Center for Clean Air Policy

State and Local Climate Change Policy Actions

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CENTER FOR CLEAN AIR POLICY

Founded in 1985 by a bipartisan group of state governors, the Center for Clean Air Policy seeks to promote and implement innovative solutions to major environmental and energy problems that balance both environmental and economic interests. The Center's work is guided by the belief that market-based approaches to environmental problems offer the greatest potential to reach common ground between these often conflicting interests. Through efforts at the state, federal, and international levels, the Center emphasizes the need for cost-effective, pragmatic, and comprehensive long-term solutions.

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INTRODUCTION

The Center for Clean Air Policy (CCAP) recognizes the importance of state actions in addressing global climate change, and it has been actively working with states since 1992 to build climate change leadership. Its work with leading state and local governments incorporates climate change concerns into existing programs and supports establishment of new programs to reduce greenhouse gases (GHGs). Our focus is on ways to achieve multiple benefits that integrate climate change with other state goals, such as air quality, relief of traffic congestion, and electricity reliability.[1] CCAP has also fostered state leadership through our State Roundtable on Global Climate Change, a forum for states to share lessons learned, coordinate efforts, and develop strategies on approaches to multiple pollutants.[2]

State and local governments have compelling reasons to reduce GHGs. First, state actions, either individually or collectively, can have a significant impact on global emissions. Emissions levels of a number of states (e.g., New York, Texas, California, Ohio, and Pennsylvania) exceed emissions of many industrialized nations (e.g., the Netherlands, Belgium, Austria, and Denmark). Therefore, state-level actions to mitigate GHG emissions can have as powerful an effect on global emissions as actions taken by many countries, and collective state action is even more effective. Table 1 illustrates the global and national significance of GHG emissions from a select number of states compared with a number of key countries. (See Appendix 1 for a complete list of state GHG emissions levels and per capita emissions.)

Second, states and localities have direct control over a number of decisions that affect GHG emissions, such as transportation infrastructure and commercial and residential energy efficiency. States also have a key role in issuing permits for industry and in regulating emissions from waste management activities. Even with the potential of a national commitment in the future, states will likely be called upon to implement major reduction efforts where they have greater direct control. Regulation of criteria pollutants such as nitrogen oxides (NO_X), ozone, and sulfur dioxide (SO_2) provides a model for how states and the national government share roles for controlling emissions. For example, to control ozone, the federal government sets a standard and establishes a model trading rule for certain sources that states can use to assist in meeting air quality requirements. The Clean Air Act provides several examples of the shared responsibility likely to emerge in efforts to control GHG emissions.

Third, states and localities can act as important "laboratories of democracy." Over the past 30 years, environmentally progressive states have enacted environmental laws that have charted the course for later passage of major national environmental legislation. For example, in the early 1980s during the debates over efforts to control acid rain, individual states acted aggressively to pass new laws and formed a multi-regional coalition to break the federal impasse for action. Reducing GHG emissions is but the latest opportunity for environmental policy leadership by states.

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[1] The Center has worked directly with New York, New Jersey, Wisconsin, Massachusetts, Maryland, and King County, Washington.

[2] The Roundtable brings together energy, environmental, transportation, and land-use officials from 14 states, four localities, and three state-based organizations.

Finally, many effects of climate change will be felt locally and regionally, and state governments will play a key role in adapting to these changes. According to the *Third Assessment Report* on the linkages between human-induced GHG emissions and climate change, which was recently released by the United Nations Intergovernmental Panel on Climate Change (IPCC), the global average surface temperature increased by about 1ºF during the 20th century—the largest increase of any century during the past millennium. This increase is largely attributable to human activities.[3] At the rate of emissions growth projected by IPCC scenarios, global temperatures are expected to increase by an additional 2.52 to 10.4°F by 2100,[4] a change that will be expressed differently in different regions. The recent *U.S. National Assessment of Climate Change* presents projections of the effects of climate change on each region in the United States (see Appendix 2).[5] Potential effects at the regional level include

- precipitation changes causing droughts and flooding;
- sea-level rise causing loss of wetlands, reduced fisheries, and salt water intrusion into water supplies;
- impacts on transportation and other infrastructure from sea-level rise and elevated storm surges;
- increased heat-related illness and death;
- species migration and habitat degradation causing certain native species to no longer exist in a given region; and
- changes in snowpack.

[3] United Nations Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2001: The Scientific Basis*. Report of Working Group I: Summary for Policymakers. Cambridge, MA: IPCC, 2001. p. 10.
[4] IPCC, 2001, p. 13.
[5] National Assessment Synthesis Team. *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change,* 2000. Available at: www.usgcrp.gov/usgcrp/Library/nationalassessment/overview.htm.

Table 1: CO_2 Emissions for Various Countries, Regions, and States, 1998					
Country/Region/State	**CO_2 Emissions (MMTCE)**	**Share of World Total (%)**	**Country/Region/ State**	**CO_2 Emissions* (MMTCE)**	**Share of World Total (%)**
World	**6,091**	**100.0**	**Illinois**	**57**	**0.9**
United States	**1,511**	**24.8**	**Michigan**	**51**	**0.8**
China	669	11.0	**New York**	**54**	**0.9**
Former Soviet Union	607	10.0	**New England**	**50**	**0.8**
Japan	307	5.0	**Georgia**	**42**	**0.7**
India	242	4.0	**New Jersey**	**31**	**0.5**
Germany	230	3.8	Belgium	28	0.5
Texas	**167**	**2.7**	**Wisconsin**	**27**	**0.4**
United Kingdom	151	2.5	**Minnesota**	**25**	**0.4**
Canada	150	2.5	**Washington**	**23**	**0.4**
Italy	121	2.0	**Maryland**	**20**	**0.3**
Mexico	101	1.7	Austria	17	0.3
France	109	1.8	Chile	16	0.3
Australia	115	1.9	Denmark	15	0.2
California	**93**	**1.5**	Sweden	13	0.2
Ohio	**70**	**1.1**	**Oregon**	**11**	**0.2**
Pennsylvania	**68**	**1.1**	Ireland	10	0.2
Netherlands	64	1.1	Norway	9	0.2
Florida	**61**	**1.0**			

MMTCE = Million metric tons carbon equivalent.
Note: Emissions levels cited here may vary from national and state reports.

Sources: World, region, and country CO_2 emissions: Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory. *Global, Regional, and National CO_2 Emission Estimates from Fossil Fuel Burning, Cement Production, and Gas Flaring: 1751-1998* Oak Ridge, TN: CDIAC: 2001. U.S. state data: U.S. Environmental Protection Agency. *Energy CO_2 Inventories*. Available at: http://yosemite.epa.gov/globalwarming/ghg.nsf/emissions/CO2EmissionsBasedOnStateEnergyData

States can take a leadership position by developing (1) a statewide emissions target; (2) a tracking system to assess progress towards the target and (3) a mitigation strategy for all sectors of the economy that is geared towards achieving the statewide target. The following summary of state and local climate actions highlights many of the innovative policies being developed at the state and local levels to reduce GHG emissions, but it does not provide a comprehensive list of all actions at these levels of government. This summary updates CCAP's earlier paper, *Highlights of State Initiatives on Global Climate Change*.[6] The actions highlighted in this paper range from specific measures affecting one sector of the economy to comprehensive, economy-wide approaches. Similarly, states are experimenting with a variety of policy mechanisms, often in combination, such as caps or mandatory standards, negotiated agreements, and financial incentives. States are also starting to build the infrastructure that will ultimately be needed to track emissions and emissions reductions at the state level.

This paper begins with a discussion of states and localities that have established GHG reduction targets. It then summarizes the innovative policies being used by states and localities, organized by sector of the economy. Finally, it ends with a discussion of the systems being developed to track emissions and emissions reductions.

[6] Center for Clean Air Policy (CCAP), *Highlights of State Initiatives on Global Climate Change.* December 2000. Available at: www.ccap.org/pdf/Statert.PDF

STATE AND LOCAL GREENHOUSE GAS REDUCTION TARGETS

Several states and 18 cities participating in the International Council for Local Environmental Initiatives' (ICLEI) Cities for Climate Protection Campaign have established numeric goals as cornerstones of their climate change policies. These goals will help prioritize actions to achieve a given emissions goal and establish a benchmark from which to measure success. Listed below are some examples of states and cities that have specified GHG reduction targets.

On June 11, 2002, the **New York** State Energy Planning Board adopted a statewide goal to reduce GHG emissions to 5 percent below 1990 levels by 2010 and 10 percent below 1990 levels by 2020. The goal, which was included in the *New York State Energy Plan*, stemmed from recommendations of CCAP and the New York State Greenhouse Gas Task Force that were issued in CCAP's draft report, *Recommendations to Governor Pataki for Reducing New York State Greenhouse Gas Emissions*. The Task Force, which was facilitated by CCAP, included representatives from the business community, environmental organizations, state agencies, and universities. The final Task Force report, due to be released later this Fall, will include a comprehensive analysis for each sector and a set of recommended policies and measures for achieving the GHG goals.

For more information: www.nyserda.org/sep.html and www.ccap.org

The **New Jersey** Department of Environmental Protection (DEP) has set a voluntary goal to reduce New Jersey's GHG emissions by 3.5 percent below 1990 levels before 2005. The goal was created in March 1998 under an administrative order issued by the commissioner of the New Jersey DEP (Administrative Order 1998-09). To meet this goal, the state has introduced a number of initiatives outlined in its *Greenhouse Gas Action Plan,* some of which are mentioned later in this report. New Jersey has also taken several measures that are not directly addressed in the *Action Plan.*

For more information: www.state.nj.us/dep/dsr/gcc/gcc.htm

On August 28, 2001**,** the **New England Governors and Eastern Canadian Premiers** (NEG/ECP) established a *Climate Change Action Plan* calling for New England states and Eastern Canadian provinces—Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Newfoundland, New Brunswick, Nova Scotia, Prince Edward Island, and Quebec—to work together to reduce GHG emissions by cutting emissions from power plants and increasing the use of renewable energy sources, energy efficiency, and conservation. The short-term goal of the NEG/ECP is to reduce regional GHG emissions to 1990 levels by 2010 and by 10 percent below 1990 levels by 2020. The long-term goal is to reduce emissions to a level that eliminates any dangerous threats to the climate—a goal scientists suggest will require reductions of 75 to 85 percent below current levels.

For more information: www.cmp.ca/CCAPe.pdf

The **Oregon** Progress Board, an independent state planning and oversight board created by the Oregon legislature in 1989, established a benchmark to stabilize the state's carbon dioxide (CO_2) emissions at 1990 levels in its 1992 report to the legislature. Progress against this benchmark is measured every several years and given a grade by the Progress Board. However, the state

recently concluded that this benchmark could not' be achieved through state actions alone. The Oregon Department of Energy (ODOE) is therefore not recommending actions that would stabilize emissions. In 1995, ODOE recommended a strategy that includes both state and national actions and which is expected to reduce Oregon's GHG emissions by at least 2 million tons in 2015.

For more information: *www.energy.state.or.us/climate/gggas.htm*

In April 2001, the **City of Portland** and **Multnomah County, Oregon,** established a goal of reducing GHG emissions to 10 percent below 1990 levels by 2010. Portland's Global Warming Plan identifies measures relating to energy efficiency, renewable energy, transportation, and waste reduction to help meet this target. To monitor the success of the efforts, Portland will inventory and report on annual emissions.

For more information: www.sustainableportland.org/Portland%20Global%20Warming%20Plan.pdf

On July 23, 2001, **Seattle, Washington,** officials announced that the city would meet a target similar to the U.S. GHG reduction target established in the 1997 Kyoto Protocol. Seattle pledged to beat the Kyoto goal of cutting CO_2 emissions to 7 percent below 1990 levels by trying to cut three times that much by 2010. The city will reduce emissions through conservation and wind power purchases and by reducing road traffic, using combined heat and power, and planting trees to increase sequestration.

For more information: www.ci.seattle.wa.us/light/climatechange

Salt Lake City, Utah, Mayor Rocky Anderson announced the development of a *Local Climate Action Plan* to reduce municipal GHG emissions to 7 percent below 1990 levels by 2012 In the plan's first phase, the city government aims to reduce emissions from entities under its control to 7 percent below 1990 levels by 2006. The second phase plans to reduce the emissions of the entire city so that they' meet the target of 7 percent below 1990 levels by 2012. The city's plan includes converting the majority of the city's fleet to alternative fuel vehicles, reducing the amount of garbage residents send to the landfill, making city offices more energy efficient, providing transit passes to city employees, and protecting open space.

For more information: *www.ci.slc.ut.us/mayor/pressreleases/kyoto%20protocol.htm*

In 1996, the city of **Austin, Texas,** established a GHG reduction goal of 20 percent below 1990 levels by 2010. Austin's strategies for meeting the goal include actions in energy efficiency, renewable resources and cogeneration, transportation, recycling, and tree planting. The city plans to meet 20 percent of its electricity demand with renewable energy by 2010. Accordingly, the municipal utility is investing in wind, solar, and landfill methane resources.

For more information: http://www.ci.austin.tx.us/sustainable/co2.htm

POWER SECTOR

The power sector, which produces more than one-third of the nation's GHG emissions, has been the focal point of several state GHG reduction programs. Some of these measures were undertaken primarily to foster a transition to cleaner generation technology, and others sought to begin to internalize the externalities associated with climate change through establishing emissions offset requirements or caps.

POWER-SECTOR CAPS AND STANDARDS

A number of state and local governments have begun to establish CO_2 emissions limits for in-state electric generators, either as absolute or rate-based reduction targets (e.g., CO_2 per kWh) or as standards for new units. These programs allow flexibility through emissions trading with other sources within the sector or by allowing regulating entities to purchase "offsets"—quantified emissions reductions—from sources outside the sector. In some cases, the programs were aimed at a limited number of facilities in the locale, and in other cases the standard was established for the sector as a whole.

On April 23, 2001, **Massachusetts** unveiled new regulations (310 CMR 7.29) to reduce emissions from the state's six oldest and dirtiest power plants. The regulations, the first of their kind in the nation, went into effect in June 2001 and require significant reductions in NO_X, SO_2, CO_2, and mercury (Hg) at the six power plants, bringing these facilities in line with emission standards for newer plants. Plants will be required to reduce CO_2 emission levels to below 1,800 lbs per MWh, resulting in an estimated 10 percent total reduction from an average of 1997 to 1999 levels. These standards can be met at the plant or through the purchase of credits from state-certified "off-site" CO_2-reduction programs. The standard for CO_2 goes into effect one year after the given facility is required to be in compliance for the other emissions. Depending on the pollutant and the chosen compliance strategy, deadlines range from 2004 through 2008.

