalities in the way that ‘transformative’ ecological modernization does. Taken together, these four approaches provide a means of thinking about the impact of Colorado’s New Energy Economy from an ecological modernization perspective. In the subsequent chapter I will employ a similar approach using the four categories employed in the EM typology (Typology 1) to provide a means of thinking about industrial policy in the context of Colorado’s NEE. Ultimately, the ecological modernization chart and industrial policy chart will be fused together into a master chart that I will use in a final assessment of the NEE in its totality.

## **Chapter 3**

### **Industrial Policy**

This chapter will introduce the concept of industrial policy. In the first section of the chapter I will provide an overview of the core elements and meaning of industrial policy theory (IP). In the second section I will provide an historical narrative of its theoretical the origins. In the third part of this chapter, I will discuss some of the key debates surrounding industrial policy theory. The fourth section is a description of IP in an American context both at the federal and sub-federal level. The last part of this chapter is devoted creating a typology of IP including a description of four basic approaches of IP developed from the literature (Grey Industrial Policy, Economic Development, Green Manufacturing and Green Industrial Policy) that will help to inform my empirical model.

#### **Core Elements and Meaning of Industrial Policy**

Although there is not a unified definition of Industrial Policy, there is a broader agreement that it involves a strategic effort by the state to influence sectoral development and promote structural change. In general, policy proposals comprising industrial policy can be grouped into five categories: policies to ease adjustment to industrial decline; research and development policies; support for key industries; investment in the growth of new industries and coordination of existing policies (Hudson, 1985). Dubnik and Holt (1985) suggest that Industrial Policy is intentional and active and based on these criteria have developed four types of state industrial policy that are, “distinguishable based on strategic differences.” The four types described emphasize trade policy, sectorial targeting, infrastructure investment and subnational

jurisdiction competition (p.116). Eisinger divides policy into four categories: export programs, high-tech programs, venture capital and mature industries. Another means of distinguishing between industrial policy types lies in the distinction between manufacturing and information economies. In this regard, Manuel Castells (2009) argues that while the two are not mutually exclusive, given examples from Germany and Japan, there is an important and worthwhile distinction to be made. Additionally, industrial policy can be differentiated in the US context as either emanating from the federal or state level. While Industrial Policy at the federal level has the capacity to address employment it is not necessarily a foundational focus. However, as industrial policy becomes a sub-national strategy, in some instances couched in the language of economic development, employment becomes a central policy objective.

Proponents of an industrial policy argue that it must, “rest on a strong public consensus about overall goals” (Magaziner and Reich, 1983). In response to the absence of a successful American industrial policy at the federal level, many U.S. states have adopted an interventionist stance with regard to local and regional economic policy. According to Susan Hansen, this has led to considerable changes both in the substance of state economic policies and in the process through which they are developed, implemented, and evaluated. In the U.S. context, industrial policy that occurs at the state level assumes a neoliberal, corporatist hue. For this reason state-level economic policies are better framed in a neoliberal corporatist framework, which provides more explanatory power than the traditional interest representation pluralism frameworks (Silver, 1987; Silver and Burton, 1986; Hayden et al., 1985). Peter Eisinger (1990) argues similarly that state industrial policy does indeed exist and that it takes a programmatic form such that it can be considered to have, “defining elements common to most industrial policies.” Eisinger goes further in describing state industrial policy as being, “developed by special gubernatorial

commissions, whose tripartite composition (business, labor and government) and procedures (consensus-building) strongly resemble the corporatist industrial policy-making arrangements found in Canada and the small European countries” (p. 513). An important feature of industrial policy is its shared theoretical origins with other European theories of development, in particular, neoliberal corporatist interpretations of state industrial policy that closely resemble ecological modernization policy. Although this chapter does not explicitly draw out parallels between the two policies, I will treat this topic later on in the empirical chapters.

### A History of Industrial Policy in the US

Cleavages existing between business and civic cultures have a long standing in American history. This contentious relationship has shaped the identity of America’s economic and social organizations. In many instances, a cultural wariness of domination by government, born as a result of the tortured origins of the American state, has affixed a culture favoring individualism over civic cooperation. Likewise, the narrative of a seemingly limitless opportunity for expansion and a vast resource base on an ‘empty’ continent served in many respects to reinforce many dominant culture mythologies that have endured well beyond their useful life. The effects of this cultural heritage can be seen in anemic environmental policies with regard to energy conservation, inadequate treatment of pollutants and toxins resulting from industrial processes, as well as a general distain for government intervention (Reich, 1983).

However, as the era of endless frontiers and limitless resources came to an end and more structured forms of business began to appear, necessitating a more coherent national economic strategy, America underwent a fundamental change in the way that government would be called upon to take a more active role in the economic affairs of the nation. It is important to note that,

however much the fundamental relationship between the American government and its citizens has changed the discourse that defined these relationships remains unchanged. While civic concerns have often found voice in the incarnation of populist movements, i.e., labor association and resultant legislation, the countering influence of business interests has played a forceful if not dominant role in the developmental path of the US. This competition for influence is described by Reich as a, “pendulum-like vacillation in American’s fundamental loyalties” (Reich, 1983, 8).

Despite the underlying tension pointed to in the dichotomy of business and civic cultures present in the US, government policies meant to stimulate economic development have been a longstanding and contested feature of the American economy. In his, “Report on the Subject of Manufacturers”, Alexander Hamilton makes a clear argument for the need for an industrial policy

The continuance of bounties on manufacturers long established must always be of questionable policy; because a presumption would arise, in every such case, that there were natural and inherent impediments to success. But, in new undertakings, they are so justifiable as they are oftentimes necessary. There is no purpose to which public money can be more beneficially applied than to the acquisition of a new and useful branch of industry; no consideration more valuable than a permanent addition to the general stock of productive labor (Alexander Hamilton, 1791, 136).

Conversely, Thomas Jefferson was viscerally opposed to this sort of intervention, insisting that it would lead to abuses of power and elite control of institutions at the expense of the states. Likewise, Hoover and Eisenhower fell on opposite sides of the debate over what role government was to play in the economic fortunes of the nation. Yet, in spite of the highly contested nature of government involvement in economic affairs, the federal government has played a significant role in the US economy. In fact, throughout much of the 19<sup>th</sup> century, government has been used as an ‘agent’ of economic development. Government, at both the federal and state level, did not replace the vitality of private activity during this period, rather, “it

shared in the risk by providing direct subsidies and supplying a legal framework that indirectly subsidized risk-taking” (Magaziner and Reich, 1982, 197). During this period, government influence of private enterprise acted as an important ingredient in the mobilization of the productive forces of the community. This has been particularly true at the state level specifically for reasons particular to the historical development of the nation.

Despite such instances of strong and meaningful government involvement in the economic and industrial affairs of the nation, the US has never developed an ‘industrial policy’ akin to those practiced in European and Asian industrialized nations. In the 19<sup>th</sup> century, with the nascent state of the US economy, large resource base and protectionist policies, this lack of a coherent policy was less important to the development of the nation. Even in the early decades of the 20<sup>th</sup> century, the US economy was a large beneficiary of the military industrial mobilizations that acted to initiate a large role for government-driven economic development in tandem with a resulting decline of European and Asian nations in the aftermath of the Second World War (Block, 2011). However, US advantage resulting from the industrial devastation of war in Europe and Asia was to be short lived as the rest of the world began a feverish campaign of rebuilding. Throughout the post war decades of the fifties and sixties, while European and Asian nations, in the pursuit of re-building their industrial competitiveness, for better or worse, chose to pursue coherent industrial policies, the US pursued an “industrial policy by default” in which, “government and business are inextricably intertwined but in which the goal of international competitiveness has not figured” (Magaziner and Reich, 1982, 255). The US alternative to a consciously constructed industrial policy has meant that the government has largely abdicated its prerogative to direct economic development and instead, “allow[ed] its

promotional policies to be shaped by politically powerful businesses and geographic regions and by the necessities of its defense programs” (Magaziner and Reich, 1982, 200).

Leading up to the 1960’s the power pendulum would swing back and forth between civic and business interests, leading to action and reaction on both sides. In the 1960’s civic groups found momentum on their side in response to a set of public concerns resulting from an intense period of industrial development. This led to serious environmental, health and consumer safety legislation imposed upon industry and accompanied by a host of other social programs. This in turn led to yet another counter response by the entrenched interests of the business community, culminating in the election of Ronald Reagan in 1981. Over the preceding decade, rising energy costs, declining industrial productivity and persistent stagflation called into question many of the key economic policy assumptions of the Keynesian macroeconomic doctrine, challenging the social consensus of post-World War II embedded liberalism. In response, the American left proposed an “industrial policy”, shifting from macroeconomic management of Keynesianism to systemic government intervention as an alternative economic policy prescription. Yet, it was the alternatives of supply side economics and traditional laissez faire approaches, dominated by proposals from the right and embraced by Ronald Reagan, that eventually won the day (Hudson, 1985). The Reagan response, championed by the business culture, re-invigorated the mythology of the individual and the inherent, resultant distrust of the federal government.

The business culture’s success in bringing back the ‘founding’ values of the nation heralded a return to a suspicion of government and gave rise to what would come to be known as a ‘neoliberal’ economic approach, precisely at a time when the industrial fortunes of the United States were in the midst of a prolonged and troublesome decline in parallel to the resurgent industrial economies of Western Europe and the industrializing developing nations. While this

shift to a 'neoliberal' discourse did not in fact reduce the involvement of government in economic affairs, it did have a profound impact on the role of the government in the industrial and economic affairs of the nation. The idea of strategic intervention through an 'industrial policy' became anathema and fell to the back of the line in terms of the considerations for possible policy approaches to combat the industrial malaise. Despite this, during the 1980's while some activities of the government with respect to industrial activities were curtailed in certain areas, overall, this period saw a steady expansion in government. Almost all of this activity assumed a lower profile, even in comparison to the previous decade, with policy makers often eulogizing the virtues of a 'free market' system, while simultaneously exercising the prerogative of Congress and the Presidency to direct federal subsidy and legislation toward activities of 'national interest' in a discrete fashion.

By the time the early 1980's arrived, serious skepticism as to the probable success of the Reagan era policies provoked a strong debate regarding the utility and necessity for an explicit, comprehensive US industrial policy. Largely revived by scholars who pointed to the accomplishments of the Europeans and Japanese, industrial policy again gained political currency on a national stage. As it moved from the periphery of academic machinations into the political spotlight, industrial policy attracted proponents (Bluestone and Harrison, 1982; Magaziner and Reich, 1982; Thurow, 1980; Reich, 1983 and Rohatyn, 1983) as well as critics (Schultze, 1983, Hudson, 1985). In many respects, proponents of industrial policy did not perceive themselves to be advocates of the left so much as a practical bi-partisan approach to international competitiveness. As Lester Thurow (1980) articulates in his book, *The Zero Sum Society*, "Major investment decisions have become too important to be left to the private market alone, but a way must be found to incorporate private corporate planning into this process in a

non-adversarial way. Japan Inc. needs to be met with U.S.A. Inc." However, the concept ultimately gained considerable currency amongst Democrats seeking to articulate a counter message to Reagan's economic platform, politicizing the industrial policy even further. Thus, the renewed debate over 'industrial policy' in the 80's at once re-opened old cleavages between competing visions for American society, while also serving as a politically expedient platform for the political opposition. What then has been the result of this debate?

### Key Debates of Industrial Policy

Some resistance to the utilization of an industrial policy has come from surprising quarters, as prominent voices on the left writing at the time argued that an American style corporatism would be an unwelcome development for US industry. Charles Schultze, serving in the Carter administration, saw proposals as adding a layer of unnecessary bureaucracy to the federal government (Schultze, 1983). Paul Krugman (1983) while arguing in favor of some deviations from the competitive model, questioned the ability of any policy to properly identify and target industries for support. With a different set of concerns, Samuel Bowles et al. (1983) challenges the idea of industrial policy on the grounds that that sort of 'corporatism' set to emerge from proposed policies was precisely what should be avoided as it would privilege business interests over those of others, notably, consumers and labor. Still, others argued that if the federal model could not succeed given the composition of American politics, then policies might appear at other scales (Eisinger, 1990).

William E. Hudson has responded to the scholarship by proponents of an American industrial policy by arguing that the effect of a corporatist arrangement currently being advocated for simply re-packages what has, admittedly, been going on for a long time already.

He argues that without more fundamental change, the end result of an expansion and centralization of existing economic policy will, within the parameters of what the American political system can produce, be simply, “policy-making mechanisms on the interest group liberal design” (Hudson, 1985, 472). Hudson uses the work of Lowi and McConnell (1979) to argue that the foundational politics of the American state will only incorporate a corporatist framework up and to the point where it affirms long-standing processes of interest group liberal policymaking. In lieu of the ability to enact a more transformative policy, Hudson argues for an incremental approach citing Lindbolm’s (1979) assertion that change should not be revolutionary, nor does the government have the capacity for large one-step change.

## Industrial Policy American Style

### Federal level

To some extent the debate over whether America should have an ‘industrial policy’ begs the question of whether or not a coherent industrial policy is possible given the historic, social and political make-up of the nation. Deeply seeded ideologies and historic developments in any nation contribute to a unique discourse regarding economic development, but also contribute to a persistence of, “politics, history, institutions and producers” that are hard to dislodge when a change in direction is desired (Duchene and Shepherd, 1987). Path dependencies emerging from capital commitments to infrastructure and types of industry in particular can often be much easier to re-direct, over the short- term, than deeply rooted cultural and social behaviors. It would seem that much of the justification provided by the intellectual drive for an industrial policy in the US is based upon the observation of other countries that have adopted such a policy and the apparent success it has entailed. However, these countries have also experienced separate histories from

that of the United States and so, while they can be used as examples in general, some comparison is important to understand how such policies would need to be translated to an American context.

As mentioned earlier, the United States has an historical and cultural path of economic development conditioned on relative ‘emptiness’ and resource abundance. Whereas Europe and Japan were mature societies with structures in place that required not simply an expansion of economic activity, but a radical restructuring, often by force, in order to advance (Kemp, 1983; Lüdtke, 1979). The process of industrialization for Europe and Japan came much later than the US and was more disruptive and violent. This has meant that these countries have “been forced by their histories to appreciate the link between their civic and business cultures”<sup>1</sup> (Reich, 1983, 15). In form, these countries follow a ‘corporatist’ arrangement, wherein the interests of business and government are understood to converge. Arrangements of this sort avail themselves to strong policy interventions by governments with little contestation.

