# ENERGY EFFICIENCY'S NEXT GENERATION: INNOVATION AT THE STATE LEVEL

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# EXECUTIVE SUMMARY

## BACKGROUND

States have long been known as "laboratories of democracy" in the U.S. federal system. It is no accident that they are also "laboratories of efficiency"; states have consistently demonstrated innovation and leadership in testing energy efficiency policies and programs. From the first wave of building energy codes and appliance efficiency standards in the 1970s, to utility efficiency programs in the 1980s, to climate change-driven initiatives in the 1990s, state legislatures, utility commissions, and executive agencies have led the way on efficiency policies and programs that often later found their way into federal policy.

Federal energy policy at the present time is displaying a distinct lack of innovation or leadership. The current energy bills in Congress, while they contain some efficiency advances (notably in appliance and equipment standards and tax credits), do virtually nothing to advance energy efficiency in two key sectors: transportation and electric utilities. Oil (especially what's consumed as motor fuel) and electricity are fast-growing energy sources with major implications for energy security, the economy, and the environment. Yet Congress shows no ability to reach consensus on policies that would have any substantial effect on these vital national issues.

This lack of bold leadership in federal energy policy leaves the United States at risk of:

- Rising dependence on oil imports from an increasingly unstable Middle East;
- Continued public health risks and economic damage from air pollution and climate change;
- Increased volatility in energy prices, threatening the economy as well as individual consumers; and
- Eroding reliability in our electricity systems.

States may hold the best opportunity in the next several years for leadership, innovation, and effectiveness in putting energy efficiency policies into action. Past examples include utility demand-side management programs and public benefit funds, state building codes, state air quality policies that incorporated efficiency, state tax incentives for efficient products and services, and state minimum-efficiency equipment standards. States were energy policy leaders during the 1970s and 1980s, but as energy issues faded in priority during the 1990s, state energy policy activity receded. Recently, in response to electric reliability problems, environmental concerns, and energy price spikes, several states (including California, Maryland, New York, and Texas) have shown leadership in developing new energy efficiency policies.

State leadership in energy policy and programs can drive national policy: many federal energy policies now in place are based on ideas first developed and implemented at the state level. For example, after the federal government declined to set appliance and equipment efficiency standards in the early 1980s, states took up the cause, laying the foundation for the federal efficiency standards legislation of 1987.

## PURPOSE AND OUTLINE OF THIS REPORT

This report is intended to serve as a guide for state legislatures, executive agencies, regulatory commissions, and stakeholders who are interested in moving forward on energy efficiency policy and program initiatives. The report describes the major categories of energy efficiency initiatives, summarizes the actions taken in leading states, and provides guidance for further action. It does not attempt to be exhaustive in listing all describable initiatives in the states; instead it focuses on exemplary efforts where reasonable documentation and results are available.

The efficiency policy categories are:

1. *Appliance and Equipment Standards*. Several states have been active in setting regulations mandating minimum efficiencies for a range of residential and commercial products. In some cases these state initiatives have paved the way for national standards.
2. *Building Energy Codes.* Half or more of the states have modern energy codes for new homes and commercial buildings that require minimum energy efficiency standards to be met.
3. *Combined Heat and Power (CHP).* Several states support policies that encourage CHP technologies that put otherwise-wasted heat from power generation to productive use, in both large power plants and smaller applications at manufacturing plants and commercial buildings.
4. *Facility Management.* Many states own and/or operate a lot of buildings, from universities to office buildings and prisons. Substantial innovation has been utilized in reducing energy use in these facilities.
5. *Tax Incentives.* Several states offer income tax credits or deductions, sales tax exemptions, and other tax-related incentives for energy-efficient products and practices.
6. *Transportation.* States have pioneered in transportation efficiency, from encouraging efficient vehicle purchases to reducing transport demand through growth policy.
7. *Utility Programs.* Almost half the states tap utility revenue systems in various ways to pay for efficiency programs. These efforts currently top $1 billion annually.

