Greenhouse Gas Emissions Trading: Emerging Markets and Opportunities for Colorado

EESI ENERGY & ENVIRONMENTAL SECURITY INITIATIVE

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EXECUTIVE SUMMARY

Emissions trading is a tool employed to accomplish a greater environmental goal. That is, emissions trading gives regulated firms the flexibility to trade emissions allowances or credits amongst themselves, thereby reducing the compliance costs of achieving an environmental target.[1] Trading can improve the performance of a regulatory framework by giving sources affected by caps or restrictions on emissions the flexibility to achieve compliance more cheaply than with command and control alternatives or through the use of environmental taxes.[2] Following initial experiments with emissions trading in the United States, including successes like the federal Acid Rain Program and market failures in programs like the Los Angeles Air Basin Regional Clean Air Incentives Market (RECLAIM), a number of countries, states and businesses are embracing emissions trading as a solution to the problem of greenhouse gas (GHG) emissions and climate change.

The European Union Emissions Trading System (EU ETS), set up to allow European countries to achieve their targets under the Kyoto Protocol, is the largest and only functioning mandatory GHG cap-and-trade system in the world.[3] The global market for CO_2 credits totaled $21.47 billion through October, 2006, up from $11 billion for all of 2005.[4] The EU ETS accounted for $19 billion of this total.[5] Pioneers in the U.S. include California with its recent commitment to cut GHG emissions by 25 percent by 2020 under a strategy that includes an emissions trading program, and a select group of Northeast states participating in the Regional Greenhouse Gas Initiative (RGGI), a mandatory GHG reduction and trading system slated to take effect in 2009.[6] Beyond mandatory systems, voluntary markets like the Chicago Climate Exchange (CCX) and reduction initiatives like those encouraged by the Federal government's Climate VISION program, present opportunities for companies to reduce and trade emissions effectively.[7] In addition, while the U.S. does not currently regulate GHG emissions at the federal level, national legislation capping GHG emissions and likely implementing an emission trading system is certainly on the horizon.[8]

Aside from governmental actors, private firms in various economic sectors are instituting voluntary caps on GHG emissions while using emissions trading to meet their environmental and business goals alike.[9] BP established a company wide emissions goal and used emissions trading between company sources for compliance.[10] Other companies involved in oil and gas are calling for federal legislation addressing climate change, citing an inability to make investments amid great regulatory uncertainty and the need for a comprehensive, uniform regulatory structure.[11] Duke Energy has cut CO_2 emissions through efficiency projects and sequestration by as much as 175 million tons.[12] Insurers and financial institutions are also adapting their services to account for risks associated with climate change, with AIG working to become the first to offer a comprehensive climate change policy and Morgan Stanley pledging to invest three billion dollars over the next five years in carbon emissions reduction projects.[13] Other sectors including automotive, air transportation, retail, manufacturing, agriculture and even waste management are adapting their business strategies to prepare for and mitigate climate change. Virgin Airlines has pledged to invest

$3 billion in renewable energy initiatives with the goal of reducing the airline industries' emissions by 25 percent;[14] Wal-Mart, the largest private electricity user in the United States hopes to build stores that create 30 percent fewer GHG emissions over the next four years;[15] and Farmers in Iowa and Nebraska are receiving offset credits from the CCX for conservation farming practices.[16]

Climate change will also have a dramatic effect on the environment and economy of Colorado.[17] Climate models show that warming will be most pronounced in high elevation areas, affecting the Rocky Mountain west more than any other U.S. region outside of the arctic.[18] Furthermore, agriculture, the ski industry as well as the real estate and retail sectors will be affected by problems such as decreased snow pack, increased incidence of severe weather and wildfire, all problems exacerbated by climate change.[19] While Colorado will be required to adapt to a changing climate, mitigation strategies also present risks and opportunities. By taking a number of actions, Colorado can position itself to take advantage of existing emissions trading markets and prepare for a federal regulatory regime that will likely involve mandatory GHG reductions and a trading system:

(1) Base Colorado's GHG inventory on the Department of Energy's 1605(b) standards to ensure that reduction projects in Colorado are credited if a federal GHG reduction or trading program emerges.
(2) Make Colorado attractive for offset projects, extending efforts to promote renewable energy and innovation in energy production methods.
(3) Encourage utilities to promote energy efficiency projects, possibly by increasing the rate base to offset revenue loss.
(4) Consider linkages with RGGI or California through an emissions trading program, observation of the Western Regional Climate Action Initiative or promotion of a new Western Governors Association (WGA) initiative to design a CO_2 reduction program and associated emissions trading program that is compatible with Western environmental values and economic circumstances.
(5) Educate state businesses about climate change impacts and the economic benefits of staying ahead of the curve.
(6) Set up a Colorado Office for Climate Change to study and implement policies for mitigating and adapting to climate change in the state.

This report for the Colorado General Assembly regarding the emerging domestic and international markets for greenhouse gas emissions trading and private firms in various economic sectors taking steps to reduce their greenhouse emissions proceeds in six chapters. Chapter 1 introduces the concept of emissions trading and also provides a synopsis of America's experience trading non-GHG pollutants. Chapter 2 addresses the development, efficacy and importance of international markets for greenhouse gas emissions, including the groundbreaking EU ETS. Chapter 3 provides similar treatment of the emerging domestic markets for GHG emissions, including functioning voluntary markets like the CCX and developing mandatory markets such as RGGI. Chapter 4 highlights activities and efforts at the municipal, state, regional, federal, international and judicial levels to address GHG emissions, all of which are sure to shape the future of emissions trading in Colorado and abroad. Chapter 5 discusses private firms in various economic sectors that are taking steps to reduce their GHG emissions. Finally, Chapter 6 provides brief recommendations as to how the State of Colorado and Colorado businesses can take advantage of emerging GHG markets while reducing the risks associated with GHG emissions trading compliance.

EXECUTIVE SUMMARY ENDNOTES:

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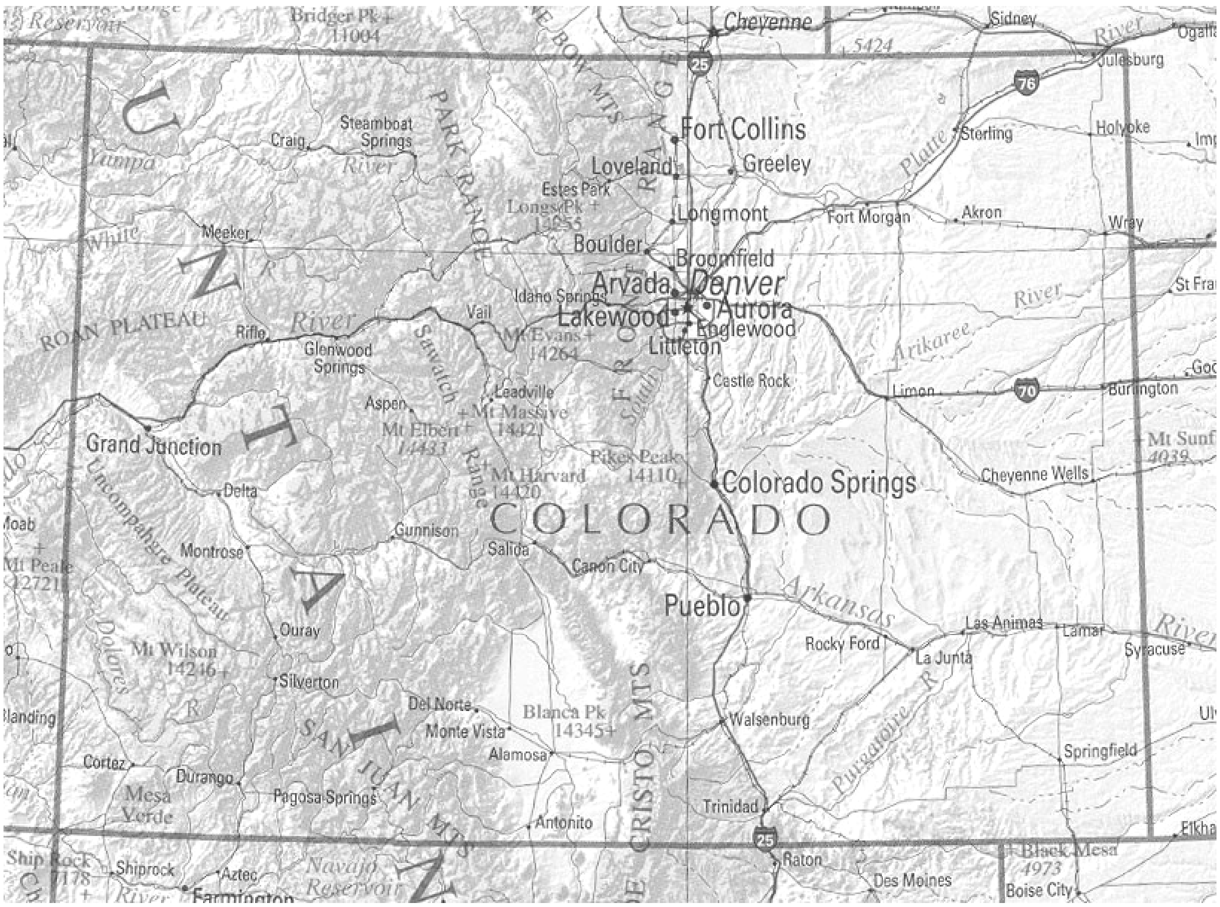
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Sidney
Julesburg
Holyoke
Sterling
Fort Collins
Greeley
Loveland
Estes Park
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Broomfield
Arvada
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Littleton
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Vail
Mt Evans
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Meeker
Rifle
Glenwood Springs
Aspen
Leadville
Mt Massive
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Mt Elbert
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Lamar
Syracuse
Springfield
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Des Moines
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PARK RANGE
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Arikaree River
Arkansas River
Purgatoire R
Dolores R
Moab
Mt Peale
12721
Blanding
Ship Rock
7178
5424
Mt Sunflower
4039

CHAPTER I: INTRODUCTION

While the science concerning the effect of GHG emissions on climate is still being debated, an overwhelming majority of climate scientists believe that climate change is occurring as a direct result of human activities.[1] The U.S. government has predicted that world CO_2 emissions will top 38.8 billion tons per year by 2025.[2] The Intergovernmental Panel on Climate Change recently reported a host of empirical evidence supporting global climate change including that global concentrations of carbon dioxide are at unnatural levels, and predicts average warming at .2 degrees centigrade per decade.[3] The effects of a warming earth are overwhelmingly negative, including increased climate variability, severe weather, sea level rise, biodiversity loss and environmental degradation.[4] Even with dramatic reductions today, climate change will continue for several decades because CO_2 lingers in the atmosphere and its effect multiplies exponentially.[5] A study released by Tufts University in October 2006 calculated the cost of global warming at $20 trillion per year by the end of the century.[6] Another estimate pegs the costs of GHG reduction and mitigation at six to eight percent of global economic output by 2100,[7] while an exhaustive study commissioned by the United Kingdom predicts that climate change will cost an average of five percent of GDP per year, with total costs rising to 20 percent of GDP if a broader range of risks and impacts of climate change are taken into account.[8] Regardless of one's position on climate change, the fact remains that various governmental and private actors are addressing the deleterious impacts of unfettered GHG pollution. While it is impossible to predict the exact shape and form of GHG regulation, emissions trading will almost certainly play an integral role.

A. HOW EMISSIONS TRADING WORKS

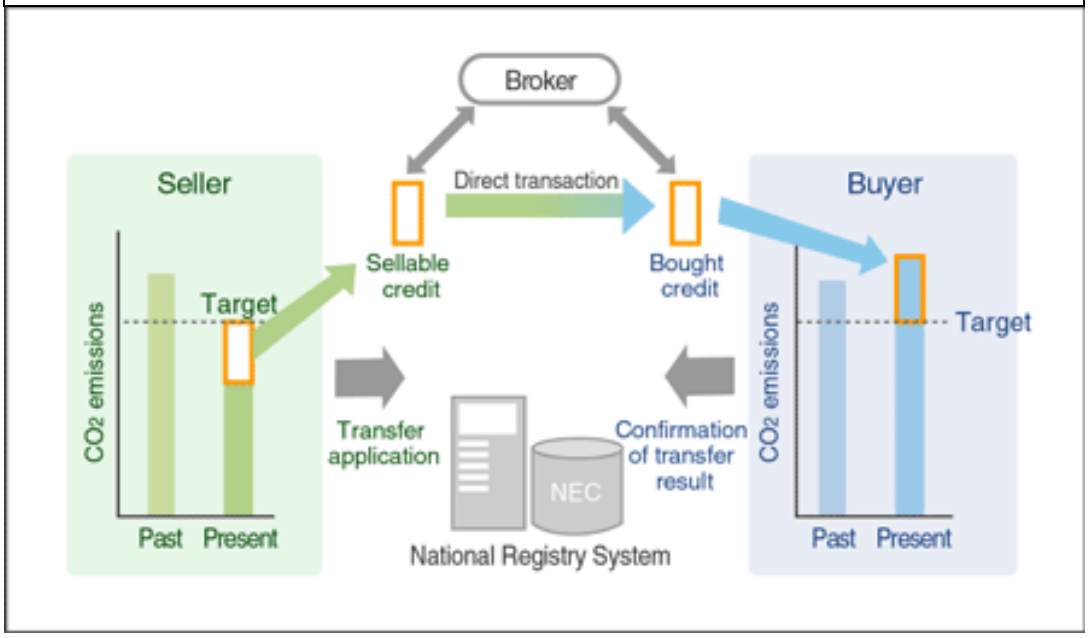
Emissions trading is a market-based mechanism for pollution control where tradable entitlements or credits for the right to emit a certain quantity of pollutants are allocated or earned.[9] Emissions trading is not, however, an end to itself. Rather, emissions trading is one means by which a larger regulatory framework can be facilitated. For instance, emissions trading is just one of three flexibility mechanisms built into the Kyoto Protocol allowing installations or countries to more easily meet their reduction obligations under that agreement. Another approach for dampening the financial impacts on sources of newly regulated emissions is the use of emissions fees or environmental taxes where sources must pay a fee or tax on each unit of emissions they produce.[10] Either approach, whether it be emissions trading or environmental taxes, provides individual firms or installations great flexibility in achieving a larger environmental mandate.

There are two main types of emissions trading systems (ETS): cap-and-trade and baseline-and-credit.[11] The most fundamental component of a cap-and-trade system is the use of a cap on certain emissions. Tradable allowances are then allocated to each regulated installation whereupon the installation submits an allowance for every unit of pollutant emitted. Unused allowances can then be sold to other installations who exceed their pollutant cap. Under a baseline-and-credit system, firms earn tradable credits for reductions below a baseline set for an installation or

industry.[12] These earned credits can then be sold to other installations. Firms can comply with either type of system in one of two ways: 1) by reducing emissions at their own installations to a level corresponding to the amount of allowances they were allocated or to their baseline amount; or 2) they can purchase allocated emissions allowances or earned credits from another facility to offset their emissions in excess of the number of allowances they were allocated or their baseline.[13] In other words, installations or countries that can reduce emissions at a low cost can sell their unused allowances or credits to installations or firms that cannot reduce their emissions as easily. Installations that have high abatement costs can purchase allowances or credits from those installations with low abatement costs, thereby rewarding some firms for their environmental performance and allowing other firms a less expensive, short-term alternative to capital investment in technologies that spur GHG reductions. Emissions trading is especially effective for curbing GHG emissions as opposed to localized pollutants like those associated with smog and acid rain, because GHGs have the same effect on the global atmosphere no matter where in the world they are released.[14]

Emissions trading systems have been used to reduce various atmospheric pollutants including sulfur dioxide and nitrogen oxide through legislation such as the Clean Air Act and have become more prevalent internationally due to growing public concern over the effect of CO_2 and other GHGs on the global environment. In an environmental program employing emissions trading, the design of an emissions trading program can have a dramatic impact on the effectiveness of achieving the ultimate environmental goal.

FIGURE 1-1: Baseline and Credit System



B. DESIGNING AN EMISSIONS TRADING SYSTEM

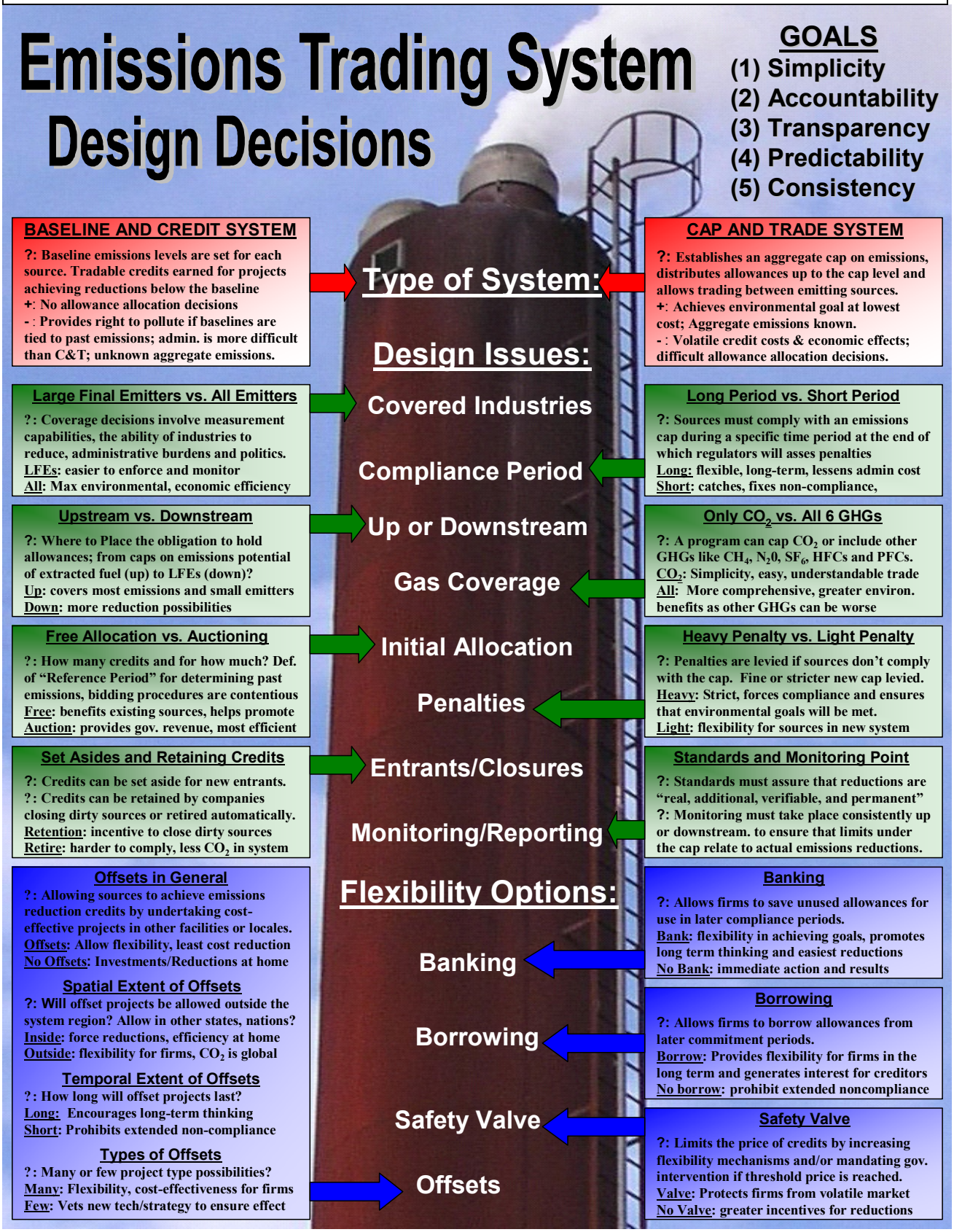
As mentioned above, emissions trading is merely one component of a larger regulatory framework. However, emission trading systems themselves are comprised of a host of characteristics and unique features. (See Figure 1 for the basic elements of an emissions trading

system). The most fundamental component of an ETS is the type of emissions trading system being employed. While cap-and-trade and baseline-and-credit systems are the most common, other hybrid systems that involve a complimentary carbon tax, energy efficiency standards or auto emissions standards are possible.[15] Furthermore, a rate-based program may be utilized, where credits are earned for reductions per unit of economic output rather than per ton of CO_2.[16] More complicated systems could more fairly distribute the burden of reductions, but the complexity of such programs could render them cost prohibitive.[17] A regulator must also address the coverage and extent of the program. An emissions trading program can be limited to large installations or extended to include a variety of economic sectors.[18] A related question is whether the program will be an "upstream" program, requiring fuel suppliers to surrender allowances equating to the carbon content of the fuels they provide, or a "downstream" program, regulating traditional sources of emissions or even consumers directly.[19] Regulators must also determine whether all six of the traditional GHGs (carbon dioxide, nitrous oxide, methane, sulfur hexafluoride, perfluorocarbons & hydrofluorcarbons) will be covered by the program.[20] These decisions will determine where the burden of reductions will be placed and will have dramatic effect on the strategies used to achieve these reductions.

Other decisions specifically affect cap-and-trade programs. One rather contentious issue concerns whether allowances should be freely given to firms in an amount reflecting past emissions, a process called "grandfathering," or whether allowances should be auctioned, providing money for other regulatory incentives.[21] A hybrid of the two approaches is also possible.[22] Firms generally favor grandfathering while regulators prefer the auctioning system.[23] Another important decision involves the penalty that will be levied if an installation does not comply with their cap.[24] Some systems require the non-complying firm to make up for the excess emissions in the next compliance period, or pay fines in an amount greater than the cost of allowances on the market and be subjected to prosecution if they knowingly violate requirements.[25] Aside from these difficult decisions, other administrative judgments must be made concerning the length of time installations have to comply with their targets and the rigor of monitoring systems to track GHG emissions and award credit.[26]

Other design decisions involve the delicate balance between environmental protection and economic efficiency. Many programs are designed to allow firms flexibility in the methods that they use to achieve their GHG reduction targets. "Banking" allows firms to retain unused credits for use or trade in later compliance periods.[27] "Borrowing" allows firms to undertake long-term projects that will achieve reductions after the compliance period is over by allowing the firm to borrow credits from later compliance periods.[28] One of the most important flexibility mechanisms is the "offset," which allows firms to commission emission reduction projects at other facilities or in other states, thereby receiving a credit for the amount of emissions reduced, which can then be used against the facilities own reduction goal.[29] Regulators must take into account questions of "leakage," a term that relates to the fact that emissions reductions in a regulated sector or area may lead to increases of emissions elsewhere.[30] Furthermore, regulators must ensure that offset projects are "additional," or would not have happened without the investment of the firm in the market for offsets.[31] Related to offsetting, a "safety valve" mechanism can also promote economic efficiency in the trading system by allowing an increased use of flexibility mechanisms or the sale of additional credits by the administrative agency if the price of carbon reaches a threshold amount.[32] The debate concerning trading system design has evolved from the United States' initial experiences with emissions trading under Environmental Protection Agency (EPA) programs. By examining some of the design features used in America's early emissions trading programs, regulators can rectify some of the mistakes made by their predecessors.

FIGURE 1-2: Emissions Trading Design Decisions



c. LESSONS LEARNED: EMISSIONS TRADING IN THE UNITED STATES

While the notion of an international GHG trading market is a relatively new construct, emissions trading has been used in varying degrees in the United States since the Clean Air Act Amendments of 1977.[33] Since that time, emissions trading has emerged as an important policy mechanism for controlling air pollution. Today, most major U.S. air quality improvement mandates include emissions trading as a component of larger emissions control programs.[34] While the existing mandatory emissions trading markets in the United States do not yet trade greenhouse gases, important lessons can be learned from America's experience with trading emissions.

i. EPA EMISSIONS TRADING PROGRAMS (EPA ET)

In the late 1970s, the EPA and the states developed four limited emissions trading programs under the Clean Air Act (CAA) to reduce the costs of compliance with air quality standards.[35] The hallmarks of these programs are: 1) netting; 2) offsets; 3) bubble; and 4) banking.[36] Collectively these programs are referred to as EPA Emission Trading or EPA ET.[37] "Netting" allows large new sources of emissions and existing sources undergoing major modifications to be exempted from otherwise applicable review procedures if a reduction of a sufficient amount of existing emissions is made elsewhere in the same facility.[38] Under the "offset" policy, a major new source of air pollution can locate and operate in a non-attainment area—an area that has not attained its National Ambient Air Quality Standard—if emissions from an existing source are reduced by an amount at least as great as the new source would contribute.[39] This policy allows a new pollution source to pay for a reduction project at another facility to "make room" for or "offset" its new emissions. The "bubble" policy also increases flexibility and decreases the expense of meeting air quality standards by providing the option to place an imaginary "bubble" over several different polluting sources and allowing them to aggregate the emissions of these different sources, promoting flexibility and economic efficiency by subjecting them to one combined emissions cap rather than multiple caps.[40] As mentioned above, banking allows sources to accumulate credits for future use or sale if they reduce their emissions below required levels.[41]

The EPA ET was America's first endeavor into emissions trading. The success of the program was severely limited by burdensome regulations on voluntarily participating sources.[42] A complicated certification system, whereby credits had to be established and approved lead to a lack of participation in these programs.[43] Additionally, offsets can only be used in certain geographic areas and trades that use offset credits are not afforded a one-for-one valuation.[44] As a result of this disappointing experience with the EPA ET programs, emissions trading was originally seen as a theoretically desirable tool, but impractical in practice.

ii. LEAD IN GASOLINE PROGRAM

A much more successful trading program, the Lead-In Gasoline Program employed an averaging scheme to regulate lead in gasoline in the mid-1980s.[45] Until 1982, lead limits were enforced on a refinery-by-refinery basis, where each refinery could allocate its average lead concentration across its total gasoline production.[46] The law was changed in 1982 to allow trading, not only by refinery installations individually, but also for refining companies on a firm-wide basis.[47] Under the new framework, individual refineries could use lead above their proscribed limit if that refinery purchased an equivalent number of rights from other refineries who were below

their lead limits.[48] Nationwide trading was implemented because the wide geographic scope of gasoline from any given refinery removed the local concerns that plagued trading in the early EPA ET programs.[49] The program was widely regarded as a success.[50] In a normal quarter over half of the refineries participated trading up to one-fifth of their lead rights.[51] Costs were minimal because no more monitoring was required beyond that of earlier command-and-control policies.[52] Furthermore, the banking policy was a success, leading to a faster reduction in lead emissions.[53]

iii. The Acid Rain Program (Title IV of the Clean Air Act Amendments of 1990)

The Acid Rain Program is the largest and most successful emissions trading systems in U.S. history. In 1980, the United States Congress commissioned a ten-year study of the causes, effects and attendant health and environmental impacts of acid rain.[54] After a decade of debate and political wrangling, Congress established Title IV of the Clean Air Act Amendments (CAAA) of 1990 to address the threat posed to the quality of the air and to human life by acid rain.[55] Title IV required the EPA to implement a program to achieve a fifty percent reduction in the amount of sulfur dioxide (SO_2) and nitrogen oxides (NO_x)—the key components of acid rain—emitted from electric generating facilities.[56] The centerpiece of the program was a market-based cap-and-trade system for SO_2 emissions.[57] NO_x is regulated more traditionally by using mandated limitations on emissions rates of certain types coal-fired boilers.[58] As such, this report will focus more specifically on the SO_2 cap-and-trade provisions of the CAAA.