In practice, corporatism is understood as a middle ground between laissez-faire capitalism and socialism. The underlying purpose of a corporatist model is to limit conflicts between labor and capital, business and government with the understanding that economic growth and international competitiveness will be enhanced. While there is national variety in the way corporatist relations take form, its key purpose is to manage social relationships in order to create a stronger consensus around economic growth (Hansen, 1989). Although an increasing concentration of economic and government power has been a consistent feature of the American landscape over the last century, the corporatist model is not amenable to the current state of US

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<sup>1</sup> In his book, *Small States in World Markets: Industrial Policy in Europe*, Peter J. Katzenstein cautions against Reich’s ‘lumping together’ of Europe and Japan as examples of industrial policy and instead proposes a more complex and comparative approach, breaking these areas into subgroups of countries following ‘corporatist’ and ‘statist’ models (p. 20).

political affairs for several reasons. The American political system is rooted in federalism and the prevention of the concentration of power, a suspicion of government, and longstanding adversarial relations between civic and business cultures. Dyson and Wilks (1983) argue that, in the US context, an approach that describes ‘industrial policies’ as short-term crisis management at the behest of organized interest groups such as defense interests, is most appropriate. In fact, their position quickly approaches models of pluralism traditionally used to describe American politics. In distinguishing between corporatist and pluralist models, Moore and Booth (1989, 5) say, “What distinguishes the corporatist analysis from pluralist models is not its concern with organized interests but their relationship to the state, and in particular, the fusion of interest representation and policy-making responsibility.” Although I will not go into further detail in the comparisons between corporatist and pluralist political arrangements, it is important to note the similarities between the two in practice.

#### Sub-Federal Level

While the debate surrounding ‘industrial policy’, up until the 1980’s had taken the ‘state’ as its unit of analysis, scholarship in the latter half of the decade began to look at the ‘U.S. states’ for illumination. Dubnick and Holt (1985) and later, Hansen’s (1989) scholarship, signaled a shift in placing the microscope on states as the primary breeding grounds for industrial policy. This new focus was more than likely the result of the federal level debate exhausting itself, but also the result of mounting empirical evidence that states had been attempting to create effective economic policies for themselves. As a result of much debate and even a high profile attempt to implement ‘industrial policy’ in Rhode Island (See, Silver, 1987; Silver and Burton, 1986) the scholarship on industrial policy did what many US states had begun to do much earlier, tackle

industrial policy at the state level in the face of an inadequate federal policy. This shift, both by the states and academics, spawned a great deal of conversation in the ensuing decade with some successes and failures, which will be described in the next section.

To look more closely at those spaces where cooperation might occur, resembling corporatism within the larger pluralistic framework of US politics occurs, some authors refer to 'meso-corporatism'. Hansen (1989, 176) argues that meso-corporatism occurs where,

Mediating institutions are present in a particular region or a level of government. Popular attitudes (strong regional identity, shared political culture), elite cohesion, a well-organized political party, or close relationships among political and economic leaders, can all operate to produce a high degree of consensus on the ends and means of economic policy.

Meso-corporatism can be seen in the way US state governments have taken on an increasing role in economic planning over the past several decades. Changing economic conditions have fostered more cooperation and, "state initiative, private-public partnerships, nonprofit economic-development corporations, and labor/management forums have been established and encouraged with government funding" (Hansen, 1989, 177). Many of these state level efforts have also attempted to depoliticize 'industrial policy' by positioning it as 'economic development' (Clarke and Gaile, 1989). In summary, the political inability of the federal government to marshal a coherent industrial policy has forced states to fill the void

In response to an implicit federal policy, states which have suffered the most from de-industrialization have moved in the direction of overt, sector-specific, industrial policies. And in response to lack of consensus in Washington, states have looked for new ways to create consensus and legitimize intervention in their economies (Hansen, 1989, p.194) As was discussed earlier in the chapter, the contested nature of US economic policy has affected the role of the federal government in the economic affairs of the nation. Particularly in the last four decades, beginning with the Nixon administration and reaching a zenith during the Reagan years, an explicit policy of government intervention has not been possible. While this

has in many ways presented a challenge to federal level ambitions, it has not prevented the federal government from pursuing strategic economic policy goals through less explicit approaches. As a result of this quiet, decentralized approach to strategic intervention, it has been possible for policymakers to maintain the rhetoric of market forces, while still directing important sectors of the economy. While the argument over the efficacy of this approach persists, the allocation of federal resources towards a strategic economic end is undeniable. Likewise, its impact upon the states, although not always apparent, by design, has been a hallmark of this policy. In this section I will discuss both the form as well as the implications of this alternative approach to economic policy. In particular, I will highlight what this means for the US states who find themselves in the dual position of influencing state level economic policy while feeling the influence of this non-explicit federal strategy.

While the government has played a critical role in the economic development of the US from its founding, the intensity of this relationship was greatly increased with World War II and the ensuing cold war period. Sociologist Fred Block (2011) points to four key turning points in this enhanced role for government in what he terms the ‘stealth state’; World War II, 1957 (the move toward greater decentralization, the 1980’s (the Reagan Era) and the Obama administration. In the first turning point, the US government was able to dramatically increase its technological and scientific capabilities leading to the establishment of the atomic laboratory system through the Manhattan project, including Los Alamos, Lawrence Berkeley, Oak Ridge, and Sandia. At the same time government officials assumed responsibility for pushing forward the technological frontier. This period served to institutionalize the role of the military as the conduit between the government and technological and economic affairs of the nation. The second turning point was institutionalized in 1958 with the creation of the defense advanced research projects agency

(DARPA). The creation of DARPA served to decentralize innovation and enabled the diffusion of technology by promoting public private partnerships between start-ups, larger firms and university researchers, leading to the commercialization and industrial build out of technological innovation. The third turning point began with the Reagan administration and served to further de-centralize and submerge this form of military industrial policy. Although the Reagan administration rejected any sort of explicit industrial policy on the Japanese or European model, it embraced and even accelerated the decentralized policies of the DARPA model (Block 2008; Slaughter and Rhoades 2002). The fourth turning point coincides with the Obama administration and the money allocated to federal projects and states through the American Recovery and Reinvestment Act (ARRA). Through this act, the federal government has allocated tens of billions of dollars to the department of energy (DOE) representing an “unprecedented expansion of government innovations to shape innovation in the civilian economy” (Block, 2011, 14). These efforts by the Obama administration are meant to overcome some of the shortcomings in the decentralized industrial policymaking of the US government by providing direct assistance to firms building production facilities, increasing the likelihood of new technologies being ramped up for mass production. The extent to which this fourth turning point turns out to be enduring depends upon the continuation and continuity of support after the initial burst of ARRA related monies is exhausted (ibid).

The decentralized industrial policy strategy of the federal government has had far reaching impacts upon various US states and the public. As the physical endpoints of laboratories and investment, the economic policies and political environs of many states have been profoundly affected by policies and resource allocations emanating from the federal level. While many states do not make explicit mention of the influence of federal level investment and

subsidy for their economies, they are all engaged through the office of the executive and congressional representatives in the attraction and retention of federal resources. In fact, it is often the case that, state economic policies, absent federal resources, remain paper tigers.

Suzanne Mettler best describes this relationship between interests and the federal government

Especially during the past two decades, the submerged state has nurtured particular sectors of the market economy and they have in turn invested in strengthening their political capacity for the sake of preserving existing arrangements. As a result, the alteration of such arrangements has required either defeating entrenched interests—which has proven impossible in most cases—or, more typically, negotiating with and accommodating them (Mettler, 2011, 804).

In his Chapter “Green Capitalists in a Purple State” Andrew Schrank (2011) points to the state of New Mexico as the beneficiary of targeted federal investment through the levers of the federal government’s decentralized industrial policy. Using Los Alamos and its eventual offshoot, Sandia laboratory, as a tool of technology driven policy, the federal government created an environment that would lead to an embrace of technological innovation and commercialization of renewable energy technologies in what would otherwise be an oil patch state. Schrank (2011) argues that it is precisely the government’s strategic intervention through Sandia laboratories that has recast the economic identity of New Mexico and spawned the Entrepreneurial and political activity that currently embraces the renewables sector. Other scholars have argued that states themselves have also sought to engage in policymaking, absent a coherent federal approach.

Peter Eisinger argues that, although the United States does not have an industrial policy, “the U.S. states have assumed a role in vigorous, self-conscious, planned micro-economic intervention generally regarded as foreign to the American political economy” (Eisinger, 1990, 511). As the national conversation regarding a federal level industrial policy wound down in the

late 80's, the role of US states has come to embody an alternative path forward for Industrial policy in the US<sup>2</sup>. In the past, economic activity at the state-level often took the form of zero-sum competition to attract established firms. As competition increased, the attention of policymakers shifted from a focus on prospective opportunities to proactive prospecting for footloose firms. The immediate purpose of economic development in this early era was the creation of jobs for a given geographic area. Even the term 'development' embodied a shift from an earlier focus on 'growth' in order to accommodate qualitative factors of community development (Eisinger, 1990). In moving from an unplanned approach to attracting firms, more planned approaches began to emerge. Less sophisticated approaches broadly targeted a range of industries whereas more sophisticated approaches began to engage in an approach of 'strategic planning'. The key function of state strategic planning is

The identification of certain industries likely both to provide high economic development benefits and to flourish in that particular states environment...the strategic planning process varies from strictly in-house, professional, bureaucratic participation to an elaborate, consensus-building, "corporatist" effort among labor leaders, business people, and government bureaucrats and elected officials (Eisinger, 1988, 27).

Although states have largely embedded industrial policy in the framework of economic development, it is important to recognize that economic development is not entirely synonymous with industrial policy. While economic development is primarily associated with job creation and expansion of the state tax base, industrial policy can be differentiated based upon a few salient criteria. In this respect, state industrial policy takes an institutional rather than neoclassical approach to economic planning. In particular, a strong acknowledgement of the role of technology and innovation is a salient characteristic of state industrial policy. Bruce Babbitt,

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<sup>2</sup> More recently the conversation topic of federal level industrial policy has been revisited in earnest. In his book *One Economics, Many Recipes*, Dani Rodrik (2007) discusses industrial policy as a compromise arguing that there is a "need to embed private initiative in a framework of public action" (p.99). Josh Lerner (2007) in *Boulevard of Broken Dreams* provides a prescription for better public intervention in the private sector.

former Governor of Arizona has articulated this symbiosis between industrial policy and technology in saying that

State programs recognize that economic development is linked to technology and that technology in turn builds upon scientific research, public education, and the investment in capital... This renewed public interest in industrial innovation and technological progress is rooted in... a realization that technology-the application of scientific knowledge-is the basis for economic expansion and diversification (Babbit, 1984, 84-93).

Hayden et al. (1985) categorize state technology policy into four areas: (1) technical assistance programs, (2) innovation centers, (3) incubator centers, and (4) research consortiums.

The authors argue that the presence of these areas of technology policy indicate a commitment to industrial policy at the state level. Looking across the economy as a whole, broader policies that are identifiable with regard to a strong industrial policy involve cooperative initially state supported market instruments, state supported financing agencies and the ability to channel information between publicly supported high-tech R&D and small independent enterprise (Solo, 1984).

To a large extent, the rise of the economic state was the result of a host of major economic and technological changes, the decline of key American industries, increased foreign competition and the federal retrenchment of the 'new economic federalism' begun by the Carter administration and continued under the Reagan administration (Scott Fosler, 1988). New economic federalism in particular played a large role in the rise of 'state entrepreneurialism' in eschewing a national or regional strategy and eviscerating those programs that did exist, i.e., the Small Business Administration Programs, Urban Development Action Grants and Economic Development Administration assistance. While the government still retained some of the existing supportive macroeconomic and regulatory policies for business, conscious development strategies became the domain of sub national politics. Thus, federal support continued to exist in certain areas and in others continued in a devolved form at the direction of states.

While state level industrial policy was often successful or at least uncontested in instances where it was quietly undertaken to respond to economic pressures, some cases where it was heavily politicized, have resulted in a backlash. The most notable example of a failed attempt at implementation of a strong state industrial policy is the Rhode Island Greenhouse Compact. Spearheaded by Ira Magaziner, it followed a neo-liberal paradigm of industrial policy, using 'strategic planning' and calling for cooperation to reach interest group consensus. Ultimately, the Compact became a lightning rod for criticism and was voted down in a referendum by a 4 to 1 margin. Most importantly, it was viewed as insufficiently democratic and quasi-corporatist, both indictments of the domination of big interests in the process. Hilary Silver has concluded that the Rhode island compact has shown that corporatist style decision-making can be problematic and thus, for state-level industrial policy to be successful, "matters of participation, accountability, representation, and inclusion-can be as crucial to its success as its content" (Silver, 1987, 360). Even in circumstances where state level industrial policies have not seen a great deal of political contestation and consensus has instead been present, problems not present at the federal level have surfaced. An immediate problem associated with this abdication to sub-national governance is in the way that decentralization of policy places a burden on the states, as they do not have the ability of the federal government to marshal resources. Additionally, regional inequalities are exacerbated by this decentralized approach leading to patterns of uneven development (Eisinger, 1990). From a federal perspective, the ad hoc attempts of states to meet their own economic needs can often conflict with national priorities and often times create inefficiencies that hinder international strategies. Recognition of these constraints at the federal level has resulted in attempts to ameliorate some of these

imbalances. In the next section evidence and approaches of these federal strategies will be discussed.

It is important to note that the mid 80's to the early 90's represents the origins of the recognition of state entrepreneurship and state economic development, but the argument has since persisted in various debates over the role of states in industrial policy. While the novelty of state-level industrial policies has given way to an acceptance of the role of states in filling the gap in federal level industrial policy, study of state-level development policies has become a mainstay of Journals such as *Economic Development Quarterly*. As state-level economic development strategies have become more sophisticated over time debate over the efficacy of various approaches has proliferated. These arguments have used the language of “waves of economic development” looking at the role of incentives, governors, leadership information and brokering in state economic development e.g., (Clarke and Gaile, 1992; Eisinger, 1995; Bradshaw and Blakely, 1999; Hart, 2008 and Taylor, 2012).

## Typology 2

Approaches to Industrial Policy (adapted from Baker et al., *The Politics of Sustainable Development*, Table .1, pg. 9).

Approach to Industrial Policy	Environment	Economy	Technology/Innovation	Decision-making
Green Industrial Policy	Cut Carbon Emissions decoupling Full Life Cycle assessment	Green Procurement Feed in Tariffs Priced Resource Consumption Subsidies/Incentives	National Laboratories Clean Tech R&D Targeted Innovation Disrupting technological Paths	1.1.1 Stakeholder Dialogue Radical Policy Change Strong State Involvement
Green Manufacturing	Green Product Green Process(Possible)	Growth Oriented Employment Creation Export Economy	Production Innovation Process/Innovation	Technocratic/Closed Strong State Involvement Weak Institutional Change
Economic Development	Resource Extraction Capital/Resource Substitution Market-Level Focus Sustenance Base Concerns	Broad Sectoral Targeting Planned/Unplanned Employment Creation	Limited Innovation Focus Incubators Small Business Cooperation	Technocratic/Closed Strong/Weak State Involvement Weak Institutional Change
Grey Industrial Policy	No Environmental Focus	Procurement Subsidies/Incentives Protection	National Laboratories Industrial R&D Targeted Innovation Public/Private Collaboration	Technocratic/Closed Weak State Involvement Industry-Driven Weak Institutional Change

## Towards a Typology of IP

In general, different approaches to IP can be separated into four categories drawing upon the preceding discussion of industrial policy. These four categories follow below and are complemented by Table 3 at the end of this chapter.

### Grey Industrial Policy

This approach to industrial policy is consistent with traditional approaches to strategic industrial development. First and foremost, it has no environmental focus. It follows a neo-classical political economy focused on industrial growth in specific sectors of the economy. As such, Grey IP identifies areas of strategic national interest based upon a nation or region's comparative advantage or economic aspirations. Grey IP is principally concerned with economic growth and zero-sum economic gains with respect to intra or international economic competition. It requires a great deal of intervention by the state in terms of provision of strategic direction and resource provision. In the U.S. it takes the form of a meso-corporatist arrangement with strong federal involvement. Grey IP is often sector specific at the level of U.S. states wherein some combination of federal targeting and state level recruitment combine to create hubs of manufacturing and research in specific industrial areas in particular U.S. regions and U.S. states and regions benefit from a combination of publicly supported R&D through federal laboratories and universities, incubators and research consortiums and assistance to small business. While almost all U.S. Grey industrial policy involves a technology/innovation focus at the federal level, not all regions participate in both R&D and manufacturing. Some regions are recipients of both research and manufacturing, other regions are only targeted for research investment, while others simply become hubs of manufacturing. U.S. state governments play an important role in determining how federal level Grey industrial policy is allocated to different states and regions.

## Economic Development

This approach originates from U.S. state level attempts to substitute for a lack of explicit industrial policy at the federal level. Economic development is similar to Treadmill EM in that it has no explicit concern for the environment beyond economic efficiency. However, it does have an indirect effect on environmental policy as a result of attempts by economic development offices to compete for economic investment through provision of air and water quality, natural areas and recreational amenities. In many cases better environmental protection and regulation can have a positive impact on economic competition for investment location decision-making. Economic Development attempts to substitute for missing federal industrial policy, but is less focused with fewer resources. Many U.S. states or regions will pursue broad sectoral targeting in an unplanned environment hoping to maximize opportunities for the attraction of primary employment and economic investment. Yet, many others U.S. states and regions have sought to target specific industry and economic investment that compliments state and regional comparative advantages. While there is still federal intervention in the decision-making of regional and state-level economic development, it is indirect and often couched in language favoring markets, entrepreneurialism and small business development. Economic Development involves a much smaller focus on innovation, mostly in the form of city level innovation incubators fostering small business creation and growth. Decision-making happens at the level of state, local and regional government with a particular emphasis on bureaucratic processes and cooperation between private interests and government planners. The process allows for some stakeholder input, but is often less available to public input.

## Green Manufacturing

This approach shares features with economic Weak EM and Eco-efficient EM, distinguished by its focus on attracting economic investment in the manufacturing of ‘green’ products. Green manufacturing is a recent category of economic development/industrial policy at the international and regional level wherein different, countries/states/ regions compete for investment associated specifically with the rise of investment in clean and green technologies. Although this approach specifically targets clean and green product manufacturing, there is not a complimentary set of explicit environmental policies associated with it. In many cases, although the product itself has environmental applications, the production process has adverse environmental impacts. Although governments may take advantage of the double dividend of attracting industry and presenting an environmental face, if there is not an attendant rise in real environmental policies accompanying attempts to attract clean and green manufacturing as well as an acknowledgement of the environmental impacts of manufacturing ‘green manufacturing’ is best described as targeted economic development. Although some process innovation occurs in terms of efficiency and product innovation, ‘green manufacturing’ is not closely associated with complimentary clustering of R&D and technology and innovation foci. In terms of decision-making green manufacturing is similar in nature to Weak EM with a select group of actors in government and the private sector seeking to maximize economic investment in clean and green manufacturing up to the point which it interferes with the established economic paradigm.

## Green Industrial Policy

This approach shares features Strong EM with regard to its explicit environmental focus. ‘Green’ industrial policy involves industrial transformation along environmental contours. As

such it exhibits explicit and enforceable environmental and climate policies meant to force the restructuring of industry and institutions. Climate action plans, carbon trading schemes, strong regulation of pollutants and renewable electricity standards are present in some combination under this approach. Full life cycle assessments and concerns with de-coupling and rebound effects move this approach away from a Treadmill-EM scenario, instead fostering a more reflexive approach to industrial reorganization. In addition to strong regulation, economic incentives in areas such as green procurement, feed in tariffs, priced resource consumption and subsidies are used to encourage the transition. Through federal support, Green Industrial Policy uses national laboratories, targeted innovation, technology missions and clean tech R&D to further its environmental goals. Interference in markets through RES, PES and ETS standards is an important feature of the decision-making process coming from both civil society and the government. The disruption of technological paths, long-term commitment and radical policy change are political features required of a Green Industrial Policy. Decision-making can take on a meso-corporatist hue similar to Strong EM, but it is more likely to include a larger array of interest groups and stakeholders from the public, especially environmental groups.

## Conclusion

Similar to approaches to ecological modernization, the extent to which differing approaches to industrial policy privilege ecological or economic rationalities can be uncovered by looking more closely at their rationale for ecological preservation. Here again, there is a continuum of thought on the environment which, on one end, starts with an understanding of the environment as a limiting resource, requiring a technologically nimble form of industry, one able to constantly substitute and reconfigure itself in order to accomplish objectives of ever increasing

productivity. On the other end of the continuum is an approach that seeks to reconfigure industry in a transformative way so as to reflect a focus on ecological balance and environmental protection. Differentiating between approaches to industrial based upon their environmental content and political organization provides an additional tool with which to empirically assess the New Energy Economy of Colorado.

## Chapter 4

### Colorado Energy and Amendment 37 (Origins)

#### A Brief History of Colorado Energy (Pre-2004)

In large part, any attempt to describe the history of the state of Colorado deals with the state's energy history. Colorado's social and economic fabric, indeed its fortune, has long been tied to its extractive industries. Colorado has long been a major producer of coal, petroleum, natural gas, and oil shale. While different resources have taken turns playing a prominent role throughout the state's history, until around the year 2000 the hegemony of fossil fuels was unquestioned. In this section I plan to entertain a brief discussion of the energy history of the state of Colorado in order to provide context for the current energy transition of the last decade, which will be covered in this and subsequent chapters. This small foray into the historical underpinnings of Colorado's current energy transition is by no means an attempt to create a comprehensive narrative of the conditions leading up to the Ritter administration's tenure beginning in 2007 but does seek to provide continuity and an historical context for more recent initiatives that have built upon previous historical events.

#### Conventional Energy in Colorado

Extraction and consumption of coal in Colorado can be traced back to the 1860's. The abundance of coal in the state along with wood allowed residents to be energy self-sufficient in the early years of state development, allowing them to avoid the cost of importing energy. By the 1880's coal extraction had become one of the state's major industries. The coal industry steadily expanded over the next several decades in tandem with overall US population growth, albeit with boom-bust cycles that followed the economic fortunes of the country. Coal was used

for three important secondary forms of energy-coke, manufactured gas and electricity. However, by the early 1920's the coal industry's long-term growth was at an end. While coal combustion constituted over 90 percent of the energy market at one point, by the early 1930's petroleum and natural gas had increased their combined share of the market to just over 30%. Further decades would signal a continued decline in coal production in parallel with a rise in the extraction and consumption of fossil fuel alternatives to coal (Scamehorn, 2002).

Beginning in the 1960's, fueled by demand from coal generated power plants both in Colorado and across the country; coal production once again began to rise (Scamehorn, 2002). In 1971 Colorado mines produced 5 million tons of coal, and discoveries of high-grade coal from large new mines led to increased production. The Clean Air Act of 1990 had the effect of dramatically expanding coal production in Colorado as eastern states sought to blend Colorado's low sulfur coal with the high sulfur coal on the East coast in order to reduce emissions of nitrogen oxides (NOx) and sulfur oxides (SOx). Coal production in Colorado peaked at 40 million tons in 2004 and has since declined as East Coast plants using Colorado coal have since been able to meet emissions requirements and further regulatory measures of carbon emissions loom on the horizon (Colorado Geological Survey, 2011). Coal production bottomed out at around 25 million tons in 2010, partly impacted by the "great recession," rising to 27 million tons in 2011. It is currently estimated that even with international demand, coal production will continue to decline as natural gas production continues to replace it (Staff, 2012).

Petroleum in Colorado has been under development since the late 1900's reaching peak production in 1960 at 47.5 million barrels. Since 1960 in the intervening decades petroleum production has steadily diminished as it has been replaced by foreign production. The oil shocks of the 1970's, which interrupted this foreign substitution of petroleum, led to a short-lived boom

in oil-shale experimentation and investment in Colorado which in turn collapsed along with the price of petroleum in the 1980's. Natural gas development in Colorado, while initially slow, took hold in the 1920's as infrastructure created demand. While the natural gas industry struggled in the ensuing decades, it expanded rapidly in the 1980's when free-market policies replaced restrictive government regulations. Production outstripped demand in the 1990's causing prices to fall (Scamehorn, 2002). However, environmental concern and shifts to natural gas power generation caused the price of natural gas to climb until fracturing techniques introduced in the 2010's has led to a large new source of oversupply.

### Renewable Energy in Colorado

The history of Colorado's renewable energy research and production can be traced back as far as the late 1960's at Colorado State University. Two professors in particular, Byron Winn and George Löff, led research efforts beginning in 1967 eventually creating the Solar Energy Application Laboratory (SEAL). Along with other researchers they constructed a Solar Village meant to explore different methods of solar power generation. The CSU project probably represents the most ambitious research program ever in solar architecture. Led by Mr. Löff, scientists on the project built a series of demonstration houses that they said were the first to be both heated and cooled by the sun (Culver, 2009). The oil shocks of the 70's further spurred research into energy alternatives across in the state of Colorado and at Colorado State University in particular. The federal government under President Jimmy Carter authorized federal tax credits for alternative energy research and development further supported research. This caused Mr. Löff to pursue commercial applications of his research, by founding Denver-based Solaron Corp. in 1974 to design and install solar-heating systems in homes and farms. In 1985 Congress

decided not to renew solar energy tax credits and many companies including Solaron folded by 1987 (Denzer, 2009).

In 1974, with the establishment of the Solar Energy Research Institute, the State of Colorado entered the network of federal laboratories and cemented the states position as a key player in alternative energy research. Through the Carter Administration, it was the recipient of a large budget for purposes of research in solar energy and the popularization of existing technologies, such as passive solar energy. Although the budget was cut by 90% during the Reagan administration the institute survived and was renamed the National Renewable Energy Laboratory (NREL) in 1991. Although the budget for NREL has fluctuated greatly over the past several decades, dependent upon the political climate in the Washington, its presence has fostered a great deal of activity around energy technology and innovation in the state of Colorado in a similar way that Sandia labs has in New Mexico, or Lawrence Berkeley or Bell Labs have in the Bay Area. NREL's presence in the state of Colorado has served as a conduit to federal research, supporting statewide activity in alternative energy. In addition to NREL's presence in the state, organizations such as the Rocky Mountain Institute (RMI), founded by Amory Lovins in 1982, have promoted awareness of energy issues across the state of Colorado. Likewise, Colorado's citizenry's long-standing outdoor ethic and environmental awareness has created a favorable environment for the support and creation of environmental (Environment Colorado, Western Resource Advocates) and energy advocacy (Colorado Renewable Energy Society (CRES), Colorado Solar Energy Association (COSEA). In this respect, Colorado can be seen as having a dual identity resulting from its historical dependence on extractive industries and its strong sense of environmental awareness. The recent energy transition, begun under the Ritter administration, has been made possible by the environmental identity of Coloradoans.

### Amendment 37: Laying the Foundation (2004-2007)

The origins of Colorado's current energy transition can be traced back to several key developments beginning in the 1990's and continuing into the 2000's. During this time period, advances in wind technology had a big effect on the unit cost of wind energy making it more cost competitive with fossil fuel generated energy. Rising public concern within the state of Colorado over carbon emissions, environmental protection and pollution led to increased pressure on utilities to increase deployment of renewable energy alternatives to coal. This led to the creation of the Windsource program by Xcel energy, Colorado's leading utility. At the same time, the public utilities commission designated wind as a "least cost" resource further pushing Xcel to build out wind energy infrastructure. These developments led environmental advocates to push for a statewide renewable portfolio standard (RES). As an interviewee points out, "A lot of people point to Amendment 37 and say, that's the big start. No no no, that wasn't the start of the story. The start of the story from Colorado's perspective as far as I'm concerned was really in 2000 and 2001 depending on which history you want to believe on this. It had to do with a program called Wind Source, which Xcel still offers" (Interviewee 8).

In both 2001, 2002 and 2003 bipartisan measures for a statewide RES were put before the legislature and each time failed to pass. Although the measures failed, the example set by the Windsource program served to shift opinions in rural areas benefitting from wind installation bringing an important interest group on board. By 2004, the effort had gained even more momentum, the renewable energy industry, economic development groups, the ski industry, major environmental organizations as well as advocates in the Republican Party were now strongly in support (Hartman, 2011). The agricultural industry was supportive because of the large royalties associated with large-scale wind projects. The main regional supporters came

from six Front Range counties, the ones most likely to benefit from an RES and jobs. Media outlets also provided for a strong source of support in the campaign. However, rather than putting the measure before the legislature for a third time, supporters instead opted to utilize the longstanding tradition in Colorado of the ballot initiative.

The use of direct democracy has been a policy tool employed by US states over the past century, more recently used in controversial arenas such as environmental and energy policy (Guber, 2003). Despite stiff opposition from Xcel energy, voters passed the initiative by a 53 to 47 percent margin and made an RES requirement Colorado law. Previous attempts in the General Assembly had been close to passing but failed on largely philosophical grounds. The Amendment included a solar carve out, which was important because without this the utility companies could have met the 10% through large wind projects, such as the Colorado Green Wind Farm in Lamar, with no change in the photovoltaic market. It also allowed existing hydropower to be counted toward the 10% RES in order to bring the Colorado Springs Municipal Utility on board, the second largest utility in the state. Amendment 37 applied to Investor Owned Utilities (IOUs), largely Xcel Energy, and municipal utilities with 40,000 or more customers. The Amendment allowed the other municipal and rural electric co-operatives to opt out of compliance, most of them doing so. According to an interviewee, “the environmental community was getting a lot of traction prior to the passage of 37” (Interviewee 5). Additionally, polling showed a willingness amongst the public to move forward with an RES.

Congressman Mark Udall and Speaker of the Colorado House of Representatives Lola Spradley campaigned across the state of Colorado in favor of the Amendment. Udall highlighted the environmental benefits of the RES and the climate change impact and pollution caused by

traditional fuels, while Spradley highlighted the economic benefits in order to appeal to the rural parts of the state and its struggling agricultural regions.

According to one interviewee, the campaign for Amendment 37 taught those who would come to work in Governor Ritter's Energy Office that regardless of the reasons for getting involved in promoting the NEE, as long as the end result was similar it really didn't matter what the motivations were. Environment Colorado shouldered the vast majority of the work and provided the overwhelming portion of the funds. Sensitivity to the dual identity of Colorado can be seen in the attempts of groups like Environment Colorado to make sure that they got credit with their constituency for what they were doing, but at the same time to keep their efforts with the Farm Bureau/Union unknown in rural communities where the Farm Bureau/Union were trying to promote their work.

As interviewees indicated, renewable energy was framed as a non-partisan issue in order to allow various stakeholders to coalesce around the amendment. This led to the focus on economic development and utilization of domestic resources while still using language that appealed to environmentally conscientious constituencies. According to an interviewee, economic development is how Amendment 37 was framed because that was the only way it would pass as a ballot initiative, and economic development was included in many other pieces of legislation associated with the NEE as well (Interviewee 13). The campaign was supported by extensive and sophisticated polling to identify strong points and neutralize opposition. Indications in the polling at the time, although not released to the public, have indicated that climate change was a concern that affected voters. As an interviewee from government speculates, "the polls are mind-blowing. People are nervous about climate change. Even if they say they deny it I think people were nervous about it and see renewables as a hedge"

(Interviewee 8). At the same time resistance came from the Colorado Mining Association, natural gas interests, Xcel energy and Rural Electric Associations (REA's). Leading up to Amendment 37 Xcel Energy spent at least \$1 million campaigning against the amendment (Hartman, 2011). According to several sources Xcel's opposition was based in part on their fears that wind power, the major source of the RES, would not fit into their system in terms of production and capacity. The company argued that the Initiative is "going to be a \$2 billion mistake." Early in 2004, in an attempt to stall Amendment 37, Xcel went to the Public Utilities Commission (PUC) and offered to install 400 megawatts of wind if the PUC agreed not to support legislation that would establish a mandate. This the company could well do given the fact that the Colorado Green Wind Farm with 162Mws came on line in 2004. After the passage of Amendment 37, Xcel issued a Request for Proposals (RFP) to get bids on renewable electricity. These bids came in lower than expected and the performance level, or capacity factor, was much higher than anticipated. By the beginning of 2007 it was evident that the company was going to meet the 2015 target of 10% RES by the end of 2007. Given this, Xcel began to see renewable energy generation as a way to hedge against fluctuations and variability in the cost of coal and natural gas. Two additional factors led to this change of heart for Xcel. First, polls taken after passage of Amendment 37 indicated people within their service territory were supportive of renewable energy. Second, given the success of amendment 37, just 28 months later, HB 07-1281, a bill doubling the RES to 20% passed in 2007 with strong bi-partisan support. Through HB 07-1281 Xcel was able to build and own their own renewable energy to earn a rate of return when their older infrastructure went off line. . This was especially important for Xcel because of legal requirements for them to deliver power reliably and affordably, and also earn a rate of return for their shareholders.

It is worth noting that new renewable electricity standards were also put in place for the rural electric co-ops through HB 07-1281 that differed from large utilities. Whereas Amendment 37 provided an opt-out for utilities that are not investor owned, such as the REAs, HB 07-1281 instituted a 10% standard for them and removed the opt-out option. Despite their concerns most of the REAs accepted this bill because the 10% RES was attainable for them, and also favored the removal of the opt-out provision. With a lower RES the REAs felt that they could remain in business and not pass increasing costs to their members. However, some of the REAs remained resolutely opposed to the new RES as they had been to Amendment 37. The REAs generally view the increase in the RES as beneficial because it provides stability, local economic benefits, and allows them to be more entrepreneurial around Colorado (Interviewees).

Other opponents made their voices heard as well. These included municipal utilities and the Municipal Utilities Association, the REAs (especially Intermountain, the largest amongst them), the coal industry through the Colorado Mining Association, and the Colorado Association of Commerce and Industry. Municipal utilities desired local control and choice of energy use, and the REAs spent money toward defeating the Amendment, even though it included an opt-out for REAs with less than 40,000 such as InterMountain, Holy Cross, and United Power. Both InterMountain and United Power opted out, while Holy Cross decided to meet and exceed Amendment 37 requirements. Colorado Springs Utilities was also opposed to Amendment 37 because it had a lot of hydropower, thus exceeding the threshold set by Amendment 37. To solve this issue, there was a legislative fix made after Amendment 37 passed to allow Colorado Springs Utilities to count its hydroelectric power towards the 10% renewable electricity requirement. One interviewee indicated this to be an advantage to having Amendment 37 as a statutory requirement instead of a constitutional amendment that would be hard to modify.

Importantly, many of the individuals and organizations that were actively involved in the Amendment 37 campaign and HB 07-1281 would go on to play key roles in the Ritter Administration. For example, Tom Plant, a former state legislator who introduced the first RES bill in 2001, became the Director of the Governor's Energy Office and oversaw the implementation of many NEE-related initiatives. Likewise, Matt Baker of Environment Colorado, who later became the State Public Utilities Commissioner, was the campaign director of Amendment 37 along with its primary drafter, Rick Gillian of Sun Edison, who previously worked with Western Resource Advocates. Additionally, Craig Cox of Interwest Energy Alliance and Tracy Bentley of the Colorado Farm Bureau played important roles. Stephanie Bonan also did a lot of the grassroots work for Environment Colorado by going to the Eastern Plains, collecting data, conducting presentations to the Farm Bureau chapters and county commissioners. Ken Regelson of Colorado Renewable Energy Society and Mary Broderick of the IBEW both played key roles in the development and promotion of the amendment through grassroots organizing (Interviews).

The passage of amendment 37 is often referred to by interviewees as the cornerstone of the NEE. For example, as an interviewee points out, "You know there's a lot of great things that we've done, but at the core of everything is we had to create a market for clean energy in Colorado and energy efficiency and we did that, the Amendment 37 campaign in 2004 that created the 10% standard, the doubling in 2007 that created the 20% standard" (Interviewee 6). Some contend that even without the passage of amendment 37, there was a movement supporting Governor Ritter's agenda and it may not have been as successful without the passage of amendment 37, but public sentiment was going in that direction anyway (Interviewee 5).

Importantly, the coalitions built around the passage of amendment 37 would later play an important role in electing Bill Ritter and furthering the NEE agenda.

Following on the heels of amendment 37, the Energy Policy Act of 2005 has contributed to the development of renewable energy by providing tax incentives and loan guarantees. While it also provides federal support for conventional energy development, the Energy Policy Act had an important impact on the state of Colorado leading up to the 2007 Gubernatorial election. NREL's annual funding jumping from \$209.6 million in 2006) to \$378.4 in 2007 (NREL, 2012).

Colorado's longstanding reputation as an intellectual garden for ideas and technologies furthering energy innovations was further enhanced by the creation of the Colorado Renewable Energy Collaboratory with the help of U.S. Senator Ken Salazar in 2006. The Collaboratory tied together the National Renewable Energy Lab (NREL) and Colorado's three major universities; University of Colorado, Colorado State and Colorado School of Mines (Hartman, 2011).

Overall, during this time period from 2004-2007 the passage of Amendment 37, the Energy Policy Act of 2005, and the creation of the Colorado Renewable Energy Collaboratory provided the impetus for the ensuing changes that would be undertaken by the Ritter administration beginning in 2007.

## Conclusion

Placing the RES period from 2004-2007 within the context of the period criteria (environment, economy, innovation and decision-making) it is possible to begin to describe the dominant approaches in each category?

## Environment

This period shows an historical emergence from an extractive economy that had dominated Colorado's economy for the better part of the last century and a half. The strong presence of mining and extraction were at best concerned with capital/resource substitution and sustenance base concerns, but mostly resource extraction with a regional/national and international focus on markets for supply outlet. Although the last half-century has seen the establishment and growth of interests associated with environmental protection, there are no limits to growth and environmental caps indicative of strong EM. On balance, the period leading up to 2004 was not marked by a great deal of success in institutionalizing environmental values through binding legislation nor institutional support in state government. In this regard, 2004 signals a big turning point in the legislation of a strong pro-environmental shift in the state with regards to its energy profile. However, overall during this period, strong industrial organization around extractive industry and the absence of a market for clean/green products and services indicates a Grey IP for Colorado environmentally.

## Economy

Dominated by extractive industries, the period favored expanded resource exploitation without advocating strong changes to patterns of consumption. Policies of exponential growth result from Colorado's historical position as a Western resource state. Minimal environmental regulation falls within a context of a public utilities commission dominated by mining interests and supportive of an extractive economic paradigm. While appeals for better environmental regulation of economic activity are put forward from environmental coalitions they do not have a great deal of impact in terms of state-level policy or institutional reorganization. In terms of

industrial organization, this period is characterized by an economic development paradigm in which employment creation, broad sectoral targeting, micro-economic and some state-level intervention follow a basic recipe for modern state-level economic development. The absence of an economic focus on clean/green manufacturing in the state precludes movement up the criteria scale from Grey IP or Treadmill-EM.

### Technology/Innovation

The capital intensive nature of Colorado's extractive economy during the period can be described as concerned with end of pipe innovations responding to emissions regulations. This period is also inertial in so far as it does not seek to reconfigure the political economy of the state in terms of its position in the broader global economy. Existing technologies and conventional industrial arrangements require little in the way of innovation. The existence of NREL, CU-Boulder, Colorado State University and Colorado School of mines do influence technology and innovation research in the state during this period and position it for further growth. In many ways the strong presence of research institutions exhibits characteristics of a Green Industrial policy with focus on clean tech R&D, targeted innovation, early stage R&D, and technology missions. However, statewide application of research in the form of manufacturing, technology deployment and small business growth is minimal absent state level support. This period is best characterized as somewhere between Grey IP and Treadmill EM/Economic Development.

### Decision-making

Decisions taken at the state level in terms of policy are driven by industry concerns with weak devolution of power. Governing institutions such as the PUC are largely captured by

industry, even though there are instances of decision-making that reflect pressure from other interest groups at times. There is marginal concern for equity with respect to environmental and economic impact resulting from the industrial composition of the Colorado economy. While civil society begins to force itself onto the Agenda at the end of the Period through referendum, there is little stakeholder input and state institutions are largely captured by private interests associated with the extractive economy and utilities. Federal intervention during this period lends some support to NREL but the stronger emphasis is on support for conventional energy development. In approach this period looks like Treadmill-EM/Economic Development.

## Chapter 5

### The NEE Period: 2007-2009

The Ritter Administration and the NEE

Bill Ritter filed papers to run for the Governor of Colorado in May 2005, five months after leaving Denver's District Attorney's office. Early on Ritter chose to outline a vision for Colorado's future that would differentiate him from his opponent. One of the issues that Ritter began to explore was the potential for Colorado to develop a clean energy economy and diversify the state's energy portfolio. He met with representatives in the wind and solar industry and decided to include clean energy under his campaign umbrella of the Colorado Promise. Governor Ritter promoted the use of renewable energy and raised awareness about it during his campaign for governor in 2006 by linking clean energy and job creation to help bridge divides between environmental and economic benefits to such a policy. Ritter referred to his vision as the New Energy Economy (NEE) and upon taking office, Governor Ritter enhanced the Governor's Energy Office (GEO) which enabled him to enact over 57 pieces of NEE related legislation enabling Colorado to begin its transition to renewables (Hartman, 2011).

For Ritter, the NEE represented a long-term energy strategy for Colorado, while it also addressed more immediate angst among the voters about energy security, fueled by a \$4 a gallon gasoline at the time. Ritter's approach to energy in Colorado was also based on the environmental benefits of clean energy. A clean energy economy would address environmental concerns among the people of Colorado. Importantly, Ritter also made a link between clean energy and job creation, thereby connecting the energy, environmental and economic benefits of the NEE (Hartman, 2011).

Former Governor Ritter describes the NEE as an ecosystem, guided by four principles: 1) diversifying energy 2) protecting the environment 3) promoting economic development, and 4) promoting equity. To realize these principles it is necessary to bring together policy, technology, financing, and workforce development. It is not possible, for instance, to promote economic development of the kind that the NEE envisions without appropriate policy, cutting edge technology, adequate financing and a workforce that is appropriately trained. These components worked together to create the right conditions for the new energy economy in Colorado. Over the years the various actors in support of the NEE have tended to emphasize one or some combination of these dimensions or frames. In some cases these choices were antagonistic while in others synergistic. In looking at the views of the supporters those of the opponents then it becomes evident that the politics of the NEE has been and remains quite complicated and contested.

