# U.S. Federal, State, and Regional Action to Address Climate Change and Improve Air Quality: Experience Relevant for China

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Supported by:
The Energy Foundation, China Sustainable Energy Program
April 2011


# PREFACE

In July 2009, a team including experts from the Natural Resources Defense Council, the Regulatory Assistance Project, the Ayres Law Group, the Energy Foundation's China Sustainable Energy Program, and additional independent experts, released *Amending China's Air Pollution Prevention and Control Law: Recommendations from the International Experience*, a report which detailed the critical experiences and lessons from the U.S. air pollution regulatory system for consideration by Chinese policymakers as they consider the amendment of China's own *Atmospheric Pollution Prevention and Control Law*.[1] Chapter 13 ("US Climate Policy") of the July 2009 report covered the main policies being pursued at the federal and state level in the U.S. to tackle climate change, including the national climate legislation being considered by Congress at the time. Although Congress ultimately failed to pass national climate legislation, we continue to believe that the close connection between policies needed to address "conventional" air pollutants and reduce greenhouse gases makes it is essential that governments integrate their climate change policies with their laws and policies to address air pollution.

Establishing a climate-friendly framework and co-control strategies in China's atmospheric pollution prevention and control law will reduce both greenhouse gas emissions and conventional air pollutants together. China has been exerting great effort in addressing climate change and air pollution, and it would make sense to build upon its achievements by establishing a systematic and in-depth co-control pollution reduction policy framework. Building on the recommendations in our July 2009 report, this report focuses in greater depth on the most recent climate policies and actions in the US, specifically those led by the U.S. EPA, federal energy policies and state and regional programs. It is our hope that the U.S. experiences and lessons described in this report can be a helpful reference to China as it considers establishing co-control and climate-friendly air pollution prevention strategies.

We also wish to extend our sincere thanks to the Regulatory Assistance Project (Rebecca Schultz and Chris James) and the Energy Foundation, China Sustainable Energy Program (Zhao Lijian, Hu Min and Catherine Witherspoon) for their helpful advice and comments during the drafting of this paper.

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[1] Available at: http://china.nrdc.org/AirLawAmendment

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## Glossary[i]

**Best Available Control Technology (BACT):** An emission limitation based on the maximum degree of emission reduction (considering energy, environmental, and economic impacts) achievable through application of production processes and available methods, systems, and techniques determined by state permitting authorities on a case-by-case basis.

**Prevention of Significant Deterioration (PSD):** EPA program in which state and/or federal permits are required in order to restrict emissions from new or modified sources in places where air quality already meets or exceeds primary and secondary ambient air quality standards.

**New Source Performance Standards (NSPS)**: Uniform national EPA air emission standards which limit the amount of pollution allowed from categories of new sources or from categories of modified existing sources.

**New Source Review (NSR)**: A Clean Air Act provision that requires state air pollution authorities to review and issue permits for the construction and operation of new and modified industrial air pollution sources.

## List of Acronyms

| | |
|---|---|
| ARRA | American Recovery and Reinvestment Act of 2009 |
| BACT | Best Available Control Technology |
| CAA | Clean Air Act |
| CAFE | Corporate Average Fuel Economy |
| CARB | California Air Resources Board |
| CCS | Carbon Capture and Sequestration |
| CCPI | Clean Coal Power Initiative |
| CERC | U.S.-China Clean Energy Center |
| DOE | U.S. Department of Energy |
| DOT | U.S. Department of Transportation |
| EGU | Electric generating unit |
| EISA | Energy Independence and Security Act of 2007 (EISA) |
| EPAct | Energy Policy Act of 2005 |
| EPA | U.S. Environmental Protection Agency |
| FERC | Federal Energy Regulatory Commission |
| MPG | Miles per gallon |
| NHTSA | National Highway Traffic Safety Administration |
| NSPS | New Source Performance Standard |
| NSR | New Source Review |
| PSD | Prevention of Significant Deterioration |
| PUC | Public Utility Commission |
| REC | Renewable Energy Credit |
| RES | Renewable Electricity Standard |
| RGGI | Regional Greenhouse Gas Initiative |
| SDWA | Safe Drinking Water Act |
| UIC | Underground Injection Control Program |
| WCI | Western Climate Initiative |

## I. HIGHLIGHTS & RECOMMENDATIONS FOR CHINA

1. Achieving climate goals requires coordination of environmental, energy, and transportation policies and agencies.

2. An effective climate program should (1) set standards for energy efficiency for buildings, the power sector, industry, heating/cooling, and appliances; (2) set emission standards for greenhouse gases (GHG) from motor vehicles and transportation fuels; and (3) establish a price on GHGs through policies such as cap and trade or a carbon tax; and (4) provide government support for development of low-carbon and GHG control technologies.

3. Regulation of GHG and "conventional" air pollutants (such as tropospheric ozone, sulfur and nitrogen oxides, and black carbon) will be more efficiently accomplished if environmental policy and the environmental dimensions of energy policy are controlled by a single environmental agency. In the U.S., where these functions are divided among numerous agencies, the result has been insufficient, less-than-effective coordination. Where a single agency has been given the authority only to *coordinate* all such work, but responsibilities remain dispersed among different agencies, the result has not been good.

    a. The primary sources of both conventional and GHG pollutants are the same – electric power generating plants, various industrial processes, and motor vehicles. Thus, many of the measures to improve the energy efficiency of these sources and reduce their emissions (e.g., integrated gasification combined cycle generation) will reduce both conventional pollutants and GHGs.

    b. Integrated, multi-pollutant regulation allows for more cost-effective investment and planning for cleaner, more efficient equipment. However, it requires that a single agency control the policies for regulating and reducing emissions from both GHGs and other air pollutants. Attempts to have a single agency coordinate such work among different responsible agencies have typically not worked well.

4. Flexibility and authority granted to state and regional authorities can facilitate innovation and policy advancements.

    a. In the U.S., state regional authorities have served as "laboratories" for national policy. California's GHG control programs and the Northeastern States' Regional Greenhouse Gas Initiative provide a preview of a likely U.S. national policy.

b. State and regional programs also spur adoption of national policies in order to provide uniformity to businesses operating at the national and international levels.

c. California's program incorporates key elements of the program described in Recommendation 2, above, and therefore will serve as a model for federal regulations.

4. Requiring industrial air pollution sources to monitor and report GHG and other emissions is a necessity for any successful air pollution control program. It is very difficult for a government agency to adopt adequate control policies or to enforce its emission reduction policies until actual emissions levels are known. EPA now requires all emitters of significant size in the U.S. to monitor and report GHG emissions as well as conventional pollutants.

5. Concerns about regulation of GHG emissions from fossil fuel use could be allayed by development of more cost-effective technologies for carbon capture and sequestration or reuse. Commercialization of better technologies could be accelerated by greater U.S.-China collaboration.

# II. INTRODUCTION

## A. The Importance of a Coordinated Climate Policy

The policy instruments available to a government to reduce the emissions of GHGs (as well as emissions of conventional pollutants) are considerably more varied than governments have typically recognized. Because consumers seek energy *services* rather than energy *per se*, reductions in GHG emissions can be achieved many ways. For example, carbon emissions from electric power production can be reduced by "add-on" pollution controls, such as carbon capture and sequestration; they can also be reduced by measures that affect the generation of electricity (such as dispatching lower-efficiency generating units only during periods of peak electricity demand), or by reducing the use of electricity through energy-saving technologies, such as home insulation or compact fluorescent bulbs.

In the U.S., jurisdiction over these different kinds of policy instruments is dispersed among different federal and state agencies, making it impossible for any one agency to weigh all options against each other. For example, EPA is charged with dealing with pollution problems in the power sector, but is limited to regulatory actions that require add-on pollution control devices to power plants. The federal Department of Transportation establishes fuel economy standards for motor vehicles. The federal Department of Energy provides funding for research and development of energy technologies. But construction of new coal-fired plants is authorized by state public utility commissions, who rarely view themselves as having environmental policy authority.

Decisions as to the order of dispatching power units are made by private entities, either electric generating companies themselves or special entities (known as transmission system operators) in "deregulated" states that determine dispatch order. Currently these entities implement a policy of dispatching the least expensive generating capacity first, without regard to environmental impact, leading to the cheapest, usually most polluting, generating units being dispatched first.[ii] As a result of this dispersed authority, regulatory solutions are often limited by the scope of the acting agency's jurisdiction, and decisions made by one agency often have unintended consequences for greenhouse gas and other pollution emissions.