Since many states are taking action on climate change, and since many policy responses to climate change depend on energy efficiency, we have also included an appendix on state climate change initiatives. It describes a range of energy efficiency initiatives emerging under the umbrella of state responses to the challenge of climate change.

Table ES-2 at the end of this summary is a quick index of initiatives and the states in which they are currently active. Each state initiative checked in the table is described in the appropriate section of the report.

### Conclusions

State energy efficiency policy can make a substantial difference in making the U.S. energy economy more efficient, more affordable, cleaner, and more sustainable. Hundreds of innovative policies and programs highlighted in this report demonstrate the enormous

potential for energy savings and the enormous ingenuity of state agencies, utilities, advocates, and other stakeholders.

To illustrate the potential benefits of state efficiency policies, an average-size state could save almost 400 trillion British thermal units (TBtu) annually in the year 2020 through aggressive application of these policies. These potential savings are summarized in Table ES-1; they are equivalent to about 20% of current total energy usage.

***Table ES-1: Typical State Savings Potential***

| Policy | Savings Potential (TBtu in 2020) |
|---|---|
| Appliance Standards | 21.4 |
| Building Codes (Residential) | 4.8 |
| CHP | 57.2 |
| State Facilities | 23.0 |
| Tax Incentives | 10.0 |
| Transportation | 200.0 |
| Utilities | 74.2 |
| TOTAL | 390.7 |

These savings estimates are very rough, and are not based on a single analytical modeling approach. More precise estimates of potential savings for a given state require much more detailed data on existing baseline conditions and other forecasting inputs. These estimates in Table ES-1 are, however, sufficient to provide a first-order estimate of the potential benefits of energy efficiency policies. Given this substantial potential, state efficiency policies should be a major focus for analysis and advocacy in the coming years.

## ACKNOWLEDGMENTS

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***Table ES-2: Quick Index of State Energy Efficiency Policies***

| STATE | POLICY CATEGORY | | | | | | |
|---|---|---|---|---|---|---|---|
| | Appliance Standards | Building Codes | Combined Heat/Power | State Facilities | Tax Incentives | Transport | Utilities |
| AK | | | | | | | |
| AL | | | | | | | |
| AR | | | | X | | | X |
| AZ | | | | X | | | X |
| CA | X | X | X | | | X | X |
| CO | | | | | | | |
| CT | X | | | | | | |
| DC | | | | | | | X |
| DE | | | | | | X | X |
| FL | | X | | | | | |
| GA | | | | | | X | |
| HI | | | | X | X | | |
| IA | | | | X | | | |
| ID | | | | | | | |
| IL | | | X | X | | | X |
| IN | | | X | X | | | X |
| KS | | | | | | | |
| KY | | | | | | | |
| LA | | | | | | | |
| MA | X | | X | X | X | X | X |
| MD | X | | | X | X | X | X |
| ME | | | | | | | X |
| MI | | | | | | | X |
| MN | X | X | | X | X | X | X |
| MO | | | | | | X | |
| MS | | | | | | | |
| MT | | | | | | | X |
| NC | | | | | | X | |
| ND | | | | | | | |
| NE | | | | | | | |
| NH | | | | | | | X |
| NJ | | | X | | | X | X |
| NM | | | | | | | X |
| NV | | | | | | | X |
| NY | X | | X | X | X | | X |
| OH | | | | | | | X |
| OK | | | | | | | |
| OR | | X | X | X | X | X | X |
| PA | | | | X | | X | X |
| RI | X | | | | | | X |
| SC | | | | | | | |
| SD | | | | | | | |
| TN | | | | | | | |
| TX | | X | X | X | | X | X |
| UT | | | | | | | X |
| VA | | | | | | | |
| VT | X | | | | | | X |
| WA | X | X | | | | X | |
| WI | | | | | | | X |
| WV | | | | | | | |
| WY | | | | | | | |

Note: This report highlights leading examples, and does not include all initiatives in all states.

# POLICY CATEGORY ONE: APPLIANCE AND EQUIPMENT STