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American policy conflict in the greenhouse: Divergent trends in federal, regional, state, and local green energy and climate change policy

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Abstract

Climate change threatens significant impacts on global ecosystems and human populations. To address this challenge, industrialized nations have ratified the Kyoto Protocol and undertaken commitments to reduce emissions of greenhouse gases, the primary agents linked to anthropogenic alteration of earth's climate. By contrast, the US government, led by the Bush Administration, has rejected mandatory targets for curbing emissions under the Protocol, and has instead pursued voluntary mitigation measures amid a larger push for clean coal and "next generation" nuclear technologies. These actions in total have fueled global perceptions that the US is not acting in substantial ways to address climate change. Nevertheless, action *within* the US is indeed moving forward, with states, cities and regional partnerships filling the federal leadership vacuum. This paper reviews the diverse policies, strategies, and cooperative frameworks that have emerged at regional, state and local levels to guide climate protection, and identifies the environmental and economic benefits linked to such programs. The paper also attempts to explain the existing federal impasse on climate policy, with attention given to how sub-national efforts may ultimately obviate national governmental inaction.

Keywords: U.S. energy policy; Climate change; Sustainable energy

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) has consistently documented scientific consensus of a link between anthropogenic greenhouse gas (GHG) emissions and climate change (Intergovernmental Panel on Climate Change (IPCC), 1996, 2001, 2007). In its most recent publication (IPCC, 2007), evidence in support of a finding of human impact on climate is reported to exceed a 90% probability standard. The US National Academy of Science, in response to a request from the Office of the President in 2001, also confirmed the existence of significant evidence of a link between recent anthropogenic GHG emissions and climate change (Committee on the Science of Climate Change, 2001).

If unabated, human-induced climate change threatens large and enduring impacts on human communities and ecosystems (IPCC, 2007; Grubb, 2004). Moreover, these effects may result in highly inequitable patterns of harm, affecting poor populations and future generations in disproportion to their GHG emissions (Agarwal et al., 2002; Byrne et al., 2004a; Qader Mirza, 2003). To avoid global calamity, industrial nations need to significantly reduce the use of fossil fuels, the largest source of human contribution to contemporary GHG releases (IPCC, 2001, 2007).

Due to their substantial use of fossil fuel-derived energy and influence on technology development, large industrialized nations are key to addressing the problem. The US emits more energy-related carbon dioxide (CO_2) per capita than any other OECD country (Byrne et al., 2006a, b), with current trends suggesting that emissions could rise 54% above 1990 levels by 2020 (IEA, 2002). However, US President George W. Bush withdrew the US government

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from the Kyoto Protocol (the international agreement that sets country targets for the reduction of GHG emissions by 2008–2012). Accordingly, the dominant international view is that the US is uninterested in proactively addressing the threat of climate change (May, 2005; Climate Action Network, 2004; Black, 2001).

But this interpretation, while understandable, fails to capture the complexity of climate change policy *within* the US and especially the achievements of US policy actors at the regional, state, and local levels. This paper offers a more nuanced examination of American policy on climate change and seeks to explain the divergence of national, state and local policy trends. It builds on earlier research depicting both the status of renewable electricity development in the US (Menz, 2005) and ways to reduce conflict among climate and energy policy goals at the state level (Peterson and Rose, 2006). It also examines avenues for policy collaboration by non-federal actors in the US in order to contribute to international cooperation on climate change mitigation. An extensive catalog of experiments in ''bottom-up'' policy are identified as underway in the US, which may countervail national political refusals to participate in international climate change mitigation policy. Equally important, the rise of state and local policy interest in the US in climate-sensitive energy policy may point to important pathways for policy innovation whose political durability could equal or exceed conventional ''top-down'' national energy policymaking.

2. US national government policy and climate-energy issues

Perceptions of US disinterest in international climate change mitigation efforts have been fueled by several key Bush Administration policy decisions: (1) the Administration's refusal to support adoption of the Kyoto Protocol; (2) its prioritization in US energy policy of next-generation fossil fuel and nuclear energy technologies over renewables such as wind and solar; and (3) its efforts to cast doubt about the phenomenon due to scientific ''uncertainties,'' while also denying a scientific consensus exists about the need to reduce GHG emissions. In 2001, only months after taking office, President George W. Bush signaled his opposition to the Kyoto Protocol because it ''exempts 80% of the world, including major population centers such as China and India, from compliance, and would cause serious harm to the US economy'' (White House, 2001a). The decision to withdraw from Kyoto placed the US government ''on a collision course'' with an earlier campaign promise to regulate CO_2 emissions from power plants (Karon, 2001). The Administration's approach to Kyoto set the stage for global divisions on climate change action, as several nations contemplated whether to proceed in ratifying the Protocol without participation of the world's single largest source of GHG emissions (e.g., European Commission, 2001).

In lieu of supporting US participation in the Kyoto Protocol, the Bush Administration introduced the ''Clear Skies Initiative'' in 2002 to reduce power plant emissions of sulfur dioxide (SO_x), nitrogen oxide, (NO_x) and mercury by 70% over 15 years. However, the initiative included no specific plans for reduction of CO_2 emissions (White House, 2004). The Administration then offered an alternative strategy aimed at reducing ''greenhouse gas intensity.'' The plan sets voluntary goals for lowering the ratio of GHG emissions to economic output by 18% by 2012, compared to 2002 (White House, 2004). As part of the program, organizations voluntarily provide information to the government on GHG reduction initiatives. This aspect of the policy has led critics to question its effectiveness, as ''the vast majority of GHG emitters choose not to report'' (Pew Center, 2002 p. 2). Furthermore, because the initiative's goal is to lower GHG ''intensity'' from 2002 as a ratio of emissions tied to economic output, actual emissions could rise 12% if US economic output grows as expected (Pew Center, 2002).

Other Administration initiatives suggest that GHG emission reduction and development of nonpolluting energy sources remain secondary policy priorities. In May 2001, the National Energy Policy Development Group, headed by Vice President Cheney, published its recommendations for US energy policy. With the intent of promoting ''dependable, affordable and environmentally sound'' energy for the future, the plan called principally for an expansion of natural gas infrastructure, coal generation, and use of nuclear power (National Energy Policy Development Group, 2001). The report also called for opening the Arctic National Wildlife Refuge (ANWR) to oil drilling, while forgoing steps to increase vehicle fuel efficiency that would ''save more oil than ANWR could ever provide'' (Lovins et al., 2004). These policy choices reflect the substantial influence of the fossil fuel and automobile industries, as many companies and trade organizations provided detailed input to the task force, while industry representatives have assumed top leadership positions and appointments within the Administration (NRDC, 2002).

After much debate in the US Congress, particularly in the Senate where concerns over ANWR drilling and other environmental impacts proved highly divisive (Babington and Allen, 2005), the Bush Administration's energy plan was signed into law on 8 August 2005 (White House, 2005c). Although the legislation did not start drilling in the Arctic refuge, proponents continue to push the measure forward (e.g., Bash, 2006).

As part of budgetary appropriations for the US Department of Energy in Fiscal Year (FY) 2006, some $376 million was set aside for coal research, including the Clean Coal Power Initiative and the ''FutureGen'' project, which targets the development of an integrated coal gasification combined cycle power plant utilizing carbon capture (White House, 2005a; US Department of Energy (DOE), 2006a). Funding for these programs is consistent with President Bush's pledge to invest $2 billion over 10 years in coal and related technologies for hydrogen production and carbon sequestration.

FY 2006 budget appropriations of $65.3 million and $54.5 million, respectively, for the Nuclear Power 2010 Initiative and Generation IV nuclear energy systems (US Department of Energy (DOE), 2006a) are instructive of the Bush Administration's priorities. This funding supports the Administration's goal of improving the commercial "feasibility" of building new nuclear power plants in the US and to develop the "next generation" of "clean" nuclear technologies. However, while some lawmakers and interest groups increasingly label nuclear energy as "environmentally sound" because of its lack of SO_x, NO_x, and CO_2 emissions, its actual ecological impacts remain profound, and many economic and environmental arguments against further nuclear development remain (Dunkerley, 2006).