While EPA is the lead agency directly regulating GHGs, other federal agencies indirectly address GHG emissions. The Department of Energy (DOE) administers a number of ongoing policy initiatives that focus on improving energy efficiency and promoting developments in clean energy, including carbon capture and storage technologies. The Federal Energy Regulatory Commission (FERC), an independent agency, is responsible for regulating the interstate transmission and wholesale sales of electricity and natural gas, as well as the interstate transportation of oil. The FERC shares jurisdiction over electricity sales with state public utility commissions (PUC); the FERC regulates wholesale, whereas the states regulate retail. The FERC is charged with assuring the reliability of the electric system, and both the FERC and the DOE support initiatives to modernize the national grid.

Under the CAA, EPA and the states share the responsibility for determining what pollution control technologies must be used by new and modernized industrial emitters. EPA establishes uniform national industry-wide technology standards for new factories known as "New Source Performance Standards" (NSPS). These standards must require new units to be equipped with the best system of emission control available, taking into account cost and certain other factors. NSPS have been adopted for dozens of types of major emitters of conventional pollutants, including electric power generators, metal production plants, oil refineries, cement manufacturing, industrial boilers, etc.

Whenever an industrial unit is built new or modified, the relevant state must do its own determination of what is the best available pollution control technology for conventional pollutants available for that particular unit at that time. Also, once EPA has established an NSPS for new or modified EGUs, the CAA authorizes EPA to require states to establish GHG emission standards for *existing* (unmodified) EGUs. EPA has hinted that it might invoke this authority but has not yet committed to doing so.

While the federal climate program takes shape, some geographical regions and states have developed their own climate regulations. Regionally, two major programs currently exist, both of which include a market-based cap-and-trade system: 1) the Regional Greenhouse Gas Initiative (RGGI) in the Northeastern states,[iii] and 2) the Western Climate Initiative (WCI), comprised of seven western states and four Canadian provinces.[iv]

Because control over actions affecting GHG emissions is so dispersed in the U.S. among different federal agencies and levels of government, efforts to coordinate agencies and policies are a recurring theme in this paper. These efforts are complicated by the fact

that the various agencies tend to defend a point of view that reflects the interests of their constituencies. Energy agencies, in particular, have tended to view providing electricity as their primary responsibility, and environmental policy as less significant. For example, neither federal nor state energy agencies that control the dispatch of electric generating plants seem to have considered that they could contribute mightily to reducing U.S. GHG emissions by dispatching cleaner units ahead of higher-emitting units. Likewise, few state energy agencies recognize lowering GHG emissions as an objective that justifies investments in energy efficiency programs.

Reduction of GHG emissions in both the U.S. and China to the degree needed requires a coordinated effort among agencies. In the U.S., such coordination has proven difficult. The problems resulting from a policy approach that does not explicitly coordinate the jurisdiction of various agencies may serve as a lesson from the U.S. experience. The siting of electric transmission lines is discussed below in section B.4. as one such example.

The U.S. experience shows that providing environmental agencies with clear regulatory authority is superior to simply mandating agency cooperation. Such mandates often become mere formalities, with little effect on policy. National policies are more likely to reflect a better balance when the environmental agencies are clearly empowered to establish caps on emissions, emission taxes, or other regulatory actions that effectively impose a cost on emitting pollutants. Energy and transportation policymakers can then take these costs into account in their decision-making.

## B. Summary of U.S. Programs

An effective GHG reduction program must be like a stool with three legs. It must reduce emissions of $CO_2$ and other GHGs from (1) motor vehicles and (2) industrial sources (including the power sector); and it must (3) greatly increase the efficiency of energy use. Despite vehement opposition from some quarters of the U.S. to "cap and trade" legislation (directed at the second leg), substantial progress towards reducing U.S. GHG emissions is being made on the remaining two legs of the policy stool. In this paper we describe the variety of global warming policies currently being pursued by the federal and state governments and multi-state regional initiatives in the U.S.

The table below gives an overview of the multiple governmental offices at the federal and state level that currently have authority to regulate GHG emissions, the scope of their authority, and examples of collaboration among governmental offices.

**Table 1. Overview of GHG Regulatory Authority in the U.S.**

| Governmental Body | Source of Authority | Role in GHG regulation | Collaboration |
|---|---|---|---|
| PRESIDENT | U.S. Constitution | Sets overall policy for federal agencies based on statutory authority | Coordinates agency efforts |
| U.S. CONGRESS | U.S. Constitution | Adopts statutes directing federal agencies to address GHG emissions | Can reallocate responsibilities among government agencies and require multiple agencies to jointly regulate |
| FEDERAL EPA | Federal statute; President | Administers the Clean Air Act (CAA) | Works with DOT to implement regulation of GHG emissions from mobile sources; works with DOE to administer the "Energy Star" energy efficiency labeling program for appliances, equipment, and buildings |
| FEDERAL DEPARTMENT OF TRANSPORTATION (DOT) | Federal statute; President | Sets fuel economy standards for motor vehicles | Works with EPA to implement regulation of GHG emissions from mobile sources |
| FEDERAL DEPARTMENT OF ENERGY (DOE) | Federal statute; President | Administers loans and grants to promote development of CCS, renewable energy, and energy efficiency; Regulates energy efficiency | Works with EPA to administer the Energy Star energy efficiency labeling program for appliances, equipment, and buildings |
| FEDERAL ENERGY REGULATORY COMMISSION (FERC) | Federal statute[v] | Oversees interstate transmission and distribution of electricity; can facilitate development of renewable energy | As an independent agency, does not collaborate with other agencies of the federal government; sets policies that affect state PUCs |
| STATE PUBLIC UTILITY COMMISSIONS (PUCs) | State statute | License new electricity generation; set retail electricity rates | Is subject to FERC rules for interstate bulk sales and transfers of electricity |
| STATE AIR POLLUTION CONTROL AGENCIES | State statute | May adopt own GHG regulations so long as not in conflict with EPA rules under CAA[vi] | Responsible to EPA under CAA |

Many of the federal executive agencies and state government bodies have already implemented GHG reduction measures, which we discuss in detail in this paper.

Over the past two years attempts were made in Congress to pass comprehensive legislation that would have capped and reduced GHG emissions from industrial emitters and applied nationally most of the energy efficiency program already in place in California. Such a bill, sponsored by Congressmen Henry Waxman (D – California) and Edward Markey (D – Massachusetts), passed the House of Representatives in June 2009. A similar bill was reported to the full U.S. Senate in 2010, but it died when coal-state Democrats refused to support it, and the Democratic Party leadership could find no Republican Senators who would vote for it. Unfortunately, the incoming Congress, seated in January 2011, will be significantly more hostile to such comprehensive climate change legislation.

Despite Congress's inability to pass new climate legislation, the Supreme Court's decision in *Massachusetts v. EPA* in 2007 continues to require EPA to adopt GHG emission control regulations under the existing Clean Air Act (CAA). EPA has also taken the first steps towards adopting a pollution control program for power plants and other industrial sources of GHGs, such as cement and metals production. EPA has announced plans to propose GHG emission standards for new and existing power plants and industrial sources. The agency has also just released federal guidance to states regarding "best available control technology" (BACT) for reducing GHG emissions from existing industrial emitters as required by the CAA.

EPA's first moves towards regulating industrial emissions have been met with hostile litigation from U.S. industry as well as opposition from coal-state Democrats and the leaders of the Republican Party in Congress. Thus, progress on GHG regulation in the next two years will largely come from elsewhere: federal grants to encourage research and development of GHG emission control machinery and state-level GHG control programs. So far, the federal government has committed over $100 billion to develop GHG control technology, as discussed in section D., below. If these funds survive an expected Republican onslaught on the federal budget, they could stimulate new technologies that would reduce the cost of curtailing GHG emissions.

Meanwhile, states have been active in developing GHG reduction programs. California has by far the most important state program. An effort to repeal the California law, known as the California Global Warming Solutions Act (or Assembly Bill (AB) 32) was rejected by voters in the last election and the State recently approved a cap and trade system for industrial emitters to be implemented beginning January 1, 2012. The 10 northeastern states that make up the Regional Greenhouse Gas Initiative (RGGI) have already implemented the first cap and trade system for GHG emissions. Thirty states in total have developed minimum requirements for the use of renewable electricity in their states. These state-level programs will provide markets for some GHG emission control technologies.

Below is a summary of the actions taken at the federal and state levels to reduce GHG emissions.

### Table 2. Summary of Major U.S. GHG Reduction Initiatives

| Governmental Body | Regulatory Action |
|---|---|
| EPA | • Declared, as required by the Supreme Court, that GHGs are pollutants requiring regulation under the CAA ("endangerment finding")<br>• Required monitoring and reporting of GHG emissions from industrial sources and electric generating units<br>• Set GHG emission standards for new motor vehicles<br>• Required states to consider GHG emissions in permitting decisions for industrial sources and electric generating sources |
| DOT | Set fuel economy standards for new motor vehicles |
| EPA/DOE | Implemented energy efficiency equipment standards designed to reduce energy use in residential and commercial appliances, including lighting, freezers, electric motors, and residential refrigerators and boilers |
| FERC | Issued proposal to require transmission providers to offer transmission services in 15-minute intervals, instead of the hourly intervals currently standard in many parts of the U.S., to encourage variable sources of electricity generation, such as wind and solar |
| California | • Passed AB 32, which requires CA to reduce its GHG emissions to 1990 levels by 2020<br>• Required sector-specific GHG reductions; approved state-wide cap and trade program, which may later be linked to regional trading program<br>• Required 33% of electricity sold in CA to be generated from renewable sources by 2020 |
| 29 states, other than CA | Required, on average, 25% of electricity to be generated from renewable sources within the next 10-15 years |
| New York | Required GHG emissions reductions of 80% from 1990 levels by 2050 with an interim target of 40% by 2030 |
| Regional Greenhouse Gas Initiative (10 northeastern states) | Implemented a regional cap and trade program for GHG emissions from electric generation sources |
| Western Climate Initiative (7 western states plus 4 Canadian provinces) | Released a design document that would set a GHG emissions reduction target of 15% below 2005 levels by 2020 |

As the above table illustrates, there are multiple efforts at many levels of American government that aim to reduce GHG emissions. According to a recent study by World Resources Institute,[vii] substantial reductions, though still short of the U.S.'s international commitments, can be achieved utilizing only federal and state programs currently in existence.

Starting from what is technically feasible, the study analyzes three potential reduction scenarios against a baseline of business as usual: 1) a "Lackluster" scenario, representing low regulatory ambition resulting in reductions on the low end of what is

technically feasible; 2) a "Middle-of-the-Road" scenario, representing moderate efforts; and 3) a "Go-Getter" scenario, in which existing regulatory tools are wielded aggressively to achieve reductions on the high end of what is technically feasible. When combined with reductions from existing state programs, the projected aggregate federal and state emission reductions achievable under existing authorities range from 6% below 2005 emission levels by 2020 under the "Lackluster" scenario to 14% under the "Go Getter" scenario. While neither would achieve the U.S.'s commitment under the Copenhagen Accord to reduce GHG emissions 17% below 2005 levels by 2020, it indicates that significant progress is possible under measures already in place alone.

It is important to note that these estimates rely on a number of assumptions,[viii] which, if changed, could alter projections in either direction. Thus, deeper reductions are possible under even existing programs, although this would require aggressive federal and state action in implementation. These estimates do not take into account reductions that could be achieved through an aggressive program of environmental dispatch of EGUs. Indirect reductions from air pollution controls not directly targeting GHG emissions (such as EPA regulations on particulate matter and coal ash disposal, for example) were also not factored into these numerical estimates and therefore present potential opportunities for further reductions. Additionally, these figures only represent federal measures that have received appropriations from Congress and therefore do not capture any future gains from increased energy efficiency and renewable energy penetration that are technically feasible but yet to receive funding.

Substantial progress toward the U.S.'s 17% goal is therefore possible under existing federal and state measures. To the extent that standards for renewable electricity and energy efficiency are increased, the need for a national cap on carbon to achieve the U.S.'s international commitments is lessened. Regulatory ambition will remain the largest variable dictating the scale of reductions.

# III. DETAILED DISCUSSION OF U.S. POLICIES

## A. U.S. EPA

### 1. Basis for Authority: *Massachusetts v. EPA*

During George W. Bush's presidency, EPA took the position that the CAA does not authorize the agency to regulate greenhouse gas emissions. Massachusetts, other states, and a coalition of environmental organizations challenged this position in court, arguing the opposite: that the CAA in fact *requires* EPA to regulate greenhouse gases. The states pointed to the endangerment finding provision in section 202(a)(1) of the CAA, which reads:

> The Administrator shall by regulation prescribe [...] standards applicable to the emissions of *any air pollutant* from any class or classes of new motor vehicles or

> new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare.[ix]

President Bush's EPA argued, among other things, that Congress did not intend the phrase "any air pollutant"[x] to include greenhouse gases. In *Massachusetts v. EPA*, the Supreme Court disagreed, held that greenhouse gases are air pollutants, and ordered EPA to determine whether they endanger public health or welfare.[xi]

Under President Obama, EPA made this endangerment finding on December 15, 2009,[xii] which had significance beyond regulation of greenhouse gas emissions from motor vehicles. Nearly identical endangerment language also appears throughout the provisions of the CAA regulating industrial emitters.[xiii] Now that EPA has made the finding that GHG emissions from motor vehicles endanger public health or welfare, it will be difficult for EPA to avoid such findings for industrial emitters.

The *Massachusetts* decision provides EPA with a clear directive to regulate GHG emissions under the CAA. The table on the next page illustrates the areas of the CAA that provide authority to regulate GHG emissions and indicates the status of regulation.

### Table 3: Authority for Greenhouse Gas Regulation Under the Clean Air Act

| Program | Status of Regulation | Type of Regulation |
|---|---|---|
| National Ambient Air Quality Standards | Not likely | n/a |
| Toxic substances | Not likely | n/a |
| Prevention of Significant Deterioration/New Source Review Permitting Program | Existing: states have responsibility for administering these permitting programs, with guidance from EPA. EPA issued GHG guidance to states on permitting for power plants and industrial facilities under these programs on 11/10/10. | Command & control |
| New Source Performance Standards | Pending: EPA has announced it will adopt GHG NSPS for new electric generating units by 5/26/12 and for new petroleum refineries by 11/15/2012. | Could be market-based or command & control |
| Existing Source Performance Standards | Rumored to be under consideration by EPA | States would have to adopt programs; could be market-based or command & control |
| Motor vehicle emissions | Existing: EPA and Department of Transportation National Highway Traffic safety Administration tailpipe and fuel economy standards for cars and light trucks adopted. | Command & control: tailpipe standards and fuel efficiency standards for GHGs |
| Stratospheric Ozone Protection | Possible, but EPA has not announced its intention to regulate high-global warming potential fluorinated gases. | Could be market-based or command & control |

Under the Obama Administration, EPA has so far used its CAA authority as interpreted in the *Massachusetts* decision as authority for many regulatory actions with respect to GHGs:

- In 2009, EPA adopted the Mandatory Greenhouse Gas Reporting Rule ("Reporting Rule"), which requires industrial units that emit more than 25,000 tons $CO_2$ equivalent annually to monitor and report their GHG emissions to EPA beginning in 2011.[xiv]
- In May 2010, EPA adopted a joint rule with the National Highway Transportation and Safety Administration (NHTSA) that requires model year 2012 through 2016

light-duty vehicles to reduce greenhouse gas emissions and to improve fuel economy ("Auto Rule").[xv]

- In order to adopt the Auto Rule, the CAA required EPA to find that GHG emissions endangered public health and welfare. A similar finding initiates the process of regulating GHG emissions from power plants and industrial facilities under the CAA New Source Review (NSR) and Prevention of Significant Deterioration (PSD) provisions. Accordingly, state permitting authorities are now obliged to require "best available control technology" (BACT) for GHG emissions from new or modified industrial GHG emitters.
- In June 2010, EPA issued a final determination, known as the "Tailoring Rule," that specified the minimum emissions rate that triggers the obligation to adopt BACT for new and modified GHG emitters.[xvi]

## 2. Conventional Air Pollution Control and Climate Change ("Co-Control")

Integrating GHG emission control requirements with emission controls for "conventional" pollutants (oxides of sulfur and nitrogen, particulate matter, and toxic pollutants such as mercury) would allow for more efficient and economical investment planning for major industrial facilities. Such "co-control" could shut down old existing units where investment in control of both conventional pollutants and GHG reduction cannot be economically justified, and would allow for more cost-effective planning and investment in new equipment and energy resources.

To maximize the benefits of co-control, a single agency would ideally be responsible for control of both conventional pollutants and GHGs. Since some conventional pollutants can be controlled with technologies designed to reduce GHGs, regulatory efficiency will be enhanced if one agency coordinates regulations and timetables for meeting emission limitations. The U.S. experience has shown that dispersed authority for control of conventional pollutants and GHGs among EPA, DOE, DOT, FERC and other agencies has made it exceedingly difficult to control conventional pollution and GHGs in the most effective way.

In the U.S., the Supreme Court's decision in *Massachusetts v. EPA* has provided EPA with the opportunity to integrate regulations for control of GHGs and conventional pollutants. EPA has taken the first steps towards co-control by promulgating regulations that identify the group of industrial emitters that will be regulated and requiring monitoring and reporting of GHG emissions. The agency has announced it plans to adopt emission limitations for GHGs for electric power plants and refineries.

In addition to potential new regulations regarding $CO_2$, the U.S. electric power industry faces a series of regulatory requirements in the next 5-8 years for pollutants already regulated under the CAA. Some facilities have managed to delay these requirements for decades, but now time has run out. The requirements include: (1) new controls on $SO_2$ and NOx emissions; (2) new particulate controls; (3) control of mercury emissions; (4) re-circulating cooling water towers; and (5) new requirements for dealing with fly ash. There are predictions that, if these regulations are applied to the electric

power sector, 25-40 GW of aging coal-fired capacity will be retired rather than retrofitted. Since these units are also among the most inefficient in generating power, retiring them would reduce carbon emissions and benefit the climate. The regulations would likewise make cleaner, low-carbon resources, like natural gas, renewable energy and energy efficiency, more cost competitive with coal for new construction.

### 3. GHG Monitoring and Reporting

The CAA provides EPA broad authority to require mandatory reporting of GHG emissions. CAA section 114(a)(1) authorizes EPA to require emitters, persons subject to the CAA, or persons whom the EPA believes may have necessary information to monitor and report emissions and provide such other information as EPA requests for the purposes of carrying out any provision of the CAA. Section 208 of the CAA provides EPA with similar broad authority regarding the manufacturers of new motor vehicles or new motor vehicle engines.

In October 2009, EPA adopted nationwide GHG emissions monitoring and reporting requirements. The rule took effect January 1, 2010 and applies to emitters of more than 25,000 metric tons of carbon dioxide-equivalent greenhouse gases, fossil fuel suppliers, and industrial gas suppliers, who must now submit annual GHG emission reports to EPA. Examples of industrial facilities covered include power plants, petroleum refineries, many types of manufacturing facilities, and certain motor vehicles.[xvii] EPA estimates that 85-90% of total U.S. GHG emissions from about 10,000 facilities are covered by the regulation.

EPA requires reporting of emission rates of GHGs from manufacturers of engines used in motor vehicles, other than light-duty vehicles (passenger cars). Motor vehicle engine manufacturers have been measuring $CO_2$ emission rates from their products for many years as a part of normal business practices and existing emission certification programs, but they have not consistently reported this data to EPA. The rule requires auto manufacturers to measure and report $CO_2$ emissions for all engines beginning with model year 2011, and $CO_2$, nitrous oxide, and methane emissions in subsequent model years.

Industrial facilities subject to reporting must follow certain procedures required by EPA to measure GHG emissions, depending on the type of facility. EPA has prescribed a unique method of measurement for each type of GHG emitter. For example, the method for measuring GHG emissions from electric generating units is different from the method for measuring GHG emissions from petroleum refineries.

The EPA rule does not require third-party verification of the data. However, reporters must certify that the data is correct and EPA will verify the data. Inaccurate reporting is subject to EPA's enforcement authority under the CAA. False certification is subject to personal criminal penalties. Reported data will be made publicly available.

EPA's mandatory reporting rule will provide a better understanding of U.S. GHG emissions sources and will aid policymakers in decisions about how to reduce GHG emissions most effectively.

## 4. Light-Duty Vehicles: EPA's First Mandatory Greenhouse Gas Reduction Requirement

As noted above, in May 2010 EPA adopted a joint rule with NHTSA that requires motor vehicle manufacturers to reduce greenhouse gas emissions from cars and light trucks.[xviii] The rule establishes standards for both greenhouse gas emissions and fuel economy for model year 2012–2016 light-duty vehicles.[xix] These vehicles must meet a combined average emissions level of 250 grams of $CO_2$ per mile by 2016, equivalent to 35.5 miles per gallon (mpg) (about 15.09 kilometers per liter), if all reductions were met through fuel economy improvements. EPA's standards for fleet-wide average $CO_2$ emissions are based on $CO_2$ emissions-footprint curves, where each vehicle has a different $CO_2$ emissions compliance target depending on its footprint value (the size of the vehicle). The table below shows projected values based on EPA's assumptions about the types and sizes of vehicles manufacturers would produce in each model year.

**Table 4: Fleet-Wide Emissions Compliance Levels (g/mi) and Corresponding Fuel Economy (mpg)**

| | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| Passenger Cars (g/mi) | 263 | 256 | 247 | 236 | 225 |
| Light Trucks (g/mi) | 346 | 337 | 326 | 312 | 298 |
| Combined Cars & Trucks (g/mi) | 295 | 286 | 276 | 263 | 250 |
| Passenger Cars (mpg) | 33.8 | 34.7 | 36.0 | 37.7 | 39.5 |
| Light Trucks (mpg) | 25.7 | 26.4 | 27.3 | 28.5 | 29.8 |
| Combined Cars & Trucks (mpg) | 30.1 | 31.1 | 32.2 | 33.8 | 35.5 |

The joint rule[xx] provides compliance flexibility by allowing engine and auto manufacturers to participate in an averaging, banking, and trading system similar to that in other EPA motor vehicle and fuel programs for non-greenhouse gas emissions from vehicles and engines. A manufacturer can generate and trade credits among all vehicles the manufacturer produces (cars and light trucks) and can also trade credits with other manufacturers. Companies can generate additional credits by reducing GHGs from vehicles' air conditioning systems, through reduced leakage of hydrofluorocarbon (HFC) refrigerants, improved air conditioning efficiency, or use of HFCs substitutes with low global warming potential. The rule allows manufacturers to generate additional credits by building flex-fuel or alternative fuel vehicles, advanced technology vehicles (such as electric

vehicles or plug-in hybrids), and by complying with the 2012 standards before they become mandatory.

EPA projects that the rule's requirements will reduce U.S. greenhouse gas emissions by 960 million metric tons and save 1.8 billion barrels of oil over the lifetime of the vehicles sold during 2012–2016.

At President Obama's request, EPA has begun work on two additional phases of greenhouse gas requirements for the transportation sector. On September 30, 2010, EPA issued a Notice of Intent to begin developing greenhouse gas and fuel economy standards for 2017–2025 model year vehicles. EPA and NHTSA plan to issue a final rule by July 31, 2012.

In October 2010, EPA and NHTSA proposed greenhouse gas and fuel economy standards for heavy-duty vehicles such as combination tractors, heavy-duty pickup trucks and vans, and "vocational vehicles" (including buses and refuse or utility trucks). EPA estimates these standards would reduce greenhouse gas emissions by about 250 million metric tons and save about 500 million barrels of oil over the lifetime of the vehicles sold in model years 2014–2018.

### 5. GHG Emissions from Industrial Sources

Under the CAA, as interpreted by the Supreme Court in *Massachusetts v. EPA*, EPA has authority to regulate GHG emissions from new and existing coal-fired power plants and industrial emitters, including industrial boilers, petroleum refineries, paper mills, incinerators, and cement, steel, copper and other metal-refining facilities. [xxi]

EPA has been asked by the states to provide guidance on how to determine best technology for control of GHGs. In November 2010, EPA released a guidance document. Carbon capture and sequestration (CCS) is mentioned throughout the document, but EPA is careful to point out that CCS is still cost-prohibitive for most sources because it is in the early stages of demonstration and commercialization. Consequently, EPA says, it is unlikely to be selected as BACT in most cases. EPA suggests that states might consider "methods, systems, or techniques to increase energy efficiency" and reduce greenhouse gas emissions. EPA encourages the states to incorporate these measures into the permit as part of the analysis used to determine the best control technology for GHGs.

As part of its guidance to the states, EPA has also just released a "white paper" evaluating the status of carbon capture and storage. It endorsed findings by the Pacific Northwest National Laboratory ("Pacific Lab") that although "CCS is technically viable today," full scale carbon separation and capture systems "have not yet been installed and fully integrated into an electric generating unit."[xxii] EPA also noted that the Pacific Lab study did not address "the cost or energy requirements of implementing CCS technology."

The U.S. government's hesitancy to move rapidly on CCS[xxiii] reflects the daunting scale and expense of such a project. A 2007 paper from the Massachusetts Institute of Technology pointed out that:

> If 60% of the $CO_2$ produced from U.S. coal-based power generation were to be captured and compressed to a liquid for geologic sequestration, its volume would about equal the total U.S. oil consumption of 20 million barrels per day.[xxiv]

Technologies that would create useful products from $CO_2$, rather than generating and requiring management of a waste product, would be far more attractive. Though none is yet commercial, a company in California known as Calera has developed a process that turns captured $CO_2$ into $CaCO_3$ and ultimately cement while producing fresh water as a byproduct. By replacing many of the plants now producing cement, the Calera process could potentially control carbon emissions from today's two top industrial sources of $CO_2$ in the U.S. Commercialization of such a process would go far to dissolve political and economic concerns about controlling carbon emissions.

EPA has recently committed to adopting an NSPS for GHG emissions from new coal-fired electric generating units (EGU) by May 2012. An NSPS could specify that any new coal-fired EGU must be equipped with carbon capture and sequestration technology.

## 6. Challenges to EPA Authority

### *a. Challenges to EPA Regulations*

As noted above, EPA has begun to adopt the regulations needed to reduce emissions from industrial sources of $CO_2$ emissions. In June 2010, the agency adopted a rule defining the minimum size of industrial units that will be subject to $CO_2$ reductions. Beginning January 2010, large industrial facilities were required to begin monitoring GHG emissions for reporting to the EPA in 2011.

Industry groups and some states have filed over 100 lawsuits in the federal courts challenging either EPA's endangerment finding or its subsequent GHG-related rulemakings.[xxv] None of the cases have been decided yet. We believe that they will be rejected by the courts given the Supreme Court's clear opinion in the *Massachusetts* case.

### *b. Congressional Challenges to EPA Authority*

The greater threat to EPA action is possible legislation to either strip EPA of its regulatory authority or halt or delay EPA action with respect to greenhouse gases. Congress could also significantly reduce EPA's budget for climate-related activities, which could effectively slow or stop EPA regulation of GHGs.

Republicans now hold a majority in the House of Representatives and are extremely unlikely to propose any positive legislation. Some of them believe they were elected in part because of their opposition to the Waxman-Markey bill. In the Senate, Republicans will have 47 votes (up from 41 in the last Congress), more than enough to block any climate legislation. About half of the newly elected Republican members of the House of Representatives have said that they do not think human activity is having any influence on the climate. Movement forward on energy legislation, however, may be a possibility in the divided Congress, as discussed further in section C.2.

## B. Energy Policy: Federal Department of Energy, the Federal Energy Regulatory Commission, and State Renewable Electricity Standards

Table 5, below, summarizes key energy legislation and initiatives, and depicts the range of authorities responsible for energy regulation and policy in the U.S.

**Table 5: Summary of Authorities for Climate-Related Energy Policy**

| Authority | Type of Initiative | Implementing Agency | Role in GHG Regulation |
|---|---|---|---|
| Energy Policy Act of 2005 (EPAct) | Federal energy law | DOE & FERC | Created financial incentives for renewable electricity generation; funded DOE's Loan Guarantee Program for technologies that reduce GHG emissions |
| Energy Independence and Security Act of 2007 (EISA) | Federal energy law | DOE & EPA | Mandated standards for fuel economy (CAFE), renewable fuels, and energy efficiency equipment |
| Energy Improvement and Extension Act of 2008 | Federal energy law | DOE | Extended renewable energy tax credits; expanded tax production credits for renewable energy sources |
| American Recovery and Reinvestment Act of 2009 (ARRA) | Federal stimulus legislation | DOE | Allocated $90 billion for a variety of clean energy programs related to improving the electric grid, energy efficiency, and renewable energy |
| FutureGen 2.0 Project | Public-private partnership | DOE | Development of commercial-scale CCS technologies |
| Clean Coal Power Initiative (CCPI) | Public-private partnership | DOE | Cost-sharing partnership accelerating private sector development of "clean coal" technologies |
| Safe Drinking Water Act (SDWA) | Federal environmental law | EPA | Gives EPA authority to regulate underground $CO_2$ injection |
| Integration of Variable Energy Resources | Administrative agency rule | FERC | Integrates renewable energy onto the national power grid |

## 1. Energy Efficiency and Supply

Policies to increase energy efficiency will play a prominent role in efforts to reduce GHG emissions. Regulatory initiatives aimed at improving efficiency are spearheaded by multiple agencies; the DOE, for example, administers competitive community-level energy efficiency grants, and the DOE and EPA jointly implement other significant energy efficiency initiatives such as the Energy Star Program for appliances, equipment, and buildings. In addition to energy efficiency and conservation, increasing low or no-carbon energy supply is the second major objective in reducing GHG emissions. Like energy efficiency, this effort spans multiple U.S. agencies and engages a number of strategies. While not an exhaustive list, the U.S.'s major energy legislation and current efforts are discussed below.

The U.S. has enacted several significant energy laws in the past decade. The first of these was the Energy Policy Act of 2005 (EPAct)[xxvi], which created a program to provide financial incentives for electricity produced by qualifying renewable energy generation facilities.[xxvii] Another key provision in the EPAct authorized the DOE's Loan Guarantee Program, which provides loans to projects that employ new or significantly improved technologies to avoid, reduce, or store GHG emissions. EPAct authorized the DOE to loan $4 billion in FY 2007, with an additional $18.5 for new nuclear plants, $8 billion for advanced coal, and $18.5 billion for renewable or energy-efficient projects.[xxviii] The American Recovery and Reinvestment Act of 2009 (ARRA),[xxix] discussed below, provided an additional $4 billion in credit subsidy to support $40 billion in loans for renewable energy and electricity transmission projects.

Following the EPAct, the Energy Independence and Security Act of 2007 (EISA) targeted energy efficiency and renewable energy.[xxx] Its key provisions included higher corporate average fuel economy (CAFE) standards for motor vehicles, a renewable fuel standard, and energy efficiency equipment standards designed to reduce energy use in residential and commercial appliances, including lighting, freezers, electric motors, and residential refrigerators and boilers. EISA also set a goal of attaining national zero-net-energy use for new commercial buildings constructed after 2025 and in retrofitting pre-2025 buildings by 2050. EISA authorized $2.7 billion in grants for local and regional energy efficiency and clean energy projects, funded by ARRA and administered by the DOE through the Energy Efficiency and Conservation Block Program.

The Energy Improvement and Extension Act of 2008 and the ARRA of 2009 provided critical financial incentives for clean energy production and conservation. The Energy Improvement Act contained key tax provisions, including extending the residential and business tax credits for renewable energy and energy-efficient appliances, expanding eligible technologies, and adding new tax provisions for an array of clean energy production activities.[xxxi]

ARRA allocated an unprecedented $90 billion for clean energy programs. This investment supports numerous DOE-run initiatives, including new programs to modernize

the electricity grid through Smart Grid and upgraded transmission systems, as well as a program to retrofit low-income housing to increase energy efficiency. ARRA continues funding for previous commitments, including renewable energy loan guarantees, state and local government energy efficiency grants, and national renewable energy and energy efficiency research, development, and deployment.

The DOE also works hand-in-hand with other agencies to increase clean energy supply. In 2009, for example, the DOE and eight other agencies signed a Memorandum of Understanding to coordinate the permitting, siting, and construction of new transmission lines on federal lands to increase electricity delivery efficiency and the availability of renewable energy.[xxxii] A number of other cross-agency programs exist, including solar and wind energy programs jointly administered by the DOE, Department of the Interior, and the Bureau of Land Management, as well as transportation initiatives.

DOE administers a variety of ongoing initiatives to increase domestic energy supply and improve energy security, including programs for producing power from hydro, biomass, and geothermal energy sources.

The future of nuclear energy, which, of course, does not directly emit GHGs, in the U.S. is unclear. Nuclear energy currently comprises approximately 20% of the U.S.'s energy supply. DOE's Office of Nuclear Energy supports research and development programs for nuclear energy technologies, with recent efforts focusing on nuclear waste management, advanced reactor design, and fuel-cycle technologies. Federal legislation provides financial incentives for nuclear energy development, including nuclear production tax credits until 2020 and $18.5 billion in loan guarantees for new reactors. The number of applications for new reactors on file with the DOE has increased in the past several years. But whether these reactors will be built remains in doubt. Political opposition, particularly around the unresolved issue of nuclear waste disposal, remains strong and may prevent additional development of nuclear energy. It is extremely unlikely that any new reactors will be built without massive government subsidies.

## 2. Carbon Capture and Storage

Further development of CCS technologies is a major focus for DOE. The DOE is currently providing financial support for several large-scale CCS projects, including the FutureGen project and several projects under the Clean Coal Power Initiative. FutureGen 2.0 is a public-private partnership to build a commercial-scale oxy-combustion power plant.[xxxiii] ARRA has awarded $1 billion to the FutureGen project to repower an existing oil-fired power plant in Illinois with advanced combustion technology capable of delivering 90% $CO_2$ capture and near zero emissions of conventional pollutants. The DOE is currently working with the State of Illinois and the project partners to select a host community for the $CO_2$ storage site.