Through Title IV of the CAAA, Congress directed the EPA to employ a "market based 'cap-and-trade' mechanism."[59] Through this program, a national cap of roughly nine million tons was established for SO_2 emissions released by electricity generating plants annually.[60] This cap was implemented in two phases. Phase I targeted the 263 electricity generating units emitting the largest volume of SO_2.[61] These facilities were subject to an interim cap requiring emissions from these units to be no greater than approximately 2.5 pounds of SO_2 per million Btu of heat input.[62] Phase II, beginning in 2000 and continuing indefinitely, includes virtually all fossil-fuel electricity generating facilities and requires a cap of approximately nine million tons or an average emission rate of less than 1.2 pounds of SO_2 per million Btu.[63]

The cornerstone of the program is a cap-and-trade system where tradable allowances are issued to the covered point sources of SO_2.[64] Each allowance unit represents one ton of SO_2, and each facility is granted allowances equal to a cap established for the total amount of SO_2 emissions allowed to be emitted for the year.[65] An allowance must then be surrendered for every ton of SO_2 emitted during the year.[66] If an installation fails to reduce emissions or purchase offsets to meet or beat its emissions cap, a fine is assessed for each excess ton of SO_2 emitted and the installation is also required to make up the difference the following year.[67] If an installation does not use or trade all of its allowances for a given year they may be banked for future use or sale.[68]

The cap-and-trade provisions of Title IV have been widely hailed as a success, primarily because they have precipitated a large drop in annual SO_2 emissions.[69] SO_2 emissions had been falling steadily during the 1980s and early 1990s, but the reduction of SO_2 emissions occurring from 1994 to 1995, which was undoubtedly caused by Title IV, was unprecedented.[70] Only the Lead-In-Gasoline Program, also implemented by the use of emissions trading and banking, has spurred a comparable magnitude of emissions reduction.[71] The numbers speak for themselves: SO_2 emissions have been reduced from 17.3 million tons of released SO_2 in 1980—Title IV's baseline year—to 10.2 million tons by 2002.[72] Moreover, the program resulted in nearly one hundred percent compliance due to rigorous emissions monitoring, allowance tracking, and a simple, automatic penalty system for noncompliance.[73]

However, the program has had its drawbacks. One major criticism of the program, and emissions trading generally, is that it creates "hot spots" or localized areas of high pollution levels because plants that cannot meet their emissions limits can purchase allowances to comply with Title IV.[74] Another criticism stems from the belief that the cap placed on SO_2 emissions was too generous.[75] Phase I emitters, those plants deemed to be the heaviest polluters of SO_2, were easily able to reduce their emissions below the required levels.[76] While this is certainly a point of contention, the program reduced SO_2 emissions to 60 percent of 1980 levels and did so at a surprisingly low cost by 2002.[77]

iv. NORTHEAST NO_x BUDGET TRADING

Congress set up the Ozone Transport Commission (OTC), a regional organization including parts of 12 northeastern states and Washington D.C., as a part of the CAAA of 1990.[78] The OTC was set up to deal with the problem of ozone—or smog—an interstate pollutant formed in a reaction between NO_x and volatile organic compounds (VOCs).[79] A 1994 Memorandum of Understanding (MOU) committed members to a regional reduction target of 219,000 emitted tons of NO_x by 1999 and 143,000 tons by 2003's peak ozone season (May 1 – September 30).[80] Full compliance was meant to achieve a ten percent reduction from 1990 levels.[81] By 1999 sources had greatly exceeded the reductions required under the MOU,[82] but this was of some concern as the program allowed unlimited banking of credits.[83] To combat the negative effects that an abundance of unused allowances could have on air quality in future years, the program placed limits on how allowances were withdrawn from the bank, referred to as "flow control."[84] If the percentage of banked allowances compared to newly allocated allowances was greater than ten percent, only a certain ratio of allowances could be withdrawn and used on a one to one basis.[85] Other banked allowances could be used that year, but were only valued at two banked allowances to one allowance allocated for that year.[86]

The second phase of the NO_x program was subsumed by the EPA's NO_x State Implementation Plan (SIP) Call in May 2003, which regulates states inside and outside of the OTC.[87] The NO_x SIP Call requires states to reduce not only NO_x emissions that affect their own states, but to reduce emissions that contribute to ozone non-attainment in other states during ozone season.[88] The NO_x SIP Call does not mandate emissions reductions for specific sources, but gives states specific emissions budgets and requires them to develop strategies to meet their budgets.[89] All of the states chose to participate in the NO_x budget trading program, a cap-and-trade program for fossil fuel fired electricity generating units, large industrial boilers and turbines.[90] The cap-and-trade program retained many of the attributes of the Northeast NO_x Budgeting Program, including banking of allowances and "flow control" to assure reductions in future years.[91] Rigorous

monitoring systems were also set up to ensure that one ton of NO_x emissions from one source equaled one ton of NO_x emissions from another.[92]

As a result of these programs, NO_x emissions in the eastern U.S. decreased by twenty-five percent between 1997 and 2004.[93] Larger reductions were achieved after the introduction of NOx SIP Call during the summers of 2003 and 2004.[94] In the central United States six states experienced reductions of over 110,000 tons of NO_x between 1997 and 2004.[95] Of the 2,500 sources covered by the program in 2004, nearly 100 percent were in compliance.[96] The trading program helped to ensure broad compliance, with 230,000 allowances traded in economically significant deals in 2004.[97] The price of allowances also stabilized in 2004, with different vintages (years in which the reductions were achieved) selling for between $2,000.00 and $4,000.00 a ton.[98] While the program has achieved reductions, more than 100,000,000 people in the Eastern U.S. still live in non-attainment areas under the CAAA.[99] However, the EPA predicts that the NO_x SIP Call along with their 2005 Clean Air Interstate Rule (CAIR) will reduce ozone season NO_x emissions by as much as fifty percent of 2003 levels by 2015.[100] The Northeast NO_x Budget Trading and NO_x SIP Call provide more examples that emissions trading can be used to accomplish environmental goals, while reducing compliance costs associated therewith. However, programs such as the EPA ET and the RECLAIM program, discussed next, have not had the success of other programs.

v. Mobile Source Averaging, Banking, and Trading (ABT) Programs

The federal mobile source averaging, banking and trading (ABT) programs are similar to the Lead-In-Gasoline Program discussed above.[101] Through these programs, manufacturers of certain mobile emission sources—cars and trucks, etc.—are provided with trade flexibility based on a specified emission rate standard, commonly expressed as emissions per horsepower-hour.[102] The ABT acronym refers to specific aspects of the program including: 1) "averaging" emissions from engine families produced by a manufacturer in a specific model year; 2) "banking" credits to offset emissions from the same or other engine families the manufacturer will produce in future years; and 3) "trading" credits to other firms to offset emissions from that firm's engine families.[103] ABT programs now include "automobiles and light duty trucks; heavy-duty truck engines; large non-road diesel engines used in construction, agriculture and other uses including, locomotive engines, marine outboard engines and personal watercraft; and small engines used in various lawn, garden and other applications."[104] While the trading aspect has not been utilized extensively, the averaging and banking aspects have allowed the EPA to set average emission levels for all engine families without worrying about unduly penalizing some engine types.[105] The flexibility provided by the program has reduced costs and allowed for more rigorous environmental standards.[106]

vi. Los Angeles Air Basin RECLAIM Program

The Los Angeles Air Basin Regional Clean Air Incentives Market (RECLAIM) is a market-based approach to achieving the emissions reductions of NOx and SO_2 mandated by the Clean Air Act Amendments of 1990.[107] The program was set up as an alternative to a 1991 air quality management plan to bring Los Angeles into compliance with the National Ambient Air Quality Standards.[108]

RECLAIM participants are freely allocated RECLAIM trading credits (RTCs) and can purchase RTCs from other participants instead of reducing NOx emissions.[109] Because weather

patterns tend to push emissions from the coastal area inland, facilities in the inland area can purchase RTCs from the coastal area, but facilities from the coastal area can only purchase RTCs from other coastal sources.[110] The system is organized around a rolling cap, where allocations are reduced at individual installations by eight percent per year.[111] Banking was not allowed because of a fear that it could hinder compliance with air quality standards in future years.[112]

However, the decision not to allow banking is one of the primary reasons RECLAIM has not been as successful as other emissions trading programs. Even with the trading program, NO_x emissions exceeded the cap for 2000 by about six percent.[113] In late 2000 and early 2001, NO_x emission credit prices spiked, driving prices as high as $40,000.00 per ton, a nearly 300 percent increase from prior years.[114] While RECLAIM's lack of banking exacerbated the problem because firms lacked the temporal flexibility to deal with changing circumstances, the price spike was caused by a variety of external factors, including increased demand for credits, the California electricity crisis and California's new deregulated electricity markets.[115] Short term fluctuations in emissions levels can lead to volatile credit prices.[116] The volatility of an emissions trading market can in turn lead to volatility in the prices of goods associated with carbon intensive production processes.[117]

As a result of the price spike, electricity generating plants were removed from RECLAIM temporarily in 2001.[118] These large installations were allowed to pay an alternative mitigation fee of $15,000.00 per ton, and then placed in a command-and-control regulatory regime.[119] In the end, the price spike was more a product of California's newly deregulated electricity markets than an endemic flaw in emissions trading systems or even RECLAIM.[120] Nevertheless, there is no doubt that certain mechanisms, namely banking, could have been employed to mitigate the impacts of the external factors that nearly doomed the system. As the world's emissions and energy markets become more volatile yet interconnected, it is important that legislators have a firm grasp on the intricacies of emission trading systems and how they can be designed to adjust for unforeseen circumstances.

Figure 1-3: Summary of Emissions Trading Programs[121]

Program	Type	Emissions Regulated; Years in Force
EPA ET	**Reduction Credit, Averaging**	Various pollutants; 1979 to Present
Lead-in-Gasoline	**Averaging**	Lead; 1982 to 1987
Acid Rain Program	**Cap-and-Trade, Reduction Credit**	Sulfur Dioxide; 1995 to Present
RECLAIM	**Cap-and-Trade**	Nitrogen Oxides, Sulfur Dioxide; 1994 to Present
ABT	**Averaging**	Various pollutants; 1991 to Present
NO_x Budget Trading	**Cap-and-Trade**	Nitrogen Oxides; 1999 to Present

vii. ANALYSIS

In summation, America's experience with emissions trading systems has been generally positive. Once viewed as merely an academic concept, emissions trading has become a fundamental component of broader federal environmental regulation. Not every experience has been a complete success, but many important lessons can be learned from America's prior attempts at emissions trading.

First, emissions trading can lower compliance costs. The Acid Rain Program provides the most solid evidence for the costs savings created by emissions trading systems.[122] In comparison to estimates of the costs that would have been incurred without emissions trading in a command-and-control context, the costs savings achieved by lower compliance costs amounts to as much as a 50 percent reduction.[123] Second, emissions trading can in fact lead to the achievement of environmental goals. The success of trading systems like those established pursuant to the CAAA have established that emissions trading can work in the broader context of environmental regulation. Third, emissions trading works best when allowances or credits being traded are clearly defined and valued without case-by-case certification.[124] Creating freely tradable "commodities" eliminates the greatest impediment to better performance from emissions: the cumbersome process of having a governmental oversight board value credits individually and pre-approve all trades.[125]

Finally, banking has played an important role in increasing the flexibility and efficacy of emissions trading programs.[126] The value of banking cannot be understated: the programs such as the Acid Rain Program that have employed it have seen important environmental goals reached. The one major program that did not have the temporal flexibility associated with banking, RECLAIM, suffered, most notably during the price spike associated with the California energy crisis of 2000 and 2001.

While America has been at the forefront of the emissions trading movement, they have fallen behind other parts of the world when it comes to GHG emissions trading. No mandatory emissions trading market for GHGs currently operates in the United States. However, across the Atlantic, the EU has created the largest and only mandatory GHG emissions trading system in the world, the European Union Emissions Trading Scheme.

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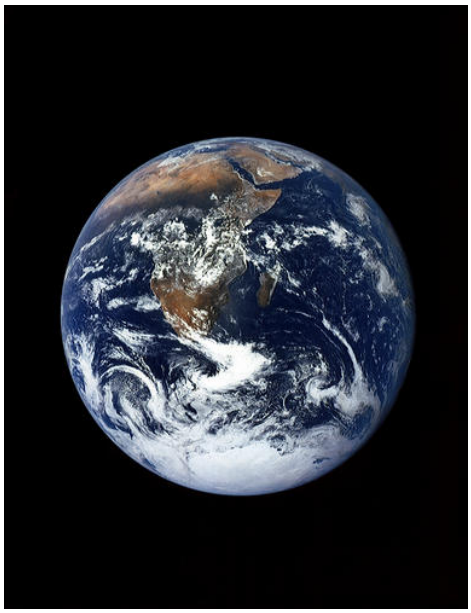
CHAPTER II: THE CURRENT STATE OF INTERNATIONAL MARKETS FOR GREENHOUSE GAS EMISSIONS

A. THE UNFCCC AND THE KYOTO PROTOCOL

The international market for GHG emissions can be traced to the United Nations Framework Convention on Climate Change (UNFCCC), adopted in Rio De Janeiro, Brazil in 1992.[1] The UNFCCC called upon industrialized Parties to reduce their GHG emissions to 1990 levels by the year 2000.[2] In 1995, the Parties reviewed the progress made under the UNFCCC and concluded that the non-binding mandate to reduce GHG emissions to 1990 levels would not accomplish the Convention's objective of atmospheric stabilization.[3] Rather, these soft commitments were deemed too aspirational and vague to effectuate a substantial global reduction of GHGs[4].



As a result of the UNFCCCs ineffectiveness, the Kyoto Protocol was negotiated in December 1997.[5] The Protocol entered into force on February 16, 2005 with Russia's ratification of the treaty. The addition of Russia pushed the total emissions of countries that had acceded to the treaty beyond the coverage threshold amount of 55 percent of global GHG emissions.[6] The United States and Australia are two notable Parties who have, as yet, failed to ratify the protocol.[7] The Protocol divides its Parties into two categories. The first category of parties are referred to as Annex I countries. These are developed countries who were members of the Organization for Economic Co-operation and Development (OECD) in 1992.[8] Of the 164 signatory states,[9] 37 Annex I countries are included in the Protocol's Annex B, and are therefore prescribed quantified limits and reduction obligations for Kyoto's first commitment period, which stretches from 2008 until 2012.[10] The United States is included in Annex B with a commitment to reduce CO_2 emissions to 93 percent of 1990 levels even though Congress has not accepted this commitment by ratifying the Protocol.[11] The second category of countries are those in the developing world, referred to generally as non-Annex I countries.[12] Non-Annex I countries do not have emission reduction obligations.[13]

Annex I countries have committed to reduce their GHG emission by 5.2 percent from 1990 levels by the end of the first compliance period through domestic and international action.[14] However, due to growth in emissions in most countries between the negotiation of the Protocol and its entry into force, much higher reductions are now required before to meet for these countries to meet their reduction obligations by 2012, the beginning of the second compliance period.[15]

i. FLEXIBILITY MECHANISMS

Under Kyoto, a participating country is given an "Assigned Amount" ("AAU"), which represents the quantity of GHG emissions a country is allowed to emit.[16] The Protocol permits Parties to use three types of flexibility mechanisms to meet their AAU: 1) international emissions

trading ("IET"); 2) joint implementation ("JI"); and 3) the clean development mechanism ("CDM").[17] The interaction between the three Kyoto mechanisms creates a "unique international framework for market-based regulation which is stimulating the development of greenhouse-gas emissions trading schemes at the regional, national and international level."[18] Moreover, these flexibility mechanisms allow Annex I countries to meet their goals under Kyoto by purchasing or earning emissions reductions from projects undertaken in non-Annex I countries. These reductions can either be purchased on an international emissions trading market or earned by funding projects that reduce emissions in non-Annex I countries.

IET enables countries with emission commitments to trade "assigned amount units" ("AAUs") with other committed countries under the Protocol.[19] Parties can also bank AAUs for future use or trade in later commitment periods.[20] To ensure a fair emissions market under Kyoto, countries must meet eligibility requirements before being allowed to participate in IET.[21] These requirements include the ratification of Kyoto, an assigned amount or emissions cap, a national system to estimate emissions and removal by carbon sinks such as forests, an electronic registry to record transactions with other countries and an annual national GHG inventory.[22] The European Union Emissions Trading System ("EU ETS"), established on January 1, 2005, functions as a trading platform for Annex I countries.[23] Presently it is open only to "EU bubble" countries, which refers to countries in the EU who were given a joint Kyoto reduction goal of eight percent below 1990 levels, rather than a reduction goal based on the individual country.[24] However, the EU ETS allows participation by installations and actors outside the EU by allowing individual investors to purchase and trade credits and through the system's recognition of other Kyoto mechanisms such as JI and the CDM.[25]

The Joint Implementation feature of the Kyoto Protocol allows nations who sponsor and invest in projects that reduce GHG emissions below a baseline standard to sell the difference between the baseline standard and the emissions created after the project.[26] That is, JI allows Annex I countries to gain "emission reduction units" ("ERUs") by undertaking GHG reduction projects in other industrialized countries.[27] The government hosting the project converts AAUs to ERUs in an amount equivalent to the verified emissions reductions created pursuant to the JI project.[28] The ERU's are then transferred to the investing country's registry account.[29] This approach is similar to emissions trading as the reductions can also be sold to the purchasing nation as AAUs.[30] Dozens of JI projects have been initiated but the precise number is unknown because registration of JI projects is not required until 2008.[31] JI projects are expected to reduce emissions by several million tons of CO_2 by the end of the first Kyoto commitment period.[32]

The Clean Development Mechanism is similar to JI, but unlike JI, the CDM allows joint reduction projects to be undertaken in developing countries.[33] Each CDM project must further sustainable development, be validated by an independent entity and be certified as to the amount of reductions.[34] Following registration by the CDM executive board, the assisting country will receive "certified emissions reductions" ("CERs") that can be applied to their reduction target.[35]

To gain ERUs or CERs a country must measure a project's "additionality."[36] Additionality refers to reductions achieved by the project that would not have otherwise occurred, such as reductions incidental to meeting environmental regulations.[37] This is especially difficult with respect to CERs under the CDM as developing nations have no quantified emissions cap and thus have an incentive to overestimate reductions.[38] AAUs, ERUs and CERs are transferable via emissions trading along with removal units ("RMUs") gained from changes in land use and forestry practices.[39] RMUs can only be gained by afforestation and reforestation, but not by halting deforestation.[40] Reductions pursuant to these flexibility mechanisms and their associated emissions units are treated as "supplemental" to real reductions by Annex I countries.[41]

ii. RESULTS

While the Protocol has spurred the growth of emissions trading, many reports are skeptical regarding its effectiveness.[42] For instance, the European Environment Agency reported that between 2003 and 2004 GHG emissions from all 25 current EU members increased by 0.4 percent.[43] GHG emissions fell 0.9 percent in 2004 base-year levels for the fifteen member-countries that belonged to the EU before the 2004 expansion (EU15), but carbon dioxide, the GHG most associated with human activity and climate change, climbed in 2004 to 4.4 percent above it's 1990 level.[44] In fact, CO_2 emissions have risen in all but one year since 1999.[45] In addition, the Canadian Minister of the Environment has predicted that her country, which ratified the Kyoto Treaty in 2002, will not meet its Kyoto target of a six percent GHG reduction by 2012.[46]

Kyoto's flexibility mechanisms have also not been as effective as anticipated. The CDM has not seen significant investment because of the burdensome transaction costs associated with attendant paperwork and forms, especially for small projects.[47] The CDM is also seen to have only a minor influence on the fundamentals of global energy investment, presently only encouraging installations to reduce emissions at the end of the pipe (downstream) but not advocating a transition to renewable fuel sources or reduction of fossil-fuel reliance.[48]

While Kyoto's flexibility mechanisms are imperfect, a more robust price signal spurred by the initiation of the European Union Emissions Trading Scheme ("EU ETS") has increased the use and efficacy of CDM and JI.[49] From November 2005 to August 2006 the number of approved CDM projects rose from 35 to 256, with another 800 projects awaiting approval.[50] These projects will result in an estimated one billion metric tons of reductions, the total amount of greenhouse gases emitting from Spain and the UK annually combined.[51] Other positive developments include a one billion dollar deal between the World Bank, private businesses and national governments to purchase 19 million tons of CO_2 reductions from the Chinese chemical industry.[52]

Both CDM and JI projects have also been bolstered by national efforts like the Dutch ERU Procurement Tender (ERUPT) and CER Procurement Tender (CERUPT).[53] Under these programs, the Dutch government buys credits from foreign installations who submit successful tender applications describing viable emissions reduction projects.[54] While CERUPT was cancelled due to its inflexibility, ERUPT is in its fourth round of tendering.[55] However, while these developments are encouraging, the revocation by the newly elected Canadian government of a CAN $1.5 million pledge to CDM projects made by the preceding Liberal government highlights the volatility of international GHG markets and the influence that national politics has with regard to international emissions trading.[56]

B. EUROPEAN UNION EMISSIONS TRADING SCHEME (EU ETS)

The fifteen member-states of the European Union existing when the Kyoto Protocol was signed committed to an eight percent reduction in GHGs collectively.[57] However, by 2000 many of these countries were having difficulty meeting their Kyoto targets despite significant reductions by the United Kingdom and Germany.[58] Concomitantly, the EU established a range of measures, most notably the European Union Emissions Trading Scheme (EU ETS) to facilitate the reduction goals under Kyoto.[59] The EU ETS was launched on January 1, 2005 and covers nearly 12,000 installations in twenty-five nations and six major industrial sectors.[60] These current installations represent 45 percent of the EU's total carbon emissions.[61] The ten nations admitted to the EU in

May 2004 are not covered by the EU target but nevertheless have their own reduction targets that in most cases require a six to eight percent reduction of GHG emissions.[62] The EU ETS Directive, 2003/87/EC, agreed to in 2003, provides a framework for the system, specifying the attributes of nation-based emissions trading platforms.[63]

The EU ETS is a downstream, company-level, CO_2 trading system where emissions credits are assigned to point sources of GHG emissions such as power plants, oil refineries, coke ovens and large production facilities.[64] This is the opposite of an upstream system that regulates industries that are responsible for taking the first steps in the energy production process, including businesses engaged in mining and drilling for oil. See Chapter 1. The EU ETS creates tradable carbon emission allowances known as European Union Allowances ("EUAs").[65] These allowances are not printed, but rather held in electronic registries established by the member-states and overseen by a Central Administrator for the EU.[66] The Administrator tracks each transaction in the Community Independent Transaction Log for any irregularities.[67] Pursuant to EU ETS, member-states must develop national allocation plans ("NAPs"), providing procedures and desired quantities for EUA allocation.[68] NAPs may be rejected by the European Commission if they do not meet the requirements of the directive or if they are not rigorous enough to achieve reduction targets under the EU's burden sharing agreement for Kyoto.[69]

In the first commitment period, stretching between 2008 and 2012, a participating government is required to allocate 95 percent of initial EUAs for free, while five percent can be sold or auctioned.[70] Most countries have chosen to adopt a method of "grandfathering," where EUAs are provided freely in a quantity based on an installation's historical emissions output.[71] Additionally, instead of allocating all EUAs for the beginning of the commitment period, member-states can also choose to reserve some allowances for new CO_2 emitters.[72] Once established in a NAP, the total combined allocation plus the allocated reserve acts as a cap and cannot be augmented except through purchase of further allowances from other participants in the market.[73] The linking directive through EU ETS allows Certified Emissions Reductions created through Kyoto to be fungible with EUAs.[74] ERUs will also be accepted by the EU ETS starting in 2008.[75] However, excess AAUs, like those held by Russia, are not accepted by EU ETS participants.[76]

i. ORGANIZATION & COMPLIANCE

EU ETS is organized around an annual cycle that distributes yearly allowances and requires an accounting of granted EUAs, purchased EUAs, CERs and ERUs (allowed in 2008) against the total emissions of the installation.[77] Installations have four months after the end of the year to comply with the previous year's obligations.[78] If an installation does not meet its obligation through reduction measures and the purchase of EUAs, it must pay damages of €40 per excess ton of CO_2 plus surrender the missing allowances in the next year.[79] The penalty will rise to €100 per excess ton of CO_2 during the next EU ETS commitment period that corresponds with the first Kyoto commitment period of 2008 to 2012.[80]

The EU ETS system is subject to country caps or baselines that are relative to each country's target under Kyoto.[81] Growth of the cap is allowed for economic expansion, but only during allocation at the beginning of the commitment period.[82] Most NAPs do not compensate for reduction that occurred before the first commitment period.[83] Furthermore, banking of EUAs between commitment periods is not allowed in most NAPs because of the problem of adding a greater burden to future Kyoto commitment periods.[84] To deal with new participants in the market a "new entrants reserve" is freely distributed on a "first-come, first-served" basis to new installations in most NAPs.[85] Also, in most NAPs, if an installation closes, the allowance for that

installation is added to the "new entrants reserve."[86] However, some counties allow transfers of EUAs from closing plants to other installations owned by the same operator.[87] With the strict requirement that total allotments to each country only be supplemented through the purchase of additional EUAs and Kyoto units, a scarcity of emissions allowances has been introduced into the market that will drive prices through simple supply and demand economics.[88]

ii. CARBON PRICE

Many factors affect the price of carbon, including the severity of emissions caps, the supply of project-based emissions credits like CERs, relative fuel prices between carbon intensive and cleaner energy sources, weather variations and other regulatory features.[89] At this early stage in the market, any increase in gas prices causes EUA prices to increase due to greater incentives for installations to switch to less expensive, more carbon intensive coal power.[90] In its first year, the ETS traded a total volume of 363 million tons of CO_2 with prices reaching as high as €30/ton.[91] In 2006, EU ETS volumes rose every month.[92] However, in May 2006 the price of EUAs crashed on reports that many member-states had set extremely high emission caps so as to protect their affected industries.[93] These protective actions resulted in an excess allotment on a continent-wide basis, 100 million tons of CO_2 higher than actual emissions occurring during the first year of the EU ETS.[94] As of March 2007 the price of an EUA was hovering around one euro, down from seven euros at the end of 2006 and nearly €40/ton earlier in 2006.[95] Along with the market crash, resistance to sufficient emission reductions by some countries has been problematic.[96] Presently, the EU plans to censure nine nations for failing to submit their National Allocation Plans by the June 2006 deadline.[97] Of the 19 NAPs submitted by October 2006, only five countries established acceptable carbon caps, leaving 130 million tons of CO_2 to be cut.[98] NAPs are currently being revised to scale back allocations in an attempt to stabilize the price of carbon.

Debates have arisen between stakeholders in the EU ETS concerning the structure of the fledgling market. Reports show that switching fuel away from carbon-based fuels is profitable between a $35-55 USD price for carbon, highlighting the need for a robust price signal in the EU ETS.[99] Furthermore, a stable price signal is needed to allow firms to make decisions involving their energy use and product line.[100] Companies must be encouraged to adopt more efficient production methods and to begin producing less carbon intensive products.[101] Uncertainty in the market also creates obstacles for establishing liquidity in the CO_2 allowance market.[102]

iii. STREAMLINING THE EU ETS

Notwithstanding the uncertainties in the EU ETS, a survey of stakeholders including governments, companies and non-profits released in November 2005 provides that nearly half of the companies surveyed "price in" the value of CO_2 allowances and 70 percent plan to in the future.[103] That is, consumers are bearing the cost of increasingly complex GHG regulation. Half of

the companies replied that the EU ETS has "a strong or medium impact on decisions to develop innovative technology.[104] Companies, government bodies and non-governmental organizations ("NGOs") rank longer term issues as the most important with respect to the development of EU ETS.[105] Stakeholders believe that topics related to uncertainty in the market, including reduction targets, allocation rules, rules for new entrants and rules for closures are the most important.[106] Companies desire longer allocation periods to allow for greater stability in the market and to provide a longer term in which to invest in long term technologies.[107] The inclusion of other industries such as the chemical industry and aviation industry is also seen as a priority for stakeholders.[108] Predictably, companies favor the grandfathering system utilized in the first compliance period, while NGOs and government bodies desire more auctioning.[109] All stakeholders believe that the rules for new entrants and closures should be harmonized across Europe.[110] However, companies and governments believe that new entrants should be required to pay a fee for units from the new entrants reserve, as opposed to NGOs and a majority of companies who would prefer to keep allowances until the end of the compliance period for closing facilities.[111] All stakeholders desire transparency during the initial stages of the EU ETS and a clear monitoring system.[112] As emissions markets develop beyond the initial incentive-creating benchmarks, performance will be more easily measured.[113]

Due to problems with market fluctuations and complaints by stakeholders, the European Commission is considering addressing the weaknesses of the EU ETS by changing the rules.[114] The commission has signaled that it will reject NAPs that are too lenient and move to regulate sectors like air transport that were left out of the initial program.[115]

C. Other National Emissions Trading Systems

i. United Kingdom

The UK is a member of the EU ETS and has developed their NAP in accordance with the mandate of the EU ETS Directive.[116] UK regulations provide that installations involved in energy activities, the production and processing of ferrous metals, mineral industries and pulp and paper industries must hold a GHG emissions permit.[117] These "covered installations" must pay a fee and submit an application for a permit.[118] Penalties are assessed for the failure to hold a permit or for late entry as well as for noncompliance with the GHG permit.[119] The UK allocated 93.7 percent of the total quantity of allowances to existing UK installations for free.[120] 6.3 percent of allowances were retained by the government to be allocated for free to new entrants during the commitment period.[121] The UK decided that the power stations sector would bear the burden of reducing CO_2 emissions to the full extent required by the Directive because of their insulation from international competition.[122] Other sectors were given allowances based on their projected emissions.[123] Non-operators interested in participating in the market can open personal holding accounts by applying online.[124] Under the UK system, banking will be allowed within periods, but in accordance with the Directive, not between commitment periods.[125] Furthermore, only permanent closure will result in the withholding of allowances for subsequent allocated years.[126] Along with these steps undertaken in compliance with EU ETS, Parliament is considering a bill to set "rolling annual carbon reduction targets."[127] The bill could involve the creation of a system allowing neutral parties to assess the UK's progress on climate change mitigation and steps to encourage a new generation of nuclear power plants.[128]

ii. SWITZERLAND

Switzerland moved to meet its Kyoto commitment through a CO_2 law passed in May 2000.[129] The law aims to reduce emissions by 10 percent from 1990 levels during the first Kyoto commitment period by incentivizing energy efficiency and renewable energy.[130] Following enactment, nearly 1,000 Swiss companies voluntarily committed to cutting emissions by 15 to 20 percent of 1990 levels; however, a rise in transportation fuel left Switzerland with a total real reduction of only 3.8 percent below 1990 levels, significantly less than its Kyoto target of eight percent.[131] This deficit led to the introduction of a carbon tax equal to $28.31 per ton of CO_2.[132] Revenue from the tax is returned to companies through reductions in social security contributions and to homes on a per capita basis.[133]

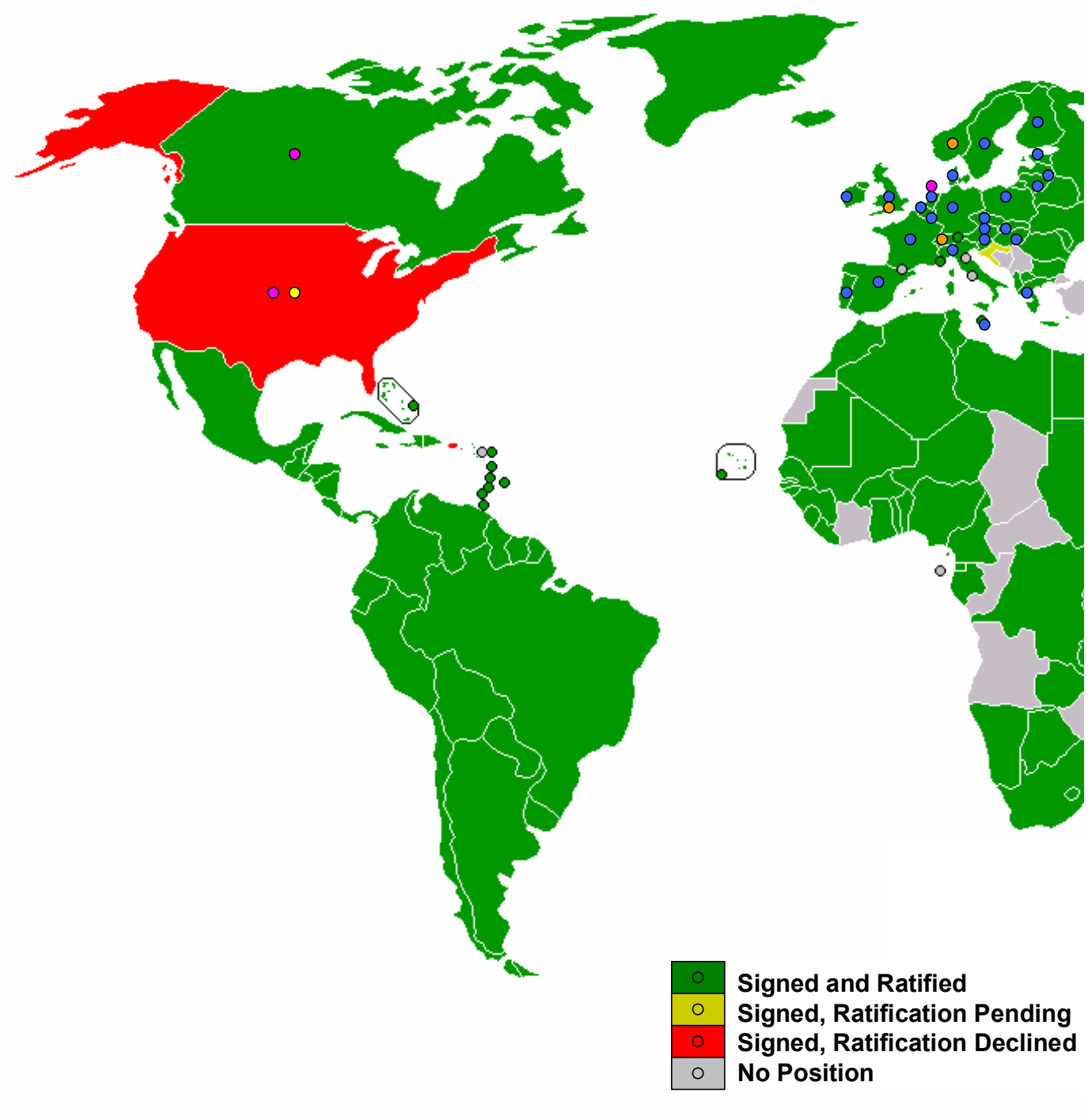
Article Nine of the Swiss Program allows large companies, energy intensive companies or groups of companies to be exempt from the tax if they sign a binding commitment to reduce emissions.[134] One of the mechanisms to reduce emissions under the law is through the trading of emissions that are "unlikely to be used for compliance" between participating companies or groups.[135] Allowances are distributed free of charge by the government for each year of the five year commitment period based on an installation's or group's expected CO_2 emissions in 2010.[136] Emissions allowances can be banked for future commitment periods and can be supplemented by up to eight percent of total emissions by CERs and ERUs from Kyoto for authorized participants and by up to 30 percent for new entrants with "best available technologies."[137] Companies or groups that do not meet their goals will be subject to the carbon tax for each ton of CO_2 over their proscribed amount, plus interest, and will not be allowed to benefit from the redistribution of revenue from the tax.[138] Groups decide how to distribute liability for missed targets and how they will trade with other groups or companies.[139] Linkages with the EU ETS are also being explored.[140]

iii. NORWAY

Norway instituted a cap-and-trade and supplementary carbon trading scheme paralleling the EU ETS in January 2005.[141] The plan covers 51 installations involved in energy production and process, representing 10 to15 percent of the country's total carbon emissions.[142] Installations subject to the national CO_2 tax are excluded from the scheme.[143] Noncompliance is punished by a penalty of €40 per ton of CO_2 emitted in excess of the installation's allotted carbon cap.[144] At present, credits are fully grandfathered, fungible with Kyoto CERs and ERUs and bankable during, but not between, commitment periods.[145] New entrants to the scheme are admitted based on their "potential to reduce emissions."[146] In 2008, Norway plans to implement a broad emissions trading program to replace the duel carbon tax system and limited emissions trading program currently in place.[147] The system will cover large industrial emitters as well as importers and traders of fuel oils.[148] The system would cover 80 percent of Norway's GHG emissions from 100 to 200 installations.[149] Emissions will either be grandfathered or auctioned.[150] Further design components may be influenced by discussions between Norway and the EU involving linkages between the two programs.[151] A new government report illustrates Norway's commitment to emissions reduction, citing a limited affect on GDP of only .5 percent for an 80 percent reduction in national GHG emissions by 2050.[152]

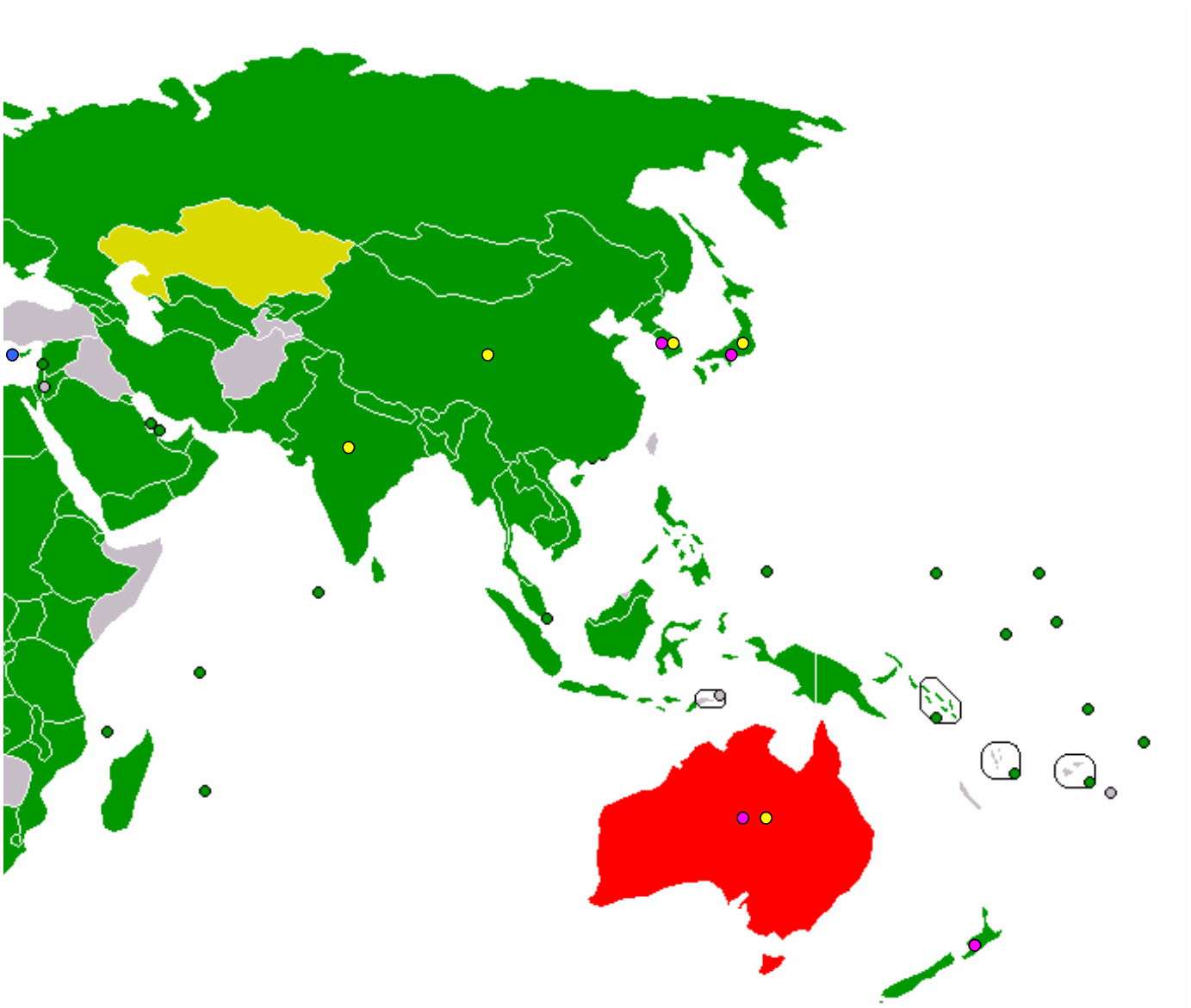
Kyoto Protocol Ratification Status and

December 2006



Source: www.unfccc.org; *Act Locally, Trade Globally*, OECD/IEA (2005); www.greenwire.com.

International Emissions Trading Systems



- EU Emissions Trading System
- National Emissions Trading System
- Asia Pacific Partnership
- Planning ETS, Pilot Project or Regional Action

iv. CANADA

Canada implemented two voluntary emissions trading schemes in the 1990s: Quebec-Ontario Pilot Emissions Reduction Trading (PERT) and Greenhouse Gas Emissions Reduction Trading (GERT). These programs were attempts to satisfy Canada's Kyoto commitment of a 6 percent reduction in CO_2 emissions from 1990 levels.[153] Both voluntary schemes established baseline years for emissions of six GHGs and allowed participating parties to achieve reductions through a variety of means including fuel switching, sequestration and investment in cleaner technology.[154] These schemes were of limited success, producing 50 and 10 projects respectively, suffering primarily from a lack of demand for emissions credits.[155]

These voluntary schemes were replaced in 2002 by the Climate Change Plan for Canada (CDET), a plan to implement a mandatory baseline-and-credit program to help Canada meet its reduction goals under Kyoto.[156] Emissions trading is set to play a large role in the scheme, which involves purchases of emissions by the Canadian government through a "climate fund" and through reduction targets for approximately 700 large final emitters made possible by domestic and international trading.[157] Reductions would focus on specific activities and sectors based on the intensity of the emissions.[158] CDET would cover 40 percent of all Canadian GHG emissions and include all firms with average emissions from individual installations exceeding 8 $KTCO_2$ and emitting more than 20 kilograms of CO_2 per $1,000 of output.[159] Process emissions would be subject to a 10 percent reduction target during the 2008 to 2012 compliance period and other sources would reduce by 15 percent during the same time period.[160] A covenant with the government could modify the commitment for all or some processes in a firm to reduce competitive disadvantages against foreign firms.[161] The government would also limit the negative effects of the system by allowing businesses to purchase up to 9$MTCO_2$ in "technology investment units" for CAD $15 per ton of CO_2, effectively capping the price of CO_2 and taking the burden of reductions away from businesses.[162] The units are required to be used within the year in which they are purchased.[163] The system would also allow companies the flexibility to achieve reductions through trading within Canada, reduction projects outside of the activities of the installation and through the purchase of Kyoto Credits, including the vast stocks of AAUs possessed by Russia and other Economies in Transition.[164]

While Canada has taken significant steps in designing an emissions trading scheme, the new conservative government has rejected emissions trading as a means for achieving the country's Kyoto targets, citing the crash of the EU ETS in April 2006 as evidence of the risk and expense associated with such schemes.[165] However, the Montréal Climate Exchange, a joint venture with the Chicago Climate Exchange in the United States, could begin trading voluntary credits by the end of 2006, with the possibility of accommodating a mandatory scheme if one is imposed.[166] Political wrangling regarding the nature of the exchange as voluntary or mandatory may scuttle emissions trading in the foreseeable future.[167]

v. AUSTRALIA

Originally a party to the Kyoto Protocol, the Australian government withdrew its support in 2002.[168] However, a 2005 Federal Australian Government report claimed that Australia is still on pace to meet its emissions target under Kyoto.[169] Australia's mandate under Kyoto would have been to restrict emissions growth to eight percent above 1990 levels by 2010.[170] This has primarily been accomplished through offshore emissions trading by Australian firms or through Australia's only emissions trading market, the New South Wales Greenhouse Gas Abatement Scheme.[171] A poll by Australian voters in October 2006 found that 70 percent of Australian voters thought the government should ratify the Kyoto Protocol.[172]

vi. NEW ZEALAND

New Zealand is still in the process of developing national GHG emissions regulation. Originally, a carbon tax of approximately eight dollars per metric ton of carbon emitted was proposed.[173] This tax was estimated to add approximately six percent to household energy prices and nine percent for most business.[174] This tax was withdrawn however, after realization that New Zealand would not meet its emissions goals under Kyoto due to a decline in forest planting and an increase in economic growth.[175] New Zealand taxpayer liability under Kyoto has increased to an estimated $438 million because of an increase in expected emissions and higher than expected credit prices.[176] The most recent figure shows that New Zealand exceeded their allotment by 41 million metric tons.[177] However, in November 2006, New Zealand's Labour Party announced an ambitious plan to make the country "carbon-neutral" through the use of renewable energy, biofuels, public transport alternatives and minimization of waste to landfills.[178]

vii. JAPAN

Japan is evaluating a GHG emissions trading program to help meet its Kyoto commitments.[179] A pilot phase allowing for voluntary commitments is underway and there are plans to initiate a full scale emissions trading program after assessing the results of the pilot.[180] All six GHGs delineated in the UNFCCC are covered under the reporting mechanism of the pilot project, which requires corporations to monitor their emissions.[181] Along with these national efforts, several companies like Mitsui, a Japanese trading company and Mitsubishi, an auto manufacturer, have engaged in voluntary emissions trading programs and have invested in emissions trading markets.[182]

viii. SOUTH KOREA

Korea, while not bound to a reduction commitment under the Kyoto Protocol, has nevertheless begun designing an emissions trading scheme.[183] Two options have been proposed, both involving voluntary commitments that will be subsidized by the government.[184] A newly proposed plan will offer financial incentives starting in 2007 in an effort to cut GHG emissions by more than 160 metric tons of oil equivalent per year.[185] The Korean program, if implemented, would be the first of its kind by a non-Annex I party to the Kyoto Protocol.[186]

ix. CHINA

China has ratified the Kyoto Protocol, but as a Non-Annex I country does not have a commitment to reduce GHGs.[187] However, China has established "Total Emissions Control," an emissions reduction program for sulfur dioxide (SO_2) in an Amendment to the Air Pollution Prevention and Control Law in 2000.[188] The Amendment promotes a 10 percent reduction in SO_2 emissions from 2000 levels generally, with more stringent goals in localized areas.[189] The program mirrors the Acid Rain Program in the United States, with the Chinese Program establishing a cap-and-trade program complete with a five yuan per ton penalty for excess emissions above the cap.[190] SO_2 trading now takes place between provinces.[191] Plans have also been introduced that would require power plants to pay 630 yuan for each ton of sulfur dioxide emitted, generating up to 7 billion yuan a year.[192] China's promotion of SO_2 emissions trading is seen as a step towards participation in future Kyoto commitments.[193]

Additionally, in a major development, China announced on February 6, 2007 that it will partner with the United Nations Development Program to launch the developing world's first carbon credit exchange.[194] The design of the program is slated for 2007, with a pilot program perhaps ready by the end of the year.[195] China sees the program not only as an environmental boon, but also recognizes the potential economic and investment value as well.[196] Not only will China be able to participate in the exploding market for GHG emissions, companies from around the world will continue to invest in Chinese operations, because they can reduce their emissions much more cheaply in China than they can in the rest of the world. The incentive to invest is even greater with the newly announced carbon market, because companies operating in China will soon receive a marketable credit for the GHG reduction activities.[197]

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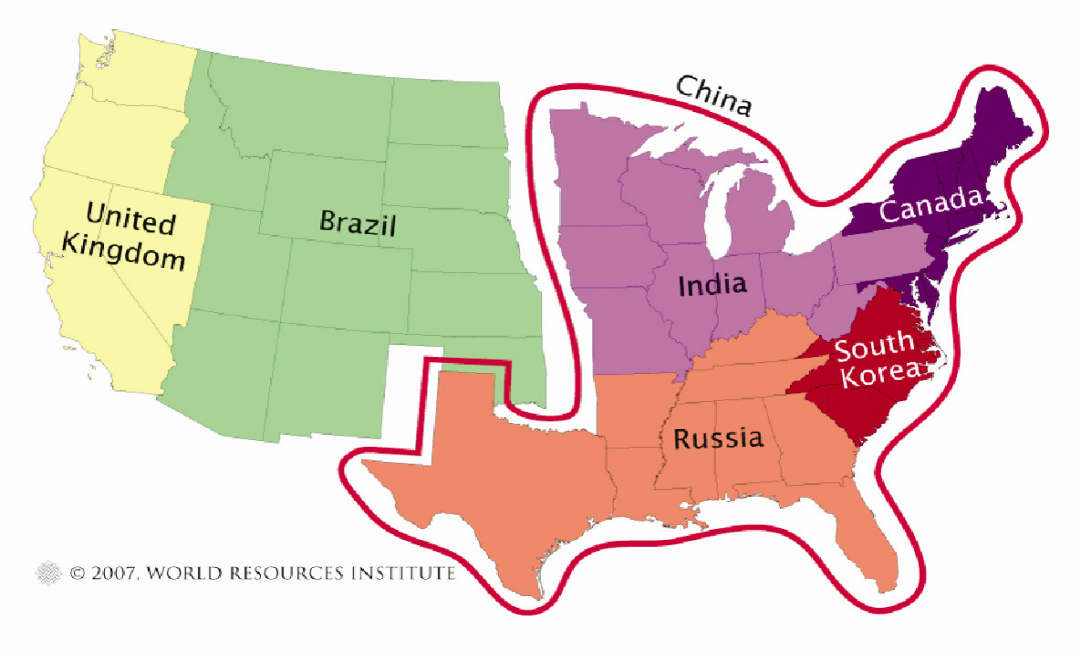
[185] *South Korea to Offer Firms Incentives to Cut Emissions*, REUTERS, Aug., 28, 2006.
[186] OECD/IEA, *supra* note 16, Chapter 2, at 109.
[187] *See* KYOTO PROTOCOL, *supra* note 8, Chapter 2.
[188] Wilder, *supra* note 153, Chapter 2, at 241.
[189] *Id.*
[190] *Id.*
[191] *China Eyes Sulphur Dioxide Emissions Trading Paper*, REUTERS NEWS, Aug. 31, 2006.
[192] *Id.*
[193] Junker, *supra* note 35, Chapter 1, at 158-59.
[194] Brian Bremner, *China Aims to Shed its Dirty Dragon Image: The Move to Set Up a Carbon-Credit Exchange Should Boost Investment in Clean Plants on the Mainland, and Heat Up the Global Market for Emissions Credits*, GLOBAL BUS., Feb. 15, 2007.
[195] *Id.*
[196] *Id.*
[197] *Id.*

CHAPTER III: THE CURRENT STATE OF DOMESTIC MARKETS FOR GHG EMISSIONS

The United States does not have a functioning mandatory market for GHG emissions trading, despite its status as the number one GHG emitter in the world (see figure 3-1). However, several voluntary projects and emerging state-based mandatory markets are developing. This chapter discusses the status of America's endeavors into GHG emissions trading markets, such as the Chicago Climate Exchange, the Regional Greenhouse Gas Initiative, California's new GHG program, and the voluntary programs supported by the federal government.

Figure 3-1: U.S. GHG Emissions Compared to Other Nations



A. CHICAGO CLIMATE EXCHANGE

In 2004, the Chicago Climate Exchange (CCX), an emissions trading platform regulating six GHGs, was launched by more than 60 companies as a voluntary effort to reduce their individual emissions.[1] The CCX is the first and only U.S. emissions trading system that requires a legally binding commitment for membership.[2] Members, now totaling over 200,[3] must pay a $50,000.00 entry fee and commit to reducing CO_2 or one of the five other GHGs.[4] Members include: Ford Motors, DuPont, Baxter and Bayer, IBM, and Motorola; utility companies such as American Electric Power and Tampa Electric; institutions of higher education such as Tufts and the University of Minnesota; non-governmental organizations such as World Resources Institute and Rocky Mountain Institute; cities such as Chicago and Oakland; the Iowa and Nebraska Farm Bureaus; and even the states of New Mexico and Illinois.[5]

The original CCX members committed to reduce their emissions during Phase I of the program by one percent per year below average emissions from 1998 to 2001 levels, the member's

baseline period.[6] Phase I will last from 2003 through 2006, so members will reduce emissions by four percent total, one percent for each year from 2003 and 2006.[7] The four percent reduction in Phase I will be followed by Phase II reductions amounting to a reduction in emissions equal to six percent or more below baseline levels.[8] Phase II will last from 2006 through 2010. New participants in Phase II will also be required to meet the six percent reduction target by reducing emissions by one to two percent per year from 2006 to 2010.[9]

The CCX has three main components of its trading system: the Trading Platform, the Cleaning and Settlement Platform and the Registry. The Trading Platform is the marketplace where trades between CCX members take place. The Clearing and Settlement Platform processes all transaction information, while the Registry is the official database for allowances received by CCX members. If a CCX member reduces emissions below its baseline amount, it may sell the allowance received to other members that are not in compliance with their 2010 goals.[10] Additionally, members that are exceeding their baseline emissions level can invest in certified offset projects instead of purchasing allowances.[11] Offsets have been allowed for projects involving capturing landfill and agricultural methane, carbon sequestration in soils, and carbon sequestration in forest biomass.[12]

A total of 10.2 million tons of CO_2 traded in 2006 on the CCX, up from only 1.4 million tons in 2005; registered offset projects totaled an additional 1.5 million tons for 2006.[13] The CCX is nevertheless dwarfed by the EU ETS, as 257 million metric tons of carbon were traded in the first eights months of 2006 on the EU ETS, whereas only eight million metric tons were traded on CCX during the same period.[14] The CCX accounts for just eight percent of the GHG emissions from U.S. point sources of emissions.[15] As of March 2007, the price of carbon traded slightly higher on the CCX than the EU ETS. The CCX market price for carbon is based on vintage year, or the year that the member banked unused allowances. Allowances for Phase I years were trading at roughly $3.75, down from around $4.15 in November 2006, with allowances for Phase II years trading slightly higher.[16] The market price of EUAs for the ETS has fluctuated to a greater extent, dropping significantly through February 2007 to a price hovering just above one Euro.[17] A lower carbon price affects a market substantially, because the lower the price of carbon, the less incentive its participants have to invest in clean technology and renewable energy. While CCX has had an impact on the domestic markets for GHGs, its voluntary nature and small number of participants has precluded significant environmental advancement.

While the CCX attracted the efforts of many prominent corporations to reduce GHG emissions, the system has been criticized.[18] Critics point to the CCX's lack of transparency, its minimal reduction goals, and its marginal effect on the environmental impacts of unfettered GHG emissions. CCX critics argue further that a federally mandated constraint or cap on GHG emissions is needed for actual progress to be made in the global fight against climate change.[19] Critics also contend that CCX offset projects would have occurred without CCX involvement and thus provide no additional benefit.[20] Nevertheless, the CCX has provided a training ground for companies preparing for possible national regulations on GHG emissions.[21] Participating in voluntary reduction programs is, among other things, an exercise in risk management for companies preparing for regulations of GHG emissions.[22] Furthermore, recent trades between CCX and EU ETS members open the possibility for further linkages with the more robust European carbon market.[23] CCX members purport that although the program is voluntary, the negative publicity which would result from noncompliance acts as a major check to the system, which is monitored by the National Association of Securities Dealers.[24] While the CCX is not a perfect solution, it is the largest active GHG emissions trading market in the country.

B. REGIONAL GREENHOUSE GAS INITIATIVE (RGGI)

The Regional Greenhouse Gas Initiative (RGGI) is a regional, multi-state initiative to "design and implement a flexible, market-based cap-and-trade program to reduce carbon dioxide emissions from power plants in the Northeast United States."[25] In 2003, New York Governor George Pataki invited governors from the northeast states to design a mandatory cap-and-trade program in the United States to facilitate reduction of GHG emissions.[26] RGGI participants include Connecticut, Delaware, Maine, Massachusetts, New Hampshire, New Jersey, New York and Vermont.[27] Maryland has committed to join by June 30, 2007.[28] Rhode Island pulled out of negotiations in December 2005 citing the adverse affects of GHG reductions on state businesses[29] and are now observers along with the District of Columbia, Pennsylvania, the Eastern Canadian Provinces, and New Brunswick.[30]

RGGI's first mandatory compliance period begins January 1, 2009.[31] The trading program will apply to fossil fuel powered electric generators 25 megawatts and larger.[32] The crux of the program is a cap on CO_2 emissions at 121.3 million tons extending through 2014.[33] This initial cap establishes 1990 as the baseline year and pegs emissions level thereto.[34] By 2018, emissions are required to be reduced approximately 10 percent below 1990 levels.[35] Participants estimate that RGGI's cap-and-trade program can decrease projected emissions as much as 35 percent by 2020.[36]

i. PUBLIC COMMENT PROCESS

On March 23, 2006, RGGI's participating states released a draft version of the program's Model Rule for public comment.[37] The draft Model Rule contained the details of the measure and formed the basis for the individual state regulatory and/or statutory proposals required to implement the program.[38] One hundred plus non-profits and corporations filed more than 1,000 pages of public comments. As a result, finalization of the Model Rule for RGGI's emissions trading program was delayed.[39] Diverse stakeholders such as Wal-Mart, Waste Management, International Paper, the New York State Catholic Conference, Three-Phases Energy Services, Environmental Defense, the New York Farm Bureau and the Nuclear Energy Institute praised the plan, but offered a variety of suggestions.[40]

Suggestions from stakeholder companies focused on increasing flexibility in the RGGI process by allowing for a greater variety of offset opportunities, allowing for credits to be achieved for projects "commenced" before the proscribed start date, allowing offset projects from non-RGGI states the same number of credits as those from RGGI states, actively involving businesses by giving them credits for their own energy conservation measures, and allowing the use of renewable resources to qualify for both RGGI offsets and renewable portfolio standards (RPS) credit.[41] Advocacy groups argued that a lenient initial cap and flexibility measures, such as allowing states to exempt some facilities, would tilt the balance towards flexibility instead of actual reductions.[42] Another common concern raised in the comments concerned the problem of leakage, the import of cheaper electricity from regions not covered by a GHG cap into regions covered by a cap.[43] Overall, the public comment process had a significant influence on the design attributes of RGGI, primarily by introducing more flexibility in the system.[44]

ii. MODEL RULE

After reviewing all of the comments and making substantial changes to the Model Rule and a corresponding Memorandum of Understanding, the participating states finalized the Model Rule in August 2006.[45] The Model Rule, as adopted, establishes a cap-and-trade program with binding state commitments to reduce GHGs.[46] "Allowances" are defined as "limited authorizations to emit one ton of CO_2" or the equivalent.[47] However, allowances do not constitute a property right.[48] Rather, under the Model Rule, states distribute allowances based on a predetermined state cap level to individual "facilities" within that state.[49] "Facilities" are defined as electricity producing sources emitting GHGs.[50]

States are required to reserve a minimum of 25 percent of their base allocation for consumer benefit or strategic energy purposes.[51] These reserved allocation units will be auctioned and are expected to generate between $50 million and $185 million in revenue to be used to defer costs to consumers and invest in end-use energy efficiency programs.[52] Any private investor may also open a general account to hold and trade emissions allowances.[53] Because of the highly influential public comment process, early reduction allowances (ERAs) that can be banked for trade or consumption during later commitment periods are now allowed to be generated by reduction projects undertaken before RGGI's first compliance period starts in 2009.[54] The model rule provides a detailed procedure for measuring, calculating and documenting early reduction allowances.[55]

1. OFFSETS

The Model Rule allows offset credits to be awarded to sponsors of projects that reduce CO_2 emissions or sequester an equivalent amount of carbon.[56] RGGI is committed to ensuring that awarded offset allowances are "real, additional, verifiable, and permanent."[57] To receive offset credits a project must be commenced on or after December 20, 2005.[58] Eligible offset projects include: (1) landfill methane capture and destruction; (2) reductions in emissions of sulfur hexafluoride (SF_6); (3) sequestration of carbon due to afforestation; (4) reduction or avoidance of CO_2 emissions from natural gas, oil or propane end-use combustion due to end-use energy efficiency; and (5) avoided methane emissions from agricultural manure management operations.[59] Each type of project is subject to strict guidelines for emissions certification, reflecting scientific information available concerning achievable reductions under each of the five acceptable strategies.[60]

Under the Model Rule, the use of offsets are premised upon the price that carbon is trading at on the emissions trading system and is designed to prevent program costs from spiking.[61] Energy producers are allowed to turn over offset credits for up to 3.3 percent of their reported emissions during each three-year compliance period.[62] This limit will be raised to five percent if allowance prices top seven dollars per ton for 12 months (not including a 14-month "market setting" period at the beginning of the compliance period).[63] The seven dollar price trigger also opens the door for offset projects within the seven RGGI states and in other non-participating states subject to certain regulations.[64] If allowances reach a price of $10 per ton, the commitment period may be extended for up to three additional years to allow more time to meet obligations[65] and producers will be eligible to offset 10 percent of their emissions commitments through offset projects.[66] Participants may also be awarded offsets for emissions retirements undertaken in other countries, including certified emission reductions made pursuant to the UNFCCC and the Kyoto Protocol.[67]

Beyond controlling the use of offsets, the Model Rule takes steps to require that emissions reductions are actual reductions and not the result of some other policy or program. Concomitantly, RGGI prohibits offsets generated from projects that are awarded credits though any other GHG trading program or any projects that are required to be undertaken for regulatory compliance.[68] Independent audits are used to ensure that offset projects achieve verifiable reductions.[69]

iii. COMPLIANCE

If a source is unable to produce an allowance for every unit of CO_2 emitted during any three-year compliance period, a fine, penalty or assessment will be imposed.[70] Emissions in excess of a source's allotment will count against a facilities budgeted allowances at three times the actual amount of CO_2 emitted that exceeds their allowance; the installation's CO_2 budget will be adjusted accordingly during the during the next compliance period.[71] Each day and each ton of excess emissions counts as a separate violation in the application of state penalties.[72] However, there remains a good deal of flexibility within the RGGI system designed to protect facilities and reduce the chance that penalties will be imposed.[73] For instance, a general system of emissions trading and banking between control periods allows facilities to take the most cost effective steps towards achieving their commitments.[74] Along with monitoring requirements for offsets, the Model Rule prescribes a detailed monitoring and reporting system to determine actual emissions from facilities and to ensure transparent carbon markets.[75]

iv. COSTS

Due to the flexibility provided under the Model Rule, RGGI studies have determined that price impacts of the system will be modest.[76] Under the "best estimate" scenario, energy price impacts for all types of consumers range from an increase of 0.3 percent to 0.6 percent in 2015, equating to a $3 to $16 increase per average household.[77] However, RGGI's promotion of energy efficient technology is expected to produce net savings for average households, reducing average household bills by $86.15 to $92.52 per year by 2015.[78] RGGI is also believed to have little impact on the growth of the regional economy, with only a "high emissions scenario" having a slight detrimental effect on economic growth.[79] However, other studies, especially those undertaken by stakeholder companies, predict economic losses as a result of the plan.[80] For example, the group Independent Power Producers of New York states that the predicted slight environmental impact is overly optimistic and that the RGGI team should reevaluate its economic analysis.[81] A comment from several business organizations also expressed concern that an increase in the price of electricity in the region would occur because of RGGI.[82]

v. ANALYSIS AND THE FUTURE OF RGGI

Aside from uncertainties involving the economic and environmental affects of RGGI, the political climate has a substantial effect on membership. Massachusetts warned that the results of the November 2006 elections could determine whether Massachusetts returns to the program.[83] True to form, Massachusetts officially joined RGGI on January 18, 2007, making it the eighth state participating.[84] The political climate could also determine whether observers such as Washington D.C., Maryland, Pennsylvania and other former members join the system.[85]

Participation by other states is also possible as shown by the action of California Governor Arnold Schwarzenegger, who signed an executive order in October 2006 directing the state to develop its GHG trading system to allow for linkages with RGGI.[86] The future of the system is also subject to national decisions on climate policy and the possibility that a national emissions trading scheme will emerge after the 2008 presidential election, which market analyses view as a likely outcome.[87] See Chapter IV, Section D. In fact, the main impetus behind RGGI is to spur federal legislation. Nevertheless, RGGI constitutes America's first mandatory cap-and-trade system for GHG emissions; its long term impacts are yet to be determined.

C. CALIFORNIA

i. GLOBAL WARMING SOLUTIONS ACT OF 2006

California, the world's 12th largest contributor to GHG emissions, passed legislation in late 2006 laying the groundwork for a state-wide cap-and-trade system.[88] Assembly Bill 32, known as the "Global Warming Solutions Act" (hereinafter referred to as "AB 32"), is the cornerstone of the state's recent environmental legislation, a triptych of laws enacted in late September 2006, which includes AB 32, Senate Bill 107 and Senate Bill 1368.[89]

AB 32 outlines a three-step plan to achieve a 25 percent reduction of CO_2 emissions from California utilities, oil refineries, cement makers and other large industrial polluters between 2012 and 2020.[90] First, the exact GHG emissions cap, as well as the regulations for mandatory emissions reporting, are to be adopted no later than Jan. 1, 2008.[91] The bill mandates the determination of a GHG emissions goal to be set according to 1990 emissions levels.[92] Also in this stage, the California Air Resources Board (CARB) will issue a series of "early action measures" for implementation before 2010.[93] These measures will be developed in concert with two advisory committees formed for this purpose: an Environmental Justice Committee and an Economic & Technology Advancement Committee.[94]

Second, CARB will draft a "scoping plan" which outlines various "direct emission reduction measures, alternative compliance mechanisms, market-based compliance mechanisms, and potential monetary and non-monetary incentives" for those sources or categories of sources contributing significantly to the state's total GHG footprint.[95] The draft scoping plan will then be subjected to a variety of reviews and vetted through public commentary. Finally, long-term mechanisms for emissions reduction will be implemented and maintained beginning January 1, 2012.[96] CARB will be responsible for overseeing and enforcing these measures.[97]

AB 32 also stipulates several principles intended to guide the development and assessment of those mechanisms employed to achieve emissions reductions. An overarching concern is cost-effectiveness: only those strategies which promise efficient allocations of resources are to be

adopted.[98] Further, those actors who have already begun in good faith to reduce their GHG emissions can receive credit for work already completed, and not have their positive steps punished by a strict emissions reduction mandate.[99] In developing and implementing reduction mechanisms, CARB must also take localized effects of those mechanisms, in addition to the expected aggregate effects, into consideration.[100] That is, if a cap-and-trade system would reduce emissions generally, but allow certain heavy GHG emitters to simply buy-off their non-compliance, CARB may enact additional mechanisms.[101]

Perhaps the principle most fundamental to the legislation is that of integration.[102] The California Legislature commanded in AB 32 that regulatory infrastructures and sanctions for non-compliance should be developed and drafted in parallel with existing laws and procedures.[103] Any market-based measure such as a cap-and-trade program must be able to work in concert with strategies implemented in other regions or even around the world, including CCX, RGGI and the EU ETS.[104]

While market-based mechanisms were included as one of the means to achieve cost-effectiveness in AB 32 §§ 38570-71, emissions trading was ultimately commanded by Governor Schwarzenegger in Executive Order No. S-20-06.[105] AB 32 does not by itself require CARB to employ an emissions trading system. Critics of this move, including co-author of AB 32 Assembly Speaker Fabian Núñez, claim the Governor's move is an attempt to revive proposals rejected during negotiations over the text of AB 32.[106] Núñez claims that the governor usurped control of the design process assigned to CARB, a relatively independent body, and which could have lead to a reduction plan without an emissions trading component.[107] Despite Executive Order No. S-20-06, the specifics of the trading system will nevertheless be determined by CARB. Schwarzenegger's Executive Order also ties the market-based mechanisms developed under AB 32 to the northeast's RGGI and the EU ETS.[108]

ii. SENATE BILLS 107 AND 1368

SB 107 amends California's existing renewable portfolio standard to require that electrical utilities serving California generate 20 percent of their power from renewable resources by 2020.[109] This moves the deadline forward seven years from the state's previous 2002 plan.[110] Both AB 32 and SB 107 provide for the development of emissions trading systems to lower compliance costs associated with the previously enacted renewable portfolio standards.[111]

SB 1368 establishes emissions caps on all of California's base-load electrical utilities—those facilities that are responsible for providing a steady flow of power and which do not shut down due to demand fluctuations.[112] This requirement, however, is not solely limited to those utilities within the state.[113] Rather, SB 1368 requires that electricity imported into California conform to the same standards as power generated within its borders and sets GHG emissions limits on all sources supplying California with electricity.[114] The law squarely confronts the fact that California cannot reduce its GHG footprint without ostensible regulation of industries and regions beyond its borders, because California imports a significant amount of electricity from outside the state. Under SB 1368, even foreign plants that wish to continue to supply energy to California customers must comply with the emissions limits set by CARB and the California Energy Commission.[115]

The controversy surrounding this bill is manifold. Since the bill prohibits entering into long-term contracts (more than five years) with any electricity utility that does not comply with the emissions caps, critics worry it may push utility providers into short-term contracts going to the highest-bidder.[116] If California suffers another energy crisis as it did in 2001, (See Chapter 1) the state may be forced to purchase more power from utilities across the west during the peak summer

season. California's emergency could therefore drain Denver, Phoenix, Las Vegas, and other major cities of their electrical resources, because utilities that would otherwise serve these areas would divert their resources to California where they would receive the highest price.[117] The Center for Energy and Economic Development, a coal-industry group based in Colorado, also claims that SB 1368 runs afoul of the "dormant" Commerce Clause by illegally impeding interstate commerce.

iii. AUTO EMISSIONS STANDARDS

Aside from emissions caps on stationary sources, California is also an innovator with respect to auto emissions standards. In 2002, California passed Assembly Bill 1493 regulating automobile emissions.[118] Two years later, state regulators approved a rule that requires auto manufacturers to reduce GHG emissions from cars and trucks sold in California starting in 2009.[119] Light-duty vehicles are required to emit 22 percent less CO_2 by 2012 and 30 percent less by 2016. For example, four speed automatic transmission vehicles will be replaced by more efficient six speed models.[120] The consumer costs of the plan remains uncertain with CARB estimating a price increase of around $1,000.00 per car or truck in 2016, but a net decrease in costs due to savings on gas.[121] The auto industry pegs the price increase due to the new auto emissions standards at around $3,000.00 per vehicle.[122]

The Association of International Automobile Manufacturers (AIAM) and a private car dealership sued the state to prevent the regulations from taking effect.[123] AIAM argues that only the federal government, through the National Highway Traffic Safety Administration, has the authority to set fuel economy standards.[124] They also argue that the technology does not exist to cost-effectively implement the California rules.[125] The case was stayed in January 2007 pending the outcome of a related Supreme Court case.[126] See Chapter 4. The outcome of this legislation could also affect 10 other states that have adopted, or are considering, similar mobile source regulations.[127]

In tandem with strict fuel efficiency requirements, California is also pursing options to encourage the production and consumption of environmentally friendly fuels such as ethanol and battery power.[128] Governor Schwarzenegger plans to introduce "low carbon fuel standards" that will regulate oil refiners and gas sellers.[129] The program will also calls for a trading mechanism to facilitate compliance and will aide the state in meeting emissions reduction targets set forth by AB 32.[130]

iv. UTILITIES AND ENERGY EFFICIENCY

With the goal of encouraging energy conservation, California decoupled revenues and sales for non-fuel costs for its utilities beginning in 1978 for natural gas and 1982 for electricity.[131] Decoupling allows utilities to encourage conservation because they are no longer dependant on consumption and revenue from consumers to cover fixed costs like pipes, wires and employment.[132] California's Electric Revenue Adjustment Mechanism (ERAM) required utilities to track the difference between actual and forecasted base rate revenues, allowing the utility to recover revenue from ratepayers if collections did not equal the utility's revenue requirements set by the Public Utilities Commission.[133] While ERAM was abandoned in 1996 because it was thought to be unnecessary in the face of utility deregulation, the California energy crisis and a new focus on energy conservation lead to the re-adoption of the approach and it is used widely today.[134]

Demand side management as it is called by utility companies, saved California from economic disaster during the energy crisis.[135] California reduced energy demand by nearly 5,000 megawatts, roughly the average daily need of Los Angeles, by incentivizing actions like replacing

inefficient old light bulbs.[136] Since decoupling started in 1982, California's total electricity use per capita has remained relatively constant at between 7,000 and 8,000 KWh per year as compared to the U.S. average that has increased to 12,000 KWh per year.[137] Electric utility PG&E believes energy efficiency is the lowest cost resource for meeting the demands of California's growing population, citing a 4,000 MW increase in demand caused by a summer heat spell and the eight coal fired plants required to cover the growth.[138] To address this increase in demand, California Utilities plan to spend $2 billion on energy efficiency programs through 2008, an investment that is expected to produce a $3 billion net gain for the state by reducing utility bills.[139]

Aside from decoupling, the California Public Utilities Code has also mandated an inverted rate structure since the 1970s to promote energy conservation.[140] Utilities must charge higher prices for users that consume more than their baseline rate, though increased charges are tempered by a low income discount for some families.[141] California also has been a leader in adopting energy efficiency standards for appliances, the first to do so in 1978, and in setting standards for new buildings, beginning in 1977.[142] The lessons learned from these and other California initiatives spurred national energy efficiency standards and lead to similar efforts in countries around the world.[143]

v. ANALYSIS

California's progress toward curbing greenhouse gas emissions is embryonic, but informative, as it currently stands as the most comprehensive state-based measure to reduce GHG emissions. By adopting laws that integrate its efforts to reduce GHG emissions with others around the country, and by reaching beyond is boundaries to try to effect change as it does with possible links to RGGI and the EU ETS in AB 32 and through regulation of foreign source of energy in SB 1368, California recognizes that GHG emissions reductions and climate change must be addressed within the state's border and without. As Governor Schwarzenegger put it: "No one state can do it alone . . . Climate change truly is a global problem where states, regions, and nations must work together to find a solution."[144]

California lawmakers are also convinced that regulating greenhouse gas emissions is good for business. In a letter to President Bush, Governor Schwarzenegger stated that "the economic argument for market-based solutions to global warming are overwhelming."[145] First, global warming threatens various state industries, including, *inter alia*, skiing (due to reduced snow pack), agriculture, commercial fishing, and wine (due to bio-sensitivity to temperature changes), as well as forestry and tourism.[146] Protecting these industries remains crucial to California's economic success. By addressing these concerns now, California has placed itself at the forefront of GHG regulation and climate change and will be in a better position to address difficulties associated therewith.

An emissions trading system requires a certain critical mass to be effective—"a scale and scope and diversity that even a state as big as California doesn't have."[147] Yet, the State's ambitious undertaking serves another purpose: second to reduction of GHG emissions, California hopes to incite the federal government to take steps to regulate CO_2 and other GHGs.[148] After meeting with Governor Schwarzenegger, former New York Governor George Pataki, the guiding force behind RGGI, stated, "We both believe firmly that having a consistent, coherent national approach would be far better than having states and regions having competing or alternating approaches."[149]

D. VOLUNTARY FEDERAL PROGRAMS:

While many believe federal regulation of GHG emissions is imminent, the Bush administration's stance has been to encourage voluntary programs rather than push for out-and-out regulation. While voluntary initiatives undoubtedly will not impact GHG emissions as effectively as a federal cap on GHG emissions would, these programs have nevertheless had an impact within the larger GHG emissions reduction framework. The two primary programs are referred to as Climate VISION and Climate Leaders. Climate VISION is a partnership amongst a host of companies in various economic sectors to reduce their GHG emissions; Climate Leaders was designed to encourage individual companies to develop long-term, comprehensive strategies to address climate change.[150]

i. CLIMATE VISION

Climate VISION (Voluntary Innovative Sector Initiatives: Opportunities Now) is the focal point of a government initiative to reduce U.S. GHG intensity—the amount of GHG emissions per unit of economic output—by 18 percent between 2002 and 2012.[151] The VISION initiative hopes to achieve the proposed reductions without hindering economic growth. The program therefore focuses on encouraging industries to take voluntary actions using available, inexpensive technologies to reduce GHG emissions.[152]

Climate VISION participants represent 14 energy-intensive industries including oil and gas production, transportation, and refining; electricity generation; coal and mineral production and mining; manufacturing (automobiles, cement, iron and steel, magnesium, aluminum, chemicals, and semiconductors); railroads; and forestry products.[153] The VISION program helps members identify and implement solutions for reducing GHG emissions that are cost-effective while developing and utilizing tools to calculate, inventory, and report GHG emissions reductions.[154] Additionally, avoidance and sequestration methods are advised, along with the development of strategies to speed the development and commercial adoption of advanced technologies and strategies across the commercial and residential sectors to help energy consumers reduce GHG emissions all while recognizing voluntary mitigation actions.[155]

For example, Climate Challenge, a Department of Energy (DOE) program under the umbrella of Climate VISION, requires participating electric utilities to voluntarily commit to reduce GHG emissions using methods that make economic sense.[156] To enter the program, utilities must agree to: 1) reduce GHG emissions by a specified amount below the utility's 1990 baseline level by the year 2000; 2) reduce GHG emissions to a particular level expressed in terms of emissions per kWh generated or sold; 3) reduce GHG emissions by or to some other specified level; 4) undertake or finance specific projects or actions to reduce GHG emissions; and 5) make a specified contribution to particular industry initiatives; or agree to some combination of the above.[157]

ii. Department of Energy: 1605(b) Standards

Climate VISION also encourages partners to monitor their GHG emissions through another DOE initiative, the Voluntary Reporting of Greenhouse Gases, or 1605(b) Program. Section 1605(b) of the Energy Policy Act of 1992 established a reporting program to document and record the results of voluntary efforts made by private firms to reduce, avoid or sequester GHG emissions.[158]

For the 2005 reporting year, 221 companies and organizations from 24 industries or services reported to the Energy Information Administration (EIA) that they had undertaken 2,379 projects to reduce or capture GHGs.[159] Most participants reduced CO_2 emissions by reducing consumption of fossil fuels or switching to less carbon-intensive methods.[160] Other projects involving carbon sequestration and abatement of other GHGs were also reported.[161] "Reported emissions reductions accounted for 294 million metric tons [of CO_2] equivalent (million $MTCO_2e$) of direct reductions, 67 million $MTCO_2e$ of indirect reductions, 8 million $MTCO_2e$ of reductions from carbon sequestration and 13 million $MTCO_2e$ of unspecified reductions."[162] Total U.S. GHG emissions for 2005 are estimated at 7,147.2 million $MTCO_2e$.[163]

The 1605(b) guidelines were revised as part of the President's Global Climate Change Initiative, and took effect June 1, 2006.[164] Section 1605(b) permits three distinct types of reporting: project-level; entity-level and commitment.[165] Project-level reporting identifies emissions reductions or carbon sequestration achieved as a result of a specific action or group of actions. Entity level reporting compiles emissions reductions and carbon sequestration for an entire organization. Commitment reporting tracks pledges made by 1605(b) participants to take action to reduce emissions in the future. These reporting mechanisms allow participants to create a detailed public record of their emissions and activities taken to reduce or mitigate them.

Since the start of the 1605(b) program in 1994, the number of reporting entities has grown by 105 percent and the number of reduction projects has increased by 275 percent.[166] Of the 221 companies reporting their emissions in 2005 under 1605(b), 119 provided entity-level reports, measuring the emissions of their entire businesses or organizations.[167] These 119 organizations, roughly half of the total number of organizations reporting under 1605(b), accounted for over 13 percent of the total U.S. GHG emissions in 2005.[168] For 2005, 69 entities reported commitments to reduce emissions, 25 of which were electricity generators involved in the DOE's Climate Challenge.[169] Other entities reported that they were involved in EPA GHG reduction programs such as Climate Leaders.[170]

iii. EPA: CLIMATE LEADERS

Climate Leaders is another federal initiative addressing climate change. The EPA program encourages partnerships between government and industry to develop strategies dealing with climate change in the private sector.[171] Industry partners voluntarily set emissions reduction goals, inventory emissions and monitor their progress.[172] In turn, the EPA provides recognition, including press events and case studies, highlighting achievements, technical assistance in formulating plans and setting GHG goals and credibility through EPA reporting procedures.[173] Climate Leaders also acts as an umbrella over the EPA's other climate-related initiatives. Some of these initiatives include Energy Star (an EPA product certification system and corresponding website that directs companies towards energy-efficient products); the Green Power Partnership (where partners make a commitment to use environmentally friendly power sources for a portion of their power needs in return for EPA technical assistance and recognition); the Combined Heat and Power (CHP)

Partnership; WasteWise (education for companies about the effect of waste on GHG emissions while providing companies with strategies to reduce waste); the Landfill Methane Outreach Program; the Coal Bed Methane Outreach Program; Natural Gas Star (providing information to landfill operators and mining companies concerning the possible sequestration or reduction of methane); and Best Workplaces for Commuters (working with employers to encourage their employees to get to work in more environmentally-friendly ways).[174]

Over 100 companies and organizations participate in the Climate Leaders Program, including Alcoa, Baxter, Campbell's Soup, IBM, Johnson and Johnson, Volvo and many others.[175] Over half of these participants have established their GHG reductions targets as of January 2007.[176] For example, Pfizer has committed to reducing GHG emissions by 35 percent of revenue per dollar from 2000 to 2007. Hasbro also pledged to reduce total U.S. source GHG emissions by 30 percent from 2000 to 2007, while Baxter International also planned to reduce emissions by 16 percent per unit of production value from 2000 to 2005.[177]

E. CONCLUSION

There are a variety of regulatory frameworks currently operating at the state, regional and federal level, yet no cohesive initiative is developing. Voluntary markets and initiatives like those sponsored by the federal government and the Chicago Climate Exchange are having an impact, but put the participants at a market disadvantage in their industries because of the voluntary compliance costs associated therewith. California is moving forward with an emissions trading system and concomitant cap on GHG emissions, but the process is still in its infancy and large obstacles must still be overcome. Regional regulation offers some solutions as well, but continues to contribute to the schizophrenic regulation of GHG emissions and related emission trading systems. As municipalities, states, regions and the nations move forward to address climate change through the use of GHG caps and trading systems, it is vital that these actors have an understanding of where the rest of the world is moving in regards to the same.

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CHAPTER IV: BEYOND EMISSIONS TRADING: LOCAL, STATE, REGIONAL, NATIONAL, AND JUDICIAL ACTIONS TO MITIGATE CLIMATE CHANGE

A. LOCAL ACTION

Greg Nickels, mayor of Seattle, Washington, launched the U.S. Mayors' Climate Protection Agreement in February, 2005.[2] As of February 14, 2007, 402 mayors representing 58.9 million Americans, have signed on to the twelve-step program outlined in the Agreement (see Figure 3).[3] The primary objective is for individual cities to meet or beat the original U.S. Kyoto target to cut GHG emissions to seven percent below 1990 levels by 2012.[4] Population growth is expected to increase GHG emissions by 38 percent over the next fifteen years.[5] To meet their Kyoto target, Seattle must, for instance reduce emissions by 683,000 tons, which is equivalent to taking over 148,000 cars off the road.[6]

Figure 4-1: Mayor's Climate Protection Agreement: Twelve Steps[1]

1. Inventory global warming emissions in City operations and in the community, set reduction targets and create an action plan.
2. Adopt and enforce land-use policies that reduce sprawl, preserve open space, and create compact, walkable urban communities;
3. Promote transportation options such as bicycle trails, commute trip reduction programs, incentives for car pooling and public transit;
4. Increase the use of clean, alternative energy by, for example, investing in "green tags",advocating for the development of renewable energy resources, recovering landfill methane for energy production, and supporting the use of waste to energy technology;
5. Make energy efficiency a priority through building code improvements, retrofitting city facilities with energy efficient lighting and urging employees to conserve energy and save money;
6. Purchase only Energy Star equipment and appliances for City use;
7. Practice and promote sustainable building practices using the U.S. Green Building Council's LEED program or a similar system;
8. Increase the average fuel efficiency of municipal fleet vehicles; reduce the number of vehicles; launch an employee education program including anti-idling messages; convert diesel vehicles to bio-diesel;
9. Evaluate opportunities to increase pump Efficiency in water and wastewater systems;
10. Increase recycling rates in City operations and in the community;
11. Maintain healthy urban forests; promote tree planting to increase shading and to absorb CO2; and recover wastewater treatment methane for energy production;
12. Help educate the public, schools, other jurisdictions, professional associations, business and industry about reducing global warming pollution.

The mayors intend to achieve this objective by following a formula offered by the International Council for Local Environmental Initiatives (ICLEI) in its "Cities for Climate Protection" (CCP) program.[7] ICLEI is an international membership organization dedicated to promoting local efforts at sustainability.[8] The CCP program presents a five step process for cities to meet their GHG goals: "(1) conduct a baseline emissions inventory and forecast; (2) adopt an emissions reduction target for the forecast year; (3) develop a local action plan; (4) implement policies and measures; and (5) monitor and verify results."[9] Almost 1,000 cities worldwide are participating in the CCP process, with 200 of them in the United States.[10] Under the program, U.S. cities have reduced waste, switched to renewable power, built green buildings, promoted energy efficiency in infrastructure, switched to renewable fuels and reengineered public transportation systems.[11] While cities have undertaken innovative projects to increase energy efficiency and reduce GHG emissions, according to a new report, few, if any, cities are on track to meet their targets under the Mayor's Agreement.[12]

Figure 4-2: Local Strategies to Combat Climate Change[13]		
CITY	**FOCUS**	**STRATEGY**
Chicago, IL	**Buildings**	Installed a rooftop green on city hall, reducing roof temperatures by over 70 degrees and lowering cooling costs. Other buildings followed suit.
Santa Monica, CA	**Buildings**	Solar panels on the first green low income housing satisfies 90 percent of the building's energy needs, reducing resident's utility costs.
Toledo, OH	**Buildings**	City buildings cut energy use by almost 6 million kwh, reduced CO_2e by more than 5000 tons; and saved taxpayers more than $20 million.
Bellingham, WA	**Clean Power**	Purchased green power for 100 percent of municipal operations in 2007, costing over $250,000, but offset by the rising cost of fossil fuel energy.
Los Angeles, CA	**Clean Power**	Has committed to relying on renewable energy for 20% of its energy needs by 2010, ending expansion activities at coal fired power plants.
Radnor Township, PA	**Clean Power**	In 2003, the suburb of Philadelphia became the largest municipal purchaser of wind energy. Wind power covers 62% of electricity needs.
Salt Lake City, UT	**Infrastructure**	Converted 1,630 traffic lights to energy efficient light-emitting diodes (LED), which will reduce CO_2 emissions by 500 tons per year.
Minneapolis	**Infrastructure**	Invested $4.7 million to retrofit 120 municipal buildings and red traffic lights. The annual savings have $752,000 and 11,300 tons of CO_2.
Denver, CO	**Transportation**	The city of Denver's "Green Fleets" program requires the purchase of the cleanest vehicles available. Denver is the world leader in hybrids.
Ann Arbor, MI	**Transportation**	The city's getDowntown program gives subsidized public transportation passes to city center workers. The program reduced CO_2 by 734 tons.
Salt Lake City, UT	**Transportation**	The city's light rail system, TRAX, carried 6.4 million passengers, 35% more than the same period last year, saving 33,000 tons of CO_2 per year.
San Francisco, CA	**Waste**	The city plans to divert 75% of all waste from city landfills by 2010 and achieve zero waste by 2020, a yearly CO_2 reduction of 70,000 tons.
Seattle, WA	**Waste**	In 2005, Seattle banned throwing recyclables in the garbage, saving $2 million dollars per year and reducing CO_2 by 260,000 tons.

B. STATE ACTION

States will play an important role in any national GHG reduction scheme, whether through implementation of federal law, regional partnerships or state-based legislation. States allocate 90 percent of all permits required under federal environmental regulations and undertake 75 percent of all environmental enforcement actions.[14] State efforts to combat climate change have been undertaken by Democrats and Republicans alike, even during times of fiscal crisis for many states.[15] Policymakers in these states have seen possible long-term economic gains from investing in strategies to deal with climate change or associated problems now.[16] Field-tested approaches

provide an alternative to a federally imposed cap on GHG emissions and serve to reduce the cost of individual state action.[17] However, as illustrated by the sentiments of regulators in California and the RGGI states, state action on climate change, while advanced to mitigate the risks and take advantage of new market opportunities, is designed to leverage support for a more efficient national GHG reduction program.[18]

While mandatory GHG emissions trading is a new concept in the United States, with only the RGGI participants and California designing actual trading platforms, many states have nevertheless established GHG reduction goals (See Figure 4) and have implemented programs to cut GHG emissions.[19] Varied strategies have been adopted, reflecting regional, environmental and economic needs: agricultural states are concerned about farm productivity; coastal states are worried about rising oceans and hurricanes; industrial states are concerned about rising energy costs; and all states are looking for opportunities to take advantage of new markets and technologies.[20] For example, the densely populated, industrialized state of Massachusetts enacted a multi-pollutant cap, including CO_2, for six major facilities, dealing with air pollution, acid rain and global warming in one fell swoop.[21] Meanwhile, Nebraska developed a structure for a pilot project that could lead to credits for low-till practices and a trading scheme between 23 state Natural Resource Districts (NRDs).[22] Forestry programs such as New Mexico's Forest Relief Program, Oregon's Forest Resource Trust and Minnesota's Relief Program provide funds for tree planting on private and public land with one of the many benefits being carbon sequestration.[23] State action to deal with waste, like North Carolina's support of the Animal and Poultry Waste Management Center, has the dual benefit of leading to carbon sequestration and toxic containment.[24] Finally, strategies to curb auto emissions, like California's greenhouse gas standard for vehicles and their zero-emission vehicle incentive program have the dual benefit of reducing CO_2 and smog, both of which are major problems for the state.[25]

To supplement these diverse strategies, many states have focused on renewable energy to deal with the universal environmental problems associated with energy production. 23 states (including Colorado) and Washington D.C. have enacted renewable portfolio standards (RPS) or goals requiring that a specific percentage or amount of total electricity produced in the state be produced using renewables (See figure 5);[26] 20 states and D.C. offer at least one type of grant program to support renewable energy technologies;[27] 24 states offer either or both corporate or private tax credits/deductions for renewable energy;[28] and 27 states have local property tax exemptions for renewables or allow localities to provide an exemption.[29] These efforts have lead to a decrease in reliance on fossil fuels and a decrease in smog as well as a decrease in GHG emissions.

Other state action has involved commitments by state governments to reduce emissions from their administrative activities. Washington state, for instance, ordered a 20 percent reduction in the use of petroleum in state vehicles by September 1, 2006.[30] Former Idaho Gov. Dirk Kempthorne also issued an executive order requiring that alternative fuels power a considerable portion of state vehicles.[31] More recently, Illinois' state government committed to reducing its emissions by six percent by 2010.[32] The state will meet its goal to reduce emissions by 1 million tons of CO_2 each year by utilizing flex fuel cars that can run on both E-85 and regular gasoline.[33] If this commitment is not met, the state will use taxpayer funds to buy emissions credits from the Chicago Climate Exchange to offset its excess emissions.[34]

Figure 4-3: State GHG Reduction Goals and Renewable Portfolio Standards		
STATE	**GHG GOAL (14)[35]**	**RENEWABLE PORTFOLIO STANDARD (23 + D.C)[36]**
Arizona	2000 levels by 2020; 50% below 2000 levels by 2040	15% of generation by 2025
California	2000 levels by 2010; 1990 levels by 2020; 80% below 1990 levels by 2050	20% of generation by 2020
Colorado	N/A	10% of sales by 2015
Connecticut	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 2001 levels in the long term in the long term	10% of generation by 2010
Delaware	N/A	10% of retail sales by 2019
Wash. D.C.	N/A	11%of sales by 2022
Hawaii	N/A	20% of sales by 2020
Illinois (goal)	1990 levels by 2020; 60% below 1990 levels by 2050	8% of sales by 2013
Iowa	N/A	105 MW of generation
Maine	1990 levels by 2010; 10% below 1990 levels by 2020; 75-80% below 2003 levels in the long term in the long term	30% of sales
Marvland	N/A	7.5% of sales by 2019
Massachusetts	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 1990 levels in the long term in the long term	4% by 2009; 1%/yr. after
Minnesota (goal)	N/A	1,125 MW wind by 2010, 10% by 2015
Montana	N/A	15% of sales by 2015
Nevada	N/A	20% of sales by 2015
New Hampshire	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 2001 levels in the long term in the long term	N/A
New Jersey	1990 levels by 2020; 60% below 2006 levels by 2050	22.5% of generation by 2021
New Mexico	2000 levels by 2012; 10% below 2000 levels by 2020; 75% below 2000 levels by 2050	10% of generation by 2011
New York	5% below 1990 levels by 2010; 10% below 1990 levels by 2020	24% of generation by 2013
Oregon	Stabilize by 2010; 10% below 1990 levels by 2020; 75% below 1990 levels by 2050	N/A
Pennsylvania	N/A	18% of sales by 2020
Rhode Island	1990 levels by 2010; 10% below 1990 levels by 2020 in the long term	15% of sales by 2020
Texas	N/A	5,880 MW by 2015
Vermont (goal)	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 2001 levels in the long term in the long term	Growth (to 10% of sales) by 2012
Wisconsin	N/A	10% of generation by 2015
Washington	1990 levels by 2020; 25% below 1990 levels by 2035; 50% below 1990 levels by 2050	15% of generation by 2020.

Beyond their internal goals and strategies, some progressive states have taken steps to compel federal regulation of GHGs. The Attorney General of Massachusetts, ten other state Attorney Generals and the District of Columbia brought suit in 2003 against the EPA for failing to designate CO_2 as a pollutant under the Clean Air Act.[37] The case, *Massachusetts v. EPA,* was heard before the Supreme Court on November 29, 2006, following multiple rulings against the plaintiffs by the U.S. Circuit Court of Appeals for the District of Columbia.[38]

Not all states are moving forward with GHG reductions however. In fact, the states supporting the EPA in the aforementioned case have a history of opposing measures to combat climate change. During 1988 and 1999, 16 states passed resolutions opposed to U.S. ratification of the Kyoto Protocol.[39] One of these states, Michigan, amended environmental legislation in 1999 to prohibit state agencies from promulgating any rule to reduce GHGs unless the legislature requested it.[40] Another state opposed to Kyoto, West Virginia, passed legislation to prevent state agencies from entering into agreements to reduce GHG emissions with federal agencies.[41] The approaches of other states are contradictory. While Texas has taken the lead in renewable energy production, the state plans to build 11 new coal-fired installations.[42] The combined effects of these plants could offset all of the benefits of California's efforts under the Global Warming Solutions Act of 2006.[43] See Chapter III Section C. In 2004, Texas power plants were responsible for 10 percent of GHG emissions in the United States, almost twice as much as any other state.[44]

C. Regional Action

Following the example set by RGGI, states are beginning to work together to address climate change. Currently, 30 states are working together to pave the way for a national emissions trading system by discussing the creation of a multi-state registry to monitor GHG emissions and reduction efforts.[45] The registry would be a partnership between the California Air Resources Board (CARB), ten Northeastern states involved in the Eastern Climate Registry, seven Midwestern states in the Lake Michigan Consortium and 12 other states in the Western Regional Air Partnership.[46] The participants want to develop common accounting procedures to ensure that one ton of CO_2 in the west equals one ton of CO_2 in the east.[47]

Western states face a particularly daunting task as a result of increasing emissions due to rapid economic development and population growth. The Western Governors' Association (WGA), representing the heads of 19 Western states, adopted a Policy Resolution on Climate Change on June 13, 2006.[48] The Governors stated that:

> "Appropriate action is needed to reduce greenhouse gas emissions. Many of these actions could create significant economic benefit for the West, if the United States moves toward new energy sources and technologies that prefer domestic energy and carbon sequestration. The opportunities to deploy clean and renewable energy and energy efficiency are abundant in the West and may economically and environmentally benefit states by increasing energy efficiency, improving air quality, saving costs, providing jobs, increasing revenues, and reducing water pollution."[49]

The statement urged the federal government to involve states in the national debate on climate change, called for higher resolution climate models to assess localized impacts, promoted efforts at carbon sequestration, encouraged energy efficiency and renewable energy projects, backed the development of a national registry and offered support for market-based policies to reduce GHGs.[50] The WGA's "Clean and Diversified Energy Initiative" also induced Arizona, California, Colorado and Nevada to adopt renewable portfolio standards.[51] Under the Initiative, 30,000 megawatts of new energy in the West will be generated by renewable sources by 2015.[52] A 20 percent increase in energy efficiency is also planned by 2020.[53]

In the Southwestern region, New Mexico spurred action in September 2005 by becoming the first state to accept a legally binding commitment to reduce its GHG emissions through the Chicago Climate Exchange.[54] Arizona took similar steps and the two states committed to the Southwest Climate Initiative to work together to find ways to measure, report and forecast GHG emissions and assess options for reductions.[55] The initiative encourages the use of renewables and climate friendly technologies in the Southwest and promotes policies that reflect regional needs.[56] The governors said:

> "Southwestern states have particular concerns about the impacts of climate change and climate variability on residents, businesses and the environment, including the potential for prolonged drought, severe forest fires, warmer temperatures, increased snowmelt, reduced snowpack and other effects."[57]

Aside from collaborating on strategies to reduce GHG emissions in their own states, the partners will seek to spur regional and national climate policies.[58]

States in the Pacific Northwest are also taking action to combat climate change individually and as a region. Individually, Oregon passed a law establishing CO_2 restrictions for new electric plants in 1997.[59] Washington has already adopted California's pre-Global Warming Solutions Act standards.[60] Regionally, California, Washington and Oregon are taking steps to implement the West Coast Governor's Global Warming Initiative, a joint effort to reduce GHG emissions on the West Coast.[61] The initiative has produced a set of strategies that the states can implement together, including: (1) setting targets for reducing GHGs from state vehicles; (2) purchasing hybrid vehicles; (3) electrifying truck stops; (4) increasing retail renewable energy sales by one percent per year in each state through 2015; (5) adopting energy efficiency standards for products not covered by the federal government; (6) achieving 15 percent greater energy efficiency in state buildings by 2015; and (7) organize a conference to inform policymakers about climate change science.[62] The governors approved the recommendations in 2004.[63]

On February 26, 2007, the leaders of five western states—Washington, Oregon, Arizona, California and New Mexico—announced the creation of the Western Regional Climate Action Initiative (WRCAI).[64] The WRCAI establishes a host of action items for the participants, including, establishing a regional target for reducing greenhouse gases within six months, establish a mechanism or mechanisms by which the participants can meet the target within 18 months including the potential use of a cap-and-trade system, and create a five state registry for tracking and managing GHG emissions.[65] The WRCAI is a major development in the area of emissions trading. Colorado would be wise to, if nothing else, act as an observer in this Initiative thereby gaining first-hand knowledge about the risks and opportunities presented by emissions cap and a concomitant cap-and-trade system.

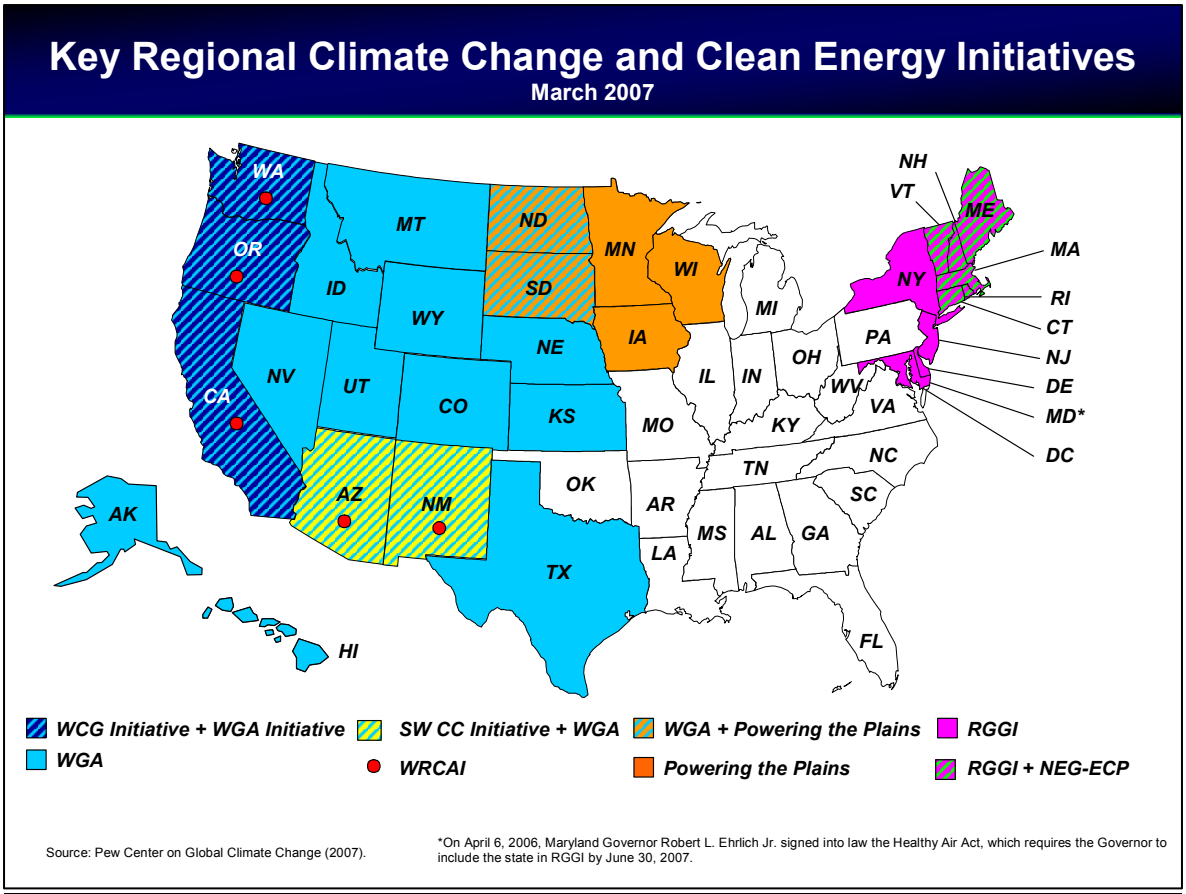

Figure 4-4: Key Climate Change and Energy Initiatives: West Coast Governors Initiative (WCG), Western Governors Association (WGA), Southwest Climate Change Initiative (SWCC), Western Regional Climate Action Initiative (WRCAI), Powering the Plaines (PP), Regional Greenhouse Gas Initiative (RGGI) and New England Governors/Eastern Canadian Premiers (NEG-ECP).

D. Federal Action

Many experts consider federal regulation of GHG emissions as no longer a matter of if, but a matter of when. A multitude of climate change and GHG emissions bills were introduced in the 109th Congress, ranging from climate change research to comprehensive cap-and-trade programs for the six GHGs covered under the UNFCCC.[66] Title XVI of the Energy Policy Act of 2005, establishes a voluntary national program designed to promote the development and deployment of technologies that may reduce the intensity of GHGs.[67] Eileen Claussen, President of the nonprofit Pew Center on Global Climate Change has predicted 2010 as a likely benchmark for federal regulation of GHGs.[68] Her prediction is based on increasing business awareness and the departure of President George W. Bush in 2008, an opponent of mandatory limits for GHG emissions.[69] 67 percent of the companies surveyed by the Pew Center on Climate Change expect U.S. regulation of GHG gases to take effect some time between 2010 and 2015.[70] The ascension of Democrats to power in the House and Senate may further impact this timeline. The first month of the 110th Congress has produced a number of bills focusing on GHG reductions, all employing cap-and-trade mechanisms (See Figure 4-5).

Figure 4-5: Climate Change Bills in the 110th Congress[71]

Topic	S. 280 (Lieberman)	S. 309 (Sanders)	S. 317 (Feinstein)	H.R. 620 (Olver)
Emission reduction/ limitation scheme	Absolute cap on total emissions from all covered entities in the electric power, transportation, industry, and commercial sectors.	Absolute cap on total emissions economy-wide.	Absolute cap on total emissions from covered electric generators.	Absolute cap on total emissions from all covered entities in the electric power, transportation, industry, and commercial sectors.
Specific emissions limits	Beginning in 2012, emissions from covered entities are capped at 6.13 billion metric tons, minus 2012 emissions from non-covered entities. Beginning in 2020, emission cap declines to 5.239 billion metric tons, minus 2020 emissions from noncovered entities. Beginning in 2030, emission cap declines to 4.1billion metric tons, minus 2030 emissions from noncovered entities. Beginning in 2050, emission cap further declines to 2.096 billion metric tons, minus annual emissions from non-covered entities.	Beginning in 2010, emissions economy-wide to be reduced 2% annually. Beginning in 2020, emission cap on economy-wide basis set at 1990 level, with declining emission caps of 26.7% below 1990 levels in 2030 and 53.3% in 2040. Beginning in 2050, emission cap set at 80% below 1990 levels.	Beginning in 2011, emissions from affected electric generators capped at 2006 levels. Beginning in 2015, emissions from affected electric generators capped at their 2001 levels, declining 1% annually until 2020. Beginning in 2020, emission cap declines 1.5% annually.	Beginning in 2012, emissions from covered entities are capped at 6.15 billion metric tons, minus 2012 emissions from non-covered entities. Beginning in 2020, emission cap declines to 5.232 billion metric tons, minus 2020 emissions from non-covered entities. Beginning in 2030, emission cap declines to 3.858 billion metric tons, minus 2030 emissions from non-covered entities. Beginning in 2050, emission cap declines to 1.504 billion tons, minus emissions from non-covered entities.
Greenhouse gases defined	Carbon dioxide, methane, nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).	Same six gases as S. 280.	Same six gases as S. 280.	Same six gases as S. 280.
Covered entities	In metric tons of carbon dioxide equivalents: any electric power, industrial, or commercial entity that emits over 10,000 metric tons carbon dioxide equivalent annually from any single facility owned by the entity; any refiner or importer of petroleum products for transportation use that, when combusted, will emit over 10,000 metric tons annually; and any importer or producer of HFCs, PFCs, or SF6 that, when used, will emit over 10,000 metric tons of carbon dioxide equivalent.	EPA promulgates rule within two years of enactment that applies the most cost-effective reduction options on sources or sectors to achieve reduction goals.	Any fossil fuel-fired electric generating facility that has a capacity of greater than 25 megawatts and generates electricity for sale, including cogeneration and government-owned facilities.	In metric tons of CO2 equivalents: any electric, industrial, or commercial entity that emits over 10,000 tons CO2 equivalent annually from any single facility owned by the entity; any refiner or importer of petroleum products for transportation use that, when combusted, will emit over 10,000 metric tons annually; and any importer or producer of HFCs, PFCs, or SF6 that will emit over 10,000 metric tons of carbon dioxide equivalent.

Topic	S. 280 (Lieberman)	S. 309 (Sanders)	S. 317 (Feinstein)	H.R. 620 (Olver)
Responsible agency	Environmental Protection Agency.	Environmental Protection Agency	Environmental Protection Agency	Environmental Protection Agency.
General allocating and implementing strategy	A tradeable allowance system is established: EPA shall determine allocations based on several economic, equity, and sector-specific criteria, including economic efficiency, competitive effects, and impact on consumers. Allowances are to be allocated upstream to refiners and importers of transportation fuel, along with producers of HFCs, PFCs, and SF6, and downstream to electric generation, industrial, and commercial entities. Allocations to covered entities are provided at no cost.	Tradeable allowance system permitted. In implementing reduction program, EPA shall select the most cost-effective emission reduction strategies. EPA shall allocate to various sectors and interests any allowances that are not allocated to affected entities, including households, dislocated workers, energy efficiency and renewable energy activities, equestration activities, and ecosystem protection activities.	Tradeable allowance system is established. Allocations to existing sources based on historic electricity output, and includes allowance allocations for incremental nuclear capacity and renewable energy, along with sequestration and early action provisions. From 2011 on, an increasing percentage of all allowances are to be auctioned, with 100% of allowances auctioned in 2036 and thereafter.	A tradeable allowance system is established: EPA shall determine allocations based on several economic, equity, and sector-specific criteria, including economic efficiency, competitive effects, and impact on consumers. Allowances are to be allocated upstream to refiners and importers of transportation fuel, along with producers of HFCs, PFCs, and SF6 and downstream to electric generation, industrial, and commercial entities. Allocations to covered entities are provided at no cost.
Public sale/auction of allowances	EPA shall determine the number of allowances allocated to the Climate Change Credit Corporation (CCCC) (established by the bill). EPA shall allocate to the CCCC allowances before 2012 to auction to raise revenue for technology deployment and dissemination. The CCCC may buy and sell allowances, and use the proceeds to reduce costs borne by consumers and other purposes. (See "Revenue recycling" below.)	EPA may choose to provide for trustees to sell allowances for the benefit of entities eligible to receive assistance under the proposal (see above).	From 2011 on, an increasing percentage of all allowances are to be auctioned, with 100% of allowances auctioned in 2036 and thereafter. Revenues from the auction are to be deposited in the Climate Action Trust Fund created by the Department of the Treasury.	EPA shall determine the number of allowances allocated to the Climate Change Credit Corporation CCCC) (established by the bill). The CCCC may buy and sell allowances, and use the proceeds to reduce costs borne by consumers and other purposes. (See "Revenue recycling" below.)
Cost-limiting safety valve	No explicit provision.	No explicit provision. However, if the President determines a national security emergency exists, the President may temporarily adjust, suspend, or waive any regulation promulgated under this program (subject to judicial review).	No explicit provision. However, limited borrowing against future reductions is permitted if EPA determines allowance prices have reached and sustained a level that is or will cause significant harm to the U.S. economy. Also, EPA may increase to 50% the share of international credits that can be used in such cases.	No explicit provision.

Topic	S. 280 (Lieberman)	S. 309 (Sanders)	S. 317 (Feinstein)	H.R. 620 (Olver)
Other market trading system features	Up to 30% of required reductions may be achieved through credits obtained through pre-certified international emissions trading programs, approved reduction projects in developing countries, domestic carbon sequestration, and reductions from non-covered entities. Borrowing against future reductions permitted.	Market trading systems incorporated into Renewable Portfolio Standard and new low-carbon generation requirement.	Up to 25% (50% for new affected units) of required reductions may be achieved with credits obtained through EPA-approved foreign government programs developed under United Nations Framework Convention on Climate Change (UNFCCC) protocols. Limited borrowing against future reductions is permitted if EPA determines allowance prices have reached and sustained a level that is causing or will cause significant harm to the U.S. economy. Also, EPA may increase to 50% the share of international credits that can be used in such cases.	Up to 15% of required reductions may be achieved through credits obtained through pre-certified international emissions trading programs, approved reduction projects in developing countries, domestic carbon sequestration, and reductions from non-covered entities. Borrowing against future reductions is permitted.
Banking	Banking of allowances is permitted; allowances may be saved for use in future years.	No specific prohibition on banking.	Banking of allowances is permitted; allowances may be saved for use in future years.	Banking of allowances is permitted; allowances may be saved for use in future years.
Early reduction credits and bonus credits	Entities with registered emission reductions achieved before 2012 may receive allowances for them, including reductions achieved under more stringent mandatory state programs. For the time period 2012-2017, entities that have entered into an agreement with EPA to reduce emissions to 1990 levels by 2012 are entitled to additional allowances to cover their additional reductions and are allowed to achieve 40% of their reduction requirement (as opposed to 30%; see above) through international emissions trading and projects, sequestration, or reductions by non-covered entities.	Reductions previously achieved under state programs that are at least as stringent as a federal trading program may be recognized by the federal program. Entities that demonstrate reductions achieved early (but not before 1992) that are as verifiable as reductions under a federal trading program may be recognized by the federal program.	Entities with reductions achieved from 2000 through 2010 shall receive credits under specific criteria, including EPA rules that ensure reductions are real, additional, verifiable, enforceable, and permanent, and that they were reported under either 1605(b) of the 1992 Energy Policy Act, or according to a state or regional registry. Quantity of credits given is limited to 10% of the 2011 allowance allocation.	Entities with registered emission reductions achieved before 2012 may receive allowances for them. For the time period 2012-2017, entities that have entered into an agreement with EPA to reduce emissions to 1990 levels by 2012 are entitled to additional allowances to cover their additional reductions and are allowed to achieve 35% of their reduction requirement (as opposed to 15%; see above) through international emissions trading and projects, sequestration, or reductions by non-covered entities.

Topic	S. 280 (Lieberman)	S. 309 (Sanders)	S. 317 (Feinstein)	H.R. 620 (Olver)
Revenue recycling	Revenues generated by allowance auctions and trading proceeds are received by a new Climate Change Credit Corporation (CCCC). Activities to be funded include mechanisms to reduce consumer costs and to assist dislocated workers, low-income persons, and affected communities, along with programs to encourage deployment of new technology and wildlife restoration. Allocations to the CCCC are to be determined by EPA based on the funding needs of the advanced technologies demonstration and deployment programs. Further, at least 50% of revenue received must be used for technology deployment.	Allowances may be allocated by EPA to households, dislocated workers, energy efficiency and renewable energy activities, sequestration activities, and ecosystem protection activities.	Revenues generated from the auction are to be deposited in the Climate Action Trust Fund created by the Department of the Treasury. Activities to be funded include an Innovative Lowand Zero-emitting Carbon Technologies Program, a Clean Coal Technologies Program, and an Energy Efficiency Technology Program, along with research and development. Adaption and mitigation activities to be funded include affected workers and communities, and fish and wildlife habitat.	Revenues generated by allowance auctions and trading proceeds are received by a new Climate Change Credit Corporation (CCCC). Activities to be funded include mechanisms to reduce consumer costs and to assist dislocated workers and affected communities, along with programs to encourage deployment of new technology and wildlife restoration.
Penalty for non-compliance	Excess emission penalties are equal to three times the market price for allowances on the last day of the year at issue.	Existing enforcement provisions of Section 113 of the Clean Air Act are extended to program.	$100 per excess ton indexed to inflation plus a 1.3 to 1 offset from future emissions allowances. If the market price for an allowance exceeds $60, the penalty is $200 per excess ton, adjusted for inflation.	Excess emission penalties are equal to three times the market price for allowances on the last day of the year at issue.
Other key provisions	Provisions include studies of research on abrupt climate change and impact of climate change on the world's poor, among others, and creation of a national greenhouse gas database. A new Innovation Infrastructure is created, along with program initiatives to promote less carbon-intensive technology, adaptation, sequestration, and related activities. Requires periodic review of target adequacy by the Under Secretary of Commerce for Oceans and Atmosphere.	Provisions include mandatory greenhouse gas emission standards for vehicles by 2010, for new electric powerplants that begin operation after December 31, 2011, and a new energy efficiency performance standard. Establishes a Renewable Portfolio Standard and credit program. Establishes a new low-carbon generation requirement and trading program. Requires periodic review of target adequacy by the National Academy of Sciences.	Establishes program to encourage offsets from the agricultural sector. Offset credits available for agricultural, forestry, grazing, and wetlands management, sequestration projects, or practices that meet specific criteria in the proposal. Offset credits also available for approved emission reduction offset projects from a variety of activities listed in the proposal. Requires periodic review of target adequacy by EPA taking into account the recommendations of a newly established Climate Science Advisory Panel.	Provisions include studies of the impact of climate change on coastal ecosystems and communities, and the world's poor, among others; assessment of adaptation technologies; and creation of a national greenhouse gas database. Requires periodic review of target adequacy by the Under Secretary of Commerce for Oceans and Atmosphere.

E. JUDICIAL ACTION

Dissatisfaction with a perceived lack of political action in the United States has prompted some states and advocacy groups to look to litigation as a potential solution to the climate change problem.[72] Litigation in the area of environmental harm requires a slightly non-traditional perspective on tort law, as environmental harm is frequently "a consequence of the aggregate risk created by a considerable number if independently acting enterprises."[73]

Potential plaintiffs face many obstacles in climate change litigation. First, because defendants are never solely responsible for the consequences of climate change, they may attempt to use the "unclean hands" of potential plaintiffs as an affirmative defense, alleging that the plaintiffs' conduct contributed to their own problems.[74] Second, as seen in tobacco litigation, many potential defendants have substantial financial resources, allowing them to finance aggressive legal campaigns that make climate change suits expensive and time-consuming.[75] Third, the effects of climate change involve shifts in natural activity rather than the creation of distinctive new problems.[76] It is difficult for plaintiffs to differentiate those climate change consequences that are caused by anthropogenic sources from those caused by natural climate variability. This difficulty forces the plaintiff to rely on weak probability-based arguments when proving causation.[77] Finally, courts are generally reluctant to apply federal common law in politically charged areas, especially those that implicate foreign policy.[78] The courts may not be well-suited for dealing with such a complex problem.[79] Despite all of these obstacles, however, litigation is a complicated but viable option in the absence of better solutions. Even if plaintiffs are unsuccessful, the litigation is valuable in terms of its ability to raise awareness on the climate change issue.[80] Greater awareness could solidify political support for legislative action at the federal, state, and local levels.[81] Despite having achieved only partial success to this point, climate change litigation has the potential to make a lasting and significant impact.[82]

i. STATES V. FEDERAL AGENCIES: *Massachusetts v. EPA*

Massachusetts v. EPA concerns the EPA's denial of a petition under section 202(a)(1) of the Clean Air Act[83] asking the agency to regulate CO_2 and other GHG emissions from new motor vehicles.[84] The EPA justified its decision not to regulate on the grounds that the effect of GHGs is unclear and that models used to predict climate change might not be accurate.[85] A primary issue in the case was whether Massachusetts and the other plaintiffs, including 11 other states, a territory, three cities, and 12 non-governmental organizations, had legal standing to bring suit.[86] The D.C. Circuit avoided the question and proceeded to consider the merits of the case.[87] A divided court ruled for the defendants, including the EPA, 11 states that opposed carbon dioxide regulation, and 19 industry groups.[88] The court held that even if the EPA had statutory authority to regulate GHG emissions from new motor vehicles, it properly exercised its considerable discretion under the statute to deny the petition for rulemaking.[89] The court then dismissed or denied all the petitions before it.[90]

Judge Sentelle, dissenting but concurring in the judgment, disagreed with the majority's reasoning.[91] He decided in the defendants' favor because he agreed with the EPA's assertion that the plaintiffs did not demonstrate the injury required to establish standing.[92]

Judge Tatel also dissented, but on different grounds.[93] Unlike Judge Sentelle, Judge Tatel believed that Massachusetts had standing to bring the case, having shown all of the necessary standing elements: unique injury due to the effects of climate change; causation, evidenced by testimony from senior U.S. climate scientists concerning the science of climate change; and

redressability, evidenced by a showing that reductions in CO_2 emissions from automobiles were achievable.[94] According to Judge Tatel's dissent, the EPA not only had statutory authority to regulate GHG emissions, but, moreover, a duty to do so.[95] Section 202(a)(1) of the Clean Air Act gives the EPA Administrator discretion only to determine whether or not an air pollutant causes or contributes to pollution that may reasonably be anticipated to endanger public health or welfare.[96] It does not allow discretion to withhold regulation because of internal agency judgments about the wisdom of the regulation.[97]

On appeal from the D.C. Circuit, the U.S. Supreme Court granted certiorari, and oral arguments were heard on November 28, 2006.[98] Oral arguments focused on the standing issue.[99] Justice Kennedy is thought to be the swing vote in a decision that will likely be issued during the summer of 2007.[100]

ii. PRIVATE CITIZENS V. FEDERAL GOVERNMENT: *Friends of the Earth, Inc. v. Watson*

In June 2005, four cities joined Greenpeace and Friends of the Earth, Inc. in suing the Export-Import Bank (Ex-Im) and the Overseas Private Investment Corporation (OPIC).[101] The plaintiffs alleged that Ex-Im, an independent government agency, and OPIC, an independent government corporation, had violated the National Environmental Policy Act of 1969 (NEPA) by providing over $32 billion in financing and insurance for oil fields, pipelines, and coal-fired power plants without evaluating the projects' global warming impacts.[102] These projects, if carried out, will ultimately result in over 32 billion tons of carbon dioxide emissions.[103] Section 102(C) of NEPA requires that agencies prepare comprehensive Environmental Impact Statements (EIS) for all major government actions that significantly affect the quality of the human environment.[104] In order to determine which actions require an EIS, agencies must conduct environmental assessments.[105] The plaintiffs argued that the statute's environmental assessment and EIS requirements should apply to overseas projects financed by U.S. government agencies.[106]

The defendants in *Watson* argued that the plaintiffs lacked standing because they had not shown the requisite elements of unique injury, causation and an available remedy.[107] In response, plaintiffs Friends of the Earth and Greenpeace argued that the subsidies given to the defendants by Ex-Im and OPIC were drawn from taxpayer dollars that could have alternatively been used to support projects that members of the plaintiffs' organizations supported, such as renewable energy projects.[108] The four municipality plaintiffs cited rising temperatures, wildly fluctuating annual rainfalls, inundation of low-lying lands due to sea level rise, damage to wildlife, and injury to their citizens among the reasons they should have standing.[109]

A federal judge in California denied the defendants' motion for summary judgment, finding legal standing for the first time in a suit alleging injury exclusively from global warming.[110] The parties are now awaiting a ruling on the merits of the lawsuit.[111] A ruling in favor of the plaintiffs, requiring defendants to do an environmental assessment prior to providing funding, could result in GHG emission reductions. Conducting an assessment would require Ex-Im and OPIC to consider a number of lending alternatives and their environmental impacts.[112] However, because Ex-Im and OPIC are government-related entities to whom NEPA applies, the decision will have limited precedential value for challenges to non-governmental GHG emitters for whom NEPA has no effect.[113]

iii. STATES V. PRIVATE INDUSTRY: *Connecticut v. American Electric Power Co.*

On July 21, 2004, eight states and one city filed a public nuisance lawsuit against five large electric power companies in the U.S. District Court for the Southern District of New York.[114] The public nuisance at issue was global warming, and the complaint alleged that the defendants had substantially contributed to this nuisance by emitting approximately 25 percent of the electric power sector's total emissions, making up ten percent of the carbon dioxide emissions in the United States.[115] In 2000, American Electric Power alone was the largest emitter of carbon dioxide in the electric power sector, accounting for seven to ten percent of industry emissions.[116]

The plaintiffs did not seek monetary damages, but instead asked for a partial injunction under which the defendants would be compelled to reduce their carbon dioxide emissions by three percent over the next ten years.[117] The court held that the case presented a "non-justiciable political question," over which it had no jurisdiction.[118] It dismissed the case "because resolution of the issues presented . . . require[d] identification and balancing of economic, environmental, foreign, policy, and national security interests, an initial policy determination of a kind clearly for non-judicial discretion."[119] Nevertheless, the case allowed state and city governments "to show both the federal government and the private sector that, even in the absence of a strong federal climate change regime, primary greenhouse gas emitters can still be held accountable for their contributions to global warming."[120]

F. INTERNATIONAL ACTION INVOLVING THE UNITED STATES

While most of the world is grappling with the difficulties of implementing their obligations under Kyoto, the United States is focusing its efforts elsewhere. The Asia-Pacific Partnership on Clean Development and Climate ("AP6") was announced on July 25, 2005 at a regional forum meeting for the Association of South East Asian Nations (ASEAN).[121] The AP6 signatories include Australia, China, India, Japan, South Korea and the United States.[122] Member countries account for fifty percent of the world's GHG emissions, energy consumption and population.[123] Additionally, the signatories produce about 65 percent of the world's coal, 48 percent of the world's steel, 37 percent of the world's aluminum and 61 percent of the world's cement.

Pursuant to AP6, eight government and business taskforces were established in the areas of: 1) cleaner fossil energy; 2) renewable energy and distributed generation; 3) power generation and transmission; 4) steel; 5) aluminum; 6) cement; 7) coal mining; and 8) buildings and appliances.[124] Unlike Kyoto, the AP6 allows signatories to establish their own goals for reducing emissions, leading some to speculate on the potential efficacy of the program.[125] Nevertheless, it represents an international commitment to achieving GHG reductions, a commitment absent from U.S. policy since the Bush Administration's withdrawal from Kyoto.

CHAPTER IV ENDNOTES:

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[3] *Office of the Mayor*, Seattle.gov, at http://www.seattle.gov/mayor/climate/; *See Mayors Climate Change Agreement*, *supra* note 3, Chapter 4.

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[6] *Id*.
[7] *Mayors for Climate Protection*, at http://www.coolmayors.com/common/news/reports/detail.cfm?Classification=report&QID=3475&ClientID=11061&TopicID=0&ThisPage=4.
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[10] *Id*.
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[17] *Id*. at 4-5.
[18] *See* Samuelsohn*, supra* note 148, Chapter 3; Scott, *supra* note 105, Chapter 3.
[19] Rabe, *supra* note 14, Chapter 4, at 11.
[20] *Id*. at 9-10.
[21] *Id*. at 16.
[22] Pew Center on Global Climate Change, *Carbon Sequestration in Agriculture*, http://www.pewclimate.org/states.cfm?ID=45.
[23] Pew Center on Global Climate Change, http://www.pewclimate.org/states.cfm (enter 'Forestry' in Keyword).
[24] Rabe, *supra* note 14, Chapter 4, at 23-25.
[25] Pew Center on Global Climate Change, *Greenhouse Gas Standards for Vehicles*, http://www.pewclimate.org/states.cfm?ID=51; Pew Center on Global Climate Change, *Zero-Emission Vehicle Incentive Program*, http://www.pewclimate.org/states.cfm?ID=16.
[26] www.dsireusa.org/library/includes/topic.cfm?TopicCategoryID=6&CurrentPageID=10&EE=1&RE=1.
[27] *Id*.
[28] *Id*.
[29] *Id*.
[30] April Reese, '*Patchwork' of State GHG Curbs Emerging in West*, http://www.eenews.net/Greenwire/2005/09/21/archive/9/.
[31] *Id*.
[32] Michael Hawthorne, *Governor Moves to Cut State Pollution*: *Greenhouse Gas Emission Limit Set*, Chicago Tribune, Oct. 5, 2006, at Metro 1.
[33] *Id*.
[34] *Id.*
[35] Pew Center on Global Climate Change, *What's Being Done in the* States, http://www.pewclimate.org/what_s_being_done/in_the_states/emissionstargets_map.cfm
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[38] *Id*.
[39] Rabe, *supra* note 14, Chapter 4, at 7.
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[41] *Id*.
[42] Cathy Booth Thomas, *The Big Deal Goes Green*, TIME, Mar. 12, 2007, at 18.
[43] *Id*.
[44] *See Id*.
[45] Arthur O'Donnell, *30 States Discuss Proposed Emissions Registry*, http://www.eenews.net/Greenwire/print/2006/10/04/14.

[46] *Id.*
[47] *Id*.
[48] Western Governors' Association Policy Resolution 06-3, Regional and National Policies Regarding Global Climate Change, June 13, 2006, http://www.westgov.org/wga/policy/06/climate-change.pdf.
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[50] *Id*.
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[68] Darren Samuelsohn, *Pew Director Forecasts 2010 as Best Guess for Warming Law*, E & E NEWS PM (Oct. 18, 2006).
[69] *Id*.
[70] *Id*.
[71] Larry Parker, C.R.S. Report, *Climate Change: Greenhouse Gas Reduction Bills in the 110th Congress* (Jan. 31, 2007).
[72] David A. Grossman, *Warming Up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation*, 28 COLUM. J. ENVTL. L. 1, 25 (2003).
[73] Robert L. Rabin, *Environmental Liability and the Tort System*, 24 HOUS. L. REV. 27, 28-29 (1987).
[74] *See Missouri v. Illinois*, 200 U.S. 496 (1906) (refusing to grant relief to Missouri from Illinois's sewage being dumped into the Mississippi River since Missouri's own cities followed similar sewage practices).
[75] Grossman, *supra* note 72, Chapter 4, at 6.
[76] *Id.* at 24.
[77] Rabin, *supra* note 73, at 29.
[78] Benjamin P. Harper, *Climate Change Litigation: The Federal Common Law of Interstate Nuisance and Federalism Concerns*, 40 GA. L. REV. 661, 690 (2006).
[79] *Id.*
[80] *Id.* at 697.
[81] *Id.* at 697–98.
[82] Sidley Austin Brown & Wood LLP, *Climate Change Litigation – Recent Developments*, MONDAQ BUS. BRIEFING, Nov. 11, 2005.
[83] 42 U.S.C. § 7521(a)(1) (2000). The statute states:

> The Administrator (of the EPA) shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission 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.

84 *See Massachusetts*, 415 F.3d at 50.

[85] *Id.*
[86] *Massachusetts*, 415 F.3d at 56.
[87] *Id.*
[88] *Id.*
[89] *Id.* at 57–58.
[90] *Id.*
[91] *Id.* at 59 (Sentelle, J., concurring in judgment).
[92] *Id.* (Sentelle, J., concurring in judgment).
[93] *Id.* at 61-65 (Tatel, J., dissenting).
[94] *Id.* (Tatel, J., dissenting).
[95] *Id*. at 67 (Tatel, J., dissenting) (allowing EPA to regulate pollutants or a "substance or matter which is emitted into the air").
[96] *Id.* (Tatel, J., dissenting) (discussing 42 U.S.C. § 7521(a)(1)).
[97] *Id.* at 74 (Tatel, J., dissenting).
[98] Darren Samuelsohn, *Supreme Court Appears Divided in Global Warming Case*, E&E NEWS PM, Nov. 29, 2006.
[99] *Id.*
[100] *Id.*
[101] Env't News Service, *Global Warming Lawsuit Against U.S. Agencies Passes Court Test* (Aug. 25, 2005), http://www.ens-newswire.com/ens/aug2005/2005-08-25-02.asp.
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[105] 40 C.F.R. § 1501.4(b)(2006)
[106] ClimateLawsuit.org, *supra* note 103, Chapter 4.
[107] *Id.*
[108] Env't News Service, *supra* note 101, Chapter 4.
[109] *Id.*
[110] Cinnamon Carlarne, *Climate Change Policies an Ocean Apart: EU and U.S. Climate Change Policies Compared*, 14 PENN. ST. ENVTL. L. REV. 435, 545–55 (2006).
[111] ClimateLawsuit.org, *supra* note 103, Chapter 4.
[112] *Id.*
[113] Sidley Austin Brown & Wood LLP, *supra* note 80, Chapter 4.
[114] Carlarne, *supra* note 110, at 455.
[115] Harper, *supra* note 78, Chapter 4, at 666-67.
[116] Grossman, *supra* note 72, Chapter 4, at 30-31.
[117] Carlarne, *supra* note 110, at 455.
[118] *Connecticut v. Am. Elec. Power Co*., 406 F. Supp. 2d 265, 274 (S.D.N.Y. 2005) (quoting *Vieth v. Jubelirer*, 541 U.S. 267, 278 (2004)).
[119] *Id.*
[120] Carlarne, *supra* note 110, at 455-56.
[121] Darren Samuelsohn, *Six-Nation Pact Draws Enviros' Fire, as E.U. Offers Cautious Praise*, GREENWIRE, July 28, 2005.
[122] *Id.*
[123] Press Release, Prime Minister of Australia, Asia-Pacific Partnership Sets New Path, to Address Climate Change (Jan. 12, 2006), http://www.pm.gov.au/news/media_releases/media_Release1743.html.
[124] *Id.*
[125] Charter for the Asia-Pacific Partnership on Clean Development and Climate § 2.1 (Jan. 12, 2006), http://www.asiapacificpartnership.org/Charter.pdf; Miguel Bustillo, *U.S. Attacked on Its Climate Stance; Canada's Paul Martin, at a U.N. on Global Warming, Warns That All Nations Must Work to Cut Greenhouse Gas Emissions*, L.A. TIMES, Dec. 8, 2005 at A20.

CHAPTER V: ACTIVITIES BY PRIVATE FIRMS TO REDUCE GHG EMISSIONS

Climate change stands to have a tremendous impact on the global marketplace. In October 2006, Tufts University researchers announced the findings of a study that global warming could cost the global economy $20 trillion per year—six to eight percent of global economic output—by the end of the century.[1] The study also found that spending $3.03 trillion per year now would save $12.14 trillion in economic damage per year in the future.[2] America is also experiencing a so-called Green Revolution where socially conscious companies are not only making a difference for the environment, they are also improving their bottom line. These reasons and others have caused businesses in nearly every sector of the economy to take notice of the potential effect that climate change and subsequent GHG regulation will have on profit margins and public goodwill.

Much like the general public however, companies are in varied stages of acceptance of climate change and consideration of its effects. This is evident in the alternate strategies of two companies in the oil and gas industry, Exxon Mobile and British Petroleum (BP). Exxon's top executives have questioned whether climate change is actually occurring[3] and has been criticized for funding organizations that misrepresent scientific information.[4] Conversely, BP set a goal of GHG reductions to 10 percent below 1990 levels by 2010.[5] The company achieved this target by 2001 (9 years early) and has since continued to reduce its GHGs, promote energy efficiency and invest in research concerning renewables and low carbon technologies.[6]

Ceres, a national organization of investors and public interest organizations helping companies address sustainability, recently named BP's corporate reduction strategy best among the companies studied.[7] The Ceres report profiled 76 U.S. companies and 24 non-U.S. companies in ten industry sectors.[8] "The scoring system—out of 10—gave most credit to companies with a sustained commitment to controlling greenhouse gas emissions, disclosing data and strategies, supporting regulatory actions, and taking practical, near-term steps to find lasting solutions to climate change."[9] (See Figure 5-1).

Figure 5-1: CERES, Climate Governance Index Results (Score out of 100)

Sector	Leaders	Lowest
Oil/Gas	BP (90 points*)	ExxonMobil (35)
Chemical	DuPont (85**)	PPG (21)
Metals/Mining	Alcan (77) & Alcoa (74)	Newmont (24)
Electric Power	AEP & Cinergy (both 73)	Sempra Energy (24)
Auto	Toyota (65)	Nissan (33)

* Top score among the 100 companies (out of 100)
**Top score among 76 U.S. companies

Source: http://www.ceres.org/news/news_item.php?nid=154

The Carbon Disclosure Project (CDP) is an organization that provides a clearing-house for institutional investors regarding the business implications of climate change, comprising the largest registry of corporate greenhouse gas emissions in the world.[10] This information is increasingly utilized by investors to manage their investments in the face of uncertain environmental costs and inconsistent corporate preparation with respect to a mandatory federal GHG reduction program.[11] The CDP issues an annual information request whereby many institutional investors collectively sign a single global request for disclosure of information on GHG emissions. The CDP 5 Information Request—issued on Feb. 1, 2007—was signed by over 280 institutional investors managing assets valued at over $41 trillion; the Request was sent to over 2,400 companies.[12] Over 940 companies answered the CD4 Request in 2006, representing 3,343,618,288 tons of CO2e, or approximately 10 percent of global GHG emissions.[13] The CDP 4 Report found that the best positioned companies could have windfall profits equaling more than $298 million, or 10 percent of their earnings, while the worst positioned could lose 25 percent of their revenue.[14] The report also concluded that GHG reductions will be less costly than previously expected.[15] Eighty-seven percent of the responding companies indicated that climate change posed "commercial risks and/or opportunities," with 48 percent of these concerned companies having an established GHG reduction program.[16]

Corporate strategies to reduce GHGs vary in their methods, from switching fuels to using less CO_2 intensive products in manufacturing to implementing energy conservation plans.[17] Reasons for implementing such a strategy are similarly diverse: (1) companies like Whole Foods depend on their "green" image for marketing purposes; (2) businesses involved in agriculture or the utilities industry are concerned with financial losses due to climate variability; (3) large corporations like Wal-Mart see GHG reductions as a side effect of energy efficiency programs that help their bottom line; (4) upstream energy intensive industries, like utilities and oil and gas producers, are concerned about the potential of GHG caps and increased competition in a low carbon market; and (5) finally, some firms, like those involved in renewable energy production, see GHG reduction as a market niche in itself. One or more of these justifications have lead some corporations, many Fortune 500 companies, to commit to a GHG reduction goal. (See Figure 2)

The heads of 10 Fortune 500 companies and four environmental organizations joined together on the eve of President Bush's 2007 State of the Union Address to lobby for a mandatory GHG reduction program for the United States.[18] These companies, forming the United States Climate Action Partnership (US-CAP), argue that voluntary strategies to reduce GHGs are insufficient.[19] In "A Call for Action," A US-CAP Report, the organization states, "we know enough to act on climate change," and calls for legislation enacting a cap-and-trade program binding all major emitting industries, and requiring a cut in GHG emissions by at least 10 percent within a decade and by as much as 60 percent by 2050.[20] However, the Bush administration continues to oppose mandatory GHG reductions.[21] Expecting a world of carbon constraints and climate change, in lieu of federal legislation, companies have pioneered a variety of strategies aimed at reducing their contribution to climate change, minimizing the risks associated with inaction and profiting from new technologies and markets. Methods that have already been adopted by some companies and industry groups, as well as their plans for future action, are discussed below.

Figure 5-2: Corporate GHG Reduction Goals		
COMPANY	**INDUSTRY**	**GHG REDUCTION GOAL**
General Motors*	Automotive	Reduce total GHG emissions by 10% for all North American facilities from 2000 to 2005.
Mack Truck, Inc. (MTI)*	Automotive	Reduce U.S. GHG emissions by 20% per unit produced from 2003 to 2010.
Toyota	Automotive	Reduce CO_2 emissions by 5% from 1990 levels by 2005, and by 10% from 1990 levels by 2010.
Volvo Trucks NA*	Automotive	Reduce U.S. GHG emissions by 20% per truck produced from 2003 to 2010.
CA Portland Cement*	Cement	Reduce U.S. GHG emissions by 9% per production index from 2003 to 2012.
Holcim (US) Inc.*	Cement	Reduce U.S. GHG emissions by 12% per ton of cement from 2000 to 2008.
St. Lawrence Cement*	Cement	Reduce global GHG emissions by 15% per ton of cementitious product from 2000 to 2010.
DuPont Company*	Chemical	Reduce GHG emissions by 65% from 1990 levels by 2010. Reduce total global GHG emissions by 15% from 2004 to 2015.
Hewlett-Packard	Computers	Reduce PFC emissions by 10% from 1990 levels by 2005.
North Bay Construction*	Construction	Reduce total U.S. GHG emissions by 20% from 2005 to 2010.
Conservation Serv. Gp.*	Consulting	Achieve net zero U.S. GHG emissions by 2006 and maintain that level through 2010.
First Environment, Inc.*	Consulting	Achieve net zero U.S. GHG emissions by 2008.
Shaklee Corporation*	Consumer Products	Maintain net zero U.S. GHG emissions from 2006 to 2009.
Lockheed Martin*	Engineering	Reduce U.S. GHG emissions by 30% per dollar revenue from 2001 to 2010.
Raytheon Company*	Engineering	Reduce U.S. GHG emissions by 33% per dollar revenue from 2002 to 2009.
N. Renewable Energy Lab.*	Federal Gov.	Reduce U.S. GHG emissions by 10% per square foot from 2000 to 2005.
Bank of America*	Financial Services	Reduce total U.S. GHG emissions by 9% from 2004 to 2009.
HSBC - North America*	Financial Services	Reduce total U.S. GHG emissions by 10% from 2005 to 2010.
Sonoma Wine Company*	Food Processing	Reduce total U.S. GHG emissions by 15% from 2005 to 2010.
Frito-Lay, Inc.* (Pepsi Co.)	Food Services	Reduce U.S. GHG emissions by 14% per pound of production from 2002 to 2010.
Weyerhaeuser	Forest Products	Reduce GHG emissions by 40% by 2020 through greater reliance on renewable fuels.

Corporate GHG Reduction Goals (Continued)		
COMPANY	**INDUSTRY**	**GHG REDUCTION GOAL**
IBM Corporation*	Hardware Manuf.	Achieve 1) average annual CO2 emissions reductions equivalent to 4% of the emissions associated with the company's worldwide energy use and 2) an absolute 10% reduction in perfluorocompound (PFC) emissions from IBM's semiconductor manufacturing processes from 2000 to 2005.
Baxter International*	Health Services	Reduce U.S. GHG emissions by 16% per unit of production value* from 2000 to 2005. Reduce energy use and associated GHG emissions by 30% per unit of product value from 1996 levels by 2005.
Johnson & Johnson*	Health Services	Reduce total U.S. GHG emissions by 14% from 2001 to 2010.
Roche Group U.S. *	Health Services	Reduce total U.S. GHG emissions by 10 % from 2001 to 2008.
Marriott International*	Hotel Services	Reduce U.S. GHG emissions by 6% per available room from 2004 to 2010.
3M*	Manufacturing	Reduce total U.S. GHG emissions by 30% from 2002 to 2007.
ABB	Manufacturing	Reduce GHG emissions by 1% each year from 1998 through 2005.
Alcan	Manufacturing	Reduce GHG emissions by 575,000 tons CO2e between 2001 and 2005. Reduce GHG emissions by 35% from 1990 until 2005.
Alcoa*	Manufacturing	Reduce GHG emissions by 25% from 1990 levels by 2010, and by 50% from 1990 levels when their inert anode technology is fully commercialized.
Ball Corporation*	Manufacturing	Reduce U.S. GHG emissions by 16% per production index from 2002 to 2012.
Baltimore Aircoil*	Manufacturing	Reduce U.S. GHG emissions by 15% per ton of steel processed from 2004 to 2009.
Caterpillar Inc.*	Manufacturing	Reduce global GHG emissions by 20% per dollar revenue from 2002 to 2010.
Cummins Inc.*	Manufacturing	Reduce global GHG emissions by 2 % per dollar revenue from 2005 to 2010.
Eastman Kodak *	Manufacturing	Reduce total global GHG emissions by 10% from 2002 to 2008.
General Electric *	Manufacturing	Reduce total global GHG emissions by 1% from 2004 to 2012 and the intensity of GHG emissions 30% by 2008 (both compared to 2004).
Hasbro, Inc.*	Manufacturing	Reduce total U.S. GHG emissions by 30% from 2000 to 2007.
Haworth, Inc.*	Manufacturing	Reduce U.S. GHG emissions by 20% per dollar sales from 2004 to 2009.
Interface, Inc.*	Manufacturing	Reduce U.S. GHG emissions by 15% per unit of production from 2001 to 2010.
International Paper*	Manufacturing	Reduce total U.S. GHG emissions by 15% from 2000 to 2010.

Corporate GHG Reduction Goals (Continued)		
COMPANY	**INDUSTRY**	**GHG REDUCTION GOAL**
Miller Brewing Company*	Manufacturing	Reduce U.S. GHG emissions by 18% per barrel of production from 2001 to 2006.
SC Johnson*	Manufacturing	Achieve an absolute GHG reduction of 8% for all U.S. operations from 2000 levels by 2005 (or reduce GHG emissions intensity by 23% (per kilograms of product manufactured) from 2000-2005.) Reduce GHG emissions from the top five factories worldwide by 5% per year from 2000 to 2005.
The Collins Companies*	Manufacturing	Reduce total U.S. GHG emissions by 18% from 2000 to 2010.
United Technologies*	Manufacturing	Reduce global GHG emissions by 16% per dollar of revenue from 2001 to 2006.
Whirlpool Corporation	Manufacturing	Decrease absolute total greenhouse gas emissions from global manufacturing, product use and end-of-life by 3% by 2008 based on a 1998 baseline.
Xerox Corporation*	Manufacturing	Reduce total global GHG emissions by 10% from 2002 to 2012.
Sterling Planet, Inc.*	Marketing	Achieve net zero U.S. GHG emissions by 2006 and maintain that level through 2010.
Rio Tinto	Mining	Reduce on-site GHG emissions per unit of production by 4.8% from 1990 levels by 2001. Reduce on-site GHG emissions per unit of production by 4% from 2003 levels by 2008.
BP*	Oil and Gas	Reduce GHG emissions by 10% from 1990 levels by 2010. Maintain net emissions at or below 2001 levels over the next decade.
Royal Dutch/Shell	Oil and Gas	Reduce GHG emissions by 10% from 1990 levels by 2002. Actively manage GHG emissions such that by 2010 emissions are still 5% or more below 1990 levels, even while they grow their business.
Novartis	Pharmaceutical	Reduced CO2 emissions by 3% absolute (based on 2000, i.e. 1%/ year). (Achieved 2.8% in spite of production increase of 4.8%.)
Pfizer Inc.*	Pharmaceutical	Reduce global GHG emissions by 35% per dollar of revenue from 2000 to 2007.
Ecoprint*	Printing	Achieve net zero U.S. GHG emissions by 2006 and maintain that level through 2010.
Melaver, Inc.*	Real Estate	Achieve net zero U.S. GHG emissions by 2006 and maintain that level through 2009.
Gap Inc.*	Retail	Reduce U.S. GHG emissions by 11% per square foot from 2003 to 2008.
Staples, Inc.*	Retail	Reduce total U.S. GHG emissions by 7% from 2001 to 2010.
Advanced Micro Devices*	Semiconductor	Reduce global GHG emissions by 40% per manufacturing index from 2002 to 2007.

Corporate GHG Reduction Goals (Continued)		
COMPANY	**INDUSTRY**	**GHG REDUCTION GOAL**
Intel Corporation*	Semiconductor	Achieve an absolute 10% reduction in PFC emissions from 1995 levels by 2010. Reduce global GHG emissions by 30% per production unit from 2004 to 2010.
STMicroelectronics*	Semiconductor	Reduce U.S. GHG emissions by 50% per manufacturing unit from 2000 to 2010.
EMC Corporation*	Software	Reduce U.S. GHG emissions by 8% per square foot from 2005 to 2012.
Oracle Corporation*	Software	Reduce U.S. GHG emissions by 6% per square foot from 2003 to 2010 for all non-data center space and to purchase 5% green power for data centers.
Sun Microsystems, Inc.*	Software	Reduce total U.S. GHG emissions by 20% from 2002 to 2012.
American Electric Pow.*	Utilities	Reduce total U.S. GHG emissions by 4% below an average 1998-2001 base year by 2006.
Calpine*	Utilities	Reduce U.S. GHG emissions by 4% per megawatt hour from 2003 to 2008.
DTE Energy	Utilities	Reduce GHG emissions by 5% from 1999 levels by 2005.
Duke Energy	Utilities	Reduce GHG emissions to an average of 5% below their 2000 level during the period 2010 through 2012.
Entergy Corporation*	Utilities	Reduce total U.S. GHG emissions by 20% from 2000 to 2010.
Exelon Corporation*	Utilities	Reduce total U.S. GHG emissions by 8% from 2001 to 2008.
FPL Group, Inc.*	Utilities	Reduce U.S. GHG emissions by 18% per kWh from 2001 to 2008.
Green Mountain Energy*	Utilities	Achieve net zero U.S. GHG emissions by 2005 and maintain that level through 2009.
Pub. Service Enterprise Gp.*	Utilities	Reduce U.S. GHG emissions by 18% per kWh from 2000 to 2008.
PG&E Corporation	Utilities	Reduce annual sulfur hexafluoride (SF_6 – a greenhouse gas) emissions by 50%, compared with the 1998 baseline. Reduce SF_6 emissions by 60% by year-end 2007, compared with the 1998 baseline.
TransAlta Corporation	Utilities	Return GHG emissions to 1990 levels by 2000.

* Climate Leaders Partner
Blue Text = Fortune 500 Company
Sources: Climate Leaders, http://www.epa.gov/stateply/partners/index.html;
Pew Center on Global Climate Change, http://www.pewclimate.org/companies_leading_the_way_belc/targets/.

A. OIL AND GAS : BP AND SHELL

In a departure from its traditional stance, the oil and gas industry is now using its substantial political clout to pressure the federal government into enacting carbon dioxide constraints.[22] At an October 2006 energy conference in Washington, D.C., Shell Oil Company's CEO John Hofmeister urged the United States government to establish a "rational national greenhouse gas framework" that supports carbon trading amongst stakeholders.[23] The rationale behind this insistence on a federal regulatory framework is basically twofold. First, the forecast for US regulation is currently so opaque that companies are finding it difficult to make substantial investments for fear of not being credited for their actions or running afoul of subsequent GHG regulation.[24] As a result, technological advancement is stalling. Second, the industry fears that a patchwork of GHG regulation based on individual state and national programs and concerns will create extensive compliance and transactions costs for its globalized companies.[25] Despite the reluctance of the United States government to impose GHG regulations, individual firms within the industry have begun to address GHG emissions and potential regulatory schemes.

i. BRITISH PETROLEUM

BP's chief executive has said that "it is becoming clear that the reduction of greenhouse gas emissions is a soluble problem, and that the mechanisms for delivering the solutions are within reach."[26] BP has therefore established company-wide goals for CO_2 emissions and its own trading program to help individual units within the company meet these standards.[27] BP's trading program operated between 1999 and 2001, helping the company reduce its GHG emissions by 10 percent.[28] The cap-and-trade system involved BP's worldwide operations, comprising over 150 business units operating in 100 countries.[29] Under their system BP allocated a specific amount of emissions credits to each of its business units, who were allowed to sell credits through a central trading platform if their actual emissions were less than their allocations.[30] Allowances were grandfathered at 1998 levels.[31] The allowances were canceled when plants closed, while plants acquired by BP were also given allocations based on 1998 levels.[32] No allocations were provided to account for growth in operations.[33] Banking between years was allowed, but only at a level of five percent of yearly allocations.[34] Total trades on the system amounted to 2.7 million tons of CO_2 at an average price of 7.60 per ton of CO_2 equivalent in 2000 and 4.5 million tons at an average price of $36 per ton in 2001.[35]

BP claims their emissions trading experiment taught them valuable lessons with respect to organizing an ETS, including the necessity of keeping the system simple, engaging key stakeholders, tracking data effectively, ensuring penalties for non-compliance and establishing clear guidelines.[36] Administrators also concluded that multi-year programs encouraged greater investment in capital projects and capital cycles, and that price alone did not determine the extent of reduction efforts.[37] Aside from this experiment, BP is also involved in the United Kingdom ETS, where it made the system's first trade, and is involved in applying new Clean Development Mechanism rules to a solar project in Brazil.[38]

Beyond emissions trading, BP, ConocoPhillips, Shell and Scottish and Southern Energy are examining the feasibility of building a $600 million hydrogen plant.[39] The proposed 350 MW power station would convert natural gas to hydrogen and CO_2.[40] The hydrogen would be used to generate electricity and the CO_2 would be exported to a North Sea oil reservoir for increased oil recovery and ultimate storage.[41] This process would reduce the amount of CO_2 released into the atmosphere by 90 percent, leading BP to call this a "carbon-free" power plant.[42] 1.3 million tons of CO_2 could be sequestered annually.[43] Already, 8 million tons of CO_2 have been captured and stored through other injection and storage projects.[44] More research in this area is being done so the technology can be widely applied at other power plants.[45] Additionally, in 2005 BP launched its low-carbon business, BP Alternative Energy to invest in the development of wind, solar, hydrogen and clean gas power.[46] Over the next three years, BP has plans to increase sales of solar products, develop a profitable wind business and build two industrial-scale hydrogen power plants.[47]

ii. SHELL

Shell is touting the value of clean coal, cap-and-trade emissions trading mechanisms and sustainable alternatives to oil and natural gas consumption.[48] Specifically, Shell is promoting the efficacy of Integrated Gasification Combine Cycle (IGCC) power plants.[49] These types of power plants create electricity by burning synthetic coal gas, derived from gasified coal, in combined-cycle turbines.[50] The synthetic gas passes through "pollutant-scrubbing" equipment that removes sulfur dioxide, nitrogen oxide, mercury and trace particulates.[51] There are currently around 120 gasification plants in operation around the world, with about two dozen demonstration IGCC plants in the U.S. and more in the planning stage.[52] Additionally, Shell has agreed to work with California Governor Arnold Schwarzenegger to establish the rules for his state's emerging cap-and-trade program.[53]

Shell also established an ambitious internal trading system which met with limited success.[54] The Shell Tradable Emissions Permit System (STEPS) was launched in 2000.[55] STEPS used an internal cap-and-trade scheme designed to last three years for units within the company who joined the program voluntarily.[56] The ultimate goal was to reduce emissions for the participating units to two percent below 1998 levels.[57] While the experiment did give Shell some experience in both trading emissions permits and calculating the cost curves for GHG abatement, it was plagued by problems.[58] For instance, the voluntary program did not attract enough participants to attain the liquidity that would be seen in a broader market with mandatory participation.[59] Additionally, midway through the program, certain units asked for and received extra permits from administrators, creating uncertainty and softness in the already illiquid market.[60]

Shell is also investing in several other projects.[61] In a partnership with General Motors, Shell is working to develop a hydrogen cell vehicle for which it is aiming to be the primary distributor of hydrogen fuel.[62] It is also funding a large wind farm in Mount Storm, West Virginia and another on Maui, both of which will produce electricity without emitting CO_2.[63] Beyond existing technology, Shell is investing in a new solar technology called copper indium diselenide technology.[64] This technology is a new thin-film photovoltaic module that, when exposed to sunlight, converts the sun's energy into electricity at a cost up to 10 times less than the silicon-based cells presently on the market.[65]

B. ENERGY & UTILITIES: DUKE ENERGY

Duke is a participant in the Department of Energy's 1605(b) voluntary GHG reporting program as well as a partner in the EPA's Climate Leaders program.[66] From 1991 through 2005, Duke has either biologically sequestered or cut carbon dioxide emissions equivalent to about 175 million metric tons.[67] It has employed many strategies to accomplish these reductions, including improved efficiency at coal-fired electric generating facilities, landfill methane capture, recycling and re-use of coal byproducts, end-use energy conservation programs and others.[68] Duke has also partnered with three different carbon sequestering initiatives and is participating in a field study to determine the best methods for capturing and permanently storing carbon dioxide.[69] While coal is still a vital part of their energy production, Duke is building highly efficient coal processing units that incorporate various emissions controls.[70]

Duke's Chairman, in the face of much criticism publicly called for the federal government to tax companies based on the amount of GHGs they release into the atmosphere.[71] Through this program, dubbed "US-CAP," he joined other leaders in the energy and technologies industries who are concerned about the environment, but are also interested in a unified national standard of emissions control as opposed to a 'patchwork' of regional, state and local regulations.[72] Duke favors a climate change policy that is economy-wide, national in scope, market-based, gradual in reducing and simple to implement.[73]

Aside from Duke's corporate climate change goals, the company has instituted a program that will assist its customers in becoming more energy efficient.[74] Duke plans to invest 50 million dollars per year in energy efficiency programs.[75] Duke also expects to profit from its conservation efforts, a result of the "decoupling" of the utilities' energy sales from the amount of revenue it is allowed to receive by local utilities commissions.[76] See Chapter 4. Decoupling allows utilities to encourage conservation because they are no longer dependant on consumption and revenue from consumers to cover fixed costs like pipes, wires and employment.[77] Duke hopes to introduce conservation products that consumers will use, reducing their utility bills and the need for Duke to build more coal power plants.[78]

C. INSURANCE: AIG

Companies providing insurance and financial services stand to gain, or lose, billions of dollars as a result of climate change. For instance, U.S. insurance companies typically set their rates using historical weather patterns that are likely to change due to the cumulative effect of GHG emissions on the environment.[79] Before Hurricane Katrina, most insurance industry models assumed that three catastrophic hurricanes would not occur in the same year in the U.S.[80] This assumption proved incorrect in the summer of 2006 as Hurricane Katrina became 10 times more costly than any other hurricane in U.S. history.[81] Furthermore, wildfire-prone areas, like those recently ravaged in the Western United States, are very susceptible to climate change induced disasters.[82] Insurance companies across the US and all over the world are adapting their traditional products and services to account for the risks posed by GHG emissions on the environment.[83]

Insurers now protect companies from economic losses if energy efficiency projects do not produce the intended energy savings.[84] They also encourage commercial building owners to demand green building standards and they guarantee carbon emissions credits to encourage participation in emissions trading markets.[85] As Mindy Lubber, the President of Ceres, noted in August 2006, "[w]hile climate change poses a potential threat, it also creates vast new business opportunities for insurance companies."[86]

AIG, the largest insurance company in the world, has released a comprehensive climate change policy. Seeing business opportunities arising from market-based environmental polices, AIG has designed extensive investment and insurance plans that will encourage GHG reduction and trading.[87] The company plans to leverage the financial value coming from GHG emissions reductions as well as other incentives for lower emissions.[88] AIG will also develop products and services to help its clients reduce emissions and support emerging carbon credit trading markets in the US and abroad.[89] On the insurance side, AIG will promote emissions mitigation technology and projects by marketing its existing insurance products and "bundling" new policies for renewable energy developers.[90] To help implement this extensive policy, AIG has established an Office of Environment and Climate Change headed by former Vice-President of the Chicago Climate Exchange, Alice LeBlanc.[91] This office will not only manage the aforementioned plans, it will also address AIG's own environmental footprint and focus on what the company can do to ameliorate its negative environmental impacts.[92]

Over the next 18 to 24 months, AIG plans to make drastic changes to accommodate the company's climate change policy.[93] The Global Investment Groups will allocate additional private equity investments to projects, technologies and other assets that contribute to GHG emissions mitigation with an overarching goal of promoting products that generate tradable carbon credits.[94] This part of the plan will focus on the investment potential of forestry assets, renewable energy resources and "green" real estate.[95] AIG's Capital Markets operations look to participate in the EU ETS as well as help developing economies earn certifiable carbon credits.[96] Though the US currently does not have a mandatory GHG emissions trading market like the EU, part of AIG's long term plan includes the promotion of such a market's development.[97] To realize this goal, AIG plans to develop risk management-derivative products to support the market.[98] It will also serve as an intermediary for risk transfer for investing companies.[99] AIG hopes to add carbon credits to the Dow-Jones AIG Commodity Index and provide brokerage and GHG management services to clients restricted by compliance obligations such as those stipulated by Kyoto.[100]

D. AUTOMOTIVE: FORD MOTOR COMPANY

Ford established their Climate Change Task Force in 2003 to examine strategies to reduce GHG emissions from its operations.[101] The Task Force focuses on three areas, planning fuel economy improvements, developing a strategic approach to "sustainable mobility" and drafting Ford's report on climate change.[102] The auto-industry's first stand-alone report on climate change, issued in 2005, provides Ford's key principles for the realization of a sustainable auto industry.[103] First, the cost of reducing emissions varies tremendously by source, necessitating the establishment of a cost signal for CO_2 to promote the most efficient reductions.[104] Second, changes in fuel, automobiles and driver's habits will be required to reduce GHGs from the automotive industry.[105] Third, future climate change scenarios are uncertain and flexibility will need to be built into any future GHG reduction program.[106] Finally, early actions to increase fuel efficiency and reduce GHG emissions may prevent more costly steps later.[107]

Aside from participating in the debate over new fuel efficiency standards, Ford has reduced emissions from its manufacturing processes.[108] Ford participates in the Department of Energy's 1605(b) program and reported emissions reductions equaling 1.3 million tons of CO_2 between 1998 and 2003.[109] Ford also committed to reducing its GHG emissions from its U.S. plants by 10 percent below 1998-2001 levels by 2006.[110] Operations in Canada are also part of an agreement to reduce manufacturing process emissions by 5.3 million tons between 2005 and 2010.[111] Furthermore, in Europe, the company is part of a non-binding industry agreement to reduce GHG emissions and fuel consumption by 25 percent between 1995 and 2008.[112] However, Ford is against efforts to achieve additional emissions reductions in Europe, including a tax on vehicular emissions, fearing it "could have substantial adverse effects on [their] sales volumes and profits.'"

To accomplish their reductions goals, Ford participates in both the Chicago Climate Exchange and the U.K Emissions Trading Scheme.[113] Ford also has 15 facilities regulated by the EU ETS.[114] Ford, like many large multinational companies, would like to see these trading approaches "harmonized to accommodate trading across different regions."[115] Aside from emissions trading, Ford has committed to reducing energy consumption in its facilities by one percent annually and purchases green power to cover five percent of its U.S. energy needs.[116] However, only 10 percent of an automobile's GHG emissions occur during manufacturing, the other 90 percent emit as a result of use.[117] As a result, Ford is testing over 50 hydrogen fuel cell test vehicles, developed the world's first partial zero-emission-capable diesel powertrain and announced plans to increase hybrid production tenfold to 250,000 vehicles.[118]

E. AIR TRANSPORTATION: VIRGIN AIRLINES

Airlines account for 13 percent of fossil fuel consumption by transportation worldwide,[119] up to 10 percent of the total U.S. transportation-based emissions of carbon dioxide,[120] and about two percent of global carbon dioxide emissions.[121] One cross-country flight burns approximately 100 gallons of fuel per passenger, which translates into one ton of carbon dioxide for every paying traveler.[122] Air travel is now recognized by many environmental groups and governments as a major contributor to climate change. As the travel industry grows, so do its harmful effects on the environment.[123] As a result, some airline companies are beginning to take steps to lessen emissions by updating fleets,[124] adjusting management systems,[125] and offering the option to offset carbon emissions to customers.[126]

Leading the industry in eco-responsibility is Virgin Atlantic and its chairman, Richard Branson. He pledged to invest three billion dollars in renewable energy initiatives over the next ten years and suggested a goal of reducing the airline industry's emissions by 25 percent.[127] Branson's plan is detailed in a letter he sent to industry leaders in both the airline and aircraft engineering sectors. The first suggestion, and one already being implemented to some degree by most airlines, is that of a "starting grid."[128] This concept allows for planes to be towed closer to the take off area, reducing the amount of time their engines are running, thereby burning less fuel and reducing their emissions.[129] Another Branson suggestion is known as the "continuous decent approach" in which planes begin their decent from a higher altitude and over a longer period of time.[130] This allows the planes to descend at a more efficient speed, reducing fuel burn and concomitant emissions.[131] Although not all traffic control authorities have adopted this approach, many domestic carriers have.[132] Other suggestions by Branson include building lighter aircrafts that require less fuel to fly and condensing Europe's many air traffic control organizations to optimize efficiency in trafficking.[133]

F. RETAIL: WAL-MART

Wal-Mart is the largest private electrical user in the United States and the second largest company based on revenue in the world behind Exxon Mobil.[134] In September 2006 Wal-Mart first reported its CO_2 emissions and hopes to build stores that create 30 percent fewer greenhouse emissions over the next four years.[135] Wal-Mart currently emits 20.8 million tons of CO_2 worldwide annually.[136] In 2006, the retail giant also launched an aggressive campaign to encourage sustainability of the world's fisheries, forest, and farmlands.[137] Pursuant to the plan, Wal-Mart will: slash gasoline use by its trucking fleet and use more hybrid trucks to increase efficiency; buy 100 percent of its wild-caught salmon and frozen fish from fisheries certified as "sustainable" by the non-profit Marine Stewardship Council; cut energy use at its more than 7,000 stores worldwide by 30 percent; and reduce solid waste from U.S. stores by 25 percent within three years.[138] Wal-Mart built one of two test lab stores in Aurora, Colorado;[139] the other facility is housed in McKinney Texas.[140] At these stores, Wal-Mart is experimenting with a multitude of potential energy solutions, including wind power to reduce CO_2 emissions and permeable asphalt to allow rainwater to seep through parking lots, refilling underground aquifers.[141] The company stands to make millions of dollars selling recycled trash and save millions more by cutting transportation costs and reducing energy use.[142]

Wal-Mart is also encouraging its customers to be more energy efficient. In November 2006 Wal-Mart and Sam's Club announced plans to sell 100 million compact florescent light bulbs (CFLs), by the end of 2007.[143] The "swirly" bulbs conserve 75 percent more energy then normal bulbs and could save customers over $3 billion in electricity costs during their lifespan.[144] The sales strategy involves interactive displays, educational materials, more shelf space, marketing campaigns and a competition to encourage stores and employees to encourage sales.[145] "Converting one conventional 60W bulb to a 13W CFL can save: $30 in electric costs over its lifetime; 10 conventional bulbs from being produced, transported and discarded in a landfill; 220 lbs. of coal from being burned; and 450 lbs. of greenhouse gases from reaching the air."[146] Wal-Mart's GHG reductions will be equivalent to taking 700,000 cars off the road or powering 450,000 single-family homes if the campaign's goals are achieved.[147]

G. FOOD SALES: WHOLE FOODS

In accordance with its overall mission to promote health and well being as the world's leading organic and natural foods supermarket, Whole Foods Market recently made the largest wind energy credit purchase in U.S. and Canadian history.[148] Austin, TX-based Whole Foods grossed $4.7 billion in sales in fiscal year 2005 with its 180 stores in the U.S., UK and Canada.[149] Its 2006 wind energy credit commitment makes the grocer the only Fortune 500 Company to offset 100 percent of its electricity use by purchasing wind credits.[150] The company began buying wind credits in late 2005 when it purchased 458,000 megawatt hours of renewable energy credits.[151] This purchase offset 700 million pounds of CO_2 in 2006; the equivalent of removing 600,000 cars from the road and planting 90,000 acres of new trees.[152] Whole Foods has chosen Boulder-based Renewable Choice Energy as its exclusive renewable wind energy credit supplier.[153] Renewable Choice is a leading national provider and marketer of wind power and is certified to sell wind energy anywhere in the U.S.[154]

Prior to this landmark wind power purchase, Whole Foods experimented with solar energy in several U.S. regions; 24 percent of the electricity for the Brentwood, CA Whole Foods

Market came from solar panels installed on the store's roof during one test in 2002.[155] This solar-generated energy prevents 140,000 pounds of CO_2 emissions per year—the equivalent of removing ten cars from the road or burning 58 fewer tons of coal.[156] Also, in March 2002 Whole Food's Berkeley, CA store became the company's first market to use solar power as its primary power source for lighting.[157] The store's roof-top solar panels will save more than one million kWh of petroleum-manufactured electricity over 25 years, the equivalent of 1,060 tons of CO_2 emissions.[158] Though the solar power experiment was successful, wind energy credits provide Whole Foods with a more efficient and less expensive method of offsetting its GHG emissions.[159]

H. WASTE DISPOSAL: WASTE MANAGEMENT, INC.

Waste Management, Inc. ("WMI") was one of the 14 founding members of the CCX.[160] As a founding member, WMI committed to a four percent reduction by 2006 from their average emissions occurring during baseline years of 1998 to 2001.[161] WMI has also been using the gas produced in its landfills for energy projects. WMI currently supplies landfill gas to 72 projects in 22 states.[162] In total these projects currently supply more than 200 megawatts of energy.[163] Furthermore, Wheelbrator Technologies, Inc. ("WTI") was created to facilitate WMI's waste-to-energy business.[164] WTI converts trash byproducts to fuel 16 waste-to-energy facilities across the United States.[165] These plants convert up to 23,285 tons of waste per day into electrical or steam energy, generating up to 671 megawatts of renewable energy per hour.[166] This amounts to enough energy to power some 575,000 homes.[167] In total, WTI has processed over 100 million tons of solid municipal waste into energy since 1975.[168]

I. AGRICULTURE: IOWA FARM BUREAU

North America lost over 50 percent of the carbon stored in its soils during the rush to clear lands and plow soils during western expansion.[169] Scientists estimate that conservation farming practices could sequester five to 15 percent of global GHG emissions in soils.[170] Farmers can therefore receive credits for conservation farming practices including no till, strip till and ridge till.[171] Conservation tillage can have significant environmental benefits, including carbon sequestration, increased water retention in the soil and a decrease in the energy required to produce a crop.[172] However, while markets are emerging for the sequestered carbon, some critics argue that providing offset credits to farmers who would have engaged in the practice anyway is unproductive.[173] Many farmers engaged in conservation tillage before the existence of carbon markets to conserve resources and money and promote sustainable agricultural production.[174]

The CCX is in the pilot stages of its agricultural offset program, where farmers are given tradable credits in exchange for conservation farming practices that reduce CO_2, capture methane or reduce nitrogen application.[175] The Iowa Farm Bureau is working with the CCX and offers assistance for offset projects, including "agricultural and landfill methane destruction in the U.S., carbon sequestration in U.S. agricultural soils [and] carbon sequestration in U.S. forestry projects."[176] The Iowa Farm Bureau is a "CCX aggregator" and is responsible for forming "pools" of carbon credits achieved from agricultural sources.[177] Exchange soil offsets ("XSOs"), fungible on the CCX, are offered to participating farmers who practice conservation tillage continuously between 2006 and 2010 at a rate of .5 tons of CO_2 equivalent per acre.[178] Farmers who choose to promote permanent grass cover on fields through 2010 will receive .75 tons of CO_2 equivalent per acre.[179] Harsh penalties are imposed on participants that break their commitments, including a

return of all of the issued offset credits, payment of a fine equal to 20 percent of the value of the returned credits and a prohibition on further participation in CCX.[180] Beyond Iowa, many other states like Nebraska and Montana are experimenting with no-till farming and carbon offsets. Also, the Canadian government is engaged in a C$1 million program to encourage carbon capture through conservation tillage.[181] The program involved over 194 farmers in its first year.[182]

J. PERSONAL AND BUSINESS OFFSET MARKETERS

Over 30 companies have emerged that provide tools for an individual, business or institution to calculate their GHG footprint—the amount of GHG emissions their lifestyles contribute to the atmosphere—and to offset their contribution to climate change by paying a fee that goes toward offsetting the impact on their GHG emissions.[183] An average person can usually go "carbon neutral" by offsetting all of the GHG emissions they are responsible for in a year by paying less than $100 (at $10 per ton of CO_2).[184] Offsets can also be purchased for specific activities such as driving, air flights or conferences.[185] The money paid to the offset provider generally is invested in projects promoting energy efficiency, renewable energy or GHG sequestration.[186] Offsetting a ton of CO_2 costs between $5 and $25 depending on the provider.[187] This range is caused by differences in the types of projects offered by offset providers. Some projects reduce more CO_2 for the dollar than others.

Differences also exist between offset providers with respect to ensuring the additional effect of the GHG offset.[188] For instance, less reputable offset providers do not provide specific information to consumers about the effect the consumers purchase will have on a GHG reduction project's viability.[189] A provider could claim 100 percent of a chosen project's GHG reduction while only contributing a small percentage to the project's cost.[190] This practice allows the provider to offer offsets to consumers at a lower price, thus undercutting competition that utilize more rigorous accounting procedures. Some offset providers also shy away from using Renewable Energy Certificates (RECs) – the equivalent of 1MW of renewable energy as RECs are oftentimes generated because of regulatory requirements, tax credits or high fuel prices and thus provide no additional environmental benefit.[191] Aside from complaints about additionality, critics say that offsets help to reduce consumer guilt, but have little effect on climate change.[192] Some even say that offsets have a negative effect, allowing people to forgo steps like using less electricity or driving less because they may feel they have already paid their dues.[193] However, even without accountability in the market and with critics portraying offsets as a copout, offset markets are thriving and new providers are appearing throughout the U.S.[194]

K. COLORADO COMPANIES

Colorado stands to be directly affected by Climate Change and the GHG regulation that will accompany it. About 51 percent of all power in the U.S. comes from coal fired power plants that emit about twice the CO_2 as gas fired plants.[195] Colorado receives about 80 percent of its electricity from coal fired plants.[196] Utilities, such as Xcel and Tri-State, the operators of most of these plants, will have to adapt if the federal government chooses to adopt a mandatory GHG reduction program. Both companies have already been affected by state programs such as the voter-initiated 10 percent Renewable Portfolio Standard (RPS) enacted by Amendment 37 in the 2004 election.[197] The tourism industry is also vulnerable to climate change impacts. The industry represents approximately ten percent of Colorado's economic base and is one of the largest

employment generators in the state, creating more than 200,000 jobs.[198] The year 2005 was a record-setting year for tourism in Colorado, which welcomed a total of 25.9 million visitors to the state who spent a total of $8.2 billion within Colorado's borders.[199] Of these nearly 26 million visitors during the 2005-2006 season; 12.5 million were skiers and snowboarders.[200] Decreases in snowfall, drought, forest fires, beetle kill and severe weather stand to have a significant impact on the ski and tourism industries. The heavily agrarian regions of Eastern Colorado and other industries dependent on the Colorado environment will also be affected by climate change as will other downstream businesses that rely on cheap electricity for their manufacturing or retail activities.

i. UTILITIES: XCEL ENERGY

With operations in eight Western and Midwestern states, Xcel Energy provides services to 3.2 million electricity customers and 1.8 million natural gas customers[201] and happens to be Colorado's largest utility provider.[202] In 2003, Xcel Energy ranked second among U.S. utilities for providing the most wind power to its customers by producing 829 MW.[203] The company expects to add about 1,700 MW of wind generation to its supply portfolio by the year 2012 through projects in Minnesota, Texas and Colorado.[204] Xcel also plans to reduce emissions by spending about $1 billion to convert two coal fired power plants to gas powered plants and to add pollution control equipment to another coal fired plant.[205] When construction started on the 750 MW coal fired unit at the Comanche generating station near Pueblo, Colorado, the plans included retrofitting other plants to reduce their emissions just enough so that there would be no new net emissions created from the Pueblo coal power unit.[206] This voluntary carbon management strategy is all part of the plan to cut Xcel's carbon intensity by seven percent by the year 2012 or to reduce emissions to 1,531 pounds of CO_2/MWh, down from 1,646 pounds of CO_2/MWh in 2003.[207] However, while the plan will cut CO_2 emissions by 12 million tons by 2009, in the long run net emissions may rise as the company seeks to meet growing demand.[208]

Dick Kelly, chief executive of Xcel Energy, sees regulation of carbon emissions not just as inevitable, but also as desirable.[209] Kelly and other business executives say they want the government to decide on limits soon so that new regulations can be incorporated into long-range plans.[210] Since Xcel serves eight states, it would prefer a single national policy rather than dealing with separate, and possibly differing, state or regional policies.[211] Kelly has reported that renewable energy sources could generate 20 percent of Xcel's output some day soon.[212]

ii. RENEWABLES: OFFSET PROVIDERS

Wind energy credits provide a way for customers to offset emissions without having to significantly alter their day-to-day operations. 98 percent of the electricity produced today comes from a combination of fossil fuels, large hydro and nuclear power.[213] According to the EPA, electricity generation is the "dominant industrial source of air emissions in the United States," with

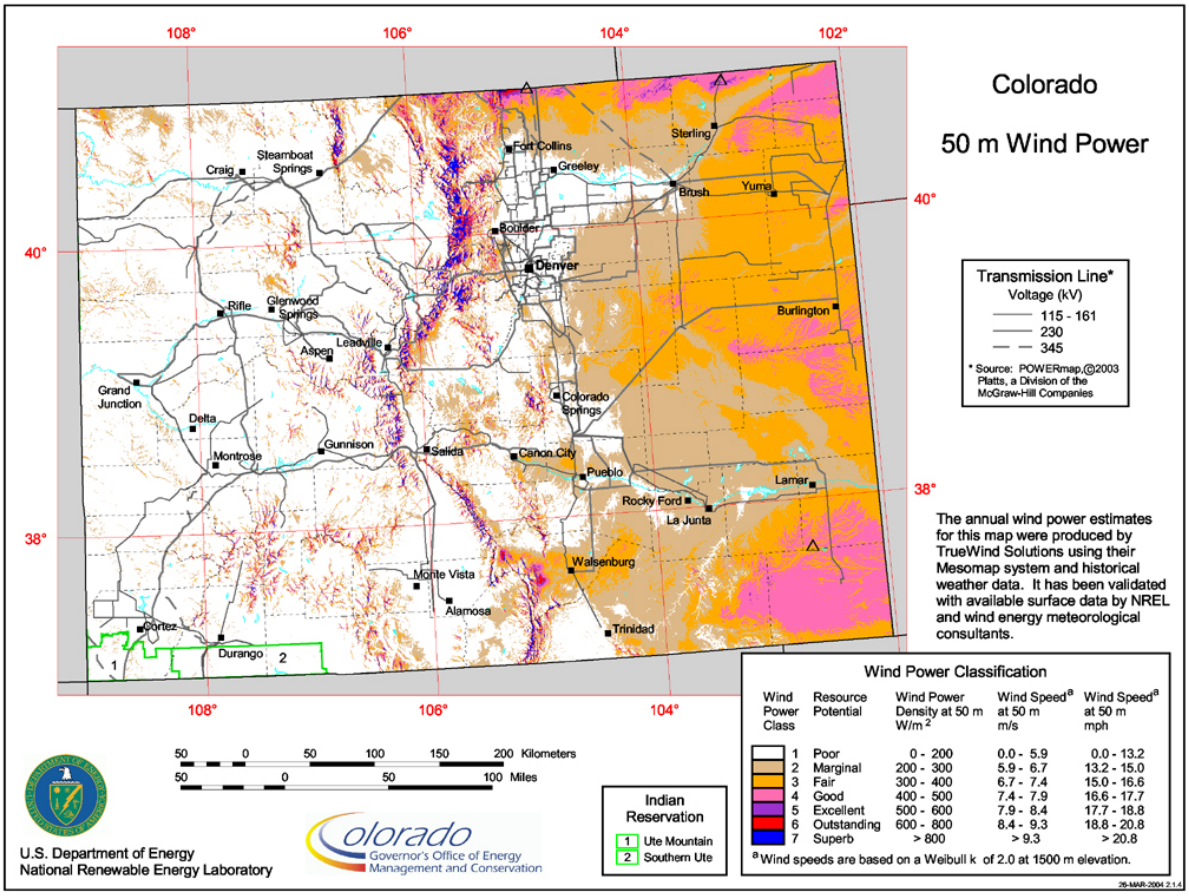
fossil fuel fired power plants responsible for 67 percent of the nation's sulfur dioxide emissions, 23 percent of nitrogen oxide emissions, and 40 percent of man-made carbon dioxide emissions.[214] Less than two percent of US electricity comes from wind, solar, geothermal, small hydro and biomass sources which emit little to no carbon.[215] However, North Dakota, Kansas and Texas alone have the capacity to generate enough wind-produced electricity to satisfy the needs of the entire United States.[216]

Many electric utilities use a grid system in which various sources of electricity feed into a massive aggregate pool.[217] Customers draw energy from the pool each time they flip a switch or turn on an electric appliance.[218] Wind farms supply electricity directly to the grids. Though it is impossible to determine exactly which electrons in a grid have come from wind sources, customers can ensure wind farms remain competitive with fossil fuels by purchasing wind credit certificates.[219] When a wind farm generates a unit of electricity (usually a kilowatt hour), the farm issues a certificate to track the exact amount of power created.[220] Buying these certificates generates income for the wind farm and "transfers ownership" of the wind-generated power to the consumer even though that consumer still receives his power from the collective grid.[221] Each certificate also represents the benefit, in reduced carbon emissions, of a unit of electricity generation.[222] As more companies and individuals buy the certificates more renewable energy will be generated.[223]

Wind energy credit companies such as Boulder, Colorado-based businesses Renewable Choice Energy and Community Energy relay wind certificates from wind farms to the consumers. As of December 2006, Colorado had 291 megawatts of installed wind capacity, with an additional 321 megawatts planned.[224] Colorado ranks 11th in the U.S. with respect to wind energy potential, with the chance to produce an average output of 54,900 megawatts if all resources are developed.[225] Most wind farms in Colorado are owned by utilities such as Xcel to meet their Amendment 37 renewable energy goals.[226] The Colorado Green wind farm in southeastern Colorado, an Xcel project, has 108 turbines, generating 162 megawatts of power. [227] The wind farm added 10 to 15 jobs to the depressed local economy and increased the tax base by $2 million.[228] Furthermore, farmers who lease their land receive an estimated $2,000.00 to $4,000.00 per turbine per year.[229]

Aside from wind energy, Colorado businesses are also involved in the renewable fuels industry. Colorado has the potential to produce 5.2 billion kWh of electricity from biomass fuels.[230] This number is based on estimates for five biomass types: "urban residues, mill residues, forest residues, agricultural residues and energy crops."[231] As of February 2007, Colorado has three functioning ethanol production facilities, in Windsor, Sterling and Golden.[232] These plants produce 100 million gallons of ethanol per year, placing Colorado 15th in production out of 22 ethanol-producing states.[233] However, Coors is expanding its Golden facility and many other plants are in different stages of construction or planning.[234] Two plants in Yuma are expected to produce 70 well-paying jobs, increasing the tax base and strengthening the local economy.[235] While these facilities are an economic boon, skeptics cite studies showing that ethanol actually takes more energy to produce than it provides when burned.[236] Also, some studies show that it takes up to 1,700 gallons of water to produce just one gallon of ethanol.[237] Nevertheless, increased demand for the fuel could encourage new technologies and processes that will reduce these estimates. General Motors, in a partnership with Colorado, promised to build 40 new E-85 (a mix of 85 percent ethanol, 15 percent gasoline) pumps in the state by the end of 2007.[238] Furthermore, Broomfield-based Range Fuels, Inc., plans to build the nation's first commercial scale wood-chip ethanol plant in Georgia.[239]

Figure 5-3: Colorado Wind Power Potential (Source: NREL)



iii. SKI INDUSTRY: VAIL RESORTS & ASPEN

In August of 2006, Vail Resorts announced it would buy 152,000 megawatt hours of wind energy per year to offset the carbon emissions from its five mountain resorts.[240] Vail plans to purchase wind energy certificates from Renewable Choice Energy to offset the 211 million pounds of CO_2 emissions it pumps into the atmosphere each year.[241] This plan will have an effect equivalent to removing 18,000 cars from the road.[242] With this purchase, Vail now ranks as the second largest corporate buyer of wind power in the nation behind Whole Foods Market.[243] In solidifying its relationship with Renewable Choice Energy, Vail has offered a free one day lift ticket to any customer who signs up for Renewable Choice's wind energy credit program for one year.[244]

In much the same way, Aspen Skiing Company has contracted with Community Energy to buy renewable energy certificates from wind farms to offset 100 percent of the emissions from the electricity it uses at its four mountain resorts.[245] This move, made in March of 2006, represented the largest purchase of wind energy certificates in the US ski industry before Vail's subsequent deal with Renewable Choice.[246] Aspen's 21,000 megawatt hour purchase will keep 20,000 tons of CO_2 out of the atmosphere each year.[247] The decision to buy wind energy credits came at nearly the same time as the Aspen Global Change Institute's report predicted that skiing in Aspen could cease to exist by 2100.[248] The report warned that temperatures in Colorado's central mountains could rise by at least six and as many as 14 degrees by the end of the century, creating a shorter, if still existent, ski season.[249]

In addition to its wind energy credit purchase, Aspen has also experimented with running its Snowcats on soy-based biodiesel fuel.[250] The Snowcats used by Aspen to groom its slopes burn about 260,000 gallons of diesel fuel each year.[251] The high particulate emissions from standard diesel fuel contributes to air pollution around Aspen that typically exceeds EPA standards.[252] In the winter of 2002, Aspen experimented with using an 80 percent diesel, 20 percent biodiesel mix to fuel some of its Snowcats.[253] The blended fuel "radically" reduced black tail pipe smoke and even allowed the Snowcats to run more smoothly.[254] As a result of this experiment, Aspen switched its entire Snowcat fleet to the biodiesel blended fuel.[255] Though biodiesel costs about $.20 more per gallon than traditional diesel, Aspen feels the 20 percent reduction of hydrocarbon emissions and ten percent reduction in particulate pollution is worth the extra cost.[256]

iv. FOOD AND BEVERAGE: NEW BELGIUM

Famed Colorado brewery New Belgium committed in 1998 to becoming the first 100 percent wind-powered brewery.[257] New Belgium has operated its brewery on 100 percent renewable energy power since November of 1999.[258] It was also the first brewery in the country to purchase all of its power from wind sources.[259] Between November, 1999 and February, 2006, New Belgium purchased nearly 22 million kWh of wind energy, reducing the company's emissions by over 36 million pounds of CO_2.[260] In addition to its wind energy commitment, New Belgium developed an "electrical cogeneration" strategy from the methane generated by the anaerobic digestion of the process-water in its water treatment facility.[261] The methane is piped back to the brewery from the water treatment facility where it has been used to generate electricity since late 2003.[262] The extra energy allows New Belgium to offset its peak energy loads and generates ten percent of the company's total electricity.[263] It also provides the heat used to warm the wastewater that travels back to the water treatment plant to begin the cycle anew.[264] New Belgium's unique water treatment plant has also functioned as a "bio-digester" wastewater facility since 2002, treating all of the water associated with the brewing process.[265] New Belgium's has also adopted a brew kettle that is 75 percent more efficient and uses energy efficient lighting and skylights in its facilities[266]

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CHAPTER VI: COLORADO – TAKING ADVANTAGE OF GHG MARKET OPPORTUNITIES, MINIMIZING ECONOMIC RISKS AND PREPARING FOR THE FUTURE

A. CLIMATE CHANGE AND COLORADO

Scientists predict that the West will be affected by climate change sooner and more dramatically than other region in the United States.[1] Changes are already occurring, including higher temperatures, more winter rain, a decreasing and faster melting snow pack and more wildfires.[2] The most recent five year period was the hottest in the last 110 years in the Colorado, Missouri and Rio Grande River Basins.[3] The warming is most pronounced during the winter months and has lead to below average snow pack levels in 11 of the past 16 years in the Colorado River Basin.[4] This trend is expected to continue in the Basin, with a "best case" scenario predicting losses of 24 percent of snow pack by 2010 to 2039 and 30 percent by 2040-2069.[5] Another study predicts a 50 percent loss of snow pack by 2070 to 2099 in Summit County, home to four of Colorado's largest ski resorts.[6] Even using conservative models, researchers predict that current water use in the west is not sustainable and that problems will increase with a growing population and economy.[7] Water supplies will also be taxed by a loss of forest cover due to wildfires.[8] The recent drought has lead to wildfires through the west, causing economic loss and contributing to climate change by adding more CO_2 to the atmosphere.[9]

Simply stated, climate change will alter the landscape of Colorado, affecting the economy along with the environment. Tourists and new residents alike come to Colorado for the many natural amenities the state provides. However, the CEO of Aspen Ski Company says that if the ski season is shortened it is "going to be an economic disaster." While the resort is typically open for 140 days, it takes 100 days to cover costs, meaning a shorter season could render the business unprofitable.[10] Studies have found that a 2.5°C temperature increase and seven percent increase in precipitation would cut downhill and cross-country skiing by 52 percent.[11] However, this loss in ski tourism could be offset by an increase in warm weather tourism like hiking, climbing and biking, leading to increased state tourism dollars.[12] Changes in opportunities for recreation and a taxed water supply could also influence Colorado's population growth, affecting industries such as varied as real estate and retail. Colorado farmers will also be affected by more severe weather and a diminished snow pack.[13]

B. Progress in Colorado: State Legislative Action

The Colorado General Assembly is addressing climate change, but has not yet committed to a GHG cap or trading program. The following table outlines the bills to be discussed by the 66th Colorado General Assembly related to climate change and energy.

Figure 6-1: Energy/Climate Change-Related Bills in the 66th General Assembly[1]

BILL	FOCUS	DESCRIPTION
SB 07-100	**Electricity Transmission**	To discover where electric transmission capacity lags behind generating capacity. Allows utilities to recover costs for new or expanded transmission.
HB 07-1268	**Energy Efficiency**	Requires new interest earned on more frequent oil and gas severance tax collections to be used to improve energy efficiency in schools.
HB 07-1146	**Energy Efficiency**	Requires counties and municipalities to adopt energy codes for buildings that meet or exceed the standards of the 2003 int. energy conservation code.
HB 07-1037	**Energy Efficiency Utilities**	Directs the Public Utilities Commission (PUC) to adopt rules for cost recovery mechanisms for natural gas distributors engaging in energy efficiency programs.
SB 07-022	**Energy Efficiency Utilities**	Grants authority to the PUC to determine rates and practices for gas and electric services that take into account the needs of low-income utility customers.
HB 07-1203	**Energy Research**	Authorizes a grant to CSU to conduct a county level study regarding the storage of carbon in soils and a grant to CU to develop a Colorado Energy Profile.
SB 07-091	**Renewable Energy**	Creates a 15 member task force to explore renewable generation development areas in Colorado, to encourage competition and to develop of a map.
HB 07-1191	**Renewable Energy**	Provides a property tax exemption for business personal property used for the generation of renewable energy.
HB 07-1150	**Renewable Energy**	Creates the "Renewable Energy and Infrastructure Authority" to provide loans and grants for the development of transmission lines for renewable sources.
SB 07-145	**Renewable Energy**	Gives counties and municipalities the authority to grant incentives for the installation of renewable energy fixtures on residential property.
HB 07-1281	**Renewable Energy**	Increases Colorado's RPS to 20 percent of generation from renewables for retail utilities and 10 percent for cooperative and municipally owned utilities by 2020.
HB 07-1145	**Renewable Energy**	Encourages the state board of land commissioners to identify state land suitable and appropriate for renewable energy resource development.
SB 07-126	**Renewable Energy**	Appropriates money to Governor's Office of Energy Management and Conservation for distribution to the Renewable Energy Authority.
HB 07-1087	**Renewable Energy**	Establishes the wind for schools grant program fund. The state will accept applications from schools for grants to enter into a wind power projects.
HB 07-1169	**Renewable Energy Utilities**	Repeals and reenacts the statutes that govern net metering for customer-generators of cooperative electric associations.
HB 07-1228	**Renewable Energy Renewable Fuels**	Requires purchase of flex-fuel vehicles unless they cost 10% more. Provides funds for CSU study on bioenergy crops. Eliminates excise tax on E-85+ fuel.
SB 07-147	**Renewable Fuels**	Requires that at least 75% of all gasoline sold in Colorado from November through April every year contain at least 10% alternative fuel by volume.
HB 07-1060	**Renewable Fuels**	Sets up a framework to delegate grant money between biofuel research projects and life science research projects.

[1] As of February 1, 2007.

C. ROCKY MOUNTAIN CLIMATE ORGANIZATION (RMCO)

The Rocky Mountain Climate Organization (RMCO) was formed to fill the void left by government with respect to climate change and its impacts on Colorado and the Rocky Mountain region.[14] The 30 member coalition includes the City of Denver, nine other local governments, Quest, Denver Water, ten other businesses and eight nonprofits.[15] The organization focuses on local impacts of climate disruption and possibilities for mitigation and adaptation.[16] To this end, RMCO set up a participatory process called the Colorado Climate Project (CCP), modeled after similar projects in New Mexico, Arizona and Montana.[17] The CCP and its Blue Ribbon Commission, composed of about 30 leaders with varied expertise from the public and private sectors, is charged with recommending a Colorado Climate Agenda to Governor Ritter.[18] The Agenda will likely include numeric goals for the reduction of GHG emissions in Colorado as well as a call to link with other states in the southwestern region to address shared challenges posed by climate change.[19]

D. RECOMMENDATIONS

This section suggests various strategies that the Colorado General Assembly may employ in response to impending regulation of GHG emissions, and the business and environmental opportunities presented by emissions trading markets. Some conclusions can be drawn as the result of our research in GHG emissions trading markets. We recommend that the state: 1) base its GHG inventory on the Department of Energy's 1605(b) standards to ensure that reduction projects in Colorado are credited if a federal GHG reduction or trading program emerges; 2) make Colorado attractive for offset projects, extending efforts to promote renewable energy and innovation in energy production methods; 3) encourage utilities to promote energy efficiency projects, possibly by increasing the rate base to offset revenue loss; 4) consider linkages with RGGI or California through an emissions trading program or promote a new Western Governors Association (WGA) initiative to design a CO_2 reduction program and associated emissions trading program that is compatible with Western environmental values and economic circumstances; 5) educate state businesses about climate change impacts and the economic benefits of staying ahead of the regulatory curve; and 6) set up a Colorado Office for Climate Change to study and implement policies for mitigating and adapting to climate change in the state.

i. ESTABLISH AN INVENTORY

While Colorado is currently working on a GHG inventory, it is vital that research be conducted to determine the optimal inventory valuation system. Any state-wide inventory should employ methods used by other trading programs so that one ton of CO_2 in Colorado equals one ton of CO_2 in other parts of the United States, allowing any actions undertaken by Colorado to be linked to broader regional, national or international actions. Section 1605(b) of the Energy Policy Act of 1992 established a voluntary reporting program to document voluntary GHG mitigation efforts by private firms or other participants in voluntary reduction plans.[20] The program was launched in 1994 and since then, the number of firms participating in the programs has more than doubled.[21] The 1605(b) program provides objective standards that can be employed by Colorado to measure and inventory existing GHG emissions, comporting with federal standards and policy. However, 1605(b) is certainly not the only tool that Colorado can use to measure its GHG emissions inventory. Regardless of the other methods available, any inventory should be discussed with an eye towards other emissions trading programs in the U.S. as well as abroad. Furthermore, by monitoring all carbon emissions, not just those from large installations, Colorado will have a better understanding of the amount of GHGs that must be reduced and the associated cost. Colorado companies will therefore have a better idea about where they stand in the greater scheme of GHG regulation and be able to plan accordingly.

ii. POSITION COLORADO FOR OFFSETS

Colorado will be in an excellent position to draw offset projects from other parts of the country by establishing an inventory that allows for easy linkage with GHG reduction efforts like RGGI. As mentioned above, offsets are emissions reduction projects that improve ambient air quality. In the case of CO_2, an installation regulated by a mandatory GHG reduction program like RGGI can invest in projects at other facilities and in some cases in other states or regions to achieve an aggregate amount of emissions reductions instead of reducing at their own facility. These projects can range from planting trees to investing in renewable energy projects that would not otherwise have been built. Offset projects generate capital investment in state business, increasing the environmental quality of Colorado and the nation while creating job opportunities for state residents. While Colorado currently mandates that state utilities and other electric providers install renewable sources, the state should also move beyond these hard requirements by promoting outside investment in renewable resources for the purposes of offset projects. The

iii. CONSIDER ELECTRIC UTILITY DECOUPLING

Colorado has experimented with providing incentives for natural gas utilities to engage in energy efficiency programs. HB 06-1133, passed in April 2006, directs the Public Utilities Commission to allow cost recovery for natural gas utilities that engage in conservation programs that will reduce their sales and revenue.[22] The process of decoupling utility revenues from sales should be extended further to cover electric utilities. This will allow electric utilities to implement energy efficiency programs without harming their economic interests. A decrease in the consumption of electricity would lead to a decrease in GHG emissions. Furthermore, energy conservation could produce a net economic benefit for the state, as illustrated by California's decoupling process. See Chapter 3.

iv. LINK WITH OTHER SYSTEMS

Colorado likely has too few major installations to establish a state-based emissions trading program, even though the state contributes more GHGs to the atmosphere than 174 nations. An emissions trading system requires a high level of market liquidity to remain stable and achieve its goal of least-cost reductions. The more expansive the emissions trading system, the more liquid it will be, allowing participants to interact with a worldwide network of potential trading partners. This is evidenced by California's recent consideration of linkages with RGGI and the EU ETS. Colorado must still prepare for the probable implementation of a mandatory federal GHG reduction program, while embracing the opportunities created by developing emissions trading systems. Therefore, Colorado should consider linking with other emerging trading systems, including RGGI and California, as well as take other steps in anticipation of a federal regulatory framework. The state could also consider partnering with other states through the Western Governor's Association to implement a regional trading program that takes into account Western values and our unique environmental circumstances. While the vagaries of an emissions trading system preclude Colorado from knowing exactly what type of federal trading program will be implemented, an inventory that is consistent with other programs will prepare Colorado for future regulation and ensure that action taken in Colorado to reduce emissions now will be credited in any forthcoming system. Additionally, if Colorado links with other systems, it will be much more attractive for offset projects. The newly announced Western Regional Climate Action Initiative may provide an excellent opportunity for Colorado to act as an observer, thereby learning firsthand how regulation of GHG emissions will effect the state of Colorado and its businesses.

v. EDUCATE COLORADO BUSINESS

Along with uncertainty concerning the effect of climate change on the western landscape is uncertainty concerning the regulatory climate. The impacts of climate change as well as the costs of GHG regulation are valued in the trillions of dollars. Businesses engaged in long term planning must be made aware of the risks associated with making decisions today without considering the possibility of future GHG regulation. For instance, utilities deciding between the construction of a pulverized coal or an IGGC power plant, should consider the increased cost of operating the dirtier plant, with a lifespan of half a century, under a cap-and-trade program. The more preparation taken by Colorado now, the better businesses can address the uncertain regulatory climate they face. Also, by starting early, Colorado companies can brace for impending GHG regulation in the most cost-effective way. Preparing for a domestic GHG framework could save millions of dollars for Colorado companies, large and small alike. The Pew Center for Global Climate Change recently released a comprehensive study of the measures companies can take to stay ahead of impending GHG legislation. The report compiles the experience and best practices of thirty-one large corporations that have developed or implemented policies, procedures, techniques and technologies to address climate change. The report highlights excellent ways for companies to prepare for GHG regulation and accompanying emissions trading systems. The state should implement a program that educates state businesses on the risks and opportunities associated with climate change and encourage best practices in different economic sectors.

vi. SET UP A COLORADO OFFICE FOR CLIMATE CHANGE

Problems concerning climate change extend across many disciplines, implicating scientific, political and even philosophical questions. While emissions trading is an important component of any state strategy to mitigate climate change, this market-based approach must be coupled with other approaches, from new utility regulations to new farming practices to new management practices on our state lands. The environmental effects of climate change and our decisions about how to mitigate and adapt involve diverse interests and stakeholders. We recommend that a body in state government be charged with studying and implementing various options for mitigating our contribution to climate change. Colorado is in an excellent position to not only prepare for climate change through regulation of GHGs and an attendant trading system, it can also prosper from it.

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