#### NEE as Economic Development (early 2007)

Economic development is an important feature of the NEE. Based upon the success of framing amendment 37 as both an environmental and an economic development policy, the NEE was initially framed as an economic development opportunity to attract jobs in the renewable energy sector that otherwise would not have been created in Colorado while protecting the environment. As an interviewee indicated, key areas were identified for Colorado's economic development, areas of aerospace, tourism, bioscience and new energy (Interviewee 1). It was largely seen as a growth opportunity for Colorado and other states with renewable manufacturing capabilities, and would be especially beneficial to municipalities (Interviewees). Additionally, Colorado took advantage of the fact that it had the manpower to support such an industry

(Interviewee 7). Opportunities for development expanded beyond just manufacturing to include, research and development, finance opportunities, and tax increase opportunities (R15). As an interviewee indicates, almost immediately after Ritter's inauguration, the administration was able to attract Vestas Wind to the state. Vestas' final decision to choose Colorado over other states offering competitive packages had to do with the RES and the potential benefit of policies emanating from the administration's commitment to driving the NEE forward (Interviewee 7). Most of the economic development has been created by wind farms out on the Eastern Plains, which is continuing to build support for NEE initiatives. Companies such as Vestas, Timestar, Abound, and SMS have all helped make Colorado one of the number one states for producing solar and wind technologies, along with research and development (Interviewee 13).

While different methodologies and definitions lead to different estimates of the overall impact of the NEE upon employment in Colorado, there is a great deal of consensus that the policies put in place have had a positive impact on jobs (Interviewees 4, 6, 10). While the most populous area of Colorado, along the Front Range and I-25 corridor, has benefitted most from the NEE, population demographics alone are not the cause. Much of the renewable resource opportunities are available in this geographic area (Interviewees 5, 7). An interviewee indicated many high profile photovoltaic projects resulted from the NEE, such as the DIA project, CSU's project, etc. Although the jobs benefits of pursuing the development of a renewable energy sector can be argued when compared to jobs benefits of traditional energy sectors, the long term potential of the project coupled with an improvement in the quality of the jobs helps to make a stronger case for the transition from conventional energy to renewables. In this regard, an interviewee believes that the Clean Tech industry is the best opportunity for Colorado to keep

advancing the NEE, and in terms of the labor perspective, jobs need to be created for the long term with a living wage (Interviewee 9).

Given the availability of strong research institutions as well as an already existing infrastructure of high technology industry there is certainly an important research and development component to the NEE. As the pursuit of Vestas and other companies indicates the economic development strategy also has a significant manufacturing component with a clear preference for renewable energy companies. Thus, the NEE also has an important jobs component with the more permanent jobs being in capital-intensive production while some retrofitting jobs have also been generated. This combination of R&D and manufacturing is worth noting because there are many instances throughout the world that manufacturing is not accompanied by R&D while there are many instances in the core of the world economy where R&D is not accompanied by manufacturing. A strategy which promotes, pursuing a more complete approach to industrial policy has a greater chance of meeting long-term goals of becoming a hub of manufacturing and innovation. However, there are many other places around the country that have larger workforces and markets that compete directly for the same kinds of industry that Colorado wants, e.g., Michigan, Indiana, Ohio and other rustbelt states. Colorado's main competitors include the intermountain states as well as Oregon/Washington and Iowa/Minnesota. In evaluating the economic development of the NEE, therefore, we have to ask not only whether it has attracted investment in renewable manufacturing but, also, whether it has delivered on its promise of making Colorado a leader in research and development. For evidence of this it is appropriate to look in greater detail at the arrival of Vestas Wind in the state of Colorado immediately after the beginning of the Ritter administration. Using Vestas as a case of large scale renewable manufacturing to the state (**see last section in this chapter, Vestas Case**

**Study**) will provide some evidence for the efficacy of the NEE’s policies upon economic development as well as its impact upon R&D.

#### Changing the Rules, the PUC and the COGCC (mid 2007)

Early on Ritter realized that he could not push forward with the NEE without organizational change. The Ritter administration created the Governor’s Energy Office (GEO), elevating the agency dealing with energy, which up to that time was in the Office of Economic Development. According to one source, “establishing an office co-equal with economic development and charging them to work cooperatively made it possible and much easier to speak to clean energy and clean tech companies”. The new agency also developed into a key facilitator in the development and adoption of a collection of policies and programs associated with the NEE. The GEO brought order because “there were a lot of people and...leads shifted depending on what specific area.” A second major organization change was the opportunity to appoint the new members of the Public Utilities Commission. The third, and most contentious change, was the reorganization of the Colorado Oil and Gas Conservation Commission to accommodate a more diverse group of members with concerns about wildlife, public health, and the environment that would cater to NEE goals. This new make-up allowed the Ritter Administration to re-write the environmental rules for drilling natural gas in Colorado, thus making natural gas a “mission critical” part of the NEE (Hartman, 2011).

Colorado regulates oil and gas drilling through the Oil and Gas Conservation Commission. COGCC oversees selecting a well, drilling, hydraulic fracturing, and restoration of the site. Prior to the NEE, seven individuals – a majority of which represented the oil and gas industry – were guaranteed to be members of the Colorado Oil and Gas Conservation

Commission (COGCC). Under HB 07-1341, then Governor Ritter changed the composition of the commission to include public health and environmental perspectives. According to several interviewees, “the first big fight with the oil and gas industry wasn’t the 20% renewable electricity standard bill. The first big fight was the change in the make-up. So we went to nine people including public health, natural resources, division of wildlife, and royalty owners; there were still three from industry. It was a really big fight.” (Interviewees). As indicated, the reorganization of the commission allowed the Ritter Administration to change the oil and gas rules. Changing the rules proved to be extremely difficult and a hard fought battle between the Ritter Administration and the oil and gas industry. The oil and gas industry believed the new regulations would be “job killers,” forcing companies to leave Colorado’s gas fields for other more favorable locations (Hartman 2011). After an extremely long and contentious process, rules for locating and managing drilling were streamlined and made more environmentally sound (Hartman 2011). In the end compromises were made on both sides, with the oil and gas industry voting for all of the rules except one or two. In 2009, after the rules had been in place for about a year, the oil and gas industry came to the Ritter Administration and expressed desire to create a bill that transitioned a gigawatt of power from coal to natural gas because they believed they were following the new rules and drilling in the right manner.

In addition to the organizational changes noted above, the Ritter Administration increased the renewable electricity standard (RES) through House Bill 07-1281 (Hartman 2011). This increase was made easier as a result of Xcel dropping its opposition to it. Therefore Governor Ritter saw the potential to increase the RES to 20% by 2020 while still maintaining the 2% rate cap on Xcel Energy, and Xcel Energy was comfortable using wind energy to help reach that RES. A number of factors led to this change of heart.

## The Colorado Climate Action Plan (late 2007)

The transition to renewables and the NEE also have an important environmental dimension. As discussed in the previous chapter environmental forces have had an important historical role in the state especially passing amendment 37, laying the foundation for the NEE. An environmental mindset complemented the economic development framing of the NEE. As Interviewee 1 points out “There was a real desire to see us address this issue and to be good environmental stewards in every respect, the land, water, air. But it was a nice way of talking about it along with energy diversification. We said it would create jobs” (R1). A single policy document underlies almost all the components of Colorado’s New Energy Economy and evidences the strong environmental focus of the NEE as envisioned by the Ritter administration. *The Colorado Climate Action Plan (CAP)*, an executive plan issued near the end of Governor Ritter’s first year in office in 2007, sets forth a road map for reductions of global warming emissions 20 percent below 2005 levels by 2020. The CAP was fundamental to most everything the New Energy Economy strived to do: “By training thousands of workers to improve energy efficiency in our homes, stores and factories, and training thousands of others to build wind farms, solar facilities and geothermal plants across the state, and by aggressively pursuing new technologies for using our abundant coal resources cleanly we can reduce our emissions, create jobs and build more sustainable communities” (CAP). The 33-page plan set out in detail numerous actions and goals for state departments, utilities and policy makers.

The state’s Climate Action Plan provides a vision of environmental goals and suggests strategies, some of which have been implemented. The Plan is not enforceable, however, largely because there is strong opposition to comprehensive climate and environmental policy in the state. Not all supporters of the NEE, as it has unfolded, value the environment equally. For this

reason, over time, environmentalists have had to strike certain bargains and create alliances that would allow them to pursue environmental goals as a collateral benefit of economic development and energy diversification. While these compromises have often allowed for environmentally minded legislation to be passed into law or accepted as guiding policy by state government, the efficacy of these achievements is less evident. As a result, a full evaluation of the environmental dimension of the NEE must look not only at whether it has achieved its RES and has moved ahead in renewables but, also, whether the leading policies of the NEE have had a discernible impact on the reduction of greenhouse gases and other environmental desirables. Some of these issues will be raised in the final chapter assessing outcomes and future directions for the state of Colorado.

#### The Vestas Wind Case (2007-2010)

As wind energy has become increasingly recognized as a viable alternative to conventional energy, national and sub-national strategies have emerged that are focused aim to benefit from the research and manufacturing associated with this emerging industry. Some strategies entail the local development of wind technology and manufacturing, this can be a costly endeavor that requires a great deal of political will and has many barriers to entry. For this reason it is often the case that governments will attempt to import technologies and manufacturing from abroad, hoping to eventually localize the research and manufacturing know how over time (Lewis and Wiser, 2007). While this second approach contradicts Porter and Stern's (2002) assertion regarding the need for national innovative capacity of domestic provenance, it seems to be at least part of the strategy employed by the state of Colorado in its attempt to foster a wind industry. In 2007 Vestas announced that it would be locating its North American blade manufacturing operations in Windsor, Colorado. In describing why he was

convinced that Windsor Colorado was the ideal location for a Vestas wind turbine blade plant, Jens Solby pointed out that it is in close proximity to where wind farms are being built; his confidence that Colorado's politicians are “serious about wind energy”; the areas access to community colleges to train future employees; and that he had a good feeling as soon as he got off the plane: he felt the wind in his hair. In his speech in Windsor, Solby also detailed the major factors leading to Vestas decision to locate in Northern Colorado among these where, the proximity to NREL's Wind Technology Center for turbine testing, Amendment 37, which would require large investments in wind farms in Colorado, the State’s central location, making it easy to ship blades anywhere in North America, Political support for wind, especially from newly elected Bill Ritter and the democratically controlled state legislature and finally, Colorado’s excellent wind resources (Colorado Building Green, 2010).

The blade manufacturing plant announcement was followed in 2008 by an announcement to build a blade and nacelle factory in Brighton, Colorado and the world's largest tower factory in Pueblo, Colorado. The new blade factory will supplement the existing blade factory in Windsor, while he planned nacelle factory, would be Vestas’ first in North America (Vestas, 2008). The decision to establish manufacturing in Brighton follows a thorough placement analysis conducted in cooperation with the Office of Economic Development and International Trade, Metro Denver Economic Development Corporation and Upstate Colorado Economic Development. “I am delighted that we have found the location for our new blade factory and we look forward to beginning operation in our first manufacturing cluster in the USA,” said Ole Borup Jakobsen, President of Vestas Blades A/S (Vestas, 2008). In describing the decision to locate its nacelle factory in Brighton decision-makers cited access to rail and highway networks, proximity to the blade plant in Windsor and access to a large pool of qualified workers (NREL,

2008). Rail access also was also cited as the primary criterion in Dragon Wind's choice of Lamar as the site of its \$15 million wind-turbine tower factory (Raabe, 2008). At the same time as the Brighton announcement, Vestas America's president Jens Soby alluded to the fact that in choosing to expand its Colorado operations Vestas was placing a significant bet that Congress would extend a wind-energy tax credit that would continue to assist the industry. Solby stated, "As of today, the United States Congress has still not extended the federal Production Tax Credit, but Vestas believes they will take action," Soby said. "Wind power is poised to become a major form of energy generation in the U.S.A and Vestas is positioning itself to meet the demands of a rapidly growing market for wind power" (Vestas, 2008).

The decision to base the tower manufacturing facility in Pueblo was described as a continuation of historical precedent when President of Vestas Tower Knud Bjarne Hansen said his company chose Pueblo for the facility because of its rich history in steel making and the opportunities to use Pueblo Community College to train new employees. "You have had steel working in this community for over 100 years," he said. "We find that essential for what we mean to do. We are extremely pleased to simultaneously provide job opportunities for the local community and outstanding product for our customers made right here in Colorado," said Hansen. He once again took the opportunity to praise the geographic endowments of Colorado on behalf of Vestas in saying, "We have deliberately located our factories in a central region in the U.S. – including our towers, nacelles and blades plants – because regional centralization allows Vestas to build and ship locally in any direction needed in North America, and that translated to a direct competitive advantage for all of our stakeholders" (Tucker, 2008). Additionally, Anthony J. Knopp, Vice President, Vestas Towers America, Inc. pointed to the manufacturing and labor attributes of Pueblo as desirable for Vestas in stating, "We've hired

people in a number of functions related to tower building, including steel fabricators, finishers, welders, assemblers and maintenance personnel, it is amazing how many traditional manufacturing job skills are directly transferable to Vestas, adding, “This translates to a win-win for our company and the people who live in this region” (Tucker, 2008).

In 2010, Vestas announced its intention to build a research facility in Louisville, Colorado. “We are extremely committed to Colorado, and we look forward to a long, successful relationship here,” Finn Madsen, president of Vestas Technology R&D, said in a statement. “By co-locating engineering and design competencies with the production cluster in Colorado, the proximity of technology R&D to manufacturing creates significant efficiencies that can be passed along as a direct benefit to our customers.” According to Ann Rascalli of *Colorado Energy News*, Louisville has long been considered an important data-storage hub, including a ConocoPhillips research campus focusing in energy, technology, alternative energy and corporate training (Rascalli, 2010). In 2008, Siemens had made the decision to locate its R&D competence center in the corridor. At the time Andreas Nauen, CEO of the Siemens Wind Power Business Unit said, “Boulder will be Siemens’ first wind turbine R&D competence center in the U.S. and will increase our ability to competitively serve this important market. Because of the proximity of important institutions such as NREL and the NWTC, Boulder is the perfect location for a R&D center in the U.S.” (Staff, 2008). Understandably, the same considerations that went into Siemen’s location decision applied to Vestas’ Louisville location nearly two years later. Regarding the important research attributes of the corridor, Louisville Mayor Chuck Sisk said, “This is just the tip of the iceberg,”. “It is not just Louisville; it is the entire Boulder-Broomfield valley.” (Svaldi, 2010) According to Vestas Spokeswoman Aili Jokela, the company chose Louisville because of the “engineering talent along the Denver-Boulder corridor, the city's

quality of life and a business-friendly climate” (Rascalli, 2010). Jokela went on to say, “There are a number, as you know, a number of high-tech businesses in that corridor, and it made good sense for us...we had good access to the highway, where we had surrounding open space. And the city was very responsive to our needs”(O’Toole, 2010).