The Clean Coal Power Initiative (CCPI) is an industry/government cost-sharing partnership aimed at accelerating private sector development of advanced coal

technologies. Started in 2002, CCPI funds up to 50% of projects by selected applicants to expedite developers' ability to assess deployment potential. A number of awards have been made to projects that would capture and sequester $CO_2$, as well as to other "clean coal" technologies.

Geological sequestration of $CO_2$ by deep well injection is currently regulated under the Safe Drinking Water Act (SDWA), which gives EPA authority to protect drinking water sources by regulating underground injection. $CO_2$ is already routinely injected underground for enhanced oil and gas recovery, a practice that is regulated by EPA under the Underground Injection Control Program (UIC). EPA recently established a new injection well class specifically for geological $CO_2$ sequestration that aims to ensure the safe and effective sequestration of $CO_2$ in geologic depositories without endangering groundwater.[xxxiv] Operators that inject $CO_2$ in the subsurface for sequestration are required to monitor, verify, and report sequestered $CO_2$ annually along with any leaks.[xxxv]

Although geological sequestration of $CO_2$ is currently being regulated under the existing UIC framework, not all carbon storage technologies utilize underground injection. This range in potential technologies, as well as differences in scale and technical challenges, suggests that a separate regulatory regime from the UIC program may ultimately be more appropriate for regulating CCS.

The U.S. and China have begun significant collaborative efforts on clean energy, most notably through the U.S.-China Clean Energy Center (CERC). CERC was established in November 2009 to facilitate joint research and development of clean energy technologies in several areas, including energy-efficient building technology, electric vehicles, and clean coal. The Center will provide at least $150 million in support to these three programs over the next five years, with each country contributing $75 million through public and private funding.

Given the U.S.'s and China's vast coal reserves and sunk costs in coal infrastructure, CCS is attractive to both countries. Several projects under the Center's coal-based initiatives involve CCS, including two joint U.S.-China feasibility studies of $CO_2$ capture and sequestration from coal-fired facilities in China. Cooperation on CCS has the advantage of accelerating research and development as well as sharing the costs, which is especially important with large-scale demonstration projects. Joint efforts on advanced coal initiatives and CCS should continue in order to ensure the most cost-efficient research, development, and deployment.

### 3. Renewable Energy Integration

FERC is taking steps to reform transmission access practices and facilitate the integration of renewable energy resources onto the national power grid.[xxxvi] A rule was formally proposed in November 2010 and is expected to be adopted in 2011. It will require transmission providers to offer transmission services in 15-minute intervals instead of the hourly intervals currently standard in many parts of the U.S. Hourly transmission schedules, which are generally not subject to adjustment outside of a threat to system

reliability, have proved to be a barrier to resources with variable electric output, like wind and solar, which cannot be scheduled with the same precision as conventional power plants. The rule also seeks to encourage enhanced electricity forecasting and requires renewable generators to share meteorological and operational data with the transmission companies. FERC expects this advent of system flexibility to reduce the demand on regulation and ancillary services, and is further proposing changes to the pricing schedule for those services.

## 4. Agency Coordination

Environmental regulation of energy production involves policies, and usually agencies, created for different purposes – purposes that can sometimes seem at odds. In the U.S., this is often further complicated by the division of authority between federal and state governments under the federal system.

The siting of new electric transmission lines in the U.S. is an example illustrating this point. To build a power line within a state, an electric generating company must obtain permission from separate state agencies that regulate energy and environmental quality. When a proposed power line would cross state boundaries, or pass through federally-owned lands within a state (such as a National Forest), it may require approval by several federal energy and environmental agencies as well.

In an effort to increase the ease of siting, the EPAct of 2005 directed DOE and FERC to create "transmission corridors."[xxxvii] In these corridors, FERC may issue a federal permit authorizing electric generating companies to seize land for transmission lines if the state or local government does not issue a permit within a designated time.[xxxviii] This "brute force" approach gives short shrift to legitimate environmental and other concerns of state and local governments, and so is not desirable. In the U.S., such an approach has seldom been successful.

The programs that have been most successful at balancing the energy and environmental interest, and produced the least friction between agencies and popular outcry, are those where the environmental agency has authority to take actions that effectively internalize the environmental cost of energy development so that it is easily taken into account in the decisions of energy authorities. An example is the acid rain program adopted by the U.S. Congress in 1970. That law placed an increasingly stringent national cap on emissions of sulfur dioxide, and distributed emission "allowances" that companies could trade amongst themselves to minimize costs. In effect, the acid rain law established a national price for sulfur dioxide. In turn, that allowed state and federal energy permitting agencies to decide among different fuels and technologies for new electric generating units based on a clear understanding of the environmental costs involved in their choices. Despite the significant economic costs of compliance, the acid rain program has provoked very little opposition from the regulated generators, and it is widely supported by the public.

## C. Action at the Regional and State Level

On the state level, more than 30 states have completed climate action plans, with more under development.[xxxix] These plans detail steps that states can take to reduce their GHG emissions; with a few exceptions, however, most of these plans do not include binding targets capable of achieving real reductions in GHG emissions. The plans announced by California, New York, and Massachusetts, as discussed below, are notable exceptions. Finally, state renewable electricity standards (RES) play an important role in transitioning the energy structure in the U.S. in the absence of a national RES, as detailed below.

### 1. Regional Programs

RGGI is now in its third year and requires electric generating units to reduce emissions 10% by 2018. The WCI, comprised of western states, including California, and four Canadian Provinces representing about two-thirds of Canada's GHG emissions, is still designing its cap-and-trade program.

RGGI and WCI both have mandatory GHG emission reporting requirements. Covered entities must measure, report, and certify their emissions on an annual basis. Failure to report or report accurately results, or would result, in fines and/or penalties under both programs.

RGGI is the first mandatory cap-and-trade system for CO2 emissions in the U.S. It requires owners or operators of electric generating units larger than 25MW in participating states to reduce carbon dioxide emissions by 10% from 2009 levels by 2018 through a cap-and-trade system, a total reduction of about 188 million tons CO2. Covered entities must buy allowances at quarterly auctions. The program also allows for qualifying offset credits to be used in lieu of allowances to comply with the cap.xl

The RGGI requirements took effect in 2009 and 10 allowance auctions have been held so far, generating a total about $730 million. RGGI serves as an important mechanism for raising funds and recycling revenue for state energy programs, with auction proceeds funding improvements in energy efficiency, renewable energy, and assistance for low-income residents in each of the participating states.xli

In anticipation of the implementation of RGGI, emissions decreased in the RGGI states 33%, from 184.4 million tons CO2 in 2005 to 123.7 million tons CO2 in 2009.xlii The decrease is attributed to a number of factors, including reduced demand due to weather, increases in energy efficiency, the economic downturn, fuel switching to natural gas, and increased use of lower-emitting sources such as wind, nuclear, and hydropower.xliii

WCI released a program design document in July 2010 that would aim to reduce greenhouse gas emissions in participating jurisdictionsxliv 15% below 2005 levels by 2020.

Like the draft California program, discussed below, WCI would initially cover only large stationary emitters and electricity generatorsxlv beginning in 2012. In 2015, providers of transportation fuels and residential and commercial fuels would also be covered. Each partner jurisdiction would choose how to allocate allowances. If the jurisdiction chooses to auction a portion of allowances, the allowances would be auctioned via a regionally-coordinated auction. Entities would be permitted to use qualifying offset credits in lieu of allowances. Use of offsets could be limited to some percentage of an entity's compliance obligation, as determined by the partner jurisdiction.

## 2. State Programs

State initiatives encompass an array of renewable energy and energy efficiency policies and measures, including net metering, smart grid development, and green building standards. A large number of states have also adopted a mandatory RES in the absence of a federal standard. Of these, California's RES is the most ambitious, as discussed below. Had Congressional efforts to pass comprehensive GHG legislation in the last Congress succeeded, the U.S. would have adopted a national standard comparable to California's. A stand-alone RES bill was also introduced in the U.S. Senate in September 2010, but it was not adopted. A clean energy bill that includes fossil-fuel-based technologies may be a possibility in the divided Congress. It should be noted that the population of the two leading states, California and New York, is more than 15% of the U.S. national population.