For more information: www.state.ma.us/dep/bwp/daqc/files/regs/729final.doc

On May 20, 2002, **New Hampshire** Governor Jeanne Shaheen signed into law a bill to reduce SO_2, NO_X, CO_2, and Hg emissions from fossil fuel–burning power plants. For CO_2, the bill requires a reduction to 1990 levels by 2010. To comply with the CO_2 cap, affected sources may use CO_2 allowances from federal or regional trading and banking programs , or other programs acceptable to the Department of Environmental Services.

For more information: www.gencourt.state.nh.us/legislation/2002/HB0284.html

New Jersey and the U.S. Environmental Protection Agency (EPA) negotiated a voluntary agreement with Public Service Electric and Gas Power (PSEG) to achieve a 15 percent reduction in the CO_2 emissions rate from in-state fossil-fueled power plants as a part of a consent decree. This GHG commitment, along with commitments for NO_X, and SO_2, were entered into NJ operating permits for the affected facilities. Also as a part of the consent decree, PSEG will spend $400 million to complete repowering from coal to natural gas at one of its plants.

For more information: www.pseg.com/media_center/pressreleases/articles/press_2002-01-24a.html

Oregon passed a state law in 1997 (HB 3283) establishing a CO_2 standard for emissions from new energy facilities in the state. The standard applies to baseload natural gas plants, nonbaseload power plants, and nongenerating energy facilities. The level for base-load plants is set at 17 percent below the most efficient baseload natural gas plant in the United States. Applicants can meet the standard by building renewable energy power plants; installing equipment that reduces direct emissions; or creating offset projects that avoid, sequester, or displace emissions. The offset can be achieved by implementing projects directly or through a third party. Alternatively, the applicant can choose to pay an established amount per ton of CO_2 (currently $0.85 per short ton); the funds are then used by the Climate Trust to purchase offsets. Neither option sets limits on the location of the projects.

For more information: www.energy.state.or.us/climate/climhme.htm and www.climatetrust.org/

In January 2000, **Washington** Governor Gary Locke signed the recommendation of the state's Energy Facility Site Evaluation Council to approve changes to the siting permit of the Chehalis plant, one of the largest gas-fired power plants in the state. The changes include a requirement that the plant recommend strategies to offset the total increase (8 percent) in GHG that will result from the permit amendment. The amendment increased the permitted capacity of this pending plant from 460 to 520 MW. The council will review the plan and develop a schedule for implementing the offset plan.

For more information: www.efsec.wa.gov/Chehalis/adj/amendedsca.pdf

The **City of Seattle** established a goal for Seattle City Light to meet all its electric power needs with zero net GHG emissions. City Light has sold its share of a coal-fired steam plant and will fully mitigate emissions from its remaining fossil-fuel resources—approximately 600,000 metric tons of CO_2 per year. GHG mitigation projects could include renewable energy and conservation projects, transportation measures that reduce fossil fuel consumption, and forestry programs that store carbon emissions in trees. The company issued a request for proposal on January 30, 2001 calling for mitigation projects that reduce GHG emissions. In addition, City Light plans to meet all load growth with energy efficiency and renewable resources.

For more information: www.ci.seattle.wa.us/light/climatechange

On August 8, 2001, New York's secretary of state filed a **Suffolk County, New York** law (Intro. Res. No. 2286-2000) to cut power plant emissions of CO_2 by 20 percent. Under this measure, the initial allowable emission rate is 1,800 pounds of CO_2 per MWh. In each subsequent year, the rate is reduced by 1 percent for each 100 MW of new generating capacity added in the county, until a 20 percent reduction has been achieved. Power plant owners can comply by upgrading equipment, switching from oil to gas, purchasing CO_2 credits, or investing in energy efficiency or renewables. If they fail to comply, plant owners will be fined $2 per ton of CO_2 above the limits in the first year and $1 per ton in following years.

For more information: www.co.suffolk.ny.us/legis/resos2000/i2286-00.htm

RENEWABLE REQUIREMENTS AND GOALS

Eleven states have renewable portfolio standards (RPS) that require a certain percentage of the energy produced in the state to be generated by renewable sources; an additional two states have

renewable energy goals.[7] In addition, a number of public and private entities, such as schools and churches, have begun voluntarily committing to purchase a given portion of their energy needs from renewable sources. Details of several such programs are listed below.

In September 2002, **California** passed legislation mandating that all companies selling retail electricity in California increase their use of renewable resources by at least 1 percent per year, until 20 percent of their retail sales are from renewables by 2017.

For more information: http://info.sen.ca.gov/pub/bill/sen/sb_1051-1100/sb_1078_bill_20020912_chaptered.pdf

Texas established a Renewable Energy Mandate Rule calling for 2,000 MW of new renewables to be installed in Texas by 2009, establishing a renewable energy credits trading program, and defining the renewable energy purchase requirements for competitive retailers in Texas. The new renewables mandated as a part of this rule are in addition to the 880 MW of existing renewable generation. Each retailer in Texas is allocated a share of the mandate on the basis of that retailer's pro rata share of statewide retail energy sales.

For more information: www.puc.state.tx.us/rules/subrules/electric/25.173/25.173.pdf

As a part of its 1997 electricity restructuring law, **Massachusetts** established a renewable portfolio standard requiring that 1 percent of electricity sales in 2003 be generated from new renewables; the requirement increases to 4 percent by 2009 and by 1 percent each year thereafter. Regulations that took effect in April 2002 allow companies to pay a fee per MWh—initially $50 and adjusted in subsequent years according to inflation—to the entity operating the state's renewable portion of the public benefit charge as a part of the company's compliance package. The fee will be used to purchase new renewable generation.

For more information: www.state.ma.us/doer/rps/225cmr.pdf

Three **Pennsylvania** universities made 5-year commitments to purchase 5 percent of their electricity needs from wind generation. Carnegie Mellon, Penn State, and the University of Pennsylvania, along with Philadelphia Suburban Water Co. and the grocery firm Giant Eagle, will purchase 75 percent of the energy produced by the Exelon-Community Energy farms. The rest of the energy will be sold to commercial and residential customers. The new 24 MW wind farm will prevent an estimated 75 million pounds of CO_2 emissions per year.

For more information: http://www.dep.state.pa.us/update/default.asp?ID=4881

RENEWABLE ENERGY FUNDS

Fourteen states have established or are in the process of developing public benefits charge funds for renewable energy.[8] States generally collect funding as a charge on electricity rates or as a lump-sum payment from utilities, and then redistribute the money to projects such as wind farms, fuel cell deployment programs, and solar energy systems. The programs generally were not designed to address climate change, but benefits include emissions reductions, improved

[7] Interstate Renewable Energy Council (IREC), *Database of State Incentives for Renewable Energy*. Available at www.ies.ncsu.edu/dsire/summarytables/reg1.cfm?&CurrentPageID=7.
[8] CCAP, Survey of state funding for energy efficiency and renewable energy funds, forthcoming.

environmental quality, greater investment in renewable resources, and increased reliability. Some examples of funding programs for renewable energy are described below.

The **California** Energy Commission's Renewable Energy Program has five funding priorities: existing technologies, new technologies, emerging technologies, customer credit, and customer education. The program uses a "reverse auction" to fund the new technologies account. Under the auction, project administrators provide an estimate of generation in kWh over 5 years and the incentive rate (up to $0.015) per kWh needed to make the source cost-competitive (e.g., the difference in cost between the new renewable unit and the market price of electricity). The project with the lowest rate receives priority funding, and each subsequent project receives money until funds are depleted.

For more information: www.energy.ca.gov/renewables/

The **Connecticut** Clean Energy Fund, the state's renewable energy fund, emphasizes the development of fuel cell technology. The fund has invested more than $109 million in renewable energy programs, and it recently funded the purchase of the largest fuel cell system in the United States. The system will supply the Connecticut Juvenile Training School in Middletown with 1.2 megawatts, which will cover all the heating, cooling, and electrical needs of the facility's 227,000 square feet.

For more information: www.ctcleanenergy.com/

GOVERNMENT GREEN ENERGY PURCHASE COMMITMENTS

In response to both climate change policies and energy needs (e.g., reliability), a number of government entities have begun to lead by example through commitments to purchase renewable energy for state-operated facilities.

In May 2002, **New Jersey** agreed to purchase 113 million kWh of "green energy," representing 12 percent of the electricity purchased by the state government. The electricity purchased from Green Mountain Energy will be supplied through June 2003 and will be used in 196 state-operated facilities.

For more information: www.prnewswire.com/cgi-bin/ micro_stories.pl?ACCT= 142794&TICK= GREENM&STORY=/www/story/05-03-2002/0001720502&EDATE=May+3,+2002

New York Governor George Pataki signed an executive order to encourage alternative energy production by mandating that state agencies purchase no less than 10 percent of state facility energy requirements from "green" power sources, such as wind, solar, biomass, geothermal, or fuel cells by 2005, increasing to 20 percent by 2010. The state Energy Planning Board recommended that the state competitively solicit 60 to 120 MW to meet this requirement. In addition, the board recommended that the two public utilities, New York Power Authority and Long Island Power Authority, should each competitively solicit long-term contracts for 100 MW of new renewable energy.

For more information: www.nyserda.org/exorder111guidelines.pdf and www.nyserda.org/sep.html

Under a March 2001 executive order, the **Maryland** state government must purchase 6 percent of the energy consumed in all state-owned facilities from renewable sources. Under the order, priority is to be given to renewable energy sources located in Maryland.

For more information: www.gov.state.md.us/gov/execords/2001/html/0102eo.html

Pennsylvania's state government committed to purchase 5 percent of the state's energy needs from "green" power sources for 2001 and 2002. To meet this goal for 2001, the Pennsylvania Department of General Services purchased 100 million kWh of green power, 20 percent of which will be derived from a wind plant located in the state.

For more information:
www.puc.paonline.com/press_releases/Press_Releases.asp?UtilityCode=EL&UtilityName=Electric&PR_ID=751&View=PressRelease

In November 2000, **San Francisco, California,** passed two bond measures that promote renewable energy and seek to replace conventional power plants. Proposition B authorized $100 million in revenue bonds for solar and wind energy. Proposition H gave the state Board of Supervisors authority to approve revenue bonds for business and residential solar projects.

For more information: www.solaraccess.com/news/story?storyid=1131

TRANSPORTATION SECTOR

Transportation-sector GHG emissions account for one-third of the U.S. total and are increasing faster than any other GHG sector. In some states, transportation accounts for the largest share of the state's GHG emissions. This trend is due to rapid growth in vehicle miles of travel (VMT), stagnant vehicle GHG emissions rates, and continued reliance on petroleum fuels. The increase in transportation GHG emissions can be slowed or reversed through reductions in VMT, lower vehicle GHG emissions rates, and increased use of low-GHG vehicles.

The following state strategies highlight the most important and innovative policy actions that appear to be successful at reducing transportation GHG emissions. Key measures include GHG tailpipe standards in California, and efforts to reorient transportation funding toward efficient alternatives and focus infrastructure spending in efficient locations.

LOW–GREENHOUSE GAS EMISSION VEHICLES

Some states require or encourage sales and purchases of low-GHG emission vehicles. They use mandates on the GHG emissions intensity of vehicles sold within the state or tax incentives for the purchase of low emission and alternative fuel vehicles. Several of these programs are highlighted below.

On July 22, 2002, **California** Governor Gray Davis signed legislation (AB 1493) to reduce GHG emissions from light-duty vehicles. The act requires that the California Air Resources Board adopt "regulations that achieve the maximum feasible reduction of GHG emissions" from passenger vehicles (i.e., cars and light trucks) by January 2005. Under the bill, the regulations would apply to vehicles manufactured in the 2009 model year and thereafter. This is the first state or federal regulatory initiative to reduce motor vehicle GHG emissions. The California effort is extremely innovative in that it addresses *all* new vehicles sold in the state—not just the small share of low-GHG vehicles that can be affected through tax credits. Under the Clean Air Act, once California has established emissions standards for light-duty vehicles, other states can adopt the California standards. Four states (Massachusetts, New York, Vermont, and Maine) have already adopted the California Low Emission Vehicle standards for emissions of criteria pollutants.

For more information: www.governor.ca.gov/govsite/pdf/links/ab_1493_bill_20020701_enrolled.pdf

New York State offers tax credits for a variety of low-GHG vehicles. A $2,000 personal income tax or corporate tax credit matches the current federal deduction allowance for vehicles powered by natural gas, propane, methanol, ethanol, and hydrogen as well as for hybrid electric vehicles. Credits are as much as $5,000 for light-duty vehicles and $10,000 for heavier vehicles. In addition, for qualified alternative fuel vehicles, the incremental cost of the vehicle is exempt from New York state sales tax. In the case of hybrid electric vehicles, for which incremental costs cannot always be determined, recently adopted state legislation creates a $3,000 sales tax credit.

For more information: www.nyserda.org/afvprogram.html

Maryland provides an excise tax exemption of $1,500 for qualifying hybrid vehicles for model year 2000 cars or later.

For more information: www.energy.state.md.us/cleanincentives.html

Oregon offers a $1,500 state income tax credit for hybrid electric vehicles through the state's residential energy tax credit program. The electric drive system and the on-board electric charging system each qualify for a $750 tax credit.

For more information: www.energy.state.or.us/trans/hybridcr.htm

Low–Greenhouse Gas Fuels

Several states are pursuing options to promote the use of renewable biofuels—fuels made with biomass resources such as agricultural and forestry residues. On a life-cycle basis, the use of biodiesel and other renewable fuels can lower GHG emissions and are important elements in a comprehensive strategy for reducing GHG emissions from the transportation sector.

Current **Minnesota** state law requires that, with few exceptions, all gasoline sold in the state contain 10 percent ethanol oxygenate. In addition, 65 E85 (85 percent ethanol and 15 percent gasoline) fueling stations are available to the public in the greater Minneapolis area. Recently passed legislation passed in Minnesota requires that most of the diesel fuel sold in the state contain 2 percent biodiesel beginning in 2005. The requirement could be implemented earlier if (1) a biodiesel production plant with 8 million gallons of annual capacity is installed in the state and (2) the federal government enacts legislation that provides a $0.02 incentive for diesel fuel containing 2 percent biodiesel. The law will create demand for an estimated 16 million gallons of biodiesel annually.

For more information: www.commerce.state.mn.us/pages/Energy/MainModTech.htm

New York is working to expand its production and use of biodiesel. In its next annual contract, the state will purchase 3 million gallons of B100 (100 percent biodiesel) for state fleets and marine passenger ferries in New York City. Current efforts are also underway for the use of biodiesel on the New York Thruway as well expanding the use of biodiesel to meet federal Energy Policy Act of Act of 1992 (EPAct) fleet requirements. New York is also considering a statewide biodiesel standard.

For more information: www.nyserda.org/exorder111guidelines.pdf

Smart Growth and Reductions in Vehicle Miles of Travel

Increases in vehicle miles of travel (VMT) have been fostered by continued sprawling development patterns and a focus on road building at the expense of other transportation modes. Such growth is key to the increases in transportation-sector GHG emissions. Several states and regions are undertaking "smart growth" initiatives designed to protect open space and target development in areas with existing population, core services and infrastructure. A subset of these policies is aimed at reducing VMT through changes in land-use patterns (e.g., fostering high density, mixed-use, pedestrian-oriented development, and growth-management zones); advocating changes in transportation infrastructure (e.g., advocating transit improvements and

bike lanes); and complementary efforts to encourage behavior change, such as incentive programs and promotional campaigns. Because efforts that reduce VMT lead to concurrent reductions in GHG emissions, these smart growth programs will likely lead to substantial emissions reductions. Noteworthy examples of such initiatives include the following.

Maryland has long been a leader in smart growth and open space protection; its policies include emphasizing mixed land-use developments, providing incentives to encourage businesses to relocate in urban areas, and preserving open space and farmland. The backbone of Maryland's smart growth efforts is to limit state infrastructure funding to "Priority Funding Areas" that local governments designate for growth; the state withholds funds for development outside of these areas. This pioneering "power-of-the-purse" approach acknowledges the importance of transportation and other infrastructure funding in shaping land-use development patterns. Recognizing that transit is an essential component of smart growth, Maryland has adopted the goal of doubling transit ridership by 2020 and has added $1.75 billion in statewide transit projects to the state's Capital Transportation Program.

For more information: www.op.state.md.us/smartgrowth/

New Jersey Governor James McGreevy signed Executive Order 4 in January 2002, which established a Smart Growth Policy Council empowered to (1) ensure that state grants, incentives, or other funding issued to promote economic activity are consistent with the state plan and smart growth; (2) ensure that state transportation, redevelopment, water resource protection, and school construction are consistent with the state plan and smart growth; and (3) empower municipalities by providing them with legal support through the attorney general's office.

For more information: www.state.nj.us/cgi-bin/governor/njnewsline/view_article.pl?id=624

New York released its State Energy Plan in June 2002. The plan charges the state with improving the efficiency of the transportation sector through a set of actions that are based on the preliminary recommendations of Governor Pataki's New York GHG Task Force. Key recommendations contained in the energy plan include:

- redirecting state transportation spending toward energy efficient alternatives, including transit, walking, and bicycling;
- targeting open space funding to prevent sprawl and reduce VMT; and
- working with regional and local planning bodies to track CO_2 emissions and energy use of transportation plans and programs.

For more information: www.nyserda.org/sep.html

The **Washington State** Legislature passed the Commute Trip Reduction (CTR) Law in 1991 with the goals of reducing traffic congestion, air pollution, and petroleum consumption through employer-based programs that reduce the number of drive-alone trips in the State's nine most populous counties. The CTR office is funded at $5.2 million on a biannual basis. The CTR law also created a Travel Demand Management (TDM) Resource Center to reduce VMT in the highly congested 4-county Puget Sound region. The TDM Resource Center anticipates reducing regional VMT by 3-6 percent through investment in employer-based commute reduction strategies, vanpools, land-use and education measures. The TDM Resource Center would be responsible for implementing a proposed $450 million TDM program focusing on vanpooling

and other strategies to help employers reduce trips and improve choices for travelers on the congested I-405 corridor. **King County, Washington,** is home to the nation's oldest van pool program and the nation's largest car- sharing program. The public vanpools in this reduce VMT by 2.7 million miles annually. King County also contributes to research efforts on the interactions among the built environment, travel choice, activity patterns, air pollution, physical activity, and public health. CCAP is coordinating a current effort documenting the link between land use, transportation, and climate change within King County.

For more information: www.metrokc.gov/earthlegacy/smartgrowth.htm

Salt Lake City, Utah, developed a visioning process for preserving open space and limiting congestion by addressing long-term growth. "Envision Utah" organized community workshops to give participants hands-on experience with balancing population growth, community preservation, and open-space protection. Using regional maps and chips representing population, many different participants were able to visualize how projected population growth could not be sustained at business-as-usual densities. Envision Utah then did careful modeling to determine the relationship among growth, infrastructure costs, and emissions. It developed four growth scenarios representing a range of densities and transportation options. These options were then presented to the public in the form of surveys, some of which were printed in local newspapers and included visual representations of the different scenarios. Most respondents favored the third-most-dense scenario, which was estimated to save $4.5 billion in infrastructure costs and reduce regional VMT by three percent. Given these results, Envision Utah is pursuing strategies to discourage sprawl, trains public officials in the Tools for Quality Growth, and builds community support for smart growth concepts.

For more information: www.envisionutah.org

MARKET MECHANISMS

Market mechanisms can be important strategies for states to help adjust individual travel behavior and potentially providing a new revenue stream to help pay for transportation-associated infrastructure costs. Examples include commuter choice, congestion pricing, parking cash-out, pay-as-you drive insurance and Wisconsin's U-Pass Program, as described below.

Maryland offers a state tax credit beyond the federal Commuter Choice benefit to Maryland employers who help pay for their employees to take transit to work. The state provides a 50 percent tax credit for every dollar spent on employee transit expenses, worth up to $30 per employee per month in tax savings.

For more information: www.commuterchoicemaryland.com/

In 1991, the city of **Santa Monica** enacted a Transportation Management Plan Ordinance to encourage employers with 50 or more employees and developers to promote alternative transport modes. As of February 1999, 26 of Santa Monica's 105 employers with 50 or more employees had implemented cash-out programs, which offer employees the equivalent cash value of their parking spaces. The program produces an estimated VMT reduction of 544,000 miles per year,

which amounts to an annual reduction in CO_2 emissions of 196 tons. Santa Monica is the only city in the nation to offer a parking cash-out program.

For more information: www.epa.gov/air/recipes/cashout.html

In **Milwaukee County, Wisconsin,** University of Wisconsin–Milwaukee students can use any County Transit System and four-county Wisconsin Coach Line Bus for free through the UPASS program. In cooperation with the Milwaukee County Transit System and Wisconsin Coach Lines, the University of Wisconsin incorporates a transit fee into incidental fees paid by students who are then entitled to unlimited use of the bus system simply by showing an appropriate identification card. The pass can be used at any time throughout the Milwaukee County Transit System without any additional fare. Studies indicate the UPASS program resulted in 221,055 fewer vehicle trips (a reduction of 5,084,265 VMT) made to UWM during a recent school year. The reduction in VMT in turn resulted in a savings of 242,108 gallons of fuel and almost $300,000 in fuel costs. The program also reduced regional emissions by approximately 0.10 percent for the entire southeastern Wisconsin region.

For more information: www.uwm.edu/Dept/Trans/alttran.html

The Port Authority of **New York** and **New Jersey** (PANYNJ) has adopted congestion, or peak-period, pricing—a highway pricing mechanism that charges a high price at peak hours and lower price at off-peak times—combined with electronic tolling on its bridges and tunnels. The toll for off-peak drivers using the E-ZPass electronic toll card is $4.00, and the toll for drivers paying cash during peak hours is $6.00. Carpools of three or more people using EZ-Pass pay only $1. Preliminary results of the PANYNJ's congestion pricing strategy indicate a 9 percent increase in EZ-Pass use, a 4 to 7 percent shift from peak to off-peak traffic, and—most relevant to GHG emissions—a 21 percent increase in carpool transactions. The congestion pricing program is a component of a Port Authority strategy to improve mobility. The bistate agency also is aggressively promoting E-ZPass use, encouraging the development of ferry service, installing intelligent highway technology to more quickly detect and clear incidents at its crossings to reduce traffic delays, and buying PATH cars and upgrading the rapid transit system's signal system to increase service reliability and encourage mass transit use.

For more information: www.panynj.gov/pr/92-01.html

Pay-as-you drive insurance is being tested in **Texas** and authorizing legislation is in place in **Washington, Oregon, Massachusetts, Georgia,** and **Pennsylvania**. Pay-as-you-drive insurance (also called distance-based vehicle insurance) means that a vehicle's insurance premiums are based directly on how much it is driven. On a per mile basis, the more you drive the more you pay and the less you drive the more you save. Existing rating factors are incorporated so higher-risk motorists pay more per unit than lower-risk drivers. Pay-as-you-drive insurance in pilot programs has shown the potential to reduce vehicle travel by more than 10 percent as well as reduce traffic congestion, road and parking facility costs, accident risk, pollution emissions, consumer costs, and sprawl.

For more information: www.vtpi.org/tdm/tdm79.htm

MULTIMODAL FREIGHT INITIATIVES

Ground freight (freight trucking and freight rail) accounts for 19.4 percent of total transportation carbon emissions and energy use in the United States. Freight movement in all modes is expected to double by 2020.

The **New York** State legislature adopted a rail property tax reform bill, which would ensure strong freight rail service in the New York–New Jersey metropolitan area. The law, currently awaiting signature by the governor, is designed to make New York's rail property tax system comparable to that of surrounding states. By reducing the ceiling for state rail property taxes, the bill aims to encourage additional investment in track infrastructure by both public and private freight rail carriers. The law also contains a provision stating that any lost school revenue (from lower state property tax receipts) must be reimbursed by the state. Truck freight is less efficient than rail service, so improvements in rail infrastructure will help reduce reliance on trucks and reduce their subsequent GHG and other air emissions.

For more information: http://assembly.state.ny.us/leg/?bn=S07602

RESIDENTIAL AND COMMERCIAL SECTORS

Residential and commercial end-use sectors account for about 20 and 15 percent, respectively, of national CO_2 emissions. A number of states encourage or mandate greater energy efficiency through establishment and use of dedicated funds, government and statewide efficiency goals, tax incentives, codes and standards, and voluntary agreements. Examples are provided below.

ENERGY EFFICIENCY FUNDS

Sixteen states have established or are in the process of developing public benefits charge funds for energy efficiency.[9] Similar to funds for renewable energy (described earlier in this report), the funds are collected through a charge on electricity rates or as a lump-sum payment from utilities. Funds are then redistributed to residential, commercial and, in some cases, industrial projects. The structure of public benefit funds for energy efficiency can vary from state to state. These dedicated funds are a primary mechanism used by states to reduce GHG intensity in commercial and residential sectors.[10] Below are some examples of these programs.

The **New York** State Energy Research and Development Authority's (NYSERDA) Energy $mart Program spends about $142 million annually on energy efficiency from public benefit funds. This program funds a range of projects for the commercial, industrial, residential, government, and low-income sectors. Examples include co-funding for energy audits, incentives to lower the cost of efficiency upgrading, and discounts on Energy Star products. NYSERDA estimates reductions of NO_X, SO_2, and CO_2 by multiplying energy savings by factors that are based on the average electric generation mix for the state.

For more information: www.nyserda.org/sbceval.html

The **New Jersey** public benefit fund spends approximately $90 million annually on energy efficiency programs. One such program is the High Performance School Fund pilot program to provide funding to pay schools to install energy efficient and renewable energy systems. The pilot program will seek to pay the additional cost of investing in energy efficient and renewable energy systems when new schools are built.

For more information: www.state.nj.us/dep/dsr/gcc/SchoolBoards.pdf

ENERGY EFFICIENCY REQUIREMENTS AND GOALS

In a program similar to government initiatives to purchase "green" energy, a limited number of states require that government facilities become more energy efficient through such requirements as the purchase of energy efficient equipment in the design of newly built or redesigned buildings.

New York Governor Pataki directed state agencies to reduce energy consumption in all state buildings to 35 percent below 1990 levels by 2010. Agencies must achieve these efficiency gains through conservation, the purchase of energy efficient products, and adherence to green building

[9] CCAP, Survey of state funding for energy efficiency and renewable energy funds, forthcoming.
[10] This mechanism is also used to promote energy efficiency in the industry and electricity sectors.

standards in construction and renovation of state buildings. In particular, new or renovated buildings must be 20 percent more energy efficient than the prevailing building code requires.

For more information: www.nyserda.org/exorder111guidelines.pdf

In a March 13, 2001, executive order, **Maryland** Governor Parris Glendening mandated a variety of initiatives to reduce energy consumption in state buildings. The order establishes the High Efficiency Green Buildings Program to guide the energy efficient design, construction, operation, and maintenance of all new facilities built by the state, as well as the renovation of existing state-owned and leased buildings. Specific goals include reducing energy consumption in buildings by 10 percent per square foot by 2005 and by 15 percent per square foot by 2010 (from 2000 average consumption figures). In addition, all new energy-using products are to carry the "Energy Star" label or must be in the top 25 percent of energy efficiency when labeled products are unavailable. Additional actions to reduce energy consumption in the state are being recommended by the Maryland Task Force on Energy Efficiency, which consists of state officials as well as environmental, business, and public representatives.

For more information: www.gov.state.md.us/gov/press/2001/mar/html/green.html and www.gov.state.md.us/gov/press/2001/jun/html/energyconserv.html

Washington State passed a law, EHB 2247, which requires that state agencies and school districts undertake energy surveys and audits for their facilities, then implement conservation improvements to minimize energy consumption.

For more information: www.leg.wa.gov/pub/billinfo/2001-02/House/2225-2249/2247_pl_09252001.txt

TAX INCENTIVES FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY

Over half of U.S. states have some form of tax credit to encourage renewable energy or more energy efficient products.[11] Two noteworthy examples are listed below.

In May 2000, **Maryland** passed the Clean Energy Incentive Act. The act will remove the state sales tax on a variety of products that are rated as energy efficient, including clothes washers, refrigerators, hot water heaters, and fuel cells. Also, the act will reduce the state titling tax on electric and hybrid vehicles and will reduce the state income tax on renewable energy equipment and sources of energy, including photovoltaic systems and wind generation.