After approximately 30–50 years of service, nuclear plants unavoidably deteriorate into highly hazardous waste sites that emit dangerous levels of radiation for thousands of years (Byrne et al., 2006a, b). Perhaps more directly relevant to the climate change debate, no empirical evidence exists that increased use of nuclear power effectively reduces national CO_2 emissions. This phenomenon can be explained by the significant role of transportation in national CO_2 emissions and by the economics of nuclear power, which depend on sustained growth in electricity demand over the 30–50 year life of plants. In Japan, one of the few remaining pro-nuclear states, such development has coincided with rapid *increases* in national CO_2 emissions, including increases in its electricity sector (Takagi, 1997). As that country's experience reveals, nuclear energy-based systems can in fact impede solutions to the threat of climate change.

Importantly, for nuclear energy to make a significant contribution to offsetting greenhouse gas emissions, a number of studies suggest that some 1500–2000 new atomic reactors would have to be constructed worldwide (Nuclear Information and Resource Service and World Information Service on Energy, 2006). This represents a substantial increase above the approximately 440 existing reactors in operation today. The full operation of these reactors—existing and proposed—could result in a 20% decrease in carbon emissions if used to replace the world's existing coal plants. However, their operation would simultaneously deplete known uranium reserves in several decades and thereby require mining for lower-grade uranium (Charters, 2006). The ensuing fuel chain process, along with construction and operation of nuclear plants, would in turn result in the release of greenhouse gas emissions far exceeding those associated with a commensurable investment in energy efficiency and renewable energy applications (Byrne et al., 2006b).

Moreover, it is likely that the financial resources necessary to ensure deployment of such nuclear capacity would run into the trillions of dollars, based on observed average prices of $4 billion per reactor brought online in the US during the 1980s and 1990s. Given historical competition for energy investment dollars in both private capital markets and public funds, it is doubtful nuclear power, energy efficiency (which would lower energy demand) and renewable energy could be supported as simultaneous solutions to the climate crisis. Even if investments could be supported, the costs of the respective approaches are difficult to reconcile on competitiveness criteria, as annual costs per 1000 kg avoided CO_2 emissions are approximately $68.90 for wind (for example) and $132.50 for nuclear power (Nuclear Information and Resource Service and World Information Service on Energy, 2006). Finally, if nuclear energy is to be a favored tool to address climate concerns, its large-scale deployment would conflict with spreading local demands in the US and elsewhere to establish community based, democratic energy governance; at the same time, its use would shift the costs of nuclear plant siting and waste repository development to local communities through top-down, undemocratic politics (Byrne et al., 2006a, chapters 1 and 5; Byrne et al., 2006b). Recent local resistance in the US (including sustained protests in the State of Nevada, home to the Yucca Mountain proposed waste site–see McKay et al., 2005), suggests that wider opposition could arise to effectively limit nuclear construction at the pace necessary to bring plants online in a timely enough manner to address the climate change challenge.

In contrast to major budget initiatives for "clean" coal and nuclear generation, renewable energy sources have garnered far lower federal support (see Table 1). Appropriations for research and development of renewable energy technologies (including biomass, solar, wind, and geothermal energy) fell in FY 2006 by approximately $2 million from FY 2005, to $235 million (US Department of Energy (DOE), 2006a). While the US President in 2006 proposed an increase in renewable energy funding for FY 2007 (in particular, $148 million for solar energy in FY 2007—a 78% increase over the previous year—see US Department of Energy (DOE), 2006b), the larger trend under the Bush Administration has been funding support for solar and other renewables at levels beneath the last budget proposed by President Clinton. Inconsistent support for renewable energy development has effectively stymied larger opportunities for commercialization of the technology (Lavelle, 2006).

A similar argument may be made in reference to the Renewable Energy Production Tax Credit (PTC), which currently offers a 1.9 cent credit per kWh generated from wind, closed-loop biomass, and geothermal. The PTC has proved to be a significant factor in encouraging renewable

Table 1
US department of energy fiscal year (FY) 2006 research funding

Programs	In thousands of dollars
Fossil Fuel Research	592,014
Nuclear Energy Research	552,028
Renewable Energy Research	235,754
Hydrogen Research	155,627

Source: US DOE (2006a).

energy development within a number of states. While the Bush Administration (after many delays) recently agreed to extend the PTC, national policy regarding this tool can be faulted for impeding larger clean energy proliferation. Specifically, the PTC has been subject to short-term policy extensions, and has even been allowed to expire (Bird et al., 2005). The effect has been to create uncertainty in the marketplace thereby reducing the ability of developers to achieve necessary financing for new projects (Union of Concerned Scientists, 2005a).

Government officials counter that the US remains headed toward a cleaner energy future. An example of supportive policy frequently cited by its supporters is the Administration's push for a Renewable Fuel Standard to increase the use of bio-fuels such as ethanol and bio-diesel through 2012, alongside a 50-cent-per-gallon tax credit for bio-diesel producers and an extension of federal tax credits for ethanol through 2007 (White House, 2005d). These measures aim to increase the nation's energy independence through cultivation of fuels from domestic farm products, with the additional benefit of their use potentially contributing to national mitigation of greenhouse gas emissions. As well, President Bush has supported a \$1.2 billion Hydrogen Fuel Initiative, introduced in 2003. Including the FreedomCAR Partnership, the initiative aims to provide \$1.7 billion over 5 years for research on hydrogen, fuel cells, and their application to automotive technologies (White House, 2003). Success with these initiatives could "reverse America's growing dependence on foreign oil by developing the technology for clean hydrogen production" (White House, 2004).

Although hydrogen has the potential to revolutionize modern energy systems throughout the world, its success in mitigating climate change will depend upon the sources of the hydrogen and the technologies used to harvest it. In this regard, the Bush Administration's hydrogen policy mainly targets fossil fuels to secure this energy carrier. Because US hydrogen development would remain firmly linked to polluting energy sources, it is doubtful that it can contribute significantly to a reduction in US carbon emissions.

Moreover, widespread development of hydrogen systems and infrastructure, regardless of the fuel source, may take 2–3 decades to achieve. This timescale does not encourage near-term action to reduce GHG emissions before sufficient atmospheric accumulation occurs to "lock in" warming and other effects. Greater targeted investment in proven renewables such as wind and solar, rather than funding of experimental hydrogen technologies, would almost certainly provide a faster and more direct path to emissions abatement and climate change mitigation (NRDC, 2004; Byrne et al., 2004a).

Yet, the national government currently favors research on fossil fuel and nuclear power, in conjunction with experimental energy technologies and resources (such as hydrogen and certain bioenergy options), while significant investments in existing and deployable sustainable energy solutions are wanting.

The Administration's record on climate change research combines efforts at outright obstruction with those that obscure the science and misstate the economic, social and ecological consequences of inaction by the US. The Administration's refusal to recognize scientific findings on the prospect of climate change is amply illustrated by its response to its own request in 2001 for a report from the National Academy of Science to summarize current knowledge and information (Committee on the Science of Climate Change, 2001). After receiving the report, which confirmed evidence of human-induced warming trends, the Administration indicated its preference for further research focusing on the "effect natural fluctuations in climate may have had on warming" (Eilperin, 2004; White House, 2001b). With the later release of a document entitled "Strategic Plan for the Climate Change Science Program," the Administration made clear its intent to research "uncertainties" related to climate change science and modeling, rather than accept the findings of the National Academy of Science that climate change is occurring, and that the phenomenon is linked directly to anthropogenic GHG releases (Climate Change Science Program and Subcommittee on Global Change Research, 2003). This decision runs counter to conclusions reached by the IPCC and other international research bodies, which overwhelmingly agree on the credibility of existing evidence (IPCC, 2001, 2007).

In addition, the Bush Administration's original FY 2005 budget set out to eliminate funding for the National Oceanic and Atmospheric Administration (NOAA) long-term climate monitoring program, which it had previously stated would be used to build the scientific basis for climate change action (Lawler, 2004; Mervis, 2005). This and other actions led to criticism of the Administration by many of the nation's leading scientists, including Nobel laureates and National Medal of Science recipients, for allegedly engaging in "the distortion of scientific knowledge for partisan political ends" (Union of Concerned Scientists, 2005b). Going further, a 2004 report released by the National Academy of Science, National Academy of Engineering, and Institute of Medicine called for vigilance against the "politicization of science and technology decision making and advice" and to recruit appointees in a manner that "encourages and protects the scientific process" (Committee on Science Engineering and Public Policy, 2005). Such concerns have only intensified, as allegations surfaced in 2006 that the Bush Administration had sought to restrict a top NASA climate scientist's public statements on climate change (Revkin, 2006).

