To Each Their Own:

Elaborating Differences in State Climate Action Plans

A Professional Paper

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List of Acronyms and Abbreviations

AFW	Agriculture, forestry, and waste management
CAP	Climate action plan
CCP	Cities for Climate Protection
CCS	Center for Climate Strategies
CO_2	Carbon dioxide
DSM	Demand-side management
EPA	Environmental Protection Agency
ES	Energy supply
GHG	Greenhouse gas
ICLEI	International Council for Local Environmental Initiatives
IPCC	International Panel on Climate Change
$MtCO_2e$	Metric ton of carbon dioxide equivalent
RCI	Residential, commercial, industrial
TLU	Transportation and land use

Introduction

Over the last twenty years, climate change has come to the forefront of many public and policy arenas. With the new Obama administration, discussions of its extent and impacts have become an important political plank at the federal and international levels. Before the issue was elevated to the national stage, however, responses to global climate change have played out at the state level, creating a wide variety of reactions and options to mitigate its effects.

This research attempts to answer several questions related to emerging climate policy at the state level. First, what differences exist between states' climate initiatives and what policies are being employed across the US? Understanding state differences in climate policy requires a detailed understanding of potential emissions reductions, popular policies being utilized in states' climate initiatives, and what differences exist in the costs or benefits of these programs to various states. Another major question is how will these programs impact alternatives for emerging climate policy at the state and federal level? While there have been a handful of analyses examining recent local and state climate policies (e.g. Wheeler, 2008), there has been no analysis of the details of these plans, including greenhouse gas (GHG) reductions and implementation costs or benefits. This research attempts to fill this void by creating a better understanding of the different policy options, GHG mitigation potentials, and costs of adopting climate policy. In doing so, this work can help policymakers in those jurisdictions implement alternatives appropriate to their unique contexts.

Understanding the current condition of state climate action plans (CAPs) is important for two reasons. First, Supreme Court Justice Louis Brandeis envisioned states as "laboratories of democracy" that provide examples for the federal government when developing new policy. Under this system, national lawmakers can learn from the experience of individual states and choose what works best for the country as a whole. Precedent for this pattern can be seen in existing federal environmental legislation that had its origins at the local and state level, including clean water and air initiatives, surface mining laws, and wildlife and soil conservation programs (Peterson & Rose, 2006).

One prominent example of the national government adopting state initiatives is seen in the Clean Air Act (Peterson & Rose, 2006). Acid rain was initially recognized as serious problems at the local and state levels, but there was little response from the federal government to combat the problem. Northern states enacted a regional solution to the problem through a market-based, cap-and-trade program, which was later amended to Title IV of the Clean Air Act. Several other national environmental regulations have followed this path, and federal legislators are now looking to state climate policies to address global warming.

Not only does the federal government use the states' examples when designing policies, but states look to each other when determining how to proceed with prevailing policy questions. With more and more states responding to the threat of climate change, those who have already developed CAPs can serve as leaders in policy design. The ultimate impact of state-level environmental initiatives are highly debated, and there is considerable research about the existence of either a "race to the bottom" or "race to the top" (Engel, 1996; Fredriksson & Millimet, 2002). Regardless of the direction, there has been evidence to indicate that policies diffuse through states, indicating that efforts to curb GHG emissions in one state will impact its neighbor's policies. In addition, regions respond differently in their interaction with neighbors, with some, such as New England states, being more prone to adopting stringent environmental standards. As a result, some sections of the country have become leaders in environmental legislation and provide a benchmark for other policymakers across the country (Fredriksson & Millimet, 2002).

In addition to political considerations, there are several practical reasons for states to be involved in climate policy. Individually, states are significant emitters of greenhouse gases. Compared to the emissions of other nations, states represent 35 of the top 75 carbon dioxide emitters (Peterson & Rose, 2006). Furthermore, there is a renewed interest in GHG regulation at the federal level. Several comprehensive reduction bills have been introduced in Congress, and the Obama administration is quickly moving forward on its campaign promises to regulate carbon dioxide and other emissions to reduce the U.S.'s GHG footprint. First-mover states that have already adopted climate policies will be well positioned to contribute to emerging federal legislation and can benefit from their early efforts later in the implementation process.

There are several other advantages to implement climate policy at the state level (Peterson & Rose, 2006). It provides a smaller scale for policy development, allowing for greater customizing for geographic and economic differences. This small scale and ability to adapt to different circumstances can result in fewer struggles designing a one-size-fits-all policy at the national level. In addition, there is a long history of federal policies being delegated to states for implementation, from welfare and Medicaid to air and water standards. If and when the national government adopts a climate plan, states that already have experience implementing its various parts will be well-positioned to utilize their experience.

These benefits, however, are countered by several disadvantages of adopting policy only at the state level (Ibid.). First, efforts in policy development, such as research, can be duplicated, resulting in wasted resources. This is particularly important given the constrained budgets plaguing many states. Second, there is the potential for negative aspects of interstate competition, such as the exportation of polluting industries. Finally, a wide variety of existing programs and policies could lead to problems implementing climate change legislation at the regional or national level.

These questions are particularly important with regard to climate and energy policy. Unlike local air pollution, GHG are dispersed into the global atmosphere, contributing equally to climate change throughout the world. So while states are significant contributors of carbon dioxide and other GHGs, their mitigation efforts are tempered by emissions in other jurisdictions across the county and the globe.

Given the pros and cons of state-level policy, there are several reasons why having a detailed understanding of emerging climate policies is important. Developing such an understanding will not only inform other states on how best to combat global warming, but can serve as a basis for unifying legislation at the federal level. As this research found, while there are some policies that many states are adopting, there is tremendous variation in the amount of reductions expected from those policies and the cost or benefits that each state expects to accrue from enacting them.

To help aid in this investigation, this paper is divided into five major sections. Part one provides a review of relevant literature on the scientific basis and public perception underpinning global climate change, how policies move between jurisdictions, and the effectiveness of existing environmental regulation. The second section introduces state CAPs and provides a history of their development since the 1980s. Parts three and four lay out the methods used to analyze a case study of CAPs and the results of that analysis. Finally, the fifth section includes a detailed discussion of the project's findings and conclusions for further research and climate policy.

Literature Review

To understand emerging climate legislation, it is helpful to review both the scientific literature and public perception surrounding global warming. In recent years, the UN's International Panel on Climate Change (IPCC) has becoming a leading resource detailing the scientific consensus on global warming. Its most recent assessment report, released in 2007, details several aspects of global climate change, including its causes, effects, and potential strategies for adaptation and mitigation (International Panel on Climate Change, 2007).

The IPCC's Fourth Assessment Report found that global average air and ocean temperatures are rising, providing unequivocal evidence that the climate is warming. This change has affected many natural systems, resulting in increased runoff in glacier and snow-fed rivers, earlier spring events, and pole-ward shifts in plant and animal ranges. At the same time, global greenhouse gases, in particular carbon dioxide, have increased substantially since the Industrial Revolution. Based on these indicators, the scientific community is near-unanimous in its finding that the rise in average global temperatures is due to the increase in anthropogenic GHG concentrations.

Further increases in GHG emissions would result in additional warming and create more changes than those seen in the last century. While these effects will differ across the globe, North America will be impacted in various ways. Global warming is expected to decrease snowpack in the western mountain ranges, increase water stress in arid regions such as the Southwest and areas with high usage and low supply, and increase the number, intensity, and duration of heat waves in urban areas.

Within the scientific community, it is widely accepted that additional mitigation measures need to be taken to reduce vulnerability to climate change. While some opponents have argued that mitigation will be detrimental to economic growth, there is high economic potential for mitigating emissions that could offset the costs of action. A wide variety of policy options, placed together into a portfolio of technologies and incentives, is available to help mitigate climate change and reduce GHG emissions (Pacala & Socolow, 2004). These options range from increasing vehicle emission standards and reduced deforestation to efficient building construction and carbon capture and storage.

In addition to the scientific community, the public plays a large role in the acceptance of climate change legislation and policies to mitigate its effects at the state and national level. While there has been significant opposition to combat climate change and reduce emissions, the majority of Americans now believe that there is scientific consensus about it and believe that it is real (Leiserowitz, 2005). At the same time, many Americans are less concerned with local impacts, perceiving the risks of climate change as affecting geographically and temporally distant people and places. Despite this perception, many Americans believe that the country should reduce its GHG emissions, regulate CO_2, and become more involved in international treaties such as the Kyoto Accords (Leiserowitz, 2006).

While opinions over the last 20 years have changed, there is still significant public debate about how to adapt to and mitigate climate change. Under the Obama administration, the Environmental Protection Agency (EPA) is proposing rules to regulate GHG emissions from automobiles and there is a comprehensive energy bill introduced in the U.S. House of Representatives that aims to tackle many of the problems related to fossil fuel consumption climate change. There is no consensus on how best to move forward, however, which leaves room for lessons from existing legislation at the state level.

A background of the scientific knowledge and public perception surrounding climate change can be complemented by an understanding of policy diffusion, a process by which policy innovations are communicated between and adopted in different jurisdictions (King & Mori, 2007). Often, this is the result of policymakers borrowing "policies developed in one setting to develop programs and policies within another" (Dolowitz & Marsh, 1996, p. 357). Initially, policy diffusion research was focused on welfare programs, such as the movement of Bill Clinton's welfare-to-work initiative from the U.S. to Great Britain, but this effort quickly moved into other fields, including environmental legislation (Dolowitz & Marsh, 2000).

Dolowitz and Marsh (2000) found that three factors are necessary for the successful transfer of policies from one jurisdiction to another. First is complete information about the policy and how it functions in the originating country. The second requirement is ensuring the complete transfer all elements that made the policy or institution successful in the country from which it was transferred.

Finally, they found that differences in the social, ideological, and economic contexts of the two countries need to be considered for a successful policy transfer to occur.

Policy diffusion is important in the context of climate policy for two specific reasons. First, there is a history of state-level environmental policies serving as a model for federal actions to reduce and regulate pollution. The Clean Air Act, soil conservation programs, and numerous other environmental initiatives all found their starts at the local or state level (Peterson & Rose, 2006). A second reason why policy diffusion is important to climate policy is the legacy of actions taken by other countries and supranational organizations. The successes and failures of the Kyoto Protocol and the EU's Emissions Trading Scheme can provide important lessons in the development of any GHG reduction program applied in the U.S.

Policy transfer, with regard to climate change and a variety of other policies, has been increasing over the past two decades for two major reasons (Dolowitz & Marsh, 2000). First, global economic ties are reducing the insulation that was previously present between jurisdictions. Second, rapid growth of communications has allowed for the exchange of knowledge and ideas at a much faster pace. Increased competitiveness in a global environment also means that political institutions often enhance their legitimacy by adopting policies that have been implemented in other jurisdictions (Vasi, 2006). By adapting policies to their unique contexts, they attempt to remain competitive while improving on the previous iteration of the particular policy.

This phenomenon can be seen in efforts to decentralize environmental policies and their differential effects at the state level. Conventional political theory holds that government decentralization promotes policy innovation by allowing each jurisdiction to pursue alternatives that best fit their particular contexts (Ringquist, 1993). In addition, the central government generally cannot experiment with various policies, because it is often restricted to enacting uniform programs in all regions (Strumpf, 2002). The "laboratories of democracy" provided by decentralization not only benefit the innovating local governments, but also their neighbors and the central government, which may imitate first movers. Strumpf has found, however, that the level of innovation depends on the number and homogeneity of the local governments (2002). Centralization encourages policy innovation when there are many local governments and they are relatively homogenous, while local control leads to more innovation if there are a variety of experimental policies available and the local governments vary in their contexts and resources.

In terms of climate policy, this suggests a need for both centralized regulation as well as the ability for state and local governments to modify policies to suit their specific contexts. Greenhouse gases are global in nature, and therefore require some large-scale coordination of reductions strategies, regulation, and monitoring. At the same time, states vary greatly in terms of their natural resource endowments, industry and agriculture mix, and population, so the ability to marginally tailor regulation for local conditions will be vital for the success of any policy addressing climate change.

There has been much policy debate regarding the effects of decentralization on environmental regulations and their impacts, including arguments supporting both a "race to the top" and "race to the bottom." Proponents of the former argue that local governments can set the socially-optimal level of environmental regulation (Levinson, 2003). This result requires that several assumptions be met including, among others, no cross-border externalities, welfare-maximizing local regulators, and no constraints on available policy instruments. Millimet (2003) found that President Ronald Regan's rapid decentralization of air-quality regulation eventually led to states increasing their abatement expenditures, evidence of a race to the top. Advocates of the opposing school argue that the conditions necessary for optimal local regulation are highly improbable, and as a result decentralization can lead to sub-optimal environmental regulations and a race to the bottom (Engel, 1996; Levinson, 2003). Even more efforts to determine the effect of decentralization have found that, although states consider their neighbors existing policies, there is no evidence to determine whether it is a race to the top or bottom (Fredriksson & Millimet, 2002).

Regardless of the race's direction, these studies have found that states respond to their neighbors when determining how to create and implement environmental policy. These findings indicate that states that have already developed climate change policies will serve as models for how remaining states respond to global warming. The federal government can play a role not only in providing minimum standards to prevent a race to the bottom, but can also provide resources for those states that want to exceed the policies and performance of their neighbors. Information sharing, open policy development processes, and regional coordination can help both states and the federal government craft climate change policies that help reduce the risk of global warming and adapt to its existing impacts.

This debate is especially important for climate policy because of the interconnectedness of the problem. GHGs are global, affecting individuals and communities far from their source and flowing easily across state and national boundaries. In addition, emissions are tied to a network of producers across state lines that export energy, agriculture, and a wide variety of other products. The multijurisdictional nature of climate change requires that large institutions set overall guidelines, while allowing individual states the ability to meet those requirements through context-specific methods.

In addition to examining the existence and transfer of environmental and regulatory policies, it is important to examine whether or not they achieve their intended impacts. Ringquist (1993) examined the impact of both state and national regulation of air pollutants, and found several themes to indicate that the regulations resulted in positive policy outcomes. First, regulations reduce the presence of pollution emissions. Between the 1970s and 1980s, states with more stringent air quality programs had fewer emissions of sulfur dioxide and nitrogen dioxide. Second, air pollution is reduced more when enforcement is consistent, focused, and well-supported. Finally, external environmental conditions impact the outcomes of air pollution regulations. Even the best-designed policies cannot predict all of the possible variables affecting climate change, so it is important that regulations be flexible and allowed to adapt to changing conditions (Ibid.). Each of these lessons can be applied to climate change policies, and it is important to keep them in mind when developing methods to combat and adapt to global warming.

Introduction and History of State Climate Action Plans

Within policymaking, there is a distinction between policy paradigms and specific policy instruments (Dolowitz & Marsh, 2000; King & Mori, 2007). Policy paradigms, which reflect a political ideology and underlying values, are broad statements that indicate the general direction that policymakers would like to take. On the other hand, policy instruments or programs are the specific ways in which paradigms are implemented. State climate action plans have pursued a variety of policy instruments reflecting their individual paradigms, including funding mechanisms, regulation, technical assistance, research and development, education and information initiatives, and monitoring and reporting (Peterson & Rose, 2006).

Early efforts by state governments to craft climate policy often bypassed elected or appointed officials, ignored public input, and did not include extensive calculations of benefits and costs (Peterson & Rose, 2006). In the 1980s and 1990s, the environmental policy paradigm in many industrialized countries shifted from a command-and-control model to a more market-based approach, using "soft" policy instruments such as voluntary agreements, information disclosure, and economic measures (King & Mori, 2007).

By the early 1990s, several cities had begun to create climate policies under the Cities for Climate Protection (CCP) program (Vasi, 2006). Beginning in 1991, the CCP program was coordinated by the International Council for Local Environmental Initiatives (ICLEI), an international environmental agency formed under the auspices of the International Union of Local Authorities. By 2008, more than 500 municipalities in the U.S. had become members, including New York City, Los Angeles, Chicago, and Minneapolis-St. Paul (International Council for Local Environmental Initiatives - USA, 2008). For many of the member cities, the main reason for joining was the economic benefits that they gained through conservation and energy efficiency (Vasi, 2006). Most local governments were more concerned with the economy than environmental problems, so framing the programs to highlight their financial benefits allowed the CCP program to spread quickly.

To achieve their goals of mitigating climate change, ICLEI worked with local governments to create a comprehensive policy package to reduce their GHG emissions. The process consisted of several steps, including a GHG emissions inventory, a quantified goal and action plan for emissions reductions, implementation of that plan, and monitoring and reporting of results. This process has been copied by the Center for Climate Strategies (CCS), a national consulting organization that has facilitated CAPs in 23 states and three regions since 2000 (Figure 1).

During the policy process, there are several categories of political actors engaged in the policy transfer, ranging from elected officials and political parties to think tanks and consultants (Dolowitz & Marsh, 2000). Increasingly, policymakers at all levels of government are relying on consultants like Climate Strategies to act as subject matter experts when developing new policies and programs. These consultants often offer a catalog of “best practices” that have been implemented in other places, allowing policymakers the opportunity to choose the most suitable option for their particular context (Ibid.).

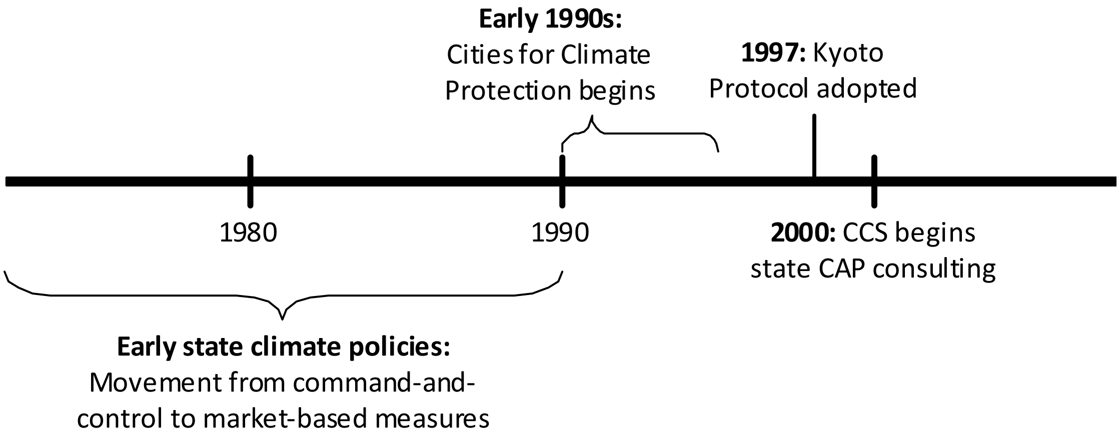

Figure 1 - Origins of local and state-level climate policies

Methodology

In order to evaluate and address differences in state climate policies, data on their CAPs were gathered from the Center for Climate Strategies' and individual states' websites. CCS has facilitated an iterative stakeholder process in 23 states, designed to examine policy options catered to different state and regional contexts. The final products were climate action plans that lay out the states' climate policies and were endorsed by the majority of involved individuals and organizations in each state.

The state CAP program facilitated by CCS adopts the common but differentiated responsibilities approach outlined in principle 7 of the United Nation's Rio Declaration on Environment and Development (King & Mori, 2007). Originally created to divide environmental protection responsibilities among developed and developing countries, this principle can also be used to split climate change mitigation policies among different sectors. This strategy is used by CCS and their clients to separate emissions and reductions goals into four sectors: energy supply; residential, commercial, and industrial; agriculture, forestry, and waste management; and transportation and land use.

In addition to dividing emissions and mitigation by sector, CCS approaches each state with a menu of various policy approaches, including regulatory, economic, and social instruments (King & Mori, 2007). Regulatory instruments include command and control regimes and direct provision of the government's fiscal resources to invest in policy implementation. Economic instruments consist of market-based incentives and disincentives and the creation of new markets such as carbon-trading. Finally, social instruments include voluntary agreements to reduce emissions or the distribution of information on environmental performance or emissions levels.

To create a CAP for each of their client states, Climate Strategies facilitated a stakeholder process that consisted of several steps. First, stakeholders across the state convene and separate into the four sector working groups mentioned above: energy supply; residential, commercial, and industrial; agriculture, forestry, and waste management; and transportation and land use. CCS then provides the sector working groups with a catalog of policies, including a rough potential for GHG reductions and estimate of potential costs or benefits to the state. At the same time, Climate Strategies is conducting an inventory of current and predicted GHG emissions in the state, to obtain a baseline calculation with which to compare any potential reductions. The working groups then proceed through several rounds of reviewing and revising the mitigation options and develop a final list, including specific information about each policy. Next, CCS takes each policy that has sufficient detail and calculates the potential GHG reductions and costs or benefits to the state. At a series of plenary sessions, the various sector working groups discuss their policies and reconcile any overlaps that may occur between them (See Minnesota Climate Change Advisory Group, 2008; South Carolina CECAC, 2008). Because CCS provides the same process and method for calculating GHG reductions and benefits or costs of each policy, the results can be compared across the various case study states in a consistent manner.

The particular sectors and estimated emissions reductions for each policy can be used to see if some sectors are relied on more than others to reduce a state's emissions. These data provide an opportunity to not only compare which policies are most popular, but also see if some sectors are more prevalent than others and how much each state is reducing its GHG emissions.

Unfortunately, not all of the CAPs are easily comparable. Many of the states created their own format for analyzing and reporting on the climate policies, making them difficult to evaluate in a systematic manner. The initial list of potential case study states was narrowed down by examining their final climate policy documents and removing any that did not match the standard CCS format. As a result of this process, eleven states were chosen, representing a variety of regions across the U.S. (Table 1).

Table 1 - Case study states with climate action plans and the months they were adopted

<table>
<tr><th>State</th><th>Month adopted</th></tr>
<tr><td>Arizona</td><td>October 2006</td></tr>
<tr><td>New Mexico</td><td>December 2006</td></tr>
<tr><td>Colorado</td><td>October 2007</td></tr>
<tr><td>Montana</td><td>November 2007</td></tr>
<tr><td>Minnesota</td><td>April 2008</td></tr>
<tr><td>South Carolina</td><td>July 2008</td></tr>
<tr><td>Maryland</td><td>August 2008</td></tr>
<tr><td>Arkansas</td><td rowspan="3">October 2008</td></tr>
<tr><td>Florida</td></tr>
<tr><td>North Carolina</td></tr>
<tr><td>Iowa</td><td>December 2008</td></tr>
</table>

When completing their CAPs, each state created a unique naming and numbering system for their particular policy options. Each policy was then categorized into one of the four sectors outlined by CCS: residential, commercial, industrial (RCI); energy supply (ES); transportation and land use (TLU); and agriculture, forestry, and waste management (AFW). Some states, however, combined several policies into one blanket program or collapsed more than one sector together. For example, Florida combined the RCI and ES sectors into a single energy supply and demand category. To ensure compatibility across states, these policies were renumbered based on a standardized system created by Climate Strategies (Center for Climate Strategies, 2008). Each policy was examined in detail, and a new number was assigned based on that assessment. A complete list of standardized policies by sector can be seen in Appendix I.

Data limitations

A major limitation of the data in this study is its small scope. Of the 23 states that CCS has helped facilitate this process in, only 11 provided reports and data that could be directly compared. As a result, the case study states are not necessarily representative of the entire population, nor do they cover all of the regions within the U.S. For example, there are not states in the sample from the Pacific Northwest or New England. Despite these drawbacks, analysis of the existing data is helpful. It provides an picture of emerging state-level climate policy, which can be used to both develop questions for further research and provide lessons learned for those currently considering GHG reduction programs.

An additional problem that presented itself during the analysis was potential overlaps in expected emissions reductions. For example, energy use reductions as a result of demand side management programs may overlap with other incentives for conservation and energy efficiency, resulting in double counting the reductions from those policies. This overlap was taken into account at the broadest level of analysis, which examines projected emissions by state. When examining emissions reductions by sector, however, it was impossible to account for overlaps, and double counting may have occurred. Because the emissions calculation process was consistent across all of case study states, it is possible to compare reductions between them, regardless of the overlap. Accordingly, the measures calculated in that section of the analysis should not be used for absolute measurement, but rather comparison of reductions by sector and state.

Analysis

Analysis of the state CAPs was done on four levels, attempting to provide a broad picture of climate policies as a whole as well as what policies are more popular and what sectors states are relying on to achieve their reduction goals.

1. Emissions reductions were assessed as a way to measure each state's goals relative to each other.
2. An examination of individual policies, based on CCS's categories, detailing what policies are more or less popular between states.
3. An overview of projected emissions reductions by sector, as calculated by CCS, to determine if some sectors are favored over others.
4. A detailed examination of the estimated costs of reductions, also calculated by CCS, for each of the most popular policies. Doing so will provide a comparative understanding of the costs or benefits states face when reducing their GHG emissions.

Examining all four of these components together will provide a holistic picture across the eleven case studies, elaborating both differences and similarities of emerging climate policies at the state level.