### *a. California*

California has led the federal government on every major air pollution initiative in the past 50 years. The State's global warming policy, administered by the California Air Resources Board (CARB) is the latest example. California's Assembly Bill 32 (AB 32), the Global Warming Solutions Act, requires the State to reduce greenhouse gas emissions to 1990 levels by 2020.[xlvi] The CARB has promulgated a number of greenhouse gas mandates, including mandatory GHG reporting requirements, and recently approved a cap-and-trade system to be implemented in California in 2012. Examples of some of the measures California has already taken include:

- Ship electrification at ports
- Heavy-duty motor vehicle GHG emission reduction
- Perfluorocarbons (PFC) reduction in semiconductor manufacturing
- Motor vehicle tire pressure program
- Low carbon fuel standard
- Landfill methane control measure
- High-global warming potential (GWP) Refrigerant Management Program for Stationary Sources
- Sulfur hexafluoride (SF6) emission reductions from the electricity sector
- Energy efficiency and co-benefits audits for large industrial sources
- Renewable electricity standard for all power sold in California setting a goal of attaining 33% of electricity from renewable sources by 2030[xlvii]

In December 2010, CARB adopted regulations for the cap-and-trade program, which will begin January 1, 2012. CARB approved the final cap-and-trade regulations on December 16, 2010.[xlviii] Sources covered by the regulation include industrial manufacturing facilities and electric generating facilities in California and importers of electricity into California, as well as suppliers of natural gas, RBOB[xlix] and distillate fuel oil, and liquefied petroleum gas.[l]

Covered entities are required to buy allowances at auction or submit qualified offset credits[li] to meet their compliance obligation. During the first two years of the program only industrial manufacturing facilities and electric generating facilities are covered. They are required to submit allowances or offsets equal to 30% of their covered annual emissions. Beginning 2014, all covered entities are required to submit a quantity of allowances or offsets equal to 100% of each entity's total annual emissions.

Some allowances will be available for free to industrial manufacturing sources for transition assistance and to electric distribution utilities for the benefit of ratepayers. The rest of the allowances would be auctioned or placed into an Allowance Price Containment Reserve.[lii]

CARB is coordinating with six other states that are part of WCI as well as four Canadian provinces to link its cap-and-trade system with a regional cap-and-trade system, still in the design phase, in the western region of the U.S. and Canada.

### *b. New York*

New York released its climate action plan interim report in November 2010, which calls for a binding 80% reduction in GHG emissions below 1990 levels by 2050, with an interim target of 40% reductions by 2030.[liii] The plan and targets were established by executive order,[liv] with a final plan that includes specific measures to follow.
To reach this goal, New York anticipates it will need to double its renewable energy resources by 2030 and achieve substantial energy savings through energy efficiency measures. As an initial step in addressing the linkage between energy and climate, New York's energy laws require the State Energy Plan to include an inventory of GHG emissions to account for the climate impacts of the State's energy production and use.

### *c. Massachusetts*

In 2008, Massachusetts passed the Global Warming Solutions Act (GWSA), which mandates a reduction of GHG emissions 80% below 1990 levels by 2050, and requires the Secretary of Energy and Environmental Affairs to set a legally enforceable GHG emissions limit for 2020 of between 10% and 25% below 1990 levels by January 1, 2011.[lv] GWSA also requires the Secretary to issue a plan for achieving those reductions while maintaining economic growth.

The Secretary of Energy and Environmental Affairs for Massachusetts recently set a reduction mandate at the statutory maximum of 25% below 1990 levels. The Secretary also released the Clean Energy and Climate Plan for 2020, which contains a portfolio of policies designed to meet the mandate, including energy efficiency requirements for buildings and a renewable portfolio standard.[lvi]

### 3. State Renewable Electricity Standards

In the absence of a federal RES, the majority of states have adopted state standards. As of December 2010, 29 states plus the District of Columbia and Puerto Rico have a mandatory RES, and an additional seven states have RES goals.[lvii] Most state policies require electricity providers to obtain a specified minimum percentage of electricity from renewable sources, although some states alternately use a capacity requirement rather than percentage. The standards range from 10%–40%, with varied timelines. On average, states require an approximately 25% reduction within the next 10 to 15 years.[lviii] Some states further require generation-specific "carve outs," which mandate that a certain percentage of electricity come from a particular renewable energy source. Alternatively, states use tiered feed-in tariffs, which pay generators a premium for particular types of renewable resources in order to incentivize the development of certain resources.

California's standard, while one of the more aggressive, illustrates the general approach taken by many states. California requires 33% of electricity to come from renewable sources by 2020, using a phase-in approach with interim targets. This regulation applies to all utilities that deliver electricity with sales of more than 200,000 megawatt-hours per year, including investor owned, publicly owned, and municipal utilities.[lix] In California alone, this will reduce GHG emissions by the equivalent of 12–13 million metric tons of $CO_2$ per year in 2020.[lx]

States are still working out whether, and to what degree, electric generating companies will be permitted to comply with the standard by using tradable credits. Renewable energy credits (REC) are generated when a company resells energy sourced from qualifying renewables while retaining the renewable attributes. Tradable REC markets may add greater compliance flexibility. But in California, for example, the largest investor owned generating companies are currently required to meet 75% of their RES quota with in-state sources (meaning that compliance through REC purchases is currently limited to 25% for these companies). Issues in implementation, such as this one, will be fleshed out as programs mature.

Federal policies, such as energy production and investment tax credits, still shape the development and penetration of renewable energy in significant ways. Nevertheless, state RESs are capable of achieving substantial reductions in GHG emissions and represent an important component of domestic efforts.

## IV. CONCLUSION

The recent U.S. election results appear to have made it unlikely that Congress will in the near future enact any comprehensive federal climate change legislation covering industrial sources and imposing new federal energy efficiency measures. But, as demonstrated by the above discussion, a national cap-and-trade system is not the only vehicle to reduce GHG emissions. An effective GHG reduction program, as described above, will have three components. It must reduce GHG emissions from (1) motor vehicles and (2) industrial sources (including the power sector); and it must (3) greatly increase the efficiency of energy use. Much of the infrastructure necessary to build this "three-legged stool" in the U.S. is in place at the federal, state, and regional levels.

- EPA is requiring reporting of GHG emissions data from industrial plants, which will be used to develop regulations for industrial emitters and electric generating units;
- EPA is regulating GHG emissions from motor vehicles;
- DOE is increasing energy efficiency standards and providing the necessary funding to develop technology to capture and deal with carbon emissions; and
- States have implemented state and regional cap-and-trade programs and complementary measures to reduce GHG emissions from industrial emitters and electric power generators as well as new energy efficiency requirements for buildings and energy-using appliances.

In other words, even in the absence of federal climate legislation, actions that will reduce emissions of GHGs are being taken at the federal, state, and regional levels.

As described at the beginning of this paper, elements of the U.S. experience may be relevant for the development of an effective Chinese GHG emission control program:

1. Implementation of key elements for an effective climate program: (1) energy efficiency standards for industry, buildings, heating/cooling systems, and appliances; (2) emission standards for GHGs from motor vehicles; (3) regulation of industrial emitters of GHGs through a cap-and-trade or pollution tax system; (4) government support for development of GHG control technologies;
2. Centralized regulation of GHG emissions in a single national agency, which coordinates actions by other relevant agencies; U.S. experience has shown that regulatory authority dispersed among different agencies leads to less effective control of conventional pollutants and GHGs;
3. Assigning regulation of GHG emissions to the same agency that regulates "conventional" air pollutants, (such as tropospheric ozone, sulfur and nitrogen oxides, and black carbon) for efficient and effective regulation;
4. Allowing state and regional authorities flexibility and authority to serve as "laboratories" to test innovative GHG emission reduction policies; and
5. Requiring monitoring and reporting of GHG emissions to facilitate policymaking decisions and measure progress in GHG emissions reductions.

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[i] From http://www.epa.gov/OCEPATERMS/aterms.html

[ii] Since 2008, several provinces in China (Jiangsu, Henan, Sichuan, Guangdong and Guizhou) have established pilot programs for efficiency dispatch which prioritize dispatch of zero or lower emissions power plants ahead of more polluting plants, and China Southern Grid company announced at the beginning of 2011 that it had implemented efficiency dispatch for all five provinces under its jurisdiction. The Chinese efficiency dispatch initiatives have been coordinated by, among others, the National Development and Reform Commission, National Energy Administration, Ministry of Environmental Protection, State Electricity Regulatory Commission and Ministry of Finance, along with provincial governments and grid and generation enterprises.

[iii] Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont are participating RGGI states.

[iv] Arizona, California, Montana, New Mexico, Oregon, Utah, Washington, and the Canadian provinces of British Columbia, Manitoba, Ontario, and Quebec are participating jurisdictions.

[v] FERC, unlike EPA or DOE, is an independent federal agency. It is composed of five commissioners who are appointed by the President, with the advice and consent of the Senate. Commissioners serve five year terms and may not be removed by the President except for malfeasance. Another difference from EPA and DOE is that FERC decisions are not reviewed by the President or Congress. FERC is funded by fees and annual charges on the industries it regulates.

[vi] For industrial emitters states may, however, adopt GHG requirements that are more restrictive that federal requirements. For motor vehicles California may adopt GHG emissions limitations that are more restrictive than federal requirements and other states may adopt either the California or federal requirements.

[vii] World Resources Institute Report, *Reducing Greenhouse Gas Emissions in the United States Using Existing Federal Authorities and State Action* (July 2010).

[viii] These figures do not include, for example, potential additional reductions from federal policies to reduce the number of vehicle miles traveled or agricultural lands and forest management, among other potential sources. Additionally, the effect of the Great Recession on depressing economic outputs, and thus emissions, yields short-term reductions as well.

[ix] 42 U.S.C. §7521(a)(1) (emphasis supplied).

[x] "Air pollutant" is defined by the CAA as "any air pollution agent or combination of such agents, including any physical, chemical, ... substance or matter which is emitted into or otherwise enters the ambient air." 42 U.S.C. § 7602(g).

[xi] *Massachusetts v. EPA*, 549 U.S. 497, 527 (2007).

[xii] 74 Fed. Reg. 66496 (Dec. 15, 2009).

[xiii] *See, e.g.* 42 U.S.C. § 7408(a)(1)(A) (relating to the setting of primary and secondary ambient air quality standards) and 42 U.S.C. § 7411(b)(1)(A) (relating to standards of performance for categories of stationary sources of air pollution).

[xiv] 74 Fed. Reg. 56260, (Oct. 30, 2009).

[xv] 75 Fed. Reg. 25324 (May 7, 2010).

[xvi] 75 Fed. Reg. 31514 (June 3, 2010).

[xvii] The full list of covered sectors is as follows: electricity purchases, general stationary fuel combustion sources, electricity generation, adipic acid production, aluminum production, ammonia manufacturing, cement production, electronics manufacturing, ethanol production, ferroalloy production, food processing, glass production, HCFC-22 production and HFC-23 destruction, hydrogen production, iron and steel production, lead production, lime manufacturing, magnesium production, miscellaneous uses of carbonate, nitric acid production, oil and natural gas systems, petrochemical production, petroleum refineries, phosphoric acid production, pulp and paper manufacturing, silicon carbide production, soda ash manufacturing, sulfur hexafluoride from electrical equipment, titanium dioxide production, underground coal mines, zinc production, municipal solid waste landfills, waste water treatment, manure treatment, suppliers of coal, suppliers of coal-based liquid fuels, suppliers of petroleum products, suppliers of natural gas and natural gas liquids, suppliers of industrial GHGs, suppliers of carbon dioxide, and non-light-duty mobile sources.

[xviii] 75 Fed. Reg. 25324,(May 7, 2010).

[xix] EPA includes in the category of "light-duty vehicles" passenger cars, light-duty trucks, and medium-duty passenger vehicles.
[xx] http://www.epa.gov/otaq/climate/regulations/420f10014.htm
[xxi] For a detailed discussion of the CAA technology requirements, see Chapter VII of our Report to MEP, "Amending China's Air Pollution Prevention and Control Law: Recommendations from the International Experience" (July, 2009), page 93 ff.
[xxii] However, the U.S. government is currently providing funding for a full-scale demonstration project, FutureGen, discussed in section VI, below.
[xxiii] If Congress had adopted comprehensive GHG legislation, placing a cap and a price on carbon emissions, this problem would have at least partly been solved.
[xxiv] MASSACHUSETTS INSTITUTE OF TECHNOLOGY, THE FUTURE OF COAL ix (2007) http://web.mit.edu/coal/The_Future_of_Coal.pdf
[xxv] *Coalition for Responsible Regulation v. EPA* (D.C. Cir. Index No. 09-1322)(consolidating 17 cases challenging the endangerment finding); *Southeastern Legal Foundation v. EPA* (D.C. Cir. Index No. 1131)(consolidating 26 cases challenging the PSD tailoring rule); *Coalition for Responsible Regulation v. EPA* (D.C. Cir. Index No. 10-1092)(consolidating 17 cases challenging the auto rule)
[xxvi] Energy Policy Act of 2005, Pub. L. No. 109-58 (2005) (amending the Energy Policy Act of 1992).
[xxvii] *See* http://apps1.eere.energy.gov/repi/ (facilities qualifying under the Renewable Energy Production Incentive program are eligible for annual incentive payments for the first 10 years of operation, subject to annual appropriations).
[xxviii] U.S. Climate Action Report 51 (2010).
[xxix] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5 (2009).
[xxx] Energy Independence and Security Act of 2007, Pub. L. No. 110-140 (2007).
[xxxi] Incorporated into the Emergency Economic Stabilization Act of 2008, Pub. L. No. 110-343 (2008).
[xxxii] Memorandum of Understanding Regarding Coordination in Federal Agency Review of Electric Transmission Facilities on Federal Land, (Oct. 23, 2009).
[xxxiii] Oxy-combustion uses a mix of oxygen and CO2 (instead of air) to burn coal, producing a concentrated CO2 stream that can be captured and stored.
[xxxiv] 75 Fed. Reg. 77230 (Dec. 10, 2010) (Final Rule establishing Class VI wells for geological sequestration).
[xxxv] 75 Fed. Reg 75060 (Dec. 1, 2010) (Final Rule requiring GHG monitoring and reporting from facilities that inject or geologically sequester CO2).
[xxxvi] Federal Energy Regulatory Commission, Integration of Variable Energy Resources, November 18, 2010. Notice of Proposed Rulemaking Docket No. RM10-11-000 available at http://www.ferc.gov/whats-new/comm-meet/2010/111810/E-1.pdf.
[xxxvii] Section 1221 of the Energy Policy Act of 2005
[xxxviii] FERC Order No. 689 (Nov. 16, 2006).
[xxxix] *See* EPA, State and Local Climate and Energy Program, Climate Change Action Plans, http://www.epa.gov/statelocalclimate/state/state-examples/action-plans.html#all (last updated 8/2010).
[xl] Initially, the use of offset credits is limited to 3% of a unit's compliance obligation, but the limit may increase to 5 or 10% if the price of allowances at auction reach $7 or $10 (in 2005$), respectively.
[xli] *See* http://www.rggi.org/rggi_benefits
[xlii] New York State Energy Research and Development Authority, *RGGI Inc.: The Relative Effects of Various Factors on RGGI Electricity Sector CO2 Emissions: 2009 Compared to 2005*, Draft White Paper pg. 3, Nov. 2, 2010.
[xliii] *Id*.
[xliv] Arizona, California, Montana, New Mexico, Oregon, Utah, Washington, and the Canadian provinces of British Columbia, Manitoba, Ontario, and Quebec are participating jurisdictions.
[xlv] WCI covers units that emit more than 25,000 metric tons CO2-equivalent annually.
[xlvi] California voters recently rejected a measure, called proposition 23, that would have overturned AB 32.
[xlvii] The California program would therefore affect electricity generated in other states besides California.
[xlviii] "Greenhouse gases" means CO2, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and other fluorinated greenhouse gases.
[xlix] Reformulated blendstock for oxygenate blending.

[l] Generally, sources in these categories that emit, or whose products would emit when combusted, less than 25,000 metric tons of CO2 equivalent per year would not be covered.
[li] Entities may submit offset credits to meet no more than 8% of their compliance obligation.
[lii] A price containment reserve would ensure a stream of allowances that would be auctioned to covered entities only. By eliminating opportunities for speculators to bid up the price, reserve allowance auctions should provide a cheaper source of allowances for covered entities than regular auctions.
[liii] Available at: http://www.nyclimatechange.us/
[liv] Exec. Order No. 24 (Aug. 6, 2009).
[lv] Global Warming Solutions Act (Chapter 298 of the Acts of 2008, and as codified at M.G.L. c. 21N)
[lvi] http://www.mass.gov/Eoeea/docs/eea/energy/2020-clean-energy-plan.pdf
[lvii] Database of State Incentives for Renewables & Efficiency, RPS Policies, www. dsireusa.org (last updated Dec. 2010).
[lviii] Id.
[lix] Electricity providers with sales of less than 200,000 megawatt-hours per year are subject to record keeping and recording requirements under the State's RES.
[lx] Press Release, CARB, California Commits to More Clean, Green Energy (Sept. 23, 2010).