Overall, Administration actions have served to stall meaningful national policy on climate change. Yet, efforts to create an aggressive national policy continue. The Climate Stewardship Act of 2003, submitted by Democratic Senator Joseph Lieberman and Republican Senator John McCain, proposed a cap on domestic GHG emissions and creation of a national GHG trading system (Paltsev et al., 2003). The measure failed to pass the US Senate in

October 2003, but the vote signaled existence of bipartisan support for efforts to address the issue. In the 109th Congress (2005–2006), four unsuccessful multi-pollutant trading bills included CO_2 cap-and-trade regimes (Parker and Blodgett, 2005). The US Senate then passed a resolution calling for mandatory controls on GHG emissions, albeit ones that would not harm the economy (Kintisch, 2005).

Another policy that has enjoyed bipartisan support is a federal renewable energy portfolio standard (RPS). In 2005 alone, the US Congress considered legislation that would establish targets of 20% by 2027, 20% by 2020, and 10% by 2020 (Union of Concerned Scientists, 2005c). The US Senate, with a Republican Party majority, passed bills containing national RPS targets of 10% by 2020 in 2002, 2003, and 2005 (Belyeu, 2005). However, no similar legislation was passed by the US House of Representatives while Republicans were in the majority, and no national RPS was included in the President's Energy Policy Act of 2005.

Moreover, as Brewer (2005) found in a comparative analysis of congressional and presidential actions on budgetary support for climate change technology programs, the US Congress adopted in 2004 and 2005 sizeable increases in funding for them, well beyond the Administration's proposals. Meanwhile, the Bush Administration advocated reductions for 2006 in climate change research (compared to levels enacted by Congress) as well as reductions in science and international programs related to climate change. Such actions reveal how "the Presidential–Congressional divide on climate policy is continuing to widen" (Brewer, 2005, p. 1).

The US national policy impasse has frustrated many stakeholders both within and beyond the US, especially after the Kyoto Protocol took effect in February 2005 (Doyle, 2005). In such a context, the actions of state and local level governments, and the civil society movements that have spearheaded them, take on special meaning, both for their carbon implications and the challenge they represent to stalemates at the national level of American policy.

3. US states, cities and regional partnerships as emerging leaders in climate change policy

In contrast to mostly inaction at the national level, US states and localities have crafted innovative, cooperative, and increasingly bold strategies to address climate change, most notably by promoting the shift to greater use of renewable energy and energy efficiency. Their motivations and strategies vary, but together suggest a sizable and growing divergence from national policy, with significant implications for the country and for international strategy. This section reviews climate policy trends among American cities, state governments, and regional networks, and examines how these actors are developing climate mitigation strategies that enhance their economies and environment. In the following section, a review of state and local sustainable or "green" energy policymaking is undertaken.[1]

Many state-based initiatives in the US emerged from state Climate Action Plans (CAPs) developed in the mid-1990s. The focus of these strategies varied, but policies targeting alternative fuel fleets, public transportation, climate-neutral land use, energy efficiency, renewable energy, waste management, and recycling were common. Twenty-eight states and Puerto Rico, with two-thirds of the US population, established GHG emissions reductions targets in their CAPs[2] (EPA, 2007a) (Fig. 1).

These state plans are complemented by recent municipal government initiatives. ICLEI (International Council for Local Environmental Initiatives (ICLEI), 2007) has created the most extensive city-based network under its Cities for Climate Protection (CCP) Campaign. Over 650 local governments worldwide, including 171 US municipalities, have set emission reductions targets, developed local action plans, and are pursuing GHG reduction strategies (ICLEI, 2007). The US CCP participants represent some of the largest urban centers in the country and account for 19% of US population. American CCP commitments have been amplified by the US Mayors Climate Protection Agreement, launched in February 2005 and endorsed unanimously by the US Conference of Mayors in June 2005. Under the agreement, 435 cities have committed to meet or exceed the US Kyoto reduction target, and to lobby state, regional, and federal officials to take more aggressive action on climate change.

Without national support, state and municipal action plans have created momentum for investment in carbon emission decreases across the country. Early local and state efforts have also set the stage for ambitious regional initiatives.

3.1. Climate policy in the US Northeast

The Northeastern US, including the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont, claims a population of 42 million (approximately 15% of the US population), an annual carbon output of 527 MMT CO_2, and an estimated regional Gross State Product of nearly $2 trillion (Bureau of Economic Analysis (BEA), 2005; Fontaine, 2005). Within this densely populated region, one state's policies affect not only those living inside its borders, but often those in surrounding states. Historically, the Northeast has experienced high energy costs compared to the national average, due to its lack of indigenous fuel supplies. Under

[1] Sustainable and "green" energy are used interchangeably in this paper and include energy efficiency and renewable energy.

[2] These targets are not mandatory. However, by legislation or executive order, California, New Jersey and several other states have mandated reductions based on their CAPs (DSIRE, 2007).

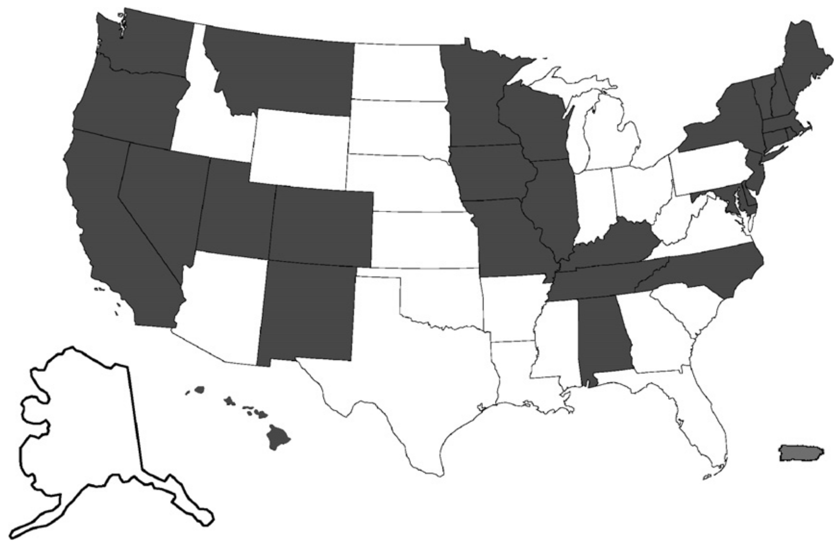

Fig. 1. States with climate action plans. *Source*: US Environmental Protection Agency (2007a).

these conditions, efforts to control GHG emissions through alternative fuels development or reductions in total energy use can lead to fuel diversity and other economic benefits besides their environmental advantages (US Department of Energy (DOE), 2003).

Longstanding concerns about energy supplies and prices in the Northeast, compounded by emerging threats to the atmosphere, motivated the Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) to develop a Climate Change Action Plan in 2001. The agreement set goals for reducing GHG emissions to 1990 levels by 2010, with further reductions sought by 2020 and beyond (New England Governors and Eastern Canadian Premiers (NEG/ECP), 2001; Thorp, 2004). Participating US states included Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

In 2003, New York's governor invited the 11 Northeast states to join forces in creating a regional cap-and-trade program for power plant emissions of CO_2 (Union of Concerned Scientists, 2003). Nine states have agreed to form a Regional Greenhouse Gas Initiative (RGGI) (Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont) and have adopted an emission reduction schedule (RGGI, 2007). Between 2009 and 2015, these states intend to stabilize carbon dioxide emissions from their power plants at 151 million short tons (137 million metric tons). Between 2015 and 2020, the RGGI plan calls for a 10% emissions reduction below the cap (RGGI, 2005). An important aspect of the plan is its openness to eventual participation by other states, including states currently with observer status (e.g., Pennsylvania). Maryland passed a law in April 2007 to join RGGI, but the state's emissions baseline has not yet been established (Maryland Department of the Environment, 2007).