By the end of this first period, then, the Administration had put in place some important organizational changes, had doubled the RES and had landed a key investment. During that same time NREL spearheaded the further development of the Colorado Renewable Energy Collaboratory, launched in 2007. The renewables sector started growing as companies were attracted by the opportunities engendered by the RES and the message that was emanating from the Administration. Solar power benefitted by the carve out but it also became apparent that the solar industry was not homogeneous. On one hand were small solar companies of COSEIA that needed rules that enabled distributed energy practices, such as net metering. On the other hand were the large companies of the CSA that looked forward to utility scale solar farms. It is not clear how these differences played out in wind power. What is evident, however, is that Colorado was put on the map of large companies, most of them foreign. The significance of foreign companies has been widely recognized, often noting the fact that the US had fallen behind. By the beginning of 2008 one could be optimistic about the future of the NEE in Colorado. The financial crisis that started unfolding during that time, however, changed the rules of the game. Yet, the renewables sector, especially wind power, is the one sector that grew during that period. The NEE certainly played a role but one must also consider the fact that global energy financing had also become increasingly invested in renewables during the last decade.

Looking at the example of Vestas and the evidence for its decision to locate its manufacturing and R&D in Colorado it is apparent that this goes beyond a simple economic

development strategy. Vestas in Colorado is symptomatic of a strategic agreement on behalf of both Vestas and the state of Colorado to change the economic structure of the state into a research and development and manufacturing hub for the renewables sector. This is an important distinction for Colorado as it tells us that, during this period, it is executing a broader strategy than green manufacturing or simple treadmill EM.

## Conclusion

### Environment

During this period the Ritter administration enacted several pieces of legislation, rulemaking and policies that had an explicitly environmental focus. Most notably the Colorado Climate Action Plan indicated a decoupling from economic interest in delineating a strong stand alone environmental policy. The plan is non-binding, so it falls short of the strongest form of commitment it could register. The reorganization of the COGCC and the PUC to bring a greater emphasis on environmental protection to both commissions helped to lay the foundation for further environmental legislation and rulemaking over the period. During this period the attraction of green manufacturing to Colorado indicates an attempt to build a clean-tech economy. Although, it is important to note that the administration did not discuss the environmental impacts of green manufacturing in Colorado, nor the impacts of coal exports upon global environmental emissions. In this regard environmental, protection, limits and carbon caps were local in scope. Despite this, this period saw dramatic institutional restructuring along environmental lines consistent with both Green IP and Strong EM approaches.

### Economy

This period saw strong market regulation in the energy sector favoring environmental policy objectives. The reorganization of the PUC and COGCC served to alter the relations between the extractive industries, utilities and the state government. In the energy sector Colorado moved from industry-driven and market-driven energy policies to a market shaped by policy goals of the Ritter administration surrounding the NEE. The attraction of Vestas shows a concerted effort to recharge the economic structure of Colorado with the introduction of a clean tech cluster. Changes to patterns of energy consumption occurred during this period as the RES was raised from 10 to 20 percent. However, at the same time the policies of this period remained closely tied to framings of economic development, continuing pro-growth economic policies associated with state competition for primary employment, economic expansion and employment. Although this period moved towards a Green IP and Strong EM, the existing economic imperative limited strong change. In economic terms during this period we see evidence of a shift toward Green IP/Strong EM and Weak EM/Green Manufacturing.

#### Technology/Innovation

This period saw a continuation and expansion of existing federal and state resources in R&D. The expansion of NREL's role in deployment and collaboration, the expansion of the Colorado Renewable Energy Collaboratory and the attraction of private R&D facilities signaled a strengthening of Colorado's leadership in renewable technology innovation, research and development. This expansion was partnered by a strong focus on attracting clean tech industry to the state, as well as fostering indigenous growth in this area. Technology missions and targeted innovation distinguished this period from previous attempts that sought a less targeted expansion of Colorado's industrial expansion. However, it is hard to make the case that during

this period of clean-tech manufacturing expansion, that there was an awareness of the environmental impacts of the clean-tech industry. Outside of NREL's research, there is no evidence that there was state-level concern for innovations and technologies that looked at product life-cycle analysis or green process innovations. While clean technologies were heavily promoted and encouraged by the Ritter administration, no policies were written to regulate the companies that were being attracted and incubated during this period. Despite this the pace of innovation and the targeting of green and clean technologies is most consistent with a Green IP or Strong EM approach.

#### Decision-making

This period saw strong institutional change as the state government re-asserted control over industry by re-configuring commissions that had previously been captured by industry. Interference in market arrangements and an increase in the RES indicate a strong government. Although the Ritter administration had a popular mandate to enact reform the process of restructuring several key commissions and state offices relied upon a diverse set of stakeholders. The involvement of environmental and labor groups in the process in addition to traditional actors signaled a more participatory and open-ended process. Although the decision-making process at times looked corporatist in nature, it was never captured by industrial or labor interests in the way that corporatist arrangements usually are. Strong civil society involvement, radical policy change and disruption of technological paths all contributed to a more transformational process. This period is very consistent with Green IP and Strong EM.

## Chapter 6

### ARRA, 30 Percent and the Rise of Natural Gas (2009-2011)

#### The Financial Crisis and ARRA

In addition to the sector's dynamics the NEE benefitted from two other factors. The first was the Obama Administration's Keynesian response to the crisis in the form of the American Recovery and Reinvestment Act (ARRA). The second was the argument that this was an opportunity not simply for dealing with the crisis but for rebuilding the US along green lines. This green Keynesianism had been growing within sectors of labor and the Democratic Party and was reflected in the 2007 Energy Independence and Security Act that was promoted by Democrats, newly returned to a majority at the federal level.

The New Energy Economy benefited from an initial infusion in 2009 of American Recovery and Reinvestment Act (ARRA) dollars. ARRA provided the state with approximately \$139 million to be spent on energy conservation and efficiency efforts, most of which was sent through the Governor's Energy Office (GEO). OF the \$139 million, a total of \$130 million went to weatherization and energy retrofits (Zaffos 2011).

Today, the Governor's Energy Office (GEO), which oversees many NEE initiatives, is still supported by federal grants, many of which expired in May 2012. Prior to the Federal funding, GEO received support from the Colorado Clean Energy Fund, funded in part by a percentage of state gaming revenue.<sup>3</sup> However, state legislators eliminated this source of funding in 2011 (Zaffos 2011). This uncertainty, according to the Associate Director of the Governor's Energy Office, Angie Fyfe, is already limiting the use of incentives and rebates especially related to renewable energy. In the solar industry, for example, uncertainty has

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<sup>3</sup> GEO funding included \$4 million in 2009 and \$7 million in 2008 (Potter 2011).

factored into Xcel Energy's announcement that it plans to decrease the number of incentives it offers to property owners that install photovoltaic systems. Moreover, the cloudy funding picture has also contributed to a net employment loss throughout the solar industry in 2011. In the Boulder Valley, these concerns are even more acute. In fact, Blake Jones, President of Namaste Solar Electric warned that job losses in the Valley's solar companies may reach up to one-half of their solar panel jobs by the end of 2011 due to Xcel's decision and the general uncertainty about GEO's future funding (Potter, 2011).

What is worth noting is that these funds may well have contributed to enabling the NEE by keeping demand up. They were not, however, intended to promote research and development nor investment. In light of the limited amounts for job training, moreover, it is reasonable to suggest that the ARRA raised the profile of the NEE for consumers during a time of crisis. It did not, however, add profound changes to the mix of the NEE or renewables, in general.

#### Increasing the RES to 30 Percent

Despite the crisis the Administration continued its NEE strategy, strong evidence of its commitment and of the significance of local politics. At the start of 2010, the Ritter Administration was considering creating three bills: one for an increase in the RES, one for certification, and one for green jobs training. Ultimately the RES and certification became one bill, House Bill 10-1001, and the green jobs training bill became HB 10-1333. At this time, environmentalists were very interested in increasing the RES because of the great job that they felt had been done with the 20% RES by 2020. Similar to Amendment 37, Environment Colorado initiated a grassroots campaign, and spent a lot of time educating the public in various forms about the legislation. After much debate and negotiations between environmentalists,

labor groups, and industry, they successfully lobbied the legislature, and HB 10-1001 was passed in March of 2010, which increased the RES to 30% by 2030 for investor owned utilities (Hartman 2011, Ritter 2010, Zaffos 2011). It also required Xcel Energy to get 3% of its energy supply from “distributed generation,” including rooftop solar, small hydro and wind, and other systems not currently used (Hartman 2011). Additionally, solar standards were increased, and there was more opportunity to put Coloradans to work on these projects. It was estimated these changes would create 33,500 new jobs and generate \$4.3 billion in total economic output (Hartman 2011). The REAs were strategically exempted from the RES increase because when asked by the Ritter Administration whether they would support an increase, the strongly expressed their opposition. This was due to their concerns about passing along costs associated with purchasing clean energy. More significantly, however, these are small entities that do not have the resources to adjust to a new energy mix. Practically all of them depend on Tri-state for coal generated energy which they then sell to their members.

HB 10-1001 was sponsored by Representatives Max Tyler and Jack Pommer, and Senators Gail Schwartz and Bruce Whitehead (State of Colorado 2010a). Even though HB 10-1001 passed, and Xcel Energy supported it, one interviewee indicated that it was at a much smaller margin because there was not the same level of bipartisan support as with the 20% RES. While most of the parties involved wanted it, they had different ideas about what it should include. This caused a lot of in-house fighting, especially for industry. To help solve this issue, a coalition developed consisting of the Ritter Administration, environmentalists, labor, and the renewable energy industry. This coalition worked against Xcel Energy to get the most aggressive RES possible. Environment Colorado was the core advocacy group on this bill, and worked on drafting the legislation and facilitating negotiations to move the legislation forward.

They also led an intense on the ground campaign to educate the public about the legislation, get the story in the press and other forms of media, and held press events with Governor Ritter. The group also released a report to explain the economic impacts of the legislation to bolster support and knowledge. Even with all of these efforts, industry still did not support the bill when it went to the Senate, and this forced the environmentalists and the Ritter Administration to keep the lack of support unknown until Xcel finally approved it. This approval was crucial because as one interviewee indicated, without the support of Xcel Energy, HB 10-1001 most likely would not have passed.

Labor groups were extremely concerned about HB 10-1001, especially in relation to the level of certification required for solar panel installers. Similar to previous legislation, the group was split along the lines of the International Brotherhood of Electrical Workers (in Colorado, IBEW-68 and IBEW-111). While IBEW-68 was interested in the higher RES, the utility workers at IBEW-111 were strongly opposed. Their opposition seems to have been fanned by Intermountain which argued that renewables would lead to economic dislocation. A more interesting debate, however, involved the certification of the people installing solar panels. One argument was that solar installation was dangerous and should be the responsibility of electricians. However, many members of the solar industry thought that went too far, especially when it included racking and mounting panels. This problem brought together the electrician's union, their contractors, and environmentalists to develop policy that met concerns on all sides. There was a great deal of collaboration on this piece between Colorado Solar Energy Industries Association (COSEIA), IBEW-68, IBEW-111, the building trades, and the AFL-CIO.

## Clean Air Clean Jobs

In late 2010, near the end of his first administration Governor Ritter was able to cobble together a coalition of interest groups and marshal the passage of HB-1365 known as Clean Air Clean Jobs (CACG). CAGC had two key areas of focus: increasing the market for Colorado's own natural gas and avoiding stricter regulations from the United States EPA (Hartman, 2011). Natural gas was appealing because it could be integrated relatively easily with wind energy (Hartman, 2011). Although natural gas only became an integral part of the NEE upon the passage of the bill, it is important to note that Governor Ritter had always privately acknowledged the role gas would play in the NEE. As an interviewee points out, "The Governor all along in that contentious time had said, "no misunderstanding I want the natural gas community in this state to thrive"" (interviewee 7). The administration had even envisioned a role for gas in writing the Colorado promise, "It was not what we promise you but the promise of the state that was not being achieved. This fit in so well with the bigger framework of the promise of this state that we could really significantly change how we do business on the energy side. We tried to tell the extractive industries that it wasn't a zero-sum game" (interviewee 1). However, early on in the administration, in 2007/2008, new drilling rules and the restructuring of the COGCC had led to a frosty relationship between the administration and natural gas interests. In order to ensure passage of CACJ, the Ritter administration had to reach out to natural gas interests, maintain the support of an environmental coalition divided over support for natural gas and fend off attempts by the coal industry to derail the process entirely. Many argue that CACJ is the best representative example of the Ritter administrations political skill, in so far as it was able to hold disparate coalitions together to achieve passage of the bill.

The Clean Air Clean Jobs Act illuminates the high stakes associated with the attempt to transition the economy from conventional to renewable energy. As political partisanship had markedly increased from the previous legislative accomplishments of the Ritter administration, a new approach to coalition building had to be employed. According to an interviewee, “There was a set of people, the coal industry, that we left out of the conversation and were pissed. And then there were also some like far left environmental groups who weren’t part of the conversation that were pissed cause they really don’t like gas. And frankly it was very challenging to keep the Xcel, environmental gas industry coalition together for the duration of the project” (Interviewee 6). Additionally, Ritter’s Chief Operating Officer Don Elliman was eager to ensure that the state’s move towards renewables and a different kind of workforce was not impaired. This was reinforced by the observations that the renewables sector, particularly wind power, continued to grow despite the recession, that there was emerging a strong workforce for this industry within the state, and that the network of NREL, CSU, CU, School of Mines Boulder, as well as private R&D were boosting promising sociotechnical innovations. Another factor that led to rapprochement between the gas industry and the administration had to do with the falling price of gas and the industry’s desire to find new markets. As an interviewee describes it, “I was being visited those days by leaders of the Colorado gas industry saying that they were really looking for a way that they could grow their market share. Xcel energy had just brought on Comanche III which is seven hundred and fifty megawatts of coal, the actual amount of gas burned in Colorado was dropping, the amount energy production from gas was dropping so they were really ripe to look for a new approach” (Interviewee 17).

Potential regulation from the U.S. EPA also played an important role in the stance different interests took and the formation of the groups that worked together. For example, the Department of Health and the PUC had to try to predict what the new regulations would look like. Xcel Energy also had to stay apprised of negotiations because they did not want the federal government to impose a plan that would impact their costs. Therefore, there was incentive for CACJ to exceed potential US EPA regulations in a preemptive fashion (Interviewee 17). As pointed out earlier, Governor Ritter viewed natural gas as one component of the energy picture, as a “mission critical fuel” rather than a bridge fuel (Ashby, 2011; Hartman 2011). This view was made easier by the drilling rules that CACJ had adopted during 2008 that had been accepted by most of the environmentalists at the table as compromises furthering the longer-term goals of the NEE. This new focus on gas served to bridge the gap between the Administration and the Colorado Oil and Gas Association (COGA) that had been strained since the reform of the Colorado Oil and Gas Conservation Commission (Ashby, 2011).

Governor Ritter wanted to move CACJ quickly, and understood that the coal industry could have derailed the legislation and possibly stopped it all together. Therefore he constructed a coalition of the willing, including Environment Colorado, the Environmental Defense Fund, Western Resource Advocates, the Public Utilities Commission, the Governor’s Energy Office, Xcel Energy and natural gas (spearheaded by Incana, Noble, and Dartko) (Interviewee 6). Jim Martin, now with the EPA, was credited with being a key facilitator of the process by several interviewees. Most of this collaboration occurred behind the scenes, and when the bill went through the House it passed overwhelmingly, but struggled to make it through the Senate because by that time the oil and gas industry had caught wind of what was being done and was able to react and include their input. As an interviewee describes,

We had a meeting where we were explaining this to a broad group of business and community leaders, and the explainers were XXXX and myself and the head of the Mining Association, which it's called, got up and bitterly complained and basically looked at XXXX and me and said, "how come I couldn't have been at the table?" And XXXX looked at me and said, cause we wanted to get a deal done. And that's the truth. If coal had been there, it never would have happened (Interviewee 7).

Sponsors of CACJ were Representatives Solano and Roberts, and Senators Whitehead and Penry (State of Colorado 2010b). Even though it was a bipartisan bill, and passed within one month of introduction, a lot of in-house fighting had to be overcome before its passage (Hartman 2011, State of Colorado 2010). Environmental groups, such as Environment Colorado, took on the task of keeping the Democrats together while the oil and gas industry kept the Republicans together. Although, the gas industry avoided openly lobbying for the bill, instead opting to let environmental and health care interests move public opinion. As an interviewee describes,

So we actually collaborated behind the scenes, but in public we didn't actually collaborate that much because we believed the natural gas industry, that the best voice for the Clean Air Clean Jobs Act, were environmentalists and health care professionals, so health professionals that could say we want to reduce pollution, and we didn't think there was a lot of benefit in the natural gas industry saying, say it creates jobs (Interviewee 11). Environmentalists and liberals were supportive of the bill because of the new oil and gas rules that had been created and the emphasis on protecting wildlife, but were concerned the Ritter Administration was going far enough with the bill's requirements, while the oil and gas industry and conservatives were opposed to "mandates" (Interviewee 7). Given the tensions between the Ritter Administration and the oil and gas industry, due to the reform of the Oil and Gas Commission and the Governor's attempt to create an oil and gas tax hike through a ballot initiative, Environment Colorado had to act as a broker between the two groups to further passage of the bill (Hartman 2011). Elliman's connections to the gas industry also alleviated the industry's concerns and facilitated this strategic alliance (Interviewee 7). It is important to note that there was a big division between environmental groups representing different geographic

interests with respect to the Bill. As an interviewee points out, “there was a harsh dynamic between environmentalists and environmentalists, so groups saying you all are promoting natural gas and it’s evil, you can’t do that, you’re selling us out, us little groups out on the Western Slope to your Front Range pollution problems”(Interviewee 11). The sequencing of the events leading up to the negotiations surrounding HB-1365 played an important role in bringing environmentalists to the table. As an interviewee describes, “so you had an environmental community who was gettable, but again probably not of been had not been for the Ritter administrations push on the gas drilling rules, cause those began to kick in in 2009, the environmentalists kind of came around on that” (Interviewee 17).

Pricing was one major concern for those supportive of the bill. Xcel Energy had to decide if retrofitting old coal plants with expensive mitigation equipment was cost effective, or if the switch to natural gas should be made more immediately to avoid costs down the road. Given the history of natural gas price fluctuations, Xcel’s primary fear was that the transition would cause the price of energy to skyrocket. The natural gas industry was concerned about long term pricing, and had to settle on a longer contract than they typically did (Interviewee 17). Additionally, the natural gas community was supportive because they could sell their product to Xcel, and they both worked together on lobbying for CACJ because Xcel sits on COGA’s board as one of their customers. This meant the bill had to be constructed so that Xcel’s rates did not increase.

The Independent Power Producers were opposed to CACJ, because they wanted to be the ones to build the plants and sell the power to Xcel. As an interviewee contends, “Producers are the guys that wanted to build those plants and sell the power to Xcel. They got shut out because Xcel insisted on building the plants themselves so they could earn that big rate of return. So

from one perspective you've got to applaud Xcel from a business perspective for doing that (Interviewee 8). Even though pricing was not a concern for Tri-State since they are owned by their members, and CACG did not pertain to them, they did have a big internal debate about where they should stand. Tri-State's opposition stemmed from the belief that it set bad precedent for the utility industry in the future where standards similar to Xcel Energy were imposed on them. So long as their costs remained low and their customers were satisfied, Tri-State remained neutral on the bill.

As noted, the negotiations took place behind closed doors, with direct negotiations between Xcel and the Administration being at the core and the coal power was purposefully excluded. This alienated the coal industry (something that the Administration expected) and fueled arguments that the move to gas would result in unemployment for utility workers. The administration had already attempted to frame the passage of Clean Air Clean Jobs as another potential boon to economic development and employment. As an interviewee argues, "There's an argument about natural gas and whether it's clean. Our premise at the time of House Bill 1365 was that it was cleaner. And from a jobs perspective, it was a good thing for Colorado. If we don't manufacture as much or produce as much energy out of coal, it's going to cost Wyoming jobs more than Colorado jobs because so much of our coal, 80% of it, comes from Wyoming. We thought about it in terms of the job creation part" (Interviewee 1).

These fears of coal industry job loss were strongly evidenced in labor groups who were also excluded from the debates due on CACJ. Similar to previous legislation, labor groups were split between IBEW-68 and IBEW-111 about the number of jobs created in the natural gas industry if coal plants were lost. To help remedy some of labor's concerns about job loss, Xcel

Energy worked with them to ensure that no jobs would be lost by shifting them to the new gas plants.

Given the short amount of time that has elapsed since the passage of CACJ, the verdict is still out with regard to the effects of the bill, and if HB-1365 will be considered a success or failure in relation to job creation and emissions reductions. Considering that one of the reasons for CACJ was to preempt U.S. EPA rules, some interviewees feel the regulations generated by CACJ have put Colorado ahead of the U.S. EPA rules, making the bill an environmental success. However, challenges still lie ahead. While Xcel Energy will be retiring old coal plants and turning to natural gas and renewables this does not mean that the company is abandoning coal as a long term source. Tri-State will continue to get about 70% of its power from coal, 12 to 13% from hydropower, and the rest from renewables.

#### Hickenlooper Administration

With the end of the Ritter administration and the arrival of the Hickenlooper administration, a big shift in the composition of the NEE has been occurring. Early on in the administration Governor Hickenlooper has made it clear that he intends to diversify the Governor's energy office to make sure that conventional forms of energy are better represented. He is not as enthusiastic about pursuing the NEE in the same way as the Ritter administration. Hickenlooper has had a much better relationship with industry and members of the previous administration are concerned that the Governor's energy office will be completely changed to serve as a means of promoting fossil fuel energy in Colorado, particularly natural gas (Lynn, 2012). Hickenlooper has already attempted to make changes to the COGCC and has made clear that he will litigate on behalf of natural gas interests were communities resist fracking (Berwyn,

2012; Rascalli, 2011). While Hickenlooper is not opposed to the NEE in principle it is unclear that he will adopt many of the NEE policies of the previous administration for his own.

## Conclusion

### Environment

From an environmental approach, the introduction of natural gas into the new energy economy casts an ambiguous shadow. The longstanding split in the environmental community as evidenced in the chapter exposes the rift between realist and fundamentalist perspectives. Using the arguments of realist, pro-gas environmentalists, the inclusion of natural gas can be seen as a means of reducing immediate greenhouse gas and pollutants. Fundamentalist, anti-gas environmentalists argue that involving natural gas trades one conventional fossil fuel regime for another, without a guarantee of an energy bridge coming to fruition. Looking at the framings given for the transition by the administration and interviewees, it is less apparent that the inclusion of natural gas has a strong environmental component. Justifications given by the administration ranged from economic development, energy expansion and development, job growth and gas as a bridge fuel assisting in the transition to renewables. The justifications for the inclusion of gas rest upon capital/resource substitution and extraction with a regional focus. Although the net environmental benefits of a shift from coal to gas fired electricity generation are arguably positive, it is not apparent that this calculation was the ultimate driver of HB-1365 legislation. A strong need for new markets for natural gas led the industry to cooperate with the administration. Likewise, the economic benefits of increased gas usage were a primary concern of the administration. At the same time, the administration did tie natural gas to renewables in rhetoric and there is an undeniable strain in environmental thinking that sees natural gas

consumption as a necessary piece of any larger energy transition. The concerns that emanate from the inclusion of natural gas are, 1) whether or not there is a desire to manage the transition closely so that the immediate environmental impacts of extraction are kept to a minimum, 2) whether renewables retain a privileged position as the long-term energy source of choice and 3) what measures if any will be put in place to keep avoided use Colorado and Wyoming coal from simply finding new markets. The last of the three concerns is not an immediate indictment of Colorado's energy transition, but is an important long-term consideration for more globalized energy transition. It is important to note that although this period took place during the height of the financial crisis, The Ritter administration was able to increase the RES from 20 to 30 percent. This increase indicates continued legislative support for the transition to renewables paralleling the rise of gas. The inclusion of natural gas in this period without a clear environmental strategy indicates a step back for this period from a Strong EM/ Green IP approach towards a Weak EM approach.

## Economy

During this period the economic system did not change dramatically in terms of policy. The continuing recession had an impact on the continued growth of the renewables industry, although ARRA money continued to belie the impact of the recession upon the industry. The most dramatic shift during the period can be argued to be the eager embrace of the energy economics afforded by greater natural gas exploitation. Although there is evidence that, at least tacitly, the Ritter administration had long considered natural gas to be an important component of the NEE, it is only during this period that the administration began to broaden the focus of the NEE to include gas in policy and rhetoric. The economic calculation was one of traditional neo-

classical economic development, employment creation, the return of broad sectoral targeting and a growth-oriented framework. Previous policies of the NEE did not fade away during this period, but the long shadow of natural gas changed the dynamic substantially. The period, marked by recession, illustrates the impact the recession had upon the transition as the administration sought to broaden its focus on economic development to spur the economy. This period saw a weakening of political will with regard to support for renewables and economic restructuring, instead shifting back towards a more open Economic Development approach with elements of Weak EM, Green Manufacturing and Eco-efficiency.

### Technology/Innovation

During this period, while the initial features of the NEE including public research and federal investment continued to support energy innovation in renewables. The technological breakthroughs in natural gas extraction represent the most salient innovation during the period. Although technological innovation in gas extraction had undergone a continuous process of improvement over several decades, the impact of hydraulic fracturing or ‘fracking’ was felt during this period as the technology began to come on line. It is hard to make an argument in favor of fracking as an example of clean tech R&D; rather, it should be seen as an industrial development with a proposed net beneficial environmental impact. Thus, it is safe to say that the natural gas period continued to see the legislative and policy benefits of the NEE with regard to investment and R&D in renewables, it was now apparent that the renewable space was also competing with innovations and investment in the conventional energy space in the form of natural gas. Research and development in renewables continued but at a slowing rate as

economic priorities shifted to favor gas and economic growth. This period saw elements of both a Green IP/Green EM and a backslide towards Weak EM and Eco-efficient EM.

### Decision-making

During this period decision-making returned to a more meso-corporatist and bureaucratic style of decision-making. Although environmental, industrial and government entities sought to constitute a broad stakeholder subset, most of the decision-making happened behind closed doors. The consequences of a more open and broadly participatory process militated against a more democratic approach to the legislation involving CACJ. The administration's fears of a long drawn out process that would eventually be derailed caused them to withdraw proceedings from public scrutiny and to negotiate with different sets of interest groups with varying degrees of information and approaches to achieve passage of CACJ. The process was however driven by the administration from start to finish wherein the state can be said to have been the driver in reaching consensus and passing the legislation. The institutional changes that favored the environment were resilient in spite of the financial crisis and the rise of natural gas, this period is still a Strong EM/ Green IP approach.

## Chapter 7

### Findings and Future Research

This chapter is broken into three sections. In the first section I intend to address my findings with respect to the primary question of this thesis? Is Colorado's New Energy Economy an example of ecological modernization American style? In the second section of this chapter I will briefly entertain conjectures as to the long-term prospects for the NEE and what form the transition will take going forward. In the third section, I will address some areas of interest for further research in this area.

Is Colorado's New Energy Economy an example of ecological modernization American style?

The evidence suggests that Colorado's NEE is in some form a state level program of ecological modernization. Thus, leaving out Grey Industrial Policy, where does the NEE sit on a smaller continuum from Treadmill EM to Transformative EM? The answer is that taken over time, the character of the NEE has changed to provide a range of approaches depending on the time period in question. To argue that what we are seeing in Colorado is a simply a type of sub federal American EM policy belies the fluidity and instability of the transition over time, making the transition appear monolithic, homogeneous and linear in its trajectory. However, by using the four categories of Environment, Economy, Technology/Innovation and Decision-making, it is apparent that the balance between and the saliency of these different categories has not been constant in any given period. As the relative balance of these categories has shifted over time so necessarily has the dominant approach to EM-IP that defines the NEE at any given point in time.

Overall, I argue that the NEE has been a weaker EM/Green Manufacturing/Eco-Efficient EM policy, flirting temporarily in the first two years of the Ritter administration with a Stronger

EM/Green IP policy approach. In the following paragraphs I will briefly summarize and defend the process by which I have arrived at this conclusion.

The first part of this thesis sought to lay out a continuum, providing for a range of possible approaches that might characterize the NEE. The literature reviews of ecological modernization and industrial policy provided the theoretical basis from which nine different approaches emerged. Placed on a continuum these approaches covered the range of possible characteristics of an economic transition from the perspective of environmental extremes. The analytical scheme outlines a master typology combining salient characteristics from Table 1 (EM) and Table 2 (IP) wherein an environmental continuum of descending environmental quality moves from top to bottom (Transformative EM-Grey Industrial Policy). Additionally, each category is measured against its environmental quality such that the criteria for Environment, Economy, Technology/Innovation and Decision-making are all assessed with regard to an overarching environmental imperative.