Projected emissions reductions by state

To determine the effectiveness of each state's policies, the amount of GHG reductions achieved through their CAP was examined. To do so, their expected emissions levels at their final benchmark as a percent of 1990 levels were calculated. The states examined for this study predicted their emissions levels out to either 2020 or 2025, depending on when their CAP was adopted. Arkansas, Florida, and Minnesota used 2025 as their final benchmark date, while the remaining states used 2020. Using a single year for all of the case studies was not possible, because the reports included data only for 2020 or 2025, not both.

Emissions in 1990 are used as a yardstick for two major reasons. First, this year was included in all of the comparison states' GHG inventories, providing common data across the case studies. In addition, it is the benchmark year established by the Kyoto Protocol. While the U.S. is not a treaty signatory, choosing this date allows for comparison not only between states, but also with other emissions reduction goals established in the international community.

The results of these calculations can be seen in Figure 2. Only four of the eleven states, Arkansas, Iowa, Maryland, and Montana, are predicted to reduce their emissions below 1990 levels. Of these, Iowa has the largest reductions of more than 60 percent below its 1990 emission levels. Three states, Arizona, Colorado, and Minnesota, are expected to be emitting GHGs at more than 20 percent above 1990 levels.

Figure 2 - Emissions at second benchmark as a percent of 1990 emissions levels – The second benchmark date for Arkansas, Florida, and Minnesota is 2025. For the remainder of the states the second benchmark is 2020.

Policy popularity

The second level of analysis examined the most prevalent policies across the eleven state CAPs, as categorized by Climate Strategies. Figure 3 shows the policies that nine or more states adopted in their emissions reductions strategies. Of the four policies that were adopted by all eleven case study states, two were in the Residential, Commercial, and Industrial sectors (utility demand-side management programs for electricity and improved building codes for energy efficiency), one is in the Energy Supply sector (renewable and/or environmental portfolio standards), and the other is in the Agriculture, Forestry, and Waste Management sector (in-state liquid biofuels production).

While all eleven case study states adopted four of the same policy options, the projected impacts, as calculated by CCS, are quite variable. Substantial differences exist in the projected amount of emissions achieved through each of the four policies, as detailed in Figure 4. Per capita GHG reductions for the second benchmark year range from less than 0.001 metric tons of CO_2 equivalent (MtCO2e) for Minnesota's new building codes to 3.24 $MtCO_2e$ for Iowa's increased domestic production of biofuels.[*]

Not only do expected emissions reductions vary across the four policies, but also between the different states adopting the same policy. Under the increased in-state biofuels production program, two states with substantial agriculture sectors—Iowa and Minnesota—have the highest expected emissions reductions, while other states such as South Carolina, Florida, and Maryland have almost no predicted reductions. Similarly, Minnesota has only marginal predicted per capita emissions reductions as a result of their revised building codes, but New Mexico and South Carolina have 1.15 $MtCO_2e$ and 1.49 $MtCO_2e$, respectively.

[*] Per capita emissions were used to normalize the data across states that vary greatly in population size. In doing so, states with small populations, such as Iowa and Montana, can be directly compared with larger populations, like Florida.

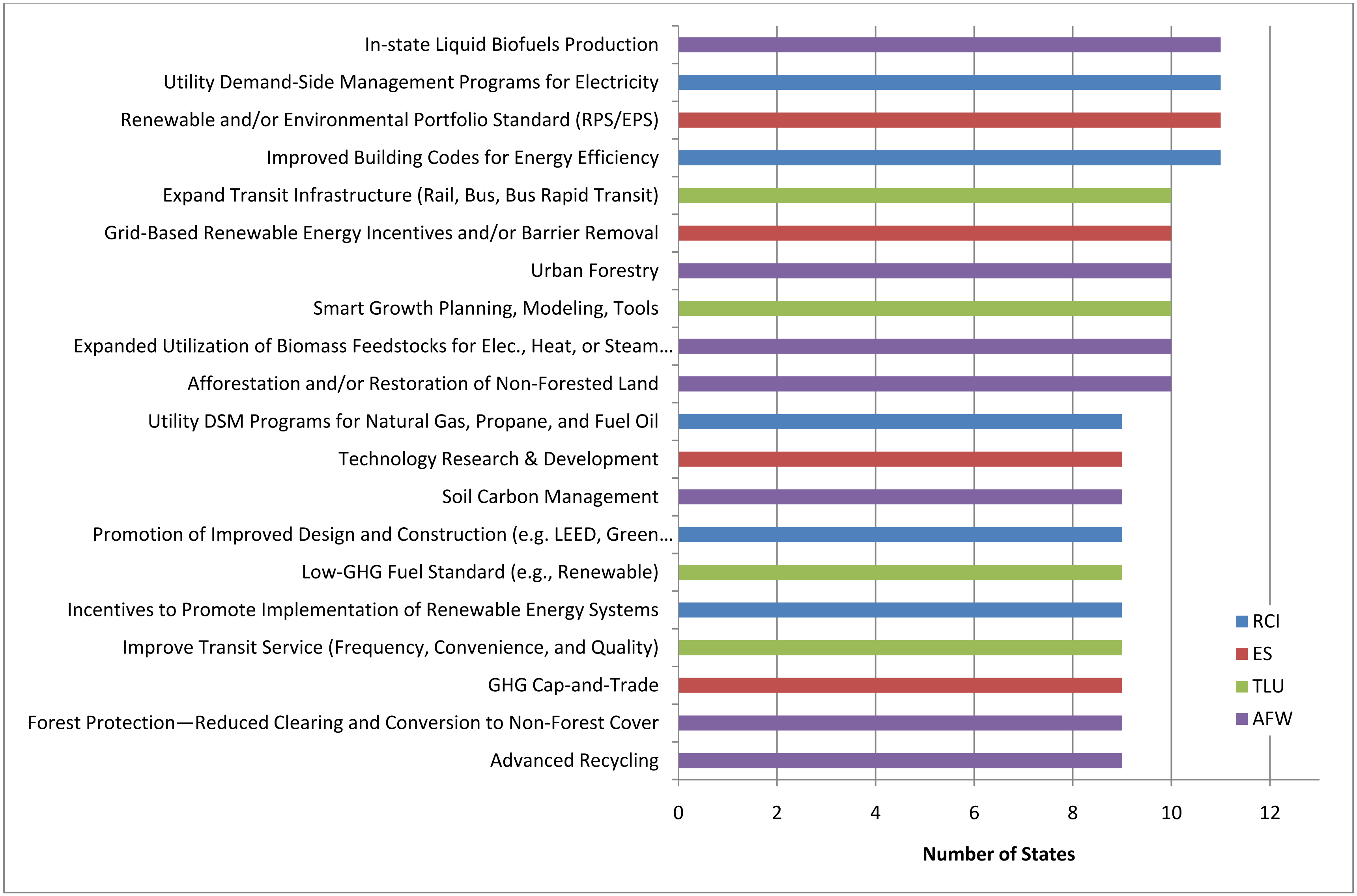

Figure 3 - Popular climate action plan policies by sector – Residential, Commercial, and Industrial (RCI); Energy Supply (ES); Transportation and Land Use (TLU); Agriculture, Forestry and Waste Management (AFW)

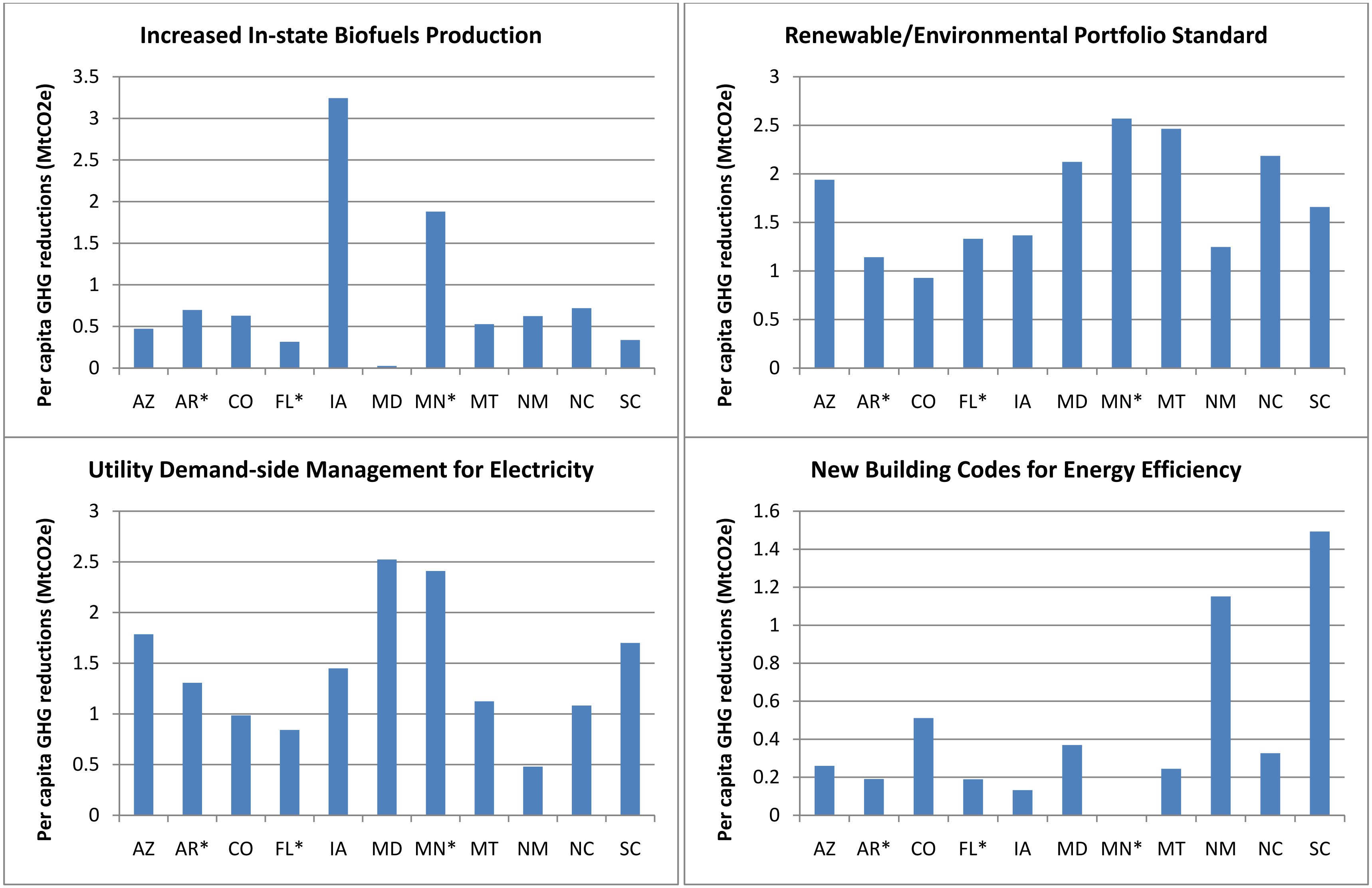

Figure 4 - Expected 2nd benchmark per capita GHG reductions for four most popular policies – The second benchmark date for Arkansas, Florida, and Minnesota is 2025. For the remainder of the states the second benchmark is 2020.

New Mexico is achieving such high reductions through more aggressive building and conservation standards. By 2010, buildings in the state are mandated to consume 50% less energy per square foot than average U.S. buildings, and they are expected to be carbon neutral by 2030. Most other states are only adopting current International Energy Conservation Codes and/or California's Title 24 building energy codes, which do not require such stringent standards (New Mexico Climate Change Advisory Group, 2006).

South Carolina's emissions reductions are high due to a different reason. The state wants to adopt international building code standards, but a 1976 law makes efficiency improvements very difficult. Removing this law will allow South Carolina to catch up with other codes and efficiencies very quickly, resulting in a rapid decrease in GHG emissions (South Carolina CECAC, 2008).

Emissions reductions by sector

To examine the impacts of each policy by sector, per capita reductions were calculated using the expected emissions reductions as calculated by CCS and U.S. Census Bureau state population projections for the second benchmark year (Figure 5). Total per capita reductions ranged from 8 $MtCO_2$ annual equivalent in Florida to a staggering 54 $MtCO_2e$ in Iowa. Montana is expected to have the next largest per capita reductions, with slightly over 30 $MtCO_2e$ per year by 2020.

One of the most striking findings of this section of the analysis is the substantial role that reductions in particular sectors are expected to play over time. Figure 6 shows reductions by sector, as a percent of total per capita emissions reductions at the second benchmark date. In Minnesota, more than 65 percent of the reductions are expected to come from the agricultural sector, followed by 45 percent in Florida and 39 percent in Arkansas. In Montana, a full 70 percent of the expected per capita reductions will come from the energy supply sector.

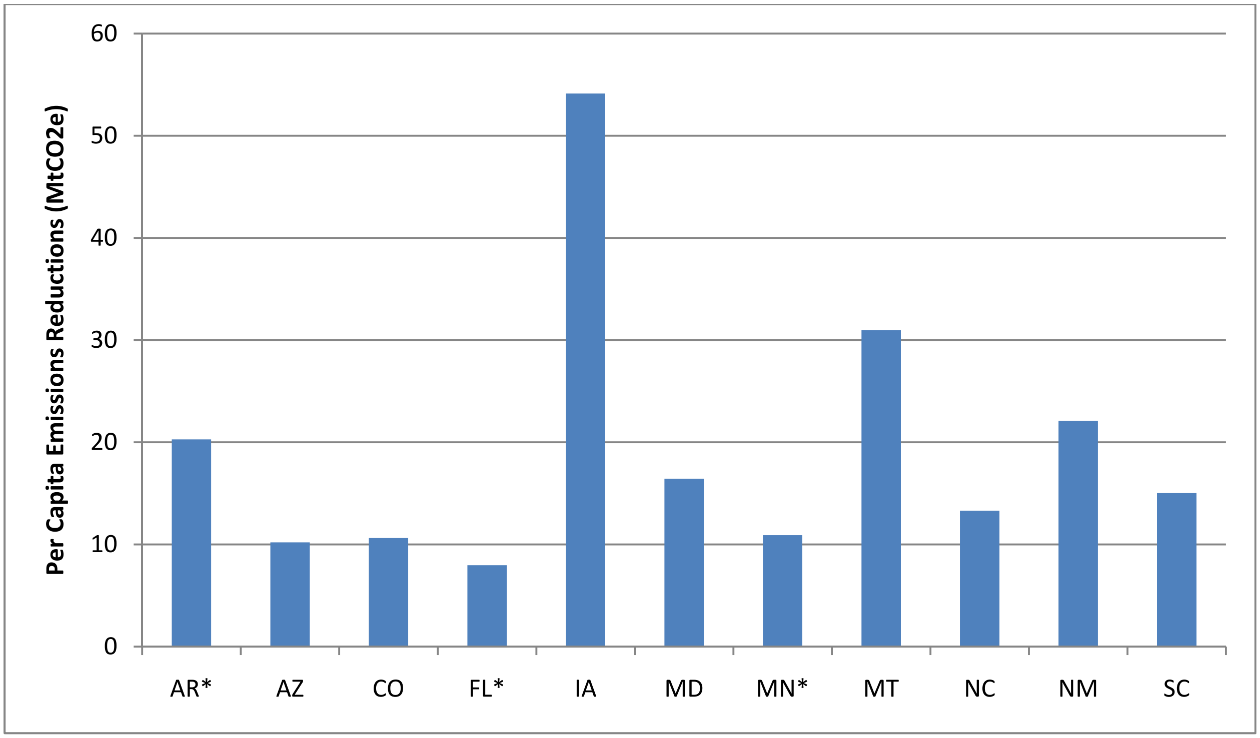

Figure 5 - Emissions reductions per capita at second benchmark year – The second benchmark date for Arkansas, Florida, and Minnesota is 2025. For the remainder of the states the second benchmark is 2020.

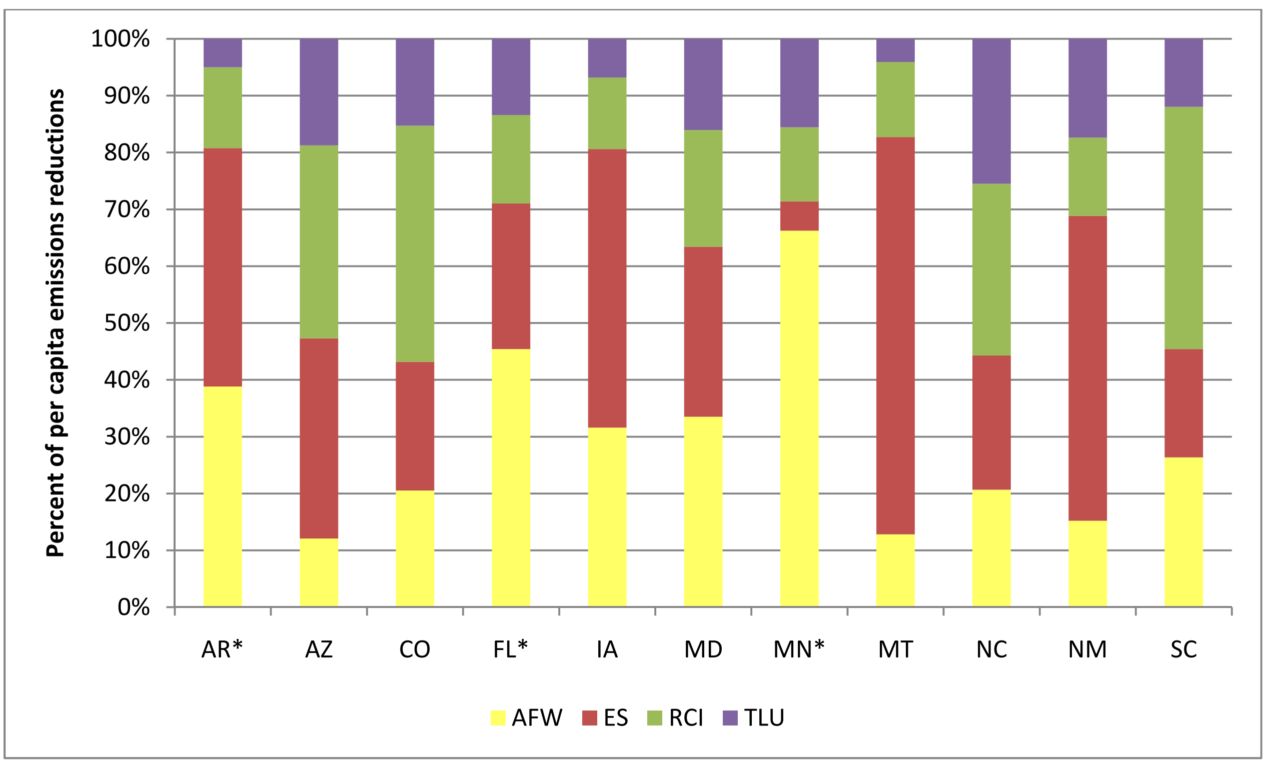

Figure 6 - Percent of per capita emissions reductions by sector – Residential, Commercial, and Industrial (RCI); Energy Supply (ES); Transportation and Land Use (TLU); Agriculture, Forestry and Waste Management (AFW). The second benchmark date for Arkansas, Florida, and Minnesota is 2025. For the remainder of the states the second benchmark is 2020.

Reliance on particular sectors for the plurality of emissions reductions is especially striking in light of how emissions are expected to be distributed across those sectors. Projected emissions in the second benchmark year make up roughly the same percentage of total emissions across the eleven case study states (Figure 7). Yet some states are attempting to attain the majority of their reductions through one particular sector. For example, Minnesota is expecting to achieve over 65 percent of its reductions from the agriculture, forestry, and waste management sector, but that same sector is predicted to make up less than 20 percent of total emissions.

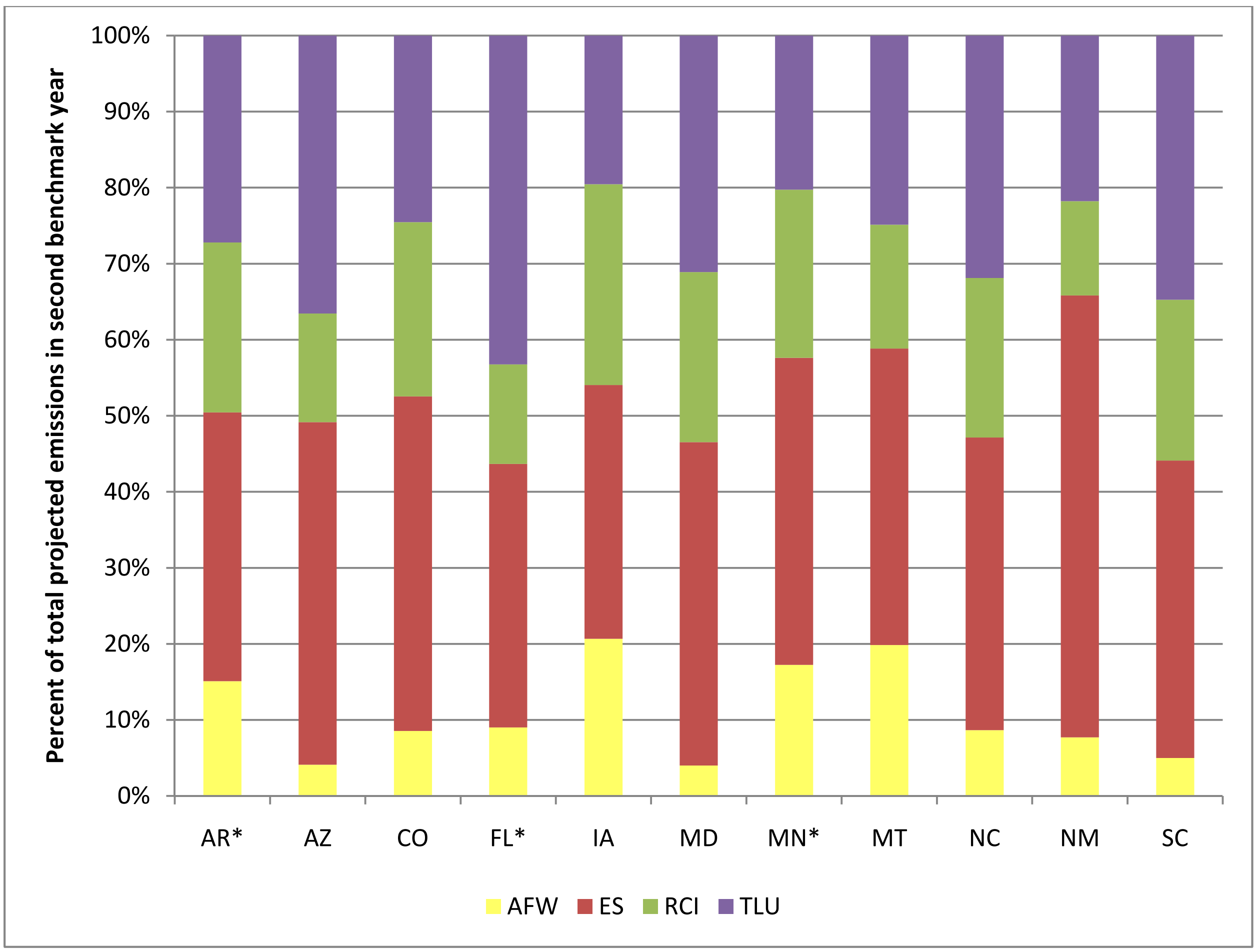

Figure 7 - Percent of BAU projected emissions in second benchmark year by sector – Residential, Commercial, and Industrial (RCI); Energy Supply (ES); Transportation and Land Use (TLU); Agriculture, Forestry and Waste Management (AFW). The second benchmark date for Arkansas, Florida, and Minnesota is 2025. For the remainder of the states the second benchmark is 2020. Emissions projections were calculated by CCS based on the consumption method. These figures do not include potential sinks from forestry and other land use measures (i.e. gross emissions only), due to variable levels of uncertainty between states.

Like the variation among expected reductions from the four most popular policies, these differences indicate two significant findings. First, some states are concentrating on particular sectors to achieve the bulk of their emissions reduction. This may be due to their availability as "low-hanging fruit," or reductions that can be easily achieved through minimal investment. A second, and more critical finding, is that states may not be realistic about what sectors are the greatest contributors of GHGs, and therefore from where their emissions reductions need to come.

Cost per ton comparison

To gain an understanding of implementation costs for each of these states, the CCS-calculated benefit-cost data for the four policies all eleven states adopted was examined (Figure 8). The four policies included:

- Improved building codes for energy efficiency
- Renewable and/or environmental portfolio standards
- Utility demand-side management (DSM) programs for electricity, and
- In-state liquid biofuels production

Only two of the case study states, Florida and Iowa, achieved net savings for all four policies. Two of the policies, improved building codes and utility DSM programs, had net savings across all of the states examined. The two remaining policies, renewable and/or environmental portfolio standards and in-state liquid biofuels production, generated net costs or small gains in the remaining nine states.

These differences can also be seen in Figure 9, which plots the cost or benefit per $MtCO_2e$ against expected per capita emissions reductions for each of the four most popular policies. While loose correlations can be seen in the renewable/environmental portfolio standards and the demand-side management programs, there are significant outliers in the in-state biofuels production and improved building code graphs. In the former, Iowa achieves substantially more GHG reductions

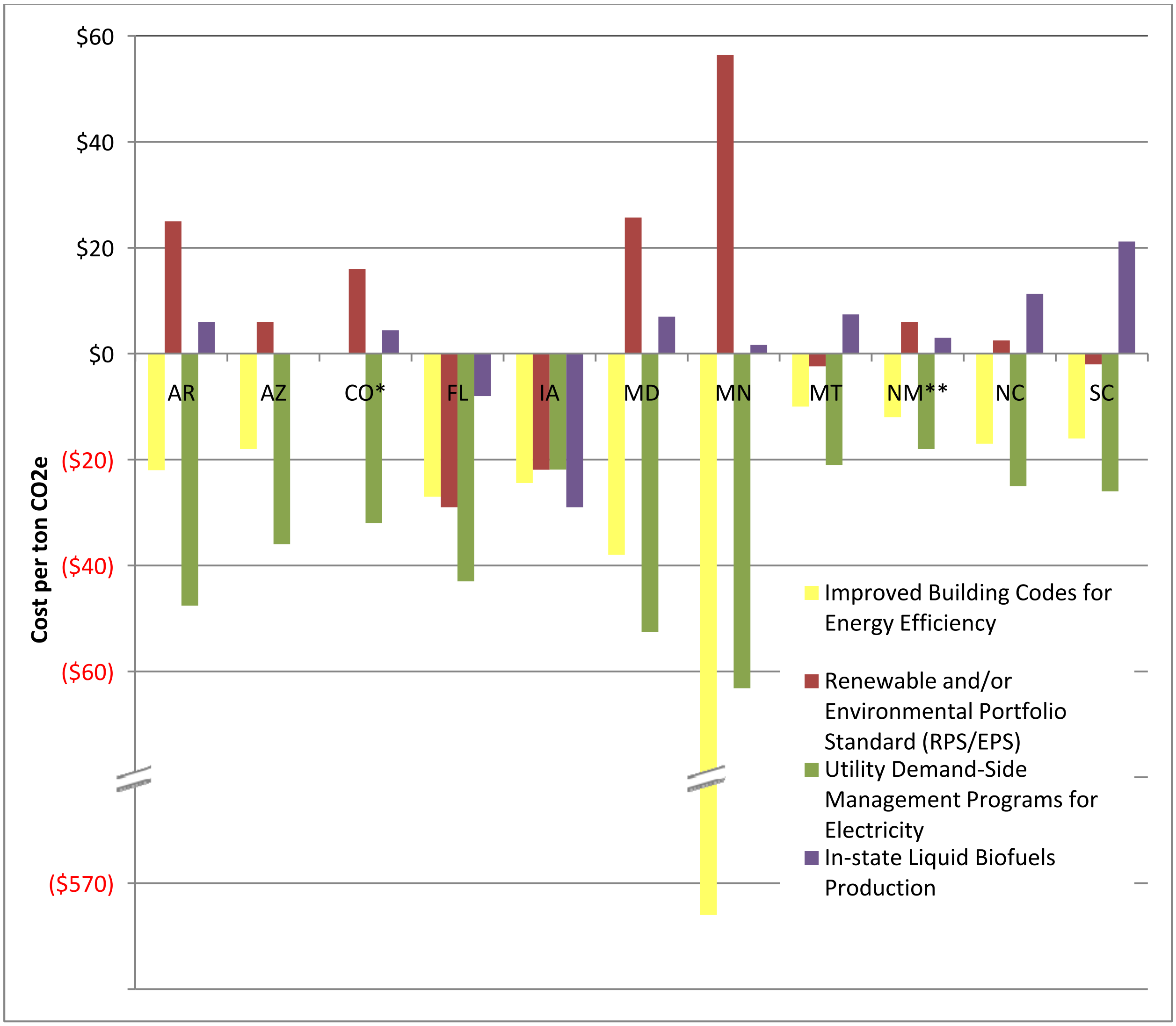

Figure 8 - Cost per ton CO2e for the four most popular policies adopted by all states
* Colorado did not calculate expected benefits or costs to enact improved building codes.
** Ethanol production only—Information on biodiesel funding levels was not available.

per capita than the remaining states and does so while saving almost $30 for each $MtCO_2e$ reduced. That savings is due entirely to the assumption that the federal subsidy of $1.01 per gallon of cellulosic ethanol will continue through the entire period of the policy. If that funding was not present, the policy would actually *cost* Iowa $30 per $MtCO_2e$ (Iowa Climate Change Advisory Council, 2008).

Another striking result is Minnesota's effort to revise their building codes, which is expected to save over $570 per $MtCO_2e$. Interestingly, the amount of GHG reductions expected from this

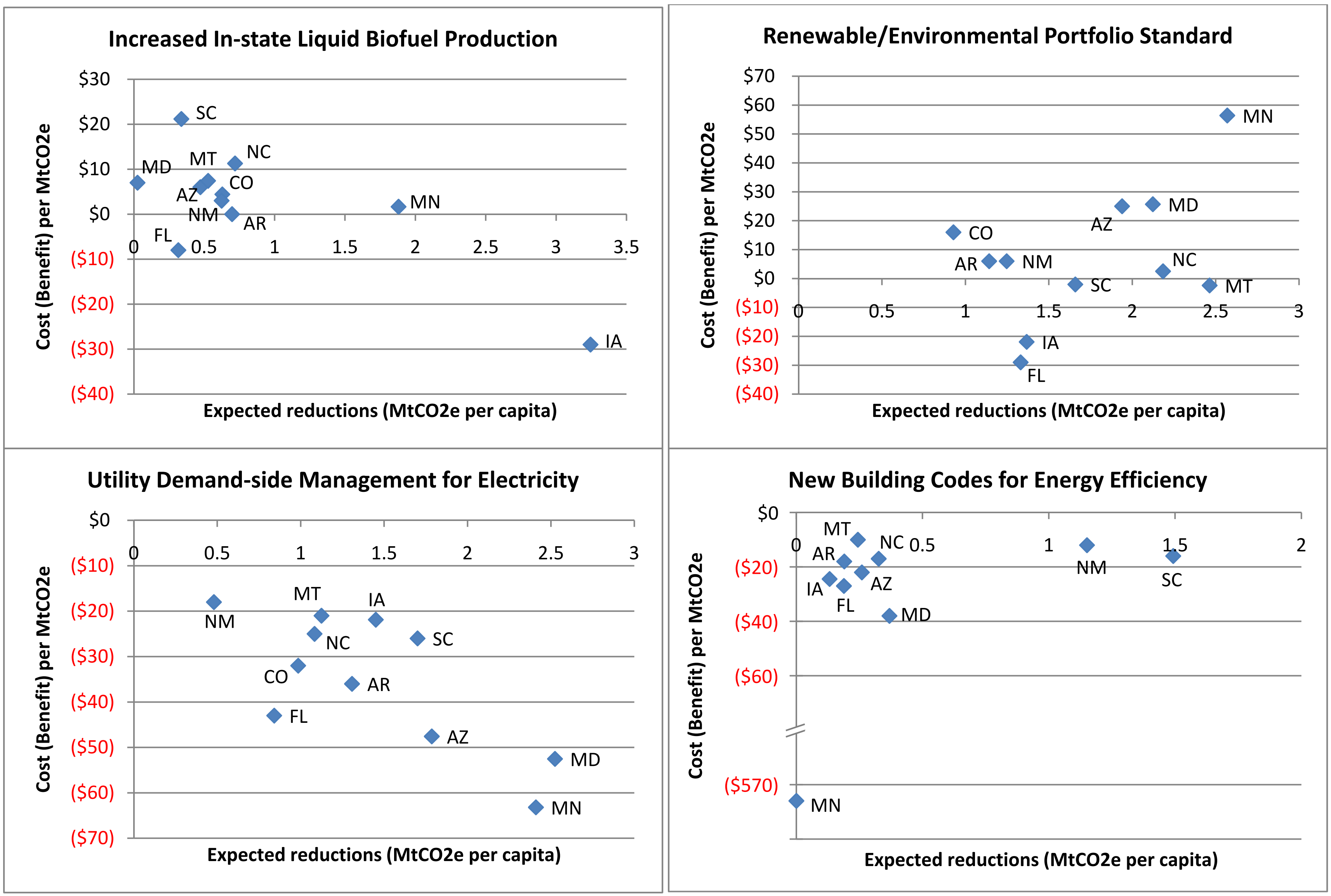

Figure 9 - Cost (benefit) and expected reductions comparison for the four most popular policies

policy is less than 0.001 $MtCO_2e$ per capita, so while the per unit savings are high, the absolute emissions reductions are very small. The reason for this discrepancy is that the new policy to be adopted only includes efficiency improvements in townhomes. A previous code revision in 2000 required an efficiency increase in one and two family homes, so those residences are already covered under the more stringent standard. The examples of Iowa's expanded production of biofuels and Minnesota's improved building codes provide important insights into the role that assumptions and small details play in the outcomes of these policy recommendations.

Discussion and Conclusion

The previous analysis and description of state CAPs provide a preliminary view of emerging climate policies at the state level, and there are several lessons that can be gleaned from the data. First, we can obtain a surface-level evaluation of the CAP process itself, through emissions reductions and costs that were expected for different states and policies. Even among the four policies that were adopted by all eleven case study states, there was substantial variation in the expected emissions reductions and benefit-cost analyses. While some of the variation can be attributed to differences in the states' climates, budgets, natural resource endowments, and energy structure, the magnitude of variation indicates how important assumptions are to these calculations, and further analysis can be performed to examine a few of these states and assumptions in detail. In addition, the variation indicates the level of uncertainty present in the cost quantification and GHG emissions prediction process.

The uncertainty present in each state's CAP is compounded by criticism of the methods that the Center for Climate Strategies used to calculate the benefits and costs of each policy option. The first major critique is that CCS has failed to quantify the economic benefits of reducing GHG emissions (Beacon Hill Institute, 2008). While they estimate how much each policy option would cost (or save) the state, their climate action plans do not take into consideration any economic gains that could be realized by reducing the impacts of global warming. They do, however, consider financial benefits that could occur through conservation and energy efficiency programs. The Center for Climate Strategies has acknowledged this limitation and stated that, "Because accurate information on the dollar value of GHG reductions benefits is typically not available, physical benefits are used instead, measured as $MMtCO_2e$" (Minnesota Climate Change Advisory Group, 2008, p. E2). So while these estimates are not strictly benefit-cost analyses because they do not include all of the economic benefits of reducing GHGs, their financial impacts can be used to help prioritize various policy options and inform policymakers and the public on how to proceed with the threat of climate change.

A second critique of the CAP process centers on the policy options that result in a net benefit to the state. Some economists and commentators have argued that if such actions would result in cost savings, they would have already been undertaken in the private market (Beacon Hill Institute, 2008; Strom, 2008). What these criticisms do not take into account, however are externalities, barriers, or other information disparities that may exist and prevent the markets from reaching socially optimal outcomes. If the benefits of implementing a certain GHG reduction policy or program do not accrue to those who have to shoulder the costs, then there is no reason for a private individual or group to undertake that action.

Despite these criticisms, state climate action plans and analyses based on their results are important for several reasons. First, policymaking can, and should, continue despite uncertainty. As Arrow et al. state, "Scientific uncertainty need not be a deterrent for action. We know a considerable amount about making policy under conditions of uncertainty, even under conditions of scientific uncertainty. Indeed most human decisions are taken under uncertain conditions" (1997, p. 204). If the research and methodologies are clear and the policymakers themselves understand the material, positive action can still be taken in light of uncertainty.

A second reason why this analysis of different state CAPs is useful is that examines states' action in relation to each other. By performing the GHG reduction and benefit-cost calculations consistently across states, CCS created a dataset that can be used to compare policies and the impacts between states. Using these data, this research can identify and examine potential strengths and weaknesses in the CAPs, not for the purpose of preventing policy from moving forward, but to make it stronger in the long run.