The region's state agencies responsible for air quality have also supported a coordinated GHG reduction strategy. These agencies coordinate their efforts through the Northeast States for Coordinated Air Use Management (NESCAUM) and, in a move that could have significant implications for US climate change policy, NESCAUM recently partnered with the California Climate Action Registry "to promote harmonized GHG accounting and reporting standards" (California Climate Action Registry, 2005). As will be discussed in greater detail below, the formation of a collaborative, bi-coastal GHG control regime would impact a significant portion of the US population and economy.

RGGI and NESCAUM are reinforcing action already underway at the state and local level and encouraging new initiatives. Connecticut's Governor recently issued an executive order mandating that state government obtain 20% of its electricity by 2010 from clean sources (Dutzik et al., 2004). Other strategies enacted into law include a "clean cars" law, adoption of California's vehicle emissions standards, and an appliance efficiency standards law (Governor's Steering Committee on Climate Change, 2005). Additional action items targeted for future adoption include energy efficiency mortgages and loans, clean combined heat and power (CHP), centralized manure digesters, and natural gas and heating oil conservation funds. Like Connecticut, Maine has also targeted the use of more efficient vehicles and has legislated goals for statewide reduction of GHG emissions, mandatory GHG reporting, and carbon sequestration via altered forestry practices (Maine Department of Environmental Protection (DEP), 2004; Thorp, 2004).

With the release of its official energy plan in 2002, New York set targets to reduce GHG emissions by 5% below 1990 levels in 2010, and 10% below 1990 levels by 2020 (New York State Energy Research and Development Authority (NYSERDA), 2002). Recommended strategies include energy demand reduction, energy efficiency, renewable energy development, and promotion of CHP and distributed generation (Center for Clean Air Policy, 2003). In 2000, Delaware's Climate Change Consortium, composed of 37 members from government, business, labor, civil society and the research community, established goals to reduce GHG emissions 7% below 1990 levels by 2010 (Byrne et al., 2000). Many of the strategies set forth in the Climate Change Action Plan have been integrated into state energy strategy recently adopted by the Governor's energy task force (Delaware Energy Task Force, 2003). And the state is now investigating the creation of a "sustainable energy utility" (SEU) in order to pursue climate-friendly energy policy (Delaware SEU (Sustainable Energy Utility) Task Force, 2007).

New Jersey developed a Sustainability Greenhouse Gas Action Plan in 1999 and set goals to reduce GHG emissions 3.5% below their 1990 levels by 2005 (New Jersey Climate Change Workgroup, 1999). To meet its targets, the state pursued a number of innovative actions, including signing a Letter of Intent with the Netherlands for cooperation on the creation of an emissions banking system (New Jersey Climate Change Workgroup, 1999). The state also undertook "covenant" agreements with public and private organizations to conserve energy, protect open space and woodlands, reduce waste, and utilize cleaner and more efficient energy technologies (New Jersey Sustainable State Institute, 2004). Recently, the state's governor signed an executive order committing New Jersey to cut its 2020 emission by 20% from 1990 levels and its 2050 emissions by 80% (nj.com, 2007).

3.2. Climate policy on the West Coast

The West Coast of the US is likewise evolving a regional climate action strategy. The states that comprise the West Coast (California, Oregon, and Washington) are home to approximately 15% of the US population and emit 491 MMT CO_2 (West Coast Governor's Global Warming Initiative, 2004). Like the Northeast, West Coast states were early adopters of comparatively ambitious climate change policies. Oregon, for example, established legislation in 1997 that requires new power plants to offset 17% of their projected CO_2 emissions (Oregon Department of Energy, 2004). Utilities may offset their emissions either by directly reducing CO_2, or paying into a CO_2 reduction project fund administered by Oregon's Climate Trust. The State of Washington has likewise adopted power plant emissions regulations similar to Oregon's in late 2004 (Washington Department of Ecology, 2004).

In September 2006, California passed Assembly Bill 32, which requires the California Air Resource Board (CARB) to develop regulations that will reduce the state's GHG emissions to 1990 levels by 2020. CARB regulations must establish the statewide cap by the beginning of 2008. Mandatory caps for large GHG emitters (including businesses, utilities, and industry) will begin in 2012 (CARB, 2006). The State Legislature has also directed CARB to establish GHG emissions standards for cars and light trucks by 2009. With a gross state product of over \$1.5 trillion, California is the world's sixth largest economy (Legislative Analyst's Office, 2004) and historically a leader of both renewable energy and energy efficiency development in the US (Geller et al., 2006) If implemented at the federal level, CARB standards would have significant implications for the national and global automobile industries, particularly as growing numbers of US states on the East and West Coasts adopt rules similar to California's (Council of State Governments Eastern Regional Conference, 2006; Freeman, 2006).

West Coast states have recently begun a collaborative process to harmonize and expand their climate policies. In 2003, the Governors of the three states created the West Coast Governor's Global Warming Initiative (WCGGWI). Inspired in part by the NEG/ECP and RGGI frameworks, the WCGGWI studied the economic and environmental implications of regional green energy and climate policy-making and developed recommendations on low-carbon vehicle fleets, emissions reductions goals for trucks and ships, and the creation of energy efficiency, renewable energy, and GHG inventories. The WCGGWI (2004) also recommended the establishment of a regional GHG reduction goal, the adoption of harmonized GHG vehicle emissions standards, and the establishment of a regional emissions trading system similar to that adopted by RGGI.

With the start of the Kyoto Protocol, and the launch of the European Union's Emissions Trading Scheme in 2005, many analysts have argued that US participation in CO_2 trading is inevitable (Jacobsen et al., 2005). The prospect of a combined carbon-trading regime on the East and West Coasts will have important implications for US climate policy. In October, 2006, the governors of California and New York announced plans to link California's GHG reduction program with RGGI (Young, 2006). This announcement opens the door to greater collaboration between RGGI and the WCGGWI states. The more than 1000 MMT CO_2 emitted annually by RGGI and WCGGWI states represents nearly 20% of US CO_2 emissions (Fontaine, 2005; Energy Information Administration, 2003). Moreover, the involvement of these economically powerful states in the US, which together claim almost 30% of the nation's population, in a coordinated GHG emissions reduction program will place pressure on the federal government to take action in order to harmonize the regulatory landscape across the country and support interstate commerce in carbon reducing technologies and strategies. Finally, the initial focus by RGGI and WCGGWI states on power plant emissions will bring significant reductions in the next decade, which we estimate (using data from the US Energy Information Administration (2006a, b)) to be more than 21% below current forecasts (see Fig. 2). With power plant emissions from the two regions accounting for 8.2% of the sector's CO_2 releases nationally, a decrease of this magnitude would represent a major step forward.

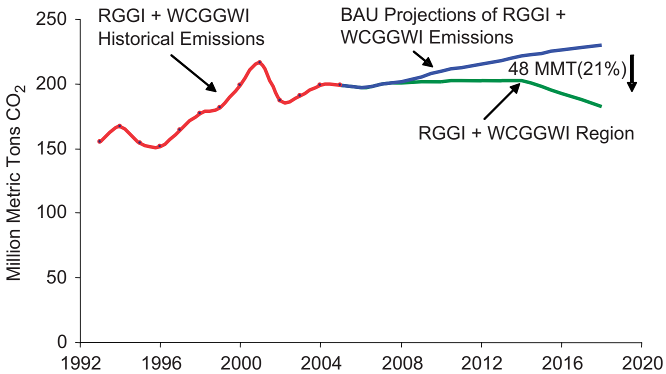

Fig. 2. Estimated Impacts of a RGGI and WCGGWI Cap-and-Trade Program on Power Plant Emissions (million metric tons of CO_2). *Sources*: US Energy Information Administration (EIA) (2006, 2007b). *Based on state-by-state projections by the EIA (2006) published in its *Annual Energy Outlook 2006 with Projections to 2030* (Table 18).

4. State leadership in the development of energy efficiency and renewable energy

In addition to the climate-specific policies discussed above, a growing number of states—41 of 50 (as of February 2007)—have pursued policies for renewable energy and energy efficiency market development.[3] Scenario analyses conducted by the Intergovernmental Panel on Climate Change (2001), Shell International Limited (2001), and others, have concluded that rapid increases in the use of energy efficiency and renewable energy will be critical to a successful global response to climate change. Despite their importance to climate change mitigation, most US policies with respect to these two sources in the last 12 years have been enacted at the state level without a national climate change policy framework to guide their development.

States have embraced sustainable energy development for many reasons, including efforts to reduce vulnerability to energy imports and to improve economic development opportunities (e.g., renewables create in-state jobs), as well as to contribute to climate change mitigation. Early state renewables policies attempted to level the playing field for customer-sited generation through interconnection and metering standards. State support has since evolved to encompass more comprehensive market transformation strategies such as procurement quotas and direct incentives to spur utilization of renewables.

Similarly, state efforts to stimulate energy efficiency improvements have expanded from early efforts to establish high-efficiency appliance standards and building codes to contemporary approaches involving state-funded rebates to promote the purchase of a wide range of energy-efficient products. In addition, states are pioneering market transformation programs to encourage major innovation (e.g., high-efficiency, zero-emission vehicle initiatives), as well as institutional reforms to address barriers to energy efficiency in a comprehensive manner (for example, Efficiency Vermont, 2007).

An overview of key policy tools is provided below to identify the major drivers for sustainable energy development by states and localities in the US. Highlighted are: net metering, voluntary green power markets, renewable portfolio standards, public benefits funds, and transport sector policies.

4.1. Net metering

This policy encourages customer-sited distributed generation by crediting the excess output of onsite energy systems for financial compensation by the utility receiving the surplus. There are a wide variety of net metering laws and regulations in the US. In some states, all utilities are required to net meter, while in other states, net metering is limited to certain types of utilities. Net metering regulations also differ in the types of renewable resources that are eligible, the rate at which utilities buy back or credit excess generation, the amount of net-metered capacity permitted in the state, and the maximum eligible system size (Forsyth et al., 2002; Hughes and Bell, 2006). Despite utility resistance to the policy in some states, net metering has expanded rapidly around the country. In 1998, there were 22 net-metering laws (Wan and Green, 1998). As of February 2007, 41 states had adopted net-metering policies (DSIRE, 2007). Twenty-one states require investor-owned utilities (typically, the largest suppliers of electricity in states) to offer net metering, and four states have at least one utility that has established net metering independently. The regulatory framework for net metering remains dynamic, with frequent expansions and adjustments to regulations around the country.[4]

4.2. Voluntary green power markets

Responding to surveys that indicated customers would pay more for green power, US utilities began to offer their retail customers green power at a premium in the 1990s. The success of these programs sparked the spread of green power offerings across the country, and the US now hosts the world's largest and most active customer-driven green power market (Bird et al., 2002). The voluntary market consists of three distinct segments: green pricing, competitive green power products, and retail renewable energy credit (REC) sales. Green pricing refers to premium green power products offered primarily by regulated utilities. Over 600 utilities in 36 states have green pricing programs,

[3]States without major energy efficiency or renewable energy policies as of February 2007 are: Alabama, Alaska, Kansas, Mississippi, Missouri, Nebraska, South Carolina, South Dakota, and Tennessee.

[4]These additions are tracked by the Interstate Renewable Energy Council in a monthly newsletter available at http://www.irecusa.org/connect/enewsletter.html.

and these programs have supported 800 MW of renewable capacity (Bird and Swezey, 2006).

While many of these programs have emerged in response to consumer demand, seven states require their utilities to provide customers with a green power option. Of the 17 states that have introduced retail competition, 10 have active green power marketers. These marketers either compete for retail electricity customers or sell green power in partnership with incumbent utilities. There is also a thriving market for RECs sold directly at the retail level, independent of utility-based products. Non-residential demand has emerged as an important driver for these RECs, with large customers using green power purchases to improve public image, reduce regulatory risks, meet corporate environmental goals, and differentiate their products (Hanson and Van Son, 2003; Holt et al., 2001). The competitive green power and retail REC markets have supported a combined total of 1710 MW of renewable capacity (Bird and Swezey, 2006).

4.3. Renewable portfolio standards

In addition to the creation of voluntary investments in renewables, a number of states have mandated that utilities

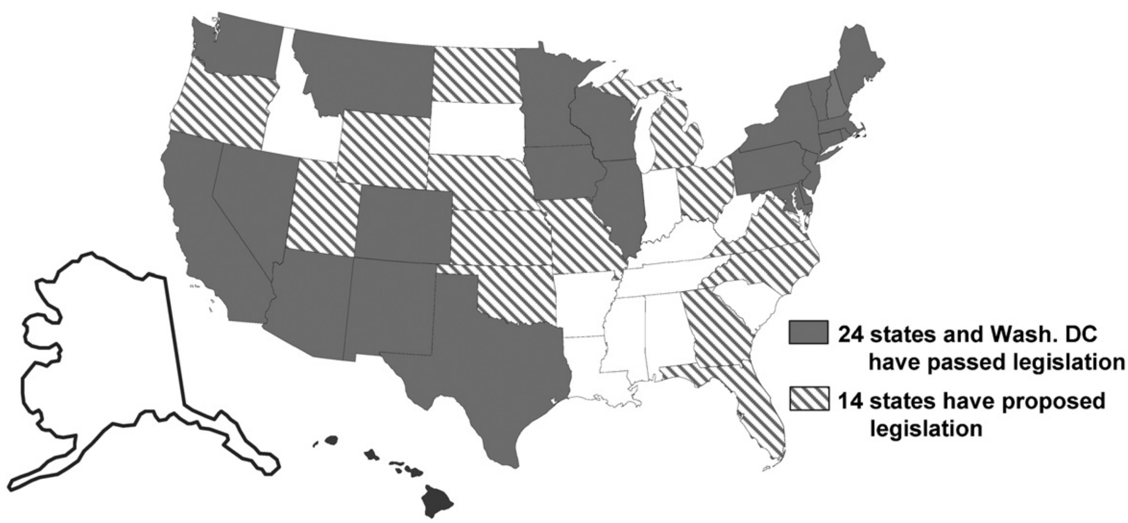

Fig. 3. State renewable portfolio standards in the US. *Sources*: (Center for Energy and Environmental Policy (CEEP), 2006: DSIRE, 2007; Union of Concerned Scientists, 2006b).

State	Target
Arizona	15% by 2025
California	20% by 2010
Colorado	10% by 2015
Connecticut	10% by 2010
Delaware	10% by 2019
Hawaii	20% by 2020
Illinois	8% by 2012
Iowa	105 MW by 1999
Maryland	9.5% by 2019
Maine	30% by 2000
Massachusetts	4% by 2009
Minnesota	25% by 2020
Montana	10% by 2015
Nevada	20% by 2015
New Hampshire	23% by 2025
New Jersey	20% by 2020
New Mexico	20% by 2011
New York	25% by 2013
Pennsylvania	18% by 2020
Rhode Island	16% by 2019
Texas	5880 MW by 2015
Vermont	Incremental growth from 2005 to 2012 with 10% cap
Washington, DC	11% by 2022
Washington State	15% by 2020
Wisconsin	10% by 2015

supply a baseline amount of green power to their customers. Known as Renewable Portfolio Standards (RPS), these policies establish renewable energy procurement quotas for utilities according to a schedule typically running for 10–15 years. As of February 2007, 23 states and the District of Columbia have enacted renewable portfolio standards, while another fourteen states are considering RPS regulation (Fig. 3). No two RPS laws are alike and some policy regimes have performed better than others (van der Linden et al., 2005). Generally speaking, however, there is a distinct trend towards stronger RPS policies and regional market integration. Only two states have voluntary standards—Illinois and Vermont—and both are now considering RPS mandates (DSIRE, 2007).

Most states with RPS policies in place for three or more years have strengthened their laws, accelerated compliance schedules, or proposed new targets (Rickerson, 2005). For example, in 2006 New Jersey accelerated its compliance schedule and increased its target to 20% by 2020 (DSIRE, 2007). Utilities in Wisconsin over-complied with the initial 2.2% by 2012 goal, and in 2006 the state increased its target to 10% by 2015 (Governor's Task Force, 2004). California has accelerated its RPS schedule partly because one utility, Southern California Edison, is already close to the 20% requirement with 17.7% of its supply derived from renewable energy (California Public Utilities Commission, 2006). As a result, the state has revised its RPS schedule from 20% by 2017 to 20% by 2010 (Doughman et al., 2004).