In the empirical chapters I sought to provide evidence with which to assess the NEE according to the continuum of approaches I had developed. In assessing the empirical evidence, I became aware of turning points that led to a natural, defensible periodization of the NEE over time. I used these natural turning points to create different temporal periods that brought to relief the evolving nature of the NEE from 2004-Present (see Analytical Scheme below). At the end of each empirical chapter I chose to draw out evidence for each of the four categories from tables 1, 2 in order to support the creation of the Analytical Scheme which would combine the approaches with the periodization bringing into relief a visual representation of the evolution of the NEE. The final results of the table follow from the methodological explanation in Chapter 2. I have weighted each of the approaches from the Analytical Scheme in order to provide a numerical

clarity to shifts over time. This nominal scale is not meant to imply a quantitative methodology, the numbers only provide a means of referencing various approaches and spaces between them.

**Typology 3**  
**Analytical Scheme. Colorado Policy Types By Period**

Period	Environment	Economic System	Technology/Innovation	Decision-Making
<b>2004-2007 RES Period</b>	<b>Increasing Environmental emphasis</b>  (3)	<b>Grey Economic Development</b>  (1)	<b>Weak Environmental Innovation</b>  (3)	<b>Less inclusive Non-integrated Policy</b>  (2)
<b>2007-2009 Ritter Period</b>	Increasing Environmental Emphasis  (4)	Green Economic Development  (3)	Strong Environmental Innovation  (4)	Meso- Corporatist Integrated Policy  (4)
<b>2009-2011 Gas Period</b>	Decreasing Environmental Emphasis  (3)	Grey/Green Economic Development  (3)	Strong Environmental Innovation  (3)	Meso- Corporatist Integrated Policy  (3)
<b>2011-Present Hickenlooper Period</b>	Decreasing Environmental Emphasis  (2)	Grey Economic Development  (2)	Weak Environmental Innovation  (3)	Non-Integrated Policy  (2)

- 1) 'Grey' IP
- 2) Treadmill-EM/Economic Development
- 3) Weaker EM/Green Manufacturing/Eco-Efficient EM
- 4) Stronger EM/ Green IP
- 5) Transformative EM

## RES Period 2004-2007

Each element in this period is somewhere between Treadmill EM/IP and Weaker EM/Green Manufacturing/Eco-Efficient EM. The period leading up to the RES looks very much like an extractive Treadmill economy. The conventional energy industry dominates all four categories in this period. A large shift occurs at the end of the period which ushers in the new energy economy, indicating the start of a transition, but economic, technological/innovation and decision-making forces are not leading this change. In fact, it is telling that the impetus for the RES comes from outside the formal institutions of the state. For this reason, Decision-making scores very low along with industrial technology and innovation that have not yet been targeted through policy. Traditional economic development foci continue to dominate economic planning during the period.

## Ritter Period 2007-2009

This period Approaches Stronger EM/ and Green IP in all categories. There is a dramatic jump during this two year period as the Ritter administration is responsible for radical policy change, doubling the RES standard, placing emphasis on environmental protection, a non-binding climate plan, a restructuring of the PUC and COGCC and an opening of the decision-making process to a broader array of stakeholders. An expansion of investment in Clean tech R&D and the creation of the Colorado Collaboratory as well as the strategic development and attraction of a renewable energy industry in the state point to strong technology/innovation policy. The economic category is the weakest of the period because it still retains an emphasis on economic growth without providing a stronger more explicit environmental focus in the face of a green manufacturing development strategy.

## Gas Period 2009-2011

This Period is defined by the financial crisis and subsequent stimulus package (ARRA) and the inclusion and emphasis on natural gas as part of the NEE. The impact of gas from an environmental perspective changes the dynamic moving the transition back to a weaker EM. At the same time the financial crisis shifts economic priorities during the period taking money and policy focus away from renewables and moving back to a broader sectoral targeting for economic development. Dispersal of ARRA money for energy efficiency and renewable energy loan guarantees masks and softens the impact of the financial crisis to a large extent, even though the administration pulls back resources at the same time. Technology/Innovation in clean-tech continues through the injection of ARRA money for the state and through NREL, but a greater deal of attention is now paid to natural gas development.

## Hickenlooper Period 2011-Present

Although this period does not command its own empirical chapter, it represents a new transition that is yet to be understood fully. Which forces will prevail remains to be seen and will depend largely upon the resiliency of the NEE policies up to this point as well as the speed of the economic recovery. Evidence I have provided at the end of Chapter 6 points to a regression in some categories with others showing resilience. I have included these preliminary shifts in Table 4 above.

By this time the stimulus money from ARRA has begun to dry up exposing the policy shift at both the federal and state-level away from support for renewables. The Hickenlooper administration decides to diversify the Governors energy office, placing a stronger emphasis once again on the extractive industries and more fervently supporting the development of natural

gas; this accounts for the environmental backslide to 2004 levels. As financing and incentives disappear, large manufacturing firms such as Vestas and Abound Solar begin to scale back operations in the state changing the economic landscape and abandoning support for the renewables industry in the state. As budgets are scaled back, R&D slows down in the state and private companies continue to develop fracking techniques. Although, the Hickenlooper administration attempts to reverse some of the institutional changes regarding the PUC and COGCC, there is an enduring quality the new arrangements and the door remains open to a broader group of stakeholders.

#### The Future of the NEE

The NEE has changed substantially in character over the past three years starting with the financial crisis in 2009. The Ritter administration's attempt to radically restructure Colorado's energy sector and economy in general has not been immune to the economic vicissitudes facing the entire country. Likewise the technological advance in natural gas extraction has been a mixed bag when considering its impact upon the overall transition.

The economic crisis has shown that the NEE's focus on building a clean tech industry does not have an enduring grasp on the political economy of the state of Colorado. Much like the previous economic collapse of the technology industry in the state of Colorado, on a smaller scale, the current retrenchment of the clean tech industry shows that without strong federal support, the state of Colorado will not be able to maintain a robust commitment in this sector. However, Colorado's longstanding history in renewables research and manufacturing has definitely contributed to the resurgence of renewables under the NEE and will continue to be a bright spot competitively when federal strategic investment again picks up in this sector. In this

regard the location of NREL in the state and the longstanding history in the renewables sector may not guarantee a thriving renewable energy industry that is not subject to broader economic trends, but it does ensure Colorado's competitive advantage amongst U.S. states in this sector. The Ritter administration has only served to strengthen this historical advantage through the promotion of renewables research, the attraction of a clean-tech industry, increases in the RES, enduring changes to institutions and rulemaking. As the world economy again picks up, Colorado should be well positioned to lead the next round of investment and development in the clean tech industry. However, as this case study shows state-level policies with regard to environmental innovation, while important, need complimentary, collaborative federal actions and policies to have robust and enduring impacts.

The technological breakthrough in natural gas extraction will play an important role in the future direction of the NEE. On one hand rock bottom prices for natural gas threaten to stymie investment and research in renewables, putting more pressure on a struggling sector. Likewise, environmental issues surrounding natural gas extraction techniques and regulation remain a source of concern for environmental quality and climate change. On the other hand natural gas provides an alternative to coal combustion and acts as a bridge for a transition to renewable energy, in so far as it does not compete with it (Staff, 2012). The ultimate impact of natural gas upon the direction of the NEE will depend upon current rulemaking and regulations for natural gas and the broader commitment to a long-term transition to renewables in the face of cheap gas.

Whether Colorado trades a coal-based energy infrastructure for a gas based infrastructure or instead, uses natural gas as a bridge to a renewable energy infrastructure will depend upon the ability of elected officials and environmental groups to chart out a strategic vision for the

transition. This will require a strong narrative regarding the proposed alternative to a natural gas economy employing a full cost accounting of environmental and social externalities that goes beyond simple environmental and ecosystem services valuations to encompass a broader set of societal values. In this regard, the NEE is a step in the right direction not for its lasting economic and technological impacts upon the state of Colorado, but for the way in which it has institutionalized a more open and inclusive stakeholder dialogue that will enable a broader array of public interests to determine the future direction the state of Colorado takes environmentally and socially. This is the enduring legacy of the NEE.

#### Limitations and Future Research

This project has several limitations associated with the research design and scope that I would like to address. First of all, the expansive time period this project covers only allows for a very cursory empirical investigation of the political dynamics occurring over the past several years. A more detailed investigation of groups of actors and the political dynamics surrounding them during different periods would warrant further investigation that is not possible in this thesis. Additionally, having chosen to look at four categories: environment, economy, Technology/innovation and decision-making has not allowed me to go into great detail regarding any one category. This thesis provides a broad overview of each category, but additional research might focus on a single category. I would like to pursue one of these categories individually in order to go into greater empirical and theoretical depth, particularly that of technology/innovation. However, other framings for Colorado's energy transition can also be employed.

Other framings for this topic, outside of ecological modernization and industrial policy framings might reveal other lessons. I have considered using the framings of socio-technical transitions or waves of economic development as alternative theoretical approaches to discussing the NEE. A future paper in this regard would add a great deal of understanding of the NEE from a different perspective. Alternatively, framing the NEE as a green cluster of innovation would be an interesting direction to take. For example, employing theories using insights into the role of innovation and entrepreneurship in regional development Cooke (2010) attempts to explain the emergence of green regional clusters of innovation as occurring through a tri-partite process of Jacobian clustering, Schumpeterian 'railroadization', and 'strategic niche management'. Observing the emergence of Colorado's own clean energy cluster we can begin to see parallels to other 'green' clusters in the existing variety of industries from solar and wind to a strong and emergent tech sector that would be consistent with predictions of varietal support leading to Jacobian green clusters of innovation. Future research might look at the way these clusters develop and interact at regional, national and international scales.

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## **Appendix A Interview Guide**

### **New Energy Economy Agenda State-Level Case Study Interview Questions**

#### **Questions**

1. Can you tell me what your current position is (more for the state-level people)? – or – who do you currently work with?
  - a. How long have you held this position/worked here?
  - b. Whom else do you work with (key individuals or organizations, etc.)?
  - c. [ask only if person has not been in current position during period of interest] What did you do prior to obtaining this position?
  
2. How would you describe the NEE?
  - a. What are some of the central elements (e.g. organizations, policies, programs)?
  - b. What are some key moments in the development of the NEE?
  - c. Do you have any knowledge of the history leading up to the development of the NEE (e.g. key issues, debates, actors)?
  
3. Can you describe to me your involvement in the development of the NEE?
  - a. [Probes on involvement in the development of the NEE]
    - i. How did you come to be involved in the NEE?
    - ii. How long were you involved in the NEE?
  - b. [Probes for each specific issue/debate]
    - i. What role did you play in this issue/debate?
    - ii. What position did you take in this issue/debate?
    - iii. What were the major positions on this issue/debate?
    - iv. Did you work with other actors/organizations?
    - v. Who else was involved in this particular issue/debate?
    - vi. Were you satisfied with the resolution of this issue/debate?
  - c. [Probes for specific programs]
    - i. What role did you play in this program?
    - ii. What was your goal/the program's goal?
    - iii. Did you work with other actors/organizations on this program?
    - iv. What were some of the major accomplishments of this program?
    - v. What were some of the barriers in achieving your/the program's goals?
  
4. To your knowledge, in what ways have local actors such as municipal officials, local businesses or civil society groups, been involved in the NEE?
  - a. Have local actors part of the discussion?
  - b. Have local actors been encouraged to be part of the discussion?
  - c. From your perspective have local actors such as municipal officials, local businesses or civil society group benefited from the NEE?

5. Can you describe to me the knowledge you have about the NEE?
  - a. What was your role prior to becoming involved with the NEE?
    - i. When did you become involved in tasks, issues or legislation associated with the NEE, and how long did you continue to work on them?
    - ii. Can you describe to me how and why you became involved with the NEE?
    - iii. Can you describe to me the role you played/focus in the process of NEE development? (this can include position)
  - b. Can you tell me about key debates regarding energy **prior** to the NEE?
    - i. What were the main issues and actors?
  - c. Can you tell me about key debates regarding energy **during** NEE negotiation?
    - i. What were the main issues and actors?
    - ii. Can you tell me about what some of the key elements were in the creation of the NEE, and how they developed?
      1. For example, how the Clean Air Clean Jobs bill came about.
    - iii. What were some of the specific pieces of legislation that came out of the NEE (that were important to you)?
      1. Can you tell me how you were affiliated and involved in the legislation, if at all?
  - d. Can you describe to me how the NEE is organized across the state government?
    - i. Can you tell me about how interactions between agencies and officials has played out?
      1. Who specifically have you interacted with, and how?
6. Can you describe to me how the NEE has played out at the local level?
  - a. How have local officials, businesses and civil society reacted both prior to, during and after the NEE?
  - b. Were there any municipal officials involved upfront and/or involved throughout the entire process of the NEE's development?
    - i. If so, why do you think these municipal officials became involved and who were they?
    - ii. If not, why do you think municipal officials did not become involved?
  - c. Has the NEE created a culture, or built upon a culture of encouraging municipal interaction on energy initiatives?
  - d. Do you believe local municipalities have benefitted from the NEE?
    - i. If so, any in particular? If not, why not?
  - e. Are there any other important local networks that have benefitted from the NEE?
7. Is there anyone else you suggest I talk to in order to find out more information about the NEE's development?

Is there anything I have not covered that you would like to discuss?

## List of Abbreviations

<b>ARRA</b>	American Recovery and Reinvestment Act
<b>CACJ</b>	Clean Air Clean Jobs
<b>CAP</b>	Climate Action Plan
<b>COGA</b>	Colorado Oil and Gas Association
<b>COGCC</b>	Colorado Oil and Gas Conservation Commission
<b>COSEIA</b>	Colorado Solar Energy Industry Association
<b>CRES</b>	Colorado Renewable Energy Society
<b>DARPA</b>	Defense Advanced Research Projects Agency
<b>DOE</b>	Department of Energy
<b>EM</b>	Ecological Modernization
<b>GEO</b>	Governor's Energy Office
<b>IP</b>	Industrial Policy
<b>NEE</b>	New Energy Economy
<b>NREL</b>	National Renewable Energy Laboratory
<b>PUC</b>	Public Utilities Commission
<b>REA</b>	Rural Electric Association
<b>RES</b>	Renewable Electricity Standard
<b>RMI</b>	Rocky Mountain Institute
<b>SEAL</b>	Solar Energy Application Laboratory