While there is substantial uncertainty present and acknowledged in these CAPs, there are still several additional findings that can be gathered from this analysis. For one, although climate change mitigation strategies are being adopted at the state level, very few programs are being implemented across the board. Of the approximately 300 different policy options that the Center for Climate Strategies presents to its client states, only four have been adopted in all of the case studies.

There were however, many policies that were not adopted by any of the case study states. About two-fifths of the total policies offered by CCS were not directly utilized by any of the states in this study. A brief examination of the unselected policies, though, does show that many of them fit into other large programs adopted through the state CAPs (See Appendix II). For example, none of the eleven case study states explicitly adopted a policy aimed at net-metering for distributed energy generation, but that may have been wrapped up in a bundle of larger policies aimed at encouraging more solar or wind capacity.

Another finding is that many of the options that were adopted did not have emission reductions or cost data calculated. Of the five states considering a carbon tax, only one—Iowa—quantified its effects. Likewise, of the eight states adopting a statewide or regional cap-and-trade program, only three—Maryland, Minnesota, and North Carolina—calculated its impacts on their emissions and state budgets. Even though they were calculated by CCS using the same methodology, the variation among results suggests transparency is needed about their emissions prediction and benefit-cost models.

These variations and lack of quantification may be directly related to the public attitude toward large-scale climate change mitigation programs. Despite strong public support for national regulation of GHGs, much of the American public opposes implementing higher prices on fossil fuel-based energy or gasoline to achieve these goals—perhaps a reason for the lack of carbon taxes and other price-related measures (Leiserowitz, 2006). This cognitive dissonance, coupled with the finding that many of the CAPs do not reduce emissions below 1990 levels, indicates that Americans are currently in the "wishful thinking" phase of policy development, hoping that the problem can be solved by someone else without altering their own behavior (Ibid.).

Each of these findings has important impacts on future federal and state climate initiatives. First, even among the few policies adopted by all of the case study states, GHG performance and cost levels vary greatly. This unevenness suggests that a framework of delegated responsibilities and actions would be an appropriate method for enacting federal climate change policy. Like the Clean Air Act and other environmental regulations, specific GHG reduction strategies can be left to the states, with large goals set and monitored by the federal government. Due to varying state contexts with regard to energy supply, agriculture, and existing policy, it is likely necessary that some decisions are made at the state level. If the states do not meet their mandates, the EPA or another regulatory body can step in and determine the best course of action for that particular jurisdiction.

On another level, states that are considering enacting their own GHG legislation can learn from the experience of these first movers (Porter, 1990; Porter & van der Linde, 1995). Through careful analysis and clear assumptions it is possible to remove some of the uncertainty present in existing CAPs and create a stable policy with more predictable outcomes. In addition, first-mover states can position themselves to lobby successfully when the federal government crafts its climate policy, benefitting their early efforts. States can also learn from these efforts by being careful to match their reductions goals with current resources and emissions, possibly preventing a revision of climate policy in the near future.

A third lesson that can be gathered from this analysis is that research is still needed to determine the viability of certain policy and mitigation options in certain states. Federal resources can be used to evaluate appropriate goals for emissions reductions, the feasibility of specific policies such as cap-and-trade, and information sharing across states to benefit from their previous experiences. With this information, national GHG reduction programs can learn from the laboratories of democracy provided by the states.

Finally, another use for federal resources is to finance policies that states might not otherwise be able to implement. In these difficult economic times, many states are constitutionally mandated to balance their budget, and cuts being made can come at the cost of emerging climate change mitigation programs. By providing a stimulus for states to be involved in this effort, the federal government can promote innovation, while permitting states to choose policies that fit their specific contexts (Welch & Thompson, 1980).

Further research on state CAP data can focus on a variety of issues. First, there are substantial questions that still remain about the capacity of these states to meet their GHG reduction goals. Further quantification would be required to determine if their objectives and timelines are feasible, given their energy supply, current emission patterns, and potential reduction areas. Another area of study can focus on the process by which these states developed their CAPs. While CCS aims to incorporate a variety of stakeholders into the plan's development, it has yet to be determined how representative the process actually is, or if certain groups tend to dominate the discussion and resulting documents. Finally, additional research can be performed to account for the potential overlaps in GHG reductions for each state. Doing so would create a more accurate picture of current and future emissions, allowing for better comparisons with other reduction plans across the U.S. and internationally.

This research explored differences in state-level climate policy aimed at the reduction of GHG emissions, but this is just a small portion of the larger effort to mitigate climate change. Global warming policy has moved beyond the city and local level to encompass mitigation efforts by states, countries, and supra-national institutions. For the U.S. to be a leader in climate change policy and technology, it needs to take a proactive approach and learn from lessons provided by state experiences with climate action plans. These examples will encourage the federal government to craft initiatives that are effective, economically beneficial, and specific to various state contexts. States can become first-movers and position themselves to take advantage of a global economy focused on "green" technologies. Examining past policies is no guarantee of future performance, but it can serve as a method for moving forward among the uncertainty inherent in any intersection between science, policy, and the public.

Appendix I – List of available state climate policies provided by CCS

Policy Sector & Number	Policy Name
RCI-1	Energy Efficiency Programs, Funds, and Goals
RCI-1.1	Utility Demand-Side Management Programs for Electricity
RCI-1.2	Utility DSM Programs for Natural Gas, Propane, and Fuel Oil
RCI-1.3	Non-Utility DSM Programs for Electricity
RCI-1.4	Energy Efficiency Funds (e.g., Public Benefits Funds) Administered by State Agency, Utility, or Third Party (e.g., Energy Trust)
RCI-1.5	Regional Market Transformation Alliance
RCI-1.6	Reduced Cost or Free Residential Energy Audits
RCI-1.7	Reduced Cost Energy Audits For Businesses
RCI-1.8	Low-Cost Loans for Energy Efficiency Improvements
RCI-1.9	Saving Energy, Savings Sales Tax
RCI-1.10	Reduce Energy Use By 10% In State-Owned Buildings
RCI-1.11	Energy Efficiency Financial Bundle (See IA EEC-3)
RCI-1.12	Promotion and Incentives of Energy-Efficient Lighting (See MD RCI-11)
RCI-1.13	Energy Efficiency Reulatory Bundle (See IA EEC-5)
RCI-1.14	Non-Utility Energy Efficiency Programs (See MN RCI-6)
RCI-2	Buildings
RCI-2.1	Improved Building Codes for Energy Efficiency
RCI-2.2	Training Building Code and Other Officials in Energy Code Enforcement
RCI-2.3	Improved Design and Construction, Government "Lead-by-Example"
RCI-2.4	Increased Use of Blended Cement (Substituting Fly Ash or Other Pozzolans For Clinker)
RCI-2.5	Support for Energy Efficient Communities Planning, "Smart Growth"
RCI-2.6	Promotion and Incentives for Improved Design and Construction (e.g. LEED1, Green Buildings) in the Private Sector
RCI-2.7	Feebate Program to Encourage Energy Efficiency in Building Design
RCI-2.8	Incentives for Retrofit of Existing Residential Buildings
RCI-2.9	Training and Education for Builders and Contractors (e.g., HVAC Sizing, Duct Sealing)
RCI-2.10	Energy Management Training and Training of Building Operators
RCI-3	Appliance Standards
RCI-3.1	Expansion of State-Level Appliance Efficiency Standards
RCI-3.2	Support for Federal-Level Appliance Efficiency Standards
RCI-3.3	Require High-Efficiency Appliances in New Construction and Retrofits
RCI-4	Education and Outreach
RCI-4.1	Consumer Education Programs
RCI-4.2	Energy Efficiency School Curriculum
RCI-4.3	Truth-in-Advertising Campaign
RCI-4.4	In-Home Energy Displays
RCI-4.5	Energy Performance Disclosure (See MN RCI-8)

Policy Sector & Number	Policy Name
RCI-4.6	Energy and Environmental Consideration in Higher Education (See NM RCI-12)
RCI-5	Pricing and Purchasing
RCI-5.1	Green Power Purchasing for Consumers
RCI-5.2	Net-Metering for Distributed Generation
RCI-5.3	Time-of-Use Rates
RCI-5.4	Tiered (Increasing Block) Rates for Electricity and Natural Gas Use
RCI-5.5	Bulk Purchasing Programs for Energy-Efficient Appliances or Other Equipment
RCI-5.6	Decoupling (See FL ESD-23)
RCI-6	Customer-Sited Distributed Energy and Combined Heat and Power
RCI-6.1	Incentives to Promote Implementation of Renewable Energy Systems
RCI-6.2	Incentives and Resources To Promote Combined Heat and Power (cogeneration)
RCI-6.3	Efficient Transformers on the Customer Side of the Meter
RCI-6.4	Incentives for Passive Solar Heating
RCI-6.5	White Roofs, Rooftop Gardens, and Landscaping (Including Shade Tree Programs)
RCI-6.6	Focus on Specific End-Uses and Technologies
RCI-6.7	Passive Solar Heating Design
RCI-6.8	Solar Hot Water Heating
RCI-6.9	Appliance Recycling and Pick-Up Programs
RCI-7	Non-Energy Emissions (HFCs, PFCs, SF6, and CO2 Process Emissions)
RCI-7.1	Voluntary Industry–Government Partnerships
RCI-7.2	Promotion and Funding for Leak Reduction or Capture, Recovery, and Recycling of Process Gases
RCI-7.3	Promotion and Funding for Process Changes and Optimization
RCI-7.4	Use of Alternative Gases (Other HFCs, and Hydrocarbon Coolants and Refrigerants)
RCI-8	GHG Emissions-Specific Goals and Policies
RCI-8.1	Support for Switching to Less Carbon-Intensive Fuels (Coal and Oil to Natural Gas or Biomass)
RCI-8.2	Industry-Specific Emissions Cap-and-Trade Program
RCI-8.3	Negotiated Emissions or Energy Savings Agreements
RCI-8.4	Local Government Program for Voluntary Emissions Targets by Businesses
RCI-8.5	Provide Tools and Information for Residents, Businesses, and Communities To Use for GHG Inventories
RCI-9	Other
RCI-9.1	Government Agency Requirements and Goals
RCI-9.2	Reduce Energy Use by 10% in State-Owned Buildings
RCI-9.3	State Building Carbon-Neutral Requirement
RCI-9.4	Municipal Energy Management
RCI-9.5	Statewide Effort to Retrofit Existing Buildings (Residential, Commercial, Public, and Industrial) for Energy Efficiency
RCI-9.6	Focus on Specific Market Segments

Policy Sector & Number	Policy Name
RCI-9.7	Energy Efficiency Reinvestment Funds
RCI-9.8	Industrial Audits
RCI-9.9	Focus on Industrial Ecology and By-Product Synergy
ES-1	Emissions Policies and Overarching Items
ES-1.1	GHG Cap-and-Trade
ES-1.2	Carbon (GHG) Tax
ES-1.3	Generation Performance Standards and/or Mitigation Requirements for Electricity
ES-1.4	Integrated Resource Planning
ES-1.5	Voluntary GHG Commitments
ES-1.6	Technology Research & Development
ES-1.7	Regulatory Reform for Electric Coops (See NM ES-16)
ES-1.8	Reform Regulatory Model to Encourage Efficiency (See SC ES-4)
ES-1.9	Carbon Intensity Targets
ES-2	Renewable Energy and Energy Efficiency
ES-2.1	Renewable and/or Environmental Portfolio Standard (RPS/EPS)
ES-2.2	Grid-Based Renewable Energy Incentives and/or Barrier Removal
ES-2.3	Distributed Renewable Energy Incentives and/or Barrier Removal
ES-2.4	Green Power Purchases and Marketing
ES-2.5	Combined Heat and Power Standards, Incentives, and/or Barrier Removal
ES-2.6	Pricing Strategies To Promote Renewable Energy and/or CHP (e.g., Net Metering)
ES-2.7	Renewable Energy Development Issues (e.g., Zoning or Siting)
ES-2.8	Technology-Focused Initiatives (e.g., Biomass Co-Firing, Energy Storage, and Fuel Cells
ES-2.9	Public Benefits Charge
ES-3	Fossil Fuel and Nuclear Electricity
ES-3.1	Advanced Fossil Fuel Technology Incentives, Support, or Requirements
ES-3.2	New Nuclear Power
ES-3.3	Relicensing/Uprating Existing Nuclear Power
ES-3.4	Efficiency Improvements and Repowering Existing Plants
ES-3.5	Technology-Focused Initiatives
ES-3.6	Nuclear Fuel Reprocessing (See SC ES-5)
ES-4	Fuel Production, Processing, and Delivery
ES-4.1	Oil and Gas Production: GHG Emission Reduction Incentives, Support, or Requirements
ES-4.2	Natural Gas Transmission and Distribution
ES-4.3	Oil Refining: GHG Emission Reduction Incentives, Support, or Requirements
ES-4.4	Coal Production: GHG Emission Reduction Incentives, Support, or Requirements
ES-4.5	Coal-to-Liquids Production: GHG Emission Reduction Incentives, Support, or Requirements
ES-4.6	Low-GHG Hydrogen Production Incentives and Support
ES-5	Carbon Capture and Storage or Reuse

Policy Sector & Number	Policy Name
ES-5.1	CCSR Incentives, Requirements, and Enabling Policies (Administration, Regulation, Liability, Incentives)
ES-5.2	R&D for CCSR
ES-6	Other Energy Supply Policies
ES-6.1	Transmission System Upgrading
ES-6.2	Reduction of Transmission and Distribution Line Losses
ES-6.3	Distributed Generation Support (e.g., Interconnection Rules, Net Metering)
ES-6.4	Environmental GHG Emissions Disclosure
ES-6.5	Landfill Gas Recovery
ES-6.6	Waste to Energy
ES-6.7	N2O Reduction Co-Benefit
ES-6.8	Smart Grid
TLU-1	Passenger Vehicles
TLU-1.1	Passenger Vehicle Technologies
TLU-1.1.1	New Vehicle Standards: Tailpipe GHG and Fuel Economy
TLU-1.1.2	ZEV/LEV-2 Implementation
TLU-1.1.3	Research and Development and Bringing to Market Lower-GHG Vehicle Technologies
TLU-1.1.4	Vehicle Add-on Technologies (e.g., Low-Friction Oil and Fuel Efficient Tires)
TLU-1.1.5	Hybrid Buses
TLU-1.1.6	Support Stronger Federal CAFÉ Standards
TLU-1.1.7	Programs for Consumer Information About GHG Emissions for Newly Purchased Cars
TLU-1.1.8	Develop Infrastructure for Plug-In Vehicles
TLU-1.2	Passenger Vehicle Operations
TLU-1.2.1	Enforce/Reduce Speed Limits
TLU-1.2.2	Vehicle Maintenance and Driver Training
TLU-1.2.3	Improved Transportation System Management (e.g., Traffic Signal Synchronization and Intelligent Transportation Systems)
TLU-1.2.4	Driver Information Technologies, Including Pay-As-You-Drive Insurance
TLU-1.2.5	Tune-Up Services, Including Tire Pressure Checks
TLU-1.2.6	Passenger Vehicle Idling Restrictions
TLU-1.2.7	School Education Programs
TLU-1.2.8	Public Education
TLU-1.2.9	Education Transit (See AR TLU-6)
TLU-1.3	Passenger Vehicle Incentives and Disincentives
TLU-1.3.1	Procurement of Efficient Fleet Vehicles
TLU-1.3.2	Feebates (State-Specific or Regional)
TLU-1.3.3	CO2-Based Registration Fees and Vehicle Licensing Fees
TLU-1.3.4	Tax Credits for Efficient Vehicles
TLU-1.3.5	Vehicle Scrappage
TLU-1.3.6	Emission-Based Tolling (Discounts for Clean Vehicles)

Policy Sector & Number	Policy Name
TLU-1.3.7	Establish a Carbon Emission Tax Modeled After the Clean Air Discount Bill
TLU-1.3.8	Establish a Fleet Replacement Grant Program
TLU-1.3.9	Provide a Tax Incentive for Adult Bicycles
TLU-1.3.10	Support Alternative Travel in the Advertising Mainstream
TLU-1.4	Fuel-related Measures
TLU-1.4.1	Low-GHG Fuel Standard (e.g., Renewable)
TLU-1.4.2	Low-GHG for State Fleets (e.g., CNG, Biodiesel)
TLU-1.4.3	Biofuel Expansion (Biodiesel, CNG, LPG, Cellulosic Ethanol)
TLU-1.4.4	Alternative Fuel Infrastructure Development
TLU-1.4.5	Fund Research and Development for a Full Range of Renewable Transportation Fuels
TLU-1.4.6	Develop Life Cycle Analyses of Transportation Fuels to Determine the Appropriate Pathways to Sustainably Protect Natural Resources
TLU-2	Land Use Efficiency and Modal Options
TLU-2.1	General Location Efficiency
TLU-2.1.1	Statewide Growth Management Plan
TLU-2.1.2	Include GHG Evaluations in State Policies
TLU-2.1.3	Shape Investment to Maximize GHG Reductions
TLU-2.1.4	Provide Technical and Financial Support to Local Agencies
TLU-2.1.5	Smart Growth Planning, Modeling, Tools
TLU-2.1.6	Land Use, Zoning, Tax and Building Code Reform
TLU-2.1.7	State Congressional Advocates for Federal Action
TLU-2.1.8	Use of Flexible Federal Transportation Funding
TLU-2.1.9	Downtown Revitalization
TLU-2.1.10	Brownfield Redevelopment
TLU-2.1.11	Infill Development
TLU-2.1.12	Transit-Oriented Development
TLU-2.1.13	Traffic Calming
TLU-2.1.14	Targeted Open Space Protection
TLU-2.1.15	Balance Economic Development With Agriculture, Protection of Natural Resources, and Preserving Rural Character
TLU-2.1.16	"Fix it first" Investment (See MN TLU-7)
TLU-2.1.17	LEED for Neighborhood Design (See MN TLU-11)
TLU-2.2	Increase Low-GHG Travel Options
TLU-2.2.1	Make Full Use of CMAQ Funds With Application Reviews That Consider GHG Reductions
TLU-2.2.2	Improve Transit Service (Frequency, Convenience, and Quality)
TLU-2.2.3	Transit Marketing and Promotion (Including Individualized Transit Marketing)
TLU-2.2.4	Expand Transit Infrastructure (Rail, Bus, Bus Rapid Transit)
TLU-2.2.5	Transit Prioritization (Signal Prioritization, HOV Lanes)
TLU-2.2.6	Guaranteed Ride Home

Policy Sector & Number	Policy Name
TLU-2.2.7	Create Regional Intermodal Transportation Centers
TLU-2.2.8	Bike and Pedestrian Infrastructure
TLU-2.2.9	HOV Lanes
TLU-2.2.10	Vanpooling and Carpooling
TLU-2.2.11	Park-and-Ride Lots
TLU-2.2.12	Car Sharing
TLU-2.2.13	Telecommute, Live-Near-Your-Work, and Compressed Work Week
TLU-2.2.14	Require Government Agencies To Use Telecommuting
TLU-2.2.15	Telecommuting Centers, Support, and Incentives / Distributed Workplace Model
TLU-2.2.16	E-Commerce
TLU-2.3	Incentives and Disincentives
TLU-2.3.1	Commuter Choice Programs / Parking Cash-Out
TLU-2.3.2	Adopt Best Workplaces for Commuters Policies
TLU-2.3.3	Issue Free Bus Passes to Downtown Workers, Students, and Retired People
TLU-2.3.4	Transit Pricing Incentives
TLU-2.3.5	Free Downtown Parking to Carpoolers
TLU-2.3.6	Reserve Parking Spaces for High-Occupancy Vehicles and Car-Share Programs
TLU-2.3.7	Benefits for Low-GHG Vehicles (Preferential Parking, Use of HOV Lanes)
TLU-2.3.8	Location-Efficient Mortgages
TLU-2.3.9	VMT Charges
TLU-2.3.10	Increased Fuel Tax (With Targeted Use of Revenue Toward Travel Alternatives)
TLU-2.3.11	Pay-As-You-Drive Insurance
TLU-2.3.12	Congestion Pricing (With Targeted Use of Revenue Toward Travel Alternatives)
TLU-2.3.13	Emission-Based Tolls (With Targeted Use of Revenue Toward Travel Alternatives)
TLU-2.3.14	Urban and Intercity Road Tolls (With Targeted Use of Revenue Toward Travel Alternatives)
TLU-2.3.15	Cordon Pricing
TLU-2.3.16	Parking Pricing, Excise Tax, and/or Supply Restrictions
TLU-2.3.17	VMT / GHG Offset Requirements for Large Developments
TLU-2.3.18	Research the Impact of GHG Emission Reduction Strategies on Transportation Revenue Sources
TLU-2.3.19	Research Alternative Ways to Fund Transportation That Create Incentives to Drive Less
TLU-2.2.20	CO2 Conformity Requirements
TLU-3	Heavy-Duty Vehicles
TLU-3.1	Heavy-Duty Vehicle Technologies
TLU-3.1.1	Vehicle Technology Improvements (e.g., Aerodynamics)
TLU-3.1.2	R&D on Low-GHG Vehicle Technology
TLU-3.1.3	Black Carbon Control Technologies (e.g., Use of Particulate Traps and Other Complementary Technologies)

Policy Sector & Number	Policy Name
TLU-3.1.4	Facilitate Adoption of New Clean Technologies—Rail and Marine Engines
TLU-3.1.5	Single-Wide Tires, Low-Rolling-Resistance Radials, Automatic Tire Inflation
TLU-3.2	Heavy-Duty Vehicle Operations
TLU-3.2.1	Freight Logistics Improvements / GIS
TLU-3.2.2	Enforce Speed Limits
TLU-3.2.3	Improve Traffic Flow
TLU-3.2.4	Increased Size and Weight of Trucks
TLU-3.2.5	Pre-Clearance at Scale Houses
TLU-3.2.6	Truck Stop Electrification
TLU-3.2.7	Enforce Anti-Idling
TLU-3.2.8	Clean Freight Operating Improvements
TLU-3.2.9	Freight Villages / Consolidation Centers
TLU-3.3	Increasing Low-GHG Heavy-Duty Transportation Options
TLU-3.3.1	Intermodal Freight Initiatives
TLU-3.3.2	Feeder Barge Container Service
TLU-3.3.3	Increase Rail Capacity and Address Rail Freight System Bottlenecks
TLU-3.3.4	Shift Freight Movements from Truck to Rail
TLU-3.3.5	Promote Strategies to Ease the Movement of Freight in More GHG-Efficient Ways
TLU-3.4	Heavy-Duty Vehicle Incentives and Disincentives
TLU-3.4.1	Procurement of Efficient Fleet Vehicles (Public, Private, or Other)
TLU-3.4.2	Incentives To Retire or Improve Older, Less Efficient Vehicles
TLU-3.4.3	Maintenance and Driver Training
TLU-3.4.4	Increased Emission-Based Truck Tolls or Highway User Fees
TLU-4	Intercity Passenger Travel: Aviation, High-Speed Rail, Bus
TLU-4.1	High-Speed Rail
TLU-4.2	Integrated Aviation, Rail, Bus Networks (Planning, Governance, and Investment)
TLU-4.3	Aircraft Emissions
TLU-4.4	Airport Ground Equipment
TLU-4.5	Intercity Bus Incentives and Subsidies
TLU-5	Off-Road Vehicles (Construction Equipment, Outboard Motors, and ATVs)
TLU-5.1	Incentives for Purchase of Efficient Vehicles and Equipment
TLU-5.2	Improved Operations, Operator Training
TLU-5.3	Increased Use of Alternative Fuels or Low-Sulfur Diesel
TLU-5.4	Adopt Green Port Strategy (Port Land-Side: Clean-up Port Dwelling and Cargo Handling Equipment Operations)
TLU-5.5	Low-Carbon Fuel (Off-road and Recreational Marine)
TLU-5.6	Locomotive Idling Reductions
TLU-5.7	Inclusion of Idling Reduction Requirements
TLU-5.8	Diesel Cranes at the Port, Electrification, or Other GHG-Reducing Alternatives
TLU-5.9	"Shore Power" at Port Sites

Policy Sector & Number	Policy Name
AFW-1	Agriculture - Production of Energy and Materials
AFW-1.1	Expanded Utilization of Biomass Feedstocks for Electricity, Heat, or Steam Production
AFW-1.2	In-state Liquid Biofuels Production
AFW-1.3	Manure Digesters/Other Waste Energy Utilization
AFW-1.4	Improving Energy Capture from Corn and Biomass Heat
AFW-1.5	Expand Production/Use of Bio-Based Materials and Chemicals
AFW-1.6	Improved Commercialization of Biomass Conversion Technologies
AFW-2	Agriculture - Livestock
AFW-2.1.1	Manure Management—Manure Utilization
AFW-2.1.2	Manure Management—Manure/Methane Capture
AFW-2.1.3	Manure Management—Rotational Grazing/Improve Grazing Crops and/or Management
AFW-2.1.4	Manure Management—Utilize Biofilters to Control CAFO Emissions
AFW-2.1.5	Manure Management—Increase Pasturing and Lower Densities
AFW-2.2	Changes in Animal Feed
AFW-2.3	Technology Improvements to Increase Water Conservation
AFW-2.4	Unmanaged Grazed Forest Land (See IA AFW-5)
AFW-3	Agriculture - Crop Production
AFW-3.1	Soil Carbon Management
AFW-3.2	Nutrient Management
AFW-3.3	Technology Improvements to Increase Efficiency
AFW-3.4	Water Management
AFW-3.5	Drainage Management
AFW-3.6	Nutrient Trading (See MD AFW-8)
AFW-4	Agriculture - Land-Use Change
AFW-4.1	Land-Use Management that Promotes Permanent Cover
AFW-4.2	Preserve Open Space / Agricultural Land
AFW-4.3	Coastal Wetlands Protection (See MD AFW-4)
AFW-5	Agriculture - Farming Practices
AFW-5.1	Increase On-Farm Energy Production and Efficiency
AFW-5.2	Promotion of Farming Practices that Achieve GHG Benefits
AFW-5.3	Programs to Support Local Farming / Buy Local
AFW-5.4	Promotion of Urban Agriculture, Community Gardens, and Green Roofs
AFW-6	Forestry - Production of Energy and Materials
AFW-6.1	Expanded Use of Biomass Feedstocks for Electricity, Heat, and Steam Production
AFW-6.2	In-State Liquid Biofuels Production
AFW-6.3	Improved Energy Capture from Wood Waste Combustion
AFW-6.4	Improved Commercialization of Biomass Conversion Technologies
AFW-6.5	Expanded Use of New, Reused, and Recycled Wood Products for Building Materials
AFW-7	Forestry - Biomass Protection and Management

Policy Sector & Number	Policy Name
AFW-7.1	Forest Protection—Reduced Clearing and Conversion to Non-Forest Cover
AFW-7.2	Urban Forestry
AFW-7.3	Afforestation and/or Restoration of Non-Forested Land
AFW-7.4	Forest Management for Carbon Sequestration
AFW-7.5	Mitigation of Forest Carbon Sequestration Loss and Emissions Due to Wildfire
AFW-7.6	Mitigation of Forest Loss Due to Insects / Disease
AFW-8	Forestry - Wood Products and Waster
AFW-8.1	Improved Mill Waste Recovery—Utilization of Sawmill Residues and Emissions
AFW-8.2	Improved Logging Residue Recovery
AFW-8.3	Silviculture Improvements
AFW-9	Waste Management - Waste Management Strategies
AFW-9.1	Expanded Use of Yard Waste Biomass Feedstocks for Electricity, Heat, and Steam Production
AFW-9.2	In-State Liquid Biofuels Production
AFW-9.3	Advanced Recycling
AFW-9.4	Promotion of Bioreactor Technology
AFW-9.5	Source Reduction Strategies
AFW-9.6	Resource Management Contracting
AFW-9.7	Enhanced Management of Organic Waste
AFW-9.8	Improved Commercialization of Biomass Conversion Technologies
AFW-10	Waste Management - Landfill Gas Strategies
AFW-10.1	Flare Landfill Methane at Non-NSPS (smaller) sites
AFW-10.2	Methane and Biogas Energy Programs
AFW-10.3	Landfill Methane Energy Programs
AFW-11	Waste Management - Wastewater Management Activities
AFW-11.1	Wastewater Treatment Plant Biosolids for Energy Production
AFW-11.2	Energy Efficiency Improvements
AFW-11.3	Lower Waste Processing Needs
AFW-11.4	Install Digesters and Turbines or Engines
AFW-11.5	Algae and Bio-Oils

Appendix II – State CAP Policies Not Selected by Any State

Policy Number	Policy
RCI-1.10	Reduce Energy Use By 10% In State-Owned Buildings
RCI-2.7	Feebate Program to Encourage Energy Efficiency in Building Design
RCI-3.2	Support for Federal-Level Appliance Efficiency Standards
RCI-3.3	Require High-Efficiency Appliances in New Construction and Retrofits
RCI-4.3	Truth-in-Advertising Campaign
RCI-5.2	Net-Metering for Distributed Generation
RCI-6.3	Efficient Transformers on the Customer Side of the Meter
RCI-6.4	Incentives for Passive Solar Heating
RCI-6.5	White Roofs, Rooftop Gardens, and Landscaping (Including Shade Tree Programs)
RCI-6.7	Passive Solar Heating Design
RCI-6.8	Solar Hot Water Heating
RCI-6.9	Appliance Recycling and Pick-Up Programs
RCI-7.2	Promotion and Funding for Leak Reduction or Capture, Recovery, and Recycling of Process Gases
RCI-8.2	Industry-Specific Emissions Cap-and-Trade Program
RCI-8.3	Negotiated Emissions or Energy Savings Agreements
RCI-8.4	Local Government Program for Voluntary Emissions Targets by Businesses
RCI-8.5	Provide Tools and Information for Residents, Businesses, and Communities To Use for GHG Inventories
RCI-9	Other
RCI-9.2	Reduce Energy Use by 10% in State-Owned Buildings
RCI-9.3	State Building Carbon-Neutral Requirement
RCI-9.4	Municipal Energy Management
RCI-9.5	Statewide Effort to Retrofit Existing Buildings (Residential, Commercial, Public, and Industrial) for Energy Efficiency
RCI-9.9	Focus on Industrial Ecology and By-Product Synergy
ES-3.3	Relicensing/Uprating Existing Nuclear Power
ES-4.2	Natural Gas Transmission and Distribution
ES-4.4	Coal Production: GHG Emission Reduction Incentives, Support, or Requirements
ES-4.6	Low-GHG Hydrogen Production Incentives and Support
ES-6.2	Reduction of Transmission and Distribution Line Losses
ES-6.3	Distributed Generation Support (e.g., Interconnection Rules, Net Metering)
ES-6.4	Environmental GHG Emissions Disclosure
ES-6.5	Landfill Gas Recovery
ES-6.6	Waste to Energy
ES-6.7	N2O Reduction Co-Benefit
ES-6.8	Smart Grid
TLU-1.1	Passenger Vehicle Technologies

Policy Number	Policy
TLU-1.1.5	Hybrid Buses
TLU-1.1.6	Support Stronger Federal CAFÉ Standards
TLU-1.1.8	Develop Infrastructure for Plug-In Vehicles
TLU-1.2.5	Tune-Up Services, Including Tire Pressure Checks
TLU-1.2.6	Passenger Vehicle Idling Restrictions
TLU-1.2.7	School Education Programs
TLU-1.3.5	Vehicle Scrappage
TLU-1.3.6	Emission-Based Tolling (Discounts for Clean Vehicles)
TLU-1.3.7	Establish a Carbon Emission Tax Modeled After the Clean Air Discount Bill
TLU-1.3.8	Establish a Fleet Replacement Grant Program
TLU-1.3.9	Provide a Tax Incentive for Adult Bicycles
TLU-1.3.10	Support Alternative Travel in the Advertising Mainstream
TLU-1.4.6	Develop Life Cycle Analyses of Transportation Fuels to Determine the Appropriate Pathways to Sustainably Protect Natural Resources
TLU-2.1	General Location Efficiency
TLU-2.1.3	Shape Investment to Maximize GHG Reductions
TLU-2.1.7	State Congressional Advocates for Federal Action
TLU-2.1.8	Use of Flexible Federal Transportation Funding
TLU-2.1.13	Traffic Calming
TLU-2.1.15	Balance Economic Development With Agriculture, Protection of Natural Resources, and Preserving Rural Character
TLU-2.2	Increase Low-GHG Travel Options
TLU-2.2.5	Transit Prioritization (Signal Prioritization, HOV Lanes)
TLU-2.2.6	Guaranteed Ride Home
TLU-2.2.7	Create Regional Intermodal Transportation Centers
TLU-2.2.9	HOV Lanes
TLU-2.2.10	Vanpooling and Carpooling
TLU-2.2.11	Park-and-Ride Lots
TLU-2.2.12	Car Sharing
TLU-2.2.14	Require Government Agencies To Use Telecommuting
TLU-2.2.16	E-Commerce
TLU-2.3	Incentives and Disincentives
TLU-2.3.3	Issue Free Bus Passes to Downtown Workers, Students, and Retired People
TLU-2.3.4	Transit Pricing Incentives
TLU-2.3.5	Free Downtown Parking to Carpoolers
TLU-2.3.6	Reserve Parking Spaces for High-Occupancy Vehicles and Car-Share Programs
TLU-2.3.8	Location-Efficient Mortgages
TLU-2.3.13	Emission-Based Tolls (With Targeted Use of Revenue Toward Travel Alternatives)
TLU-2.3.15	Cordon Pricing
TLU-2.3.17	VMT / GHG Offset Requirements for Large Developments

Policy Number	Policy
TLU-2.3.18	Research the Impact of GHG Emission Reduction Strategies on Transportation Revenue Sources
TLU-2.3.19	Research Alternative Ways to Fund Transportation That Create Incentives to Drive Less
TLU-2.2.20	CO2 Conformity Requirements
TLU-3.1	Heavy-Duty Vehicle Technologies
TLU-3.1.2	R&D on Low-GHG Vehicle Technology
TLU-3.1.3	Black Carbon Control Technologies (e.g., Use of Particulate Traps and Other Complementary Technologies)
TLU-3.1.4	Facilitate Adoption of New Clean Technologies—Rail and Marine Engines
TLU-3.1.5	Single-Wide Tires, Low-Rolling-Resistance Radials, Automatic Tire Inflation
TLU-3.2	Heavy-Duty Vehicle Operations
TLU-3.2.1	Freight Logistics Improvements / GIS
TLU-3.2.3	Improve Traffic Flow
TLU-3.2.4	Increased Size and Weight of Trucks
TLU-3.2.5	Pre-Clearance at Scale Houses
TLU-3.2.8	Clean Freight Operating Improvements
TLU-3.2.9	Freight Villages / Consolidation Centers
TLU-3.3	Increasing Low-GHG Heavy-Duty Transportation Options
TLU-3.3.2	Feeder Barge Container Service
TLU-3.3.4	Shift Freight Movements from Truck to Rail
TLU-3.3.5	Promote Strategies to Ease the Movement of Freight in More GHG-Efficient Ways
TLU-3.4	Heavy-Duty Vehicle Incentives and Disincentives
TLU-3.4.1	Procurement of Efficient Fleet Vehicles (Public, Private, or Other)
TLU-3.4.3	Maintenance and Driver Training
TLU-3.4.4	Increased Emission-Based Truck Tolls or Highway User Fees
TLU-4.4	Airport Ground Equipment
TLU-4.5	Intercity Bus Incentives and Subsidies
TLU-5.2	Improved Operations, Operator Training
TLU-5.4	Adopt Green Port Strategy (Port Land-Side: Clean-up Port Dwelling and Cargo Handling Equipment Operations)
TLU-5.5	Low-Carbon Fuel (Off-road and Recreational Marine)
TLU-5.7	Inclusion of Idling Reduction Requirements
TLU-5.8	Diesel Cranes at the Port, Electrification, or Other GHG-Reducing Alternatives
TLU-5.9	“Shore Power” at Port Sites
AFW-1.4	Improving Energy Capture from Corn and Biomass Heat
AFW-1.5	Expand Production/Use of Bio-Based Materials and Chemicals
AFW-2.1.4	Manure Management—Utilize Biofilters to Control CAFO Emissions
AFW-2.1.5	Manure Management—Increase Pasturing and Lower Densities
AFW-2.2	Changes in Animal Feed
AFW-2.3	Technology Improvements to Increase Water Conservation

Policy Number	Policy
AFW-3.3	Technology Improvements to Increase Efficiency
AFW-3.5	Drainage Management
AFW-5.4	Promotion of Urban Agriculture, Community Gardens, and Green Roofs
AFW-6.3	Improved Energy Capture from Wood Waste Combustion
AFW-8.1	Improved Mill Waste Recovery—Utilization of Sawmill Residues and Emissions
AFW-8.2	Improved Logging Residue Recovery
AFW-8.3	Silviculture Improvements
AFW-9.6	Resource Management Contracting
AFW-10	Waste Management - Landfill Gas Strategies
AFW-10.1	Flare Landfill Methane at Non-NSPS (smaller) sites
AFW-11	Waste Management - Wastewater Management Activities
AFW-11.3	Lower Waste Processing Needs
AFW-11.4	Install Digesters and Turbines or Engines
AFW-11.5	Algae and Bio-Oils

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