While Texas initially accounted for most of the renewable MW capacity installed in RPS markets (Petersik, 2004), renewable energy installations are now becoming more widely distributed as new and strengthened RPS regimes have appeared across the American landscape. The Union of Concerned Scientists (2006a) projects over 44,900 MW of new renewable capacity will be added to the grid by 2020 to satisfy current RPS mandates (see also Byrne et al., 2005b).

Another sign of the growing maturity and momentum of state RPS policies is the trend toward regional coordination and integration. In order to encourage supply diversity, almost every state RPS policy in the US permits its utilities to procure renewable resources from neighboring states. As a result, markets for tradable renewable energy credits (RECs)[5] have emerged to facilitate compliance in Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, Texas and Washington, DC. The existence of a solar PV "carve out" requirement in New Jersey's RPS has created solar-specific REC prices above $200/megawatt-hour (MWh) (Holt and Bird, 2005, p. 2; Evolution Markets LLC, 2006), and similar requirements in Pennsylvania, New York and Washington, DC could drive solar PV market growth region wide. To support these markets, regional authorities have established credit-tracking systems in the Northeast, Mid-Atlantic, and Texas. Similar systems are also under development for the states of the West and the upper Midwest (Porter and Chen, 2004; Wingate and Lehman, 2003). These systems facilitate RPS compliance and encourage non-RPS states to develop resources for participation in regional RPS markets.

To date, RPS has proven to be the most successful tool used by states in the US to realize rapid development of renewable energy options.

4.4. Public benefits funds

Many states have supplemented their market-based renewable energy policies with direct incentives that include production credits and rebates. These incentives are typically funded by a public (or systems) benefit charge (PBC or SBC) that is assessed on each kilowatt-hour (kWh) of electricity sold in the state. The revenues from these charges, which typically range between $0.001 and $0.003 per kWh, are collected in accounts known as public benefits funds (PBFs) (Kushler et al., 2004). These funds are then disbursed in support of energy efficiency, clean energy research, low-income household weatherization, and renewable energy projects.

As of February 2007, there were 21 state PBFs in the US, of which 15 have dedicated funds for renewable energy development (DSIRE, 2007). The annual income of state renewable energy funds is close to $500 million, and the PBFs will spend $4.03 billion on renewables by 2017 (Union of Concerned Scientists, 2004). At present, the majority of state renewables spending has been to support wind energy. In a survey of 250 utility-scale projects, wind accounted for over 60% of the $475 million obligated by 10 different funds over the past several years (Bolinger and Wiser, 2006). But PBFs have also been the primary driver for PV installations around the country. California's solar program was given a substantial boost in 2006 through the creation of the California Solar Initiative (CSI), under which $2.35 billion in PBF monies will be spent on solar incentives through 2017 (Go Solar California!, 2006).

The lion's share of state PBF monies is spent on investment in energy efficiency, with many states using PBFs to leverage even larger private and utility-sector commitments to efficiency. The combined public benefit fund investments in energy efficiency by 21 American states will average $1.2 billion annually through 2015 (DSIRE, 2007; American Council for an Energy-Efficient Economy, 2005). This spending estimate is conservative, however, because it does not take into account the programs managed by individual municipal utilities, rural electric cooperatives, investor owned utilities, and cities. This figure also does not reflect the broad range of state policies designed to supplement public spending. For example, 14 states provide tax incentives for energy-efficiency investments, 12 have established minimum efficiency standards for appliances sold in the state, and more than one-half

[5] Also known as Tradable Green Credits, or TGCs in Europe.

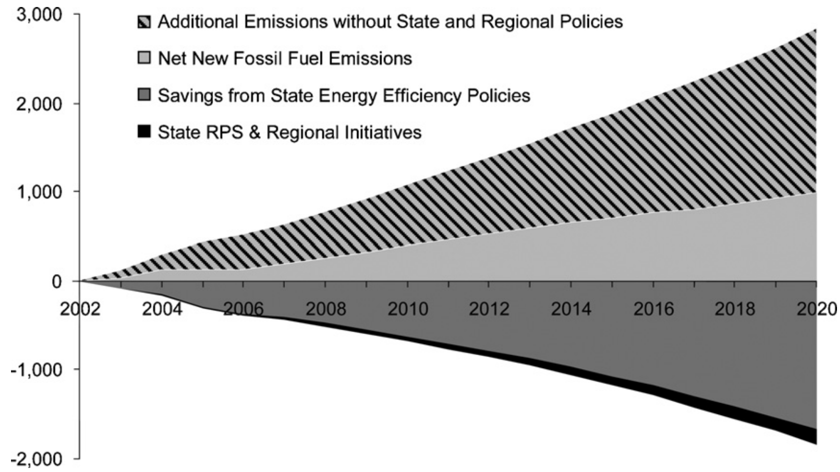

Fig. 4. Projected emissions savings from energy efficiency and RPS policies by US states, 2002–2020 [Million tons CO_2]. *Sources*: (EIA, 2007a, b; Union of Concerned Scientists, 2007; DSIRE, 2007; Hassol et al., 2002; Alcamo et al., 1998). Calculations by the authors—see specifics below.

Source	Emissions savings [million tons of CO_2] 2010	Emissions savings [million tons of CO_2] 2020
Avoided emissions due to State Energy Efficiency Policies	624	1663
State RPS	45	111
RGGI&WCGGWI	—	48
Total savings	669	1822
Emissions without savings	1066	2812
Emissions after savings	397	990

have adopted energy-efficient building codes (Alliance to Save Energy, 2005). The number of states adopting energy-efficiency policies has expanded rapidly, according to a recent report from the American Council for an Energy-Efficient Economy, and include increasingly comprehensive suites of policies targeting everything from consumer appliances, industrial equipment, buildings and vehicles to land use planning and materials recycling (Prindle et al., 2003).

4.5. Emerging transport sector policies

In addition to the policies noted above, states are pursuing aggressive measures to alter energy use in the transport sector. Noteworthy examples include California's efforts to reduce GHG emissions from vehicles, as discussed above. Other policies by states range from tax incentives, feebates and vehicle labels promoting buyer interest in low-emission or high-mileage models, to "smart growth" policies favoring urban developments that forego the need for personal automobiles (Prindle et al., 2003). Additional programs have focused on supporting the use of biofuels and faster market dissemination of hybrid-electric and fuel cell vehicles (Curtin and Gangi, 2006). The wide diversity and growing number of such policies point to the likelihood of their meaningful contributions to energy savings over time. For example, current state-level subsidies targeted only to biofuel output have been estimated at approximately $155 million annually (Koplow, 2006). As transport represents a relatively new area of state policy innovation, attempts have yet to be made in quantifying the projected long-term impact of such policies across all states in reducing energy use and GHG emissions.

4.6. Projecting GHG emission impacts of state and local green energy policies

A large body of existing policy research on energy efficiency and renewable energy allows greater confidence for projecting their potential impact of existing state policies in non-transport areas. In Fig. 4, the authors provide their estimates of projected CO_2 emission reductions attributable to state energy efficiency policies (except those focused on transportation), RPS policies, and the combined RGGI–WCGGWI partnerships.

To obtain the estimates shown in Fig. 4, energy savings were calculated for US state policies on energy efficiency, including the impacts of state public benefit funds and other programs (DSIRE, 2007; American Council for an Energy-Efficient Economy, 2005). Improvements in energy efficiency linked to expectable technological innovation under Business-as-Usual (BAU) scenarios were accounted for, through the application of an "Automatic Energy-Efficiency Indicator" (AEEI) of 0.75% per year.[6] The

[6]Fig. 4 is derived by removing from the BAU projection for energy consumption an amount of energy use equal to an annual AEEI of 0.75%. This value is the midpoint of the range of US AEEI estimates of 0.5% and

resulting amount was deducted from the larger savings achieved through 2020,[7] based on EIA projections of US energy intensity (2006). This calculation suggests emission reductions of 1663 millions tons CO_2 by 2020 due to state energy-efficiency policies.

To assess the impact of RPS policies, figures were obtained for both mandatory state policy targets, as well as state planning targets, for renewable energy development (DSIRE, 2007 and Union of Concerned Scientists 2006a). Such policies are projected to result in CO_2 emissions savings of 111 million tons by 2020.