For more information: www.energy.state.md.us/cleanincentives.html

Oregon businesses can receive a tax credit for investment in systems that provide energy savings or produce renewable energy. Oregon also has a residential tax credit for households that make energy efficiency improvements, including credit for energy efficient appliances, solar water heating, and alternative fuel vehicles.

For more information: www.energy.state.or.us/bus/tax/taxcdt.htm

[11] IREC, *Database of State Incentives for Renewable Energy.* Available at www.dsireusa.org.

VOLUNTARY AGREEMENTS

Many **New Jersey** municipalities, education, and religious institutions have signed the GHG Covenant, an agreement with the state to reduce GHG emissions to at least 3.5 percent below 1990 levels by 2005. In February 2001, New Jersey's 56 universities and colleges signed the covenant. Other key signatories include the New Jersey School Board Association; four individual school boards; and Partners for Environmental Quality, a faith-based coalition that represents nine denominations consisting of approximately 6,000 congregations, or about 75 percent of the congregations in the state. Finally, through the New Jersey Department of Environmental Protection's Performance Partnership Agreement Process with the state's municipalities, 15 mayors have signed the covenant.

For more information: www.state.nj.us/dep/dsr/ click "climate change" and "programs and partners."

ENERGY CONSERVATION GOALS

In response to a potential electricity shortfall during the summer of 2001, **California** Governor Davis issued an energy conservation goal to reduce peak demand for the summer by 5,000 MW. To achieve this target, the state encouraged voluntary reductions and provided incentives. The state experienced a reduction in energy use between 2000 and 2001 of more than 6 percent, 10 percent of which occurred in the summer months of 2001.

For more information: www.energy.ca.gov/efficiency/2001_CONSERVATION_REPORT.PDF

APPLIANCE STANDARDS

Five states—**California, Massachusetts, Minnesota, New York,** and **Wisconsin**—have created equipment standards for transformers, which are not covered under federal regulation. In addition, in February 2002 California adopted standards for eight other products not covered by federal standards, including commercial refrigerators, traffic signals, and torchiere lighting fixtures. The state also set standards for air conditioners that are 10 percent more stringent than the proposed federal standards.

For more information: http://38.144.192.166/releases/2002_releases/2002-02-14_aircondition_nr.html

INDUSTRY SECTOR

The industrial sector contributes about one-third of the U.S. GHG emissions when electricity used in this sector is included. A number of industry facilities are reducing GHG emissions either as a part of a national program or through company-wide targets. States are also beginning to work with local companies and facilities to develop GHG reduction programs. A number of the programs described earlier, such as public benefit charges, provide support for programs in the industrial sector. Programs mentioned earlier in this report are not included below.

NEGOTIATED AGREEMENTS

New Jersey is spearheading the use of negotiated agreements between government and other parties to achieve voluntary binding commitments to GHG reductions. Other states are currently evaluating this approach as a way of reducing industrial GHG emissions as part of broader state GHG reduction goals.

New Jersey's Silver and Gold Track, developed in conjunction with the U.S. EPA's Project XL, provides a mechanism for companies to achieve permitting and other federal regulatory flexibility in return for accepting the state's GHG reduction target. New Jersey's Silver and Gold Track offers various degrees of regulatory flexibility. Silver II Track requires participating entities to commit to lowering CO_2 caps to 3.5 percent below 1990 levels by 2005. Gold Track requires declining caps for CO_2, NO_X, and volatile organic compounds. Incentives for companies to participate in Silver and Gold Track include recognition, an expedited process for obtaining permits, consolidated reporting, project flexibility, and regulatory flexibility.

For more information: www.state.nj.us/dep/opppc/silver.htm

AGRICULTURE AND FORESTRY SECTORS

The agriculture and forestry sectors contribute GHG emissions as well as increase the absorption of CO_2 through carbon sequestration. For example, agricultural practices use fossil-fueled equipment in their daily operations; therefore, decreasing the use of such equipment can lead to subsequent reductions in emissions. The forestry and agriculture sectors can also influence GHG emissions through agricultural energy production and biomass production for fuel use.

In addition, actions taken within these sectors affect rates of carbon sequestration and therefore lead to an increase (or decrease) in the amount of carbon taken out of the atmosphere. Several state and local governments have developed programs on pilot and other bases in such areas as methane recovery for electricity generation; conservation tillage, which can improve the carbon sequestration ability of soils; tax credits for energy production; forestry conservation and reforestation; and urban forest planting. Actions within this sector are an important component of strategies to reduce GHG emissions, but research on specific programs is beyond the scope of this report. Future editions of this report will provide greater detail on leading GHG reduction programs in these sectors as information becomes available.

STATE GREENHOUSE GAS INVENTORIES AND REGISTRIES

Thirty-eight states and one U.S. territory have completed state-authored inventories of their GHG emissions, and two states are in the process of developing inventories.[12] A handful of states are also developing registries to record emission reductions and encourage early action. These inventories are essential to tracking emissions on a regular basis, but most states are simply building experience in the development of inventories, usually on a top-down basis using data on aggregate fuel use. A bottom-up inventory, in which emissions and fuel use are disaggregated to substate (e.g., by major urban area) and subsector (e.g., energy use from individual companies) levels, can assist in tracking success of individual programs, highlight areas needing greater efforts, and increase the accuracy of the statewide emissions inventory. Similarly, most of the registries developed to date are appropriate for voluntary reporting but are not yet designed to link to mandatory reduction requirements.

In accordance with Senate bills 1771 and 527, **California** established a voluntary GHG emissions registry, administered by the California Climate Action Registry, a nonprofit organization. The registry began operations in September 2001, and participating entities will begin enrollment in fall 2002. These entities will be able to establish GHG emissions baselines, and in return for voluntary participation, the state will use its best efforts to ensure that they receive appropriate consideration under future GHG policies. California's registry program is unique in that participants are required to register entity-wide emissions in addition to project-specific data. Participants must report direct emissions (e.g., onsite combustion and tailpipe emissions from vehicles) and indirect emissions from electricity consumption.

For more information: www.climateregistry.org/

New Hampshire passed a law in July 1999 requiring the Department of Environmental Services to develop rules for a voluntary GHG emissions reduction registry (Chapter 220). Under the registry, participants can register emissions reductions on a project or company-wide basis. Company-wide reporting is being encouraged by the state as a means to establish a company's baseline under a future regulatory regime.

For more information: www.des.state.nh.us/rules/enva-3800.PDF

In May 2000 **Wisconsin** passed a law (1999 Wisconsin Act 195) requiring the Department of Natural Resources to establish a system to register GHG emissions reductions. A proposed regulation (Chapter NR 437, Wisconsin Administrative Code) specifies the requirements and operating parameters for the registry.

For more information: www.dnr.state.wi.us/org/aw/air/hot/climchgcom/

New Jersey has developed a GHG registry component in concert with the Open Market Emissions Trading (OMET) rule established by the state Department of Environmental Protection. The GHG registry component has been operational since June 2000 (NJ OMET rule

[12] Information on state-authored GHG inventories is available at: U.S. EPA, *State-Authored Inventories*. Available at http://yosemite.epa.gov/globalwarming/ghg.nsf/emissions/StateAuthoredInventories.

as amended). Under the rule, entities can report GHG emissions reductions into the emissions bank.

For more information: www.state.nj.us/dep/aqm/ometp2ad.htm

The **Oregon** legislature passed a carbon sequestration registry bill during the 2001 session. The law, ORS chapter 526, establishes a forestry carbon offset program to market, register, transfer, and sell forestry offsets. The state Forester has jurisdiction to execute contracts and agreements and negotiate prices of offsets.

For more information: www.leg.state.or.us/01reg/measures/HB2200.dir/HB2200.intro.html

APPENDIX

APPENDIX 1: STATE GREENHOUSE GAS EMISSIONS LEVELS

Table A1 shows the GHG emissions of all 50 states and the District of Columbia according to per capita emissions and total state emissions in 1999.

Table A1: Total and Per Capita CO_2 Emissions by State, 1999

State	Total CO_2 Emissions		Per Capita CO_2 Emissions	
	MMTCE	State Rank	MTCE per person	State Rank
Texas	166.56	1	8.31	10
California	94.83	2	2.86	49
Ohio	69.75	3	6.20	19
Pennsylvania	64.05	4	5.34	27
Florida	60.83	5	4.03	37
Indiana	59.85	6	10.07	6
Illinois	58.58	7	4.83	33
Michigan	52.96	8	5.37	26
New York	52.31	9	2.87	48
Louisiana	51.16	10	11.70	5
Georgia	43.11	11	5.54	24
North Carolina	37.19	12	4.86	32
Kentucky	36.43	13	9.20	8
Alabama	35.90	14	8.22	11
Missouri	35.17	15	6.43	18
Tennessee	32.36	16	5.90	22
New Jersey	32.10	17	3.94	39
West Virginia	30.65	18	16.96	4
Virginia	29.62	19	4.31	35
Wisconsin	27.97	20	5.33	28
Oklahoma	25.04	21	7.46	13
Minnesota	25.02	22	5.24	30
Washington	23.11	23	4.01	38
Arizona	21.47	24	4.49	34
Colorado	21.32	25	5.26	29
Maryland	21.16	26	4.09	36
South Carolina	20.93	27	5.39	25
Iowa	20.65	28	7.20	15
Kansas	19.43	29	7.32	14
Massachusetts	17.16	30	2.78	50

Table A1: Total and Per Capita CO_2 Emissions by State, 1999				
State	Total CO_2 Emissions		Per Capita CO_2 Emissions	
	MMTCE	State Rank	MTCE per person	State Rank
Arkansas	17.09	31	6.70	16
Mississippi	17.05	32	6.16	20
Wyoming	16.79	33	35.01	1
Utah	16.60	34	7.79	12
New Mexico	15.10	35	8.68	9
North Dakota	13.82	36	21.81	2
Oregon	11.24	37	3.39	43
Nebraska	11.11	38	6.67	17
Alaska	11.03	39	17.80	3
Nevada	10.91	40	6.03	21
Connecticut	10.09	41	3.07	46
Montana	8.37	42	9.48	7
Maine	4.86	43	3.88	40
New Hampshire	4.55	44	3.79	41
Delaware	4.30	45	5.71	23
Hawaii	4.25	46	3.58	42
Idaho	4.11	47	3.28	44
South Dakota	3.63	48	4.95	31
Rhode Island	3.08	49	3.11	45
Vermont	1.77	50	2.98	47
District of Columbia	1.13	51	2.18	51
U.S. Total	**1477.32**		**5.42**	

MMTCE = Million metric tons of carbon equivalent; MTCE = Metric tons of carbon equivalent.

Note: Emissions levels may differ from state-developed inventories due to differences in scope of coverage, underlying data, emission factors, or assumptions. Emissions are calculated according to where fuel is sold, an approach that can over- or underestimate the quantity of fuel used in the state.

Sources: U.S. state data: U.S. Environmental Protection Agency. *Energy CO_2 Inventories*. Available at: http://yosemite.epa.gov/globalwarming/ghg.nsf/emissions/CO2EmissionsBasedOnStateEnergyData. Per capita data are based on population estimates from the U.S. Census Bureau

APPENDIX 2: REGIONAL IMPACT OF CLIMATE CHANGE

Key regional effects of climate change, as highlighted in the *U.S. National Assessment,* include the following:[13]

- ***Northeast** (CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT, WV)*
  - Winter minimum temperature increases of 4° to 5°F, potentially causing a number of ski areas and other winter recreation locations to be eliminated
  - Precipitation increases of up to roughly 25 percent by 2100, with potentially significant changes in drought patterns
  - Negative effects on fall foliage as a result of increased autumn warmth and droughts and the loss of maple species
  - Losses of beachfront property and destruction of barrier islands as a result of the rise in sea level.

- ***Southeast (AL, AR, GA, FL, KY, LA, MS, NC, SC, TN, VA, and Eastern TX)***
  - Heat index increases of 8 to 20°F
  - Precipitation changes of no change to 25 percent increases
  - Destruction of barrier islands and wetlands, reduced fisheries productivity, and saltwater intrusion into surface and groundwater supplies a result of the rise in sea level.

- ***Midwest (IN, IA, IL, MI, MN, MO, and OH)***
  - Temperature increases throughout the region at a greater rate than has been observed in the 20th century (5° to 10°F over the northern Midwest)
  - Increases in precipitation of 10 to 30 percent across much of the region
  - Reduced water levels in the Great Lakes and increased flash flooding
  - Increased crop yields in the region as a whole, but decreases in crop yields in some portions of the region.

- ***Great Plains (KS, eastern MT, NE, ND, OK, SD, most of TX, WY, and parts of CO and NM)***
  - Increased temperatures, with the largest increase in western parts of the Great Plains, stressing human and livestock health
  - Exacerbated competition for water among the agricultural sector; natural ecosystems; and urban, industrial, and recreational users
  - Net reductions in soil moisture for large parts of the region
  - Increased productivity of crops and grasses as a result of increased CO_2 concentrations, especially for crops with adequate water and nitrogen.

- ***West (AZ, CA, UT, NV, western CO and NM, and panhandle of Texas)***
  - Annual average temperature increases from 3° to 4°F by 2030 and 8° to 11°F by 2090
  - More extreme wet and dry years

[13] The National Assessment Synthesis Team, *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change,* 2000. Available at: www.usgcrp.gov/usgcrp/Library/nationalassessment/overview.htm.

- Reductions in snowpack and changes in the amount and timing of peak water flows
- Northward shift in cropping areas due to milder winter temperatures.

- ***Pacific Northwest (ID, OR, WA, and western MT)***
  - Average temperature warming of 3° F by 2030 and 5° F by 2050
  - Increased flooding in rain-fed rivers and summer water shortages in rivers fed by both rain and snow
  - Hampered efforts to restore depleted salmon stocks and increased stress on presently healthy stocks
  - Likely changes in the extent, species mix, and productivity of the region's forests.

- ***Alaska***
  - Temperature increases of 1.5° to 5°F by 2030 and 5° to 18°F by 2100
  - Accelerated thawing of permafrost and continued loss of sea ice
  - Increased risk of fire and insect disturbances.

- ***Islands (HI, Pacific Islands, and U.S. Virgin Islands)***
  - Changes in patterns of natural climate variability
  - Changes in the frequency, intensity, and tracks of tropical cyclones
  - Changes in ocean currents
  - Adverse effects on island populations and ecosystems as a result of rising sea levels.

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