Also included in Fig. 4 are the projected impacts of the RGGI and WCGGWI programs, as reported earlier in Fig. 2. Savings from those programs are calculated at 48 million tons CO_2 in 2020. In total, all three categories of state policy action are projected to yield emissions savings of 1822 million tons CO_2 in 2020, against the BAU case of 2812 million tons CO_2 (US Energy Information Administration (EIA), 2007a), a 65% improvement from business as usual.

5. Explaining the divergence in national, state and local climate change policy action in the US

The divergence in national, state and local government policy activity on climate change and renewable energy development demands explanation. Below we offer a multi-dimensional response.

One evident factor is popular support for green energy and climate policy action. Over 90% of Americans in 2001 favored investment in alternative power sources such as solar and wind energy (Gillespie, 2001). In 2006, 77% said that developing alternative and renewable energy should be the "top priority" for US energy policy (Opinion Research Corporation, 2006), and 98% said that meeting 25% of US domestic energy consumption from renewable sources by 2025 was important for the country (McInturf and McCleskey, 2006). Regarding climate change, a recent poll indicated that, although 85% of Americans oppose a higher gasoline tax, 59% would support gas tax increases if it would "reduce global warming" compared to only 24% that would support the tax if it would be used to "fight terrorism" (Uchitelle and Thee, 2006). Moreover, 83% support more leadership from the national government to address global warming, and support state and local efforts to curb global warming and develop renewable energy in the absence of federal action (Opinion Research Corporation, 2006). This support suggests practical political reasons for emerging leadership at the state and local level. But left unexplained is why the federal level of the US government has been less responsive.

"Institutional gridlock" is a term often used to characterize policymaking at the US federal level, where a complex system of rules and procedures governs legislative action. Draft bills are assigned to specialized committees for review, and alternately "recommended" for passage, revision, or "tabling," with the latter action setting aside perhaps indefinitely action on a bill. For bills released from committees in either chamber of the US Congress, majority votes are required for passage, after which differing versions of the legislation must be reconciled before the legislation is submitted to the US president for signature or veto. If the president vetoes the legislation, a two-thirds majority vote in both bodies of the US Congress can still secure its passage into law. However, instances of overridden vetoes remain rare, especially because in the US Senate, one senator acting alone can prevent legislation from being voted upon by invoking a filibuster, a tactic that may only be curtailed by the votes of 60 members (Johnson, 2003; Rabe, 2002). In brief, it is usually easier to prevent legislative action than it is to pass new policies.

While this factor plays a role in slowing national action on energy policy, it cannot readily explain the gulf between state, local and federal initiatives on climate and green energy policies. Most American states have similar procedures for legislative action. More compelling is the differential power of the energy lobbies at the federal level (Rajan, 2006), which have consistently demonstrated the ability to pressure federal politics (compared to those of the 50 states). This stems from several factors, but high among these are the national and, indeed, international scale of their operations and their critical role in funding federal political campaigns (Sussman et al., 2002). The consequences of special interest involvement are exacerbated by the way in which groups claim representation in the political process. More specifically, the US federal system is dominated by a "winner take all," majoritarian form of democratic rulemaking (Hill, 2002), rather than the system of proportional representation and coalition governments found in many European nations. In the latter, green parties and other groups supportive of climate change mitigation have gained power in recent years (Tjernshaugen, 2005). By contrast, popular environmental initiatives in the US supported by substantial numbers of American citizens may ultimately fail to be represented in national elections and national politics.

Although a similar barrier can exist for state and local initiatives, there are reasons why civil society may nonetheless be able to exercise a greater voice in state and local policymaking. For one thing, 23 states allow citizens to petition for direct vote on a policy initiative (Initiative and Referendum Institute, 2007). This method of "direct democracy" has been used to win environmental and energy policy adoption in some states (e.g., the State of Washington passed an RPS initiative by ballot in 2006—see Initiative and Referendum Institute, 2007). The less costly conditions of citizen participation in state and local,

(*footnote continued*)
1.0% found in the research literature (Hassol et al., 2002; Alcamo et al., 1998).

[7]This target year was chosen because many state RPS policies reach maturity at that time.

compared to national, politics may also create more fertile ground for civil society influence. In this regard, civil society mobilization and activism can have local feasibility when it is less effective or more difficult at the national level.

By contrast, national political culture in the US appears to be especially vulnerable to interest-group lobbies, perhaps nor more so than in the areas of energy and environment. Leggett's (2001) analysis of the "carbon club" in the US underscores this point. Analyses by others (e.g., Public Citizen, 2005; NRDC, 2001) of the inordinate influence of the automobile and fossil fuel industries in US energy and environmental policy likewise points to why it has been so difficult to adopt an aggressive national policy to reduce GHG emissions. As noted earlier, the National Energy Policy Development Group received information and advice "principally" from those representing the petroleum, nuclear, natural gas, coal, automobile, and electricity industries (US General Accounting Office (GAO), 2003). In addition, former top executives, lobbyists, and representatives from the oil, natural gas, electric, auto, and mining industries have assumed leadership positions in the current national Administration, including posts in the White House, the Department of the Interior, the Department of Commerce, the Department of Energy, and the Environmental Protection Agency (Bogardus, 2004; Drew and Oppel Jr., 2004; NRDC, 2001).

While interest group influence is not limited to federal policymaking, state and local-level activism has often been able to overcome it in order to pass climate change action plans and promotional policies for sustainable energy development. This may be explained in part by states' and cities' historical jurisdiction over activities relevant to issues of energy development and climate change mitigation. These include regulation of electricity and natural gas companies (and in some cases, public ownership of these utilities), land use planning, job creation, public health, and disaster management. Because of public expectations for states and cities to address these concerns, political efforts to legislate green energy use and climate change mitigation have often dovetailed with agendas to increase jobs, improve air quality, address congestion and govern energy investment in the direct interests of communities and local businesses. With a few exceptions, most states and localities in the US are not economically dependent on the auto and fossil fuel industries and, therefore, are less likely to feel compelled to address the political agendas of these industries. Such dynamics are perhaps most evident in the recent wave of energy-related initiatives announced by governors in their 2006 State of the State addresses. These included goals for air quality improvement in California, a push for bio-fuel development in Georgia, and tax credits and exemptions benefiting renewable energy companies in New Mexico and New York (State of California, 2006; Georgia Office of the Governor, 2006; New Mexico Office of the Governor, 2006; New York State, 2006; Stateline.org, 2006).

Another motivating factor for green energy and climate change policy has been the projected impact of temperature shifts and melting ice caps on state geography and industries. Potential sea level rise threatens approximately 10,928 miles of coastline for the Northeast states stretching from Maine to Delaware and approximately 8043 miles of coastline for California, Oregon, and Washington (National Oceanic and Atmospheric Administration (NOAA), 2004). In Rhode Island, climate change could result in coastal flooding, crop losses, and saltwater contamination of drinking water, while New Jersey's large seashore communities and related ecosystems are threatened not only with submersion but also hurricanes and droughts (Rhode Island Greenhouse Gas Stakeholder Process, 2002; New Jersey Office of the Governor, 2005; New Jersey Climate Change Workgroup, 1999). The last century brought an average temperature increase to Connecticut of 1.4 F° (0.8 °C), and rainfall increased by 20% in many areas of the state (Dutzik et al., 2004). In the next 100 years, sea level along the Connecticut coastline could rise 22 in (56 cm), requiring $500 million to $3 billion in protective measures (Dutzik et al., 2004). These trends portend loss of fisheries as well as hardwood forests, the latter threatening vital state industries linked to traditional fall foliage, maple syrup production, and tourism.

Climate change policy proponents in US states have also been able to strengthen their arguments by linking CO_2 reduction strategies to existing regulatory requirements for environmental quality. Under the US Clean Air Act, states must meet minimum ambient air quality standards for a number of "criteria pollutants." These include carbon monoxide, lead, nitrogen dioxide, ozone, particular matter, and sulfur dioxide (US Environmental Protection Agency (EPA), 2007b). "Non-attainment" areas that fail to meet designated standards may lose federal funding and permit approvals for a range of activities vital to economic development, in particular transportation and highway projects (McCarthy, 2004). Accordingly, state efforts to ensure compliance under the Clean Air Act for criteria pollutants can simultaneously allow them to achieve significant reductions in CO_2.

GHG reductions that lessen fossil fuel demand and promote clean alternatives can mitigate energy price volatility, support local economies, and create jobs (Awerbuch, 2006; Bird et al., 2005; Center for Energy and Environmental Policy (CEEP), 2005). Technologies such as wind and solar rely on "free" fuel and purchasers incur only capital and maintenance costs. The US electricity industry is increasingly exposed to natural gas price volatility because most new generation has been gas-fired, and the amount of electricity generated from this source has increased by 62% since 1997 (Henning et al., 2003; Klass, 2003; Zarnikau, 2005). Renewable energy and energy efficiency can serve as hedges against natural gas price variation when integrated into energy resource portfolios because both decouple the cost of energy service from fuel price (Delaware SEU (Sustainable Energy

Utility) Task Force, 2007; Biewald et al., 2003; Rickerson et al., 2005). These risk management benefits were recently brought into sharp focus by hurricanes Katrina and Rita. Hurricane damage to US natural gas infrastructure in the Gulf of Mexico in fall 2005 caused natural gas price spikes that resulted in significantly higher electricity prices and heating costs (US Energy Information Administration (EIA), 2006).

Besides serving as hedges against price variability, renewable energy (especially solar) and targeted energy efficiency improvements can also put downward pressure on wholesale electricity prices by displacing and decreasing peak demand. The Lawrence Berkeley National Laboratory recently concluded that this price reduction effect can be significant, with a boiler fuel natural gas price decline of up to 2% for each 1% of demand displaced by green energy development (Wiser et al., 2005). Several state-level analyses have taken this dynamic into account when evaluating the potential costs of RPS regulation. Studies of RPS proposals in Colorado, Delaware, Maryland, New York, Pennsylvania, and Texas, for example, projected that renewable investment might actually decrease retail electricity rates over time by reducing natural gas demand (Binz, 2004; CEEP, 2005; Chen et al., 2003; Deyette and Clemmer, 2005; New York State Department of Public Service et al., 2004; Pletka et al., 2004). Such impacts can be critical in the Northeast, where growing regional demand has increased reliance by these states on imported natural gas and other fossil fuels (US Department of Energy, Boston Regional Office, 2004).

Another major factor driving state climate and green energy policies is the desire to capture the economic development benefits of investment in energy efficiency and renewables. By encouraging both options, states can create jobs, attract manufacturers, and generate revenue for local and rural economies. Job creation has been one of the most frequently emphasized economic development benefits, especially following the 2004 national election's focus on jobs shifting overseas. For example, a number of organizations have projected job growth from national renewable energy legislation on a state-by-state basis (Hoerner and Barrett, 2004; Union of Concerned Scientists, 2005d). While national RPS legislation has yet to pass, advocates have found such projections helpful in generating support for state-level renewable energy policies. Studies predicted that the Colorado and Pennsylvania RPS laws, for example, would generate 2000 and 3500 jobs, respectively (Deyette and Clemmer, 2004; Pletka et al., 2004).

A second targeted economic benefit is the development of new manufacturing capacity. By creating policy environments that encourage energy efficiency and renewable energy development, states hope to both attract new manufacturers and to provide new business opportunities for existing manufacturers (Sterzinger and Svrcek, 2004a, b). In addition to the benefits that the sustainable energy industry might bring to state economies, analysts have also emphasized local economic benefits. For example, locally sited renewable energy projects can create significant revenues for both landowners and local authorities, and renewable energy project investments can have a higher multiplier effect on local economies than comparable investments in fossil fuel (Hopkins, 2003).

For all of these reasons, states and cities in the US have found green energy and climate change action policies to be attractive elements of election politics and viable tools to maintain and even advance the power of a broader "green" politics. By contrast, national policy debate has often been vulnerable to special interest politics. As a result, the gap in policy initiatives between cities, states and the national government can be expected to persist at least until a change in national administration occurs. Even then, the capacity of the energy and auto lobbies to stymie national policy reform is likely to be significant. Recently, the principal impetus for closing the gap in the US and forcing national action has been a perceived policy emergency such as the 1970s oil crises and 2005–2006 gasoline price spikes. In such cases, national political gridlock in the US has given way (grudgingly) to popular demands for action on a green policy agenda.[8]

6. American politics in the greenhouse

Effective global mitigation of climate change will require strong leadership by national governments, including that of the US. More specifically, national governments remain vital in mandating and enforcing compliance among diverse actors within their jurisdiction. Only national governments can promote uniform standards for compliance and related programs, thus ensuring achievement of policy goals with maximum fairness and minimal costs (Rabe, 2002). National funding also remains vital to underwrite long-term commitments needed to meet ever more challenging climate action targets (Rabe, 2002).

At the same time, American civil society has found pathways to express its interests in green policy agendas despite the national government's refusal to ratify the Kyoto Protocol or to enact national requirements for GHG reduction or to mandate increased use of renewable energy and energy efficiency. Indeed, political challenges to federal intransigence are mounting, as evidenced by the evolution of state initiatives into regional compacts (notably, RGGI and WCGGWI). The latter have even undertaken the provocative step of participating in meetings of the Conference of the Parties negotiating action on the UNFCCC treaty.

[8]Recent retail energy price spikes in the US may be indicative of this, as the US President acknowledged for the first time in his 2007 State of the Union Address the threat of climate change and the need for faster development of renewable energy (White House, 2007). Others await a more calamitous trigger such as the "peak oil" effect to cause a significant national policy shift (Simmons, 2005; and Deffeyes, 2005). In either circumstance, the sizable state and local constituencies already mobilized by "bottom-up" policymaking may prove crucial in defining the green energy agenda to contest the efforts of the "carbon club."

Successful implementation of the Kyoto Protocol by Europe and Japan and cooperation in "climate-relevant fields" may produce increasing pressure on the US to reengage the international policy process (Tjernshaugen, 2005). In combination, international performance and US state and local initiatives may augur a shift in policy away from damaging energy production linked to fossil fuels and nuclear power and toward environmentally and economically sustainable energy sources. A rapidly growing mix of state and local policies to support renewables and energy efficiency, based on national RPS, RECs, and PBF policies, may lead American society, notwithstanding federal political obstinacy, to *de facto* support of international efforts to avert continuing climate change (Byrne et al., 2004b, 2005a).

This suggestion derives from the potential for sizeable environmental achievements. As previously discussed, over the next decade the combined efforts of RGGI and WCGGWI states could lower power plant emissions some 21% against present forecasts. Combined with wider state and city policies for energy efficiency and renewable energy, American "bottom-up" politics could lower national CO_2 emissions by 65% against baseline projections. These findings reveal how a potent civil-society counterbalance is defying national trends of recent years and aligning American communities with international policy (particularly as a function of policies embraced by the Northeast and Western states).

However, this optimistic prospect must be considered in the context of countervailing forces. If the Kyoto Protocol parties fail to meet their 2008–2012 goals, for example, this could strengthen the political hand of those promoting climate inaction, which might in turn lead to an erosion of US state and local political initiatives. As well, the high economic stakes for US energy industries may cause them to more extensively develop strategies focused on local elections (as well as national ones). Because these industries are enriched during episodes of price volatility—as reflected in ExxonMobil's 27% jump in fourth quarter 2005 earnings and its record 2006 earnings, which represent "the most profitable year [of any company] in the history of American capitalism" (Romero and Andrews, 2006; ExxonMobil, 2006; Free Internet Press, 2007), the crises that stimulate interest in sustainable energy can simultaneously advance the economic power of the energy *status quo*. In this regard, it is surely not reasonable to expect corporate leaders of the American energy sector to idly watch as green energy developers increase market share through policy victories in statehouses and city halls.

Still, "bottom-up" green energy policymaking and climate change action planning constitute a new and potent contestant that may give American civil society the political voice it now lacks in the national policy debate. Moreover, the emergence and impact of state and locally based initiatives may actually contribute to the success of any related policies eventually passed at the national level, by spotlighting the most effective strategies across a range of sectors. In this regard, useful suggestions may spring from local policy successes in the US and elsewhere[9] for societies battling to shape their energy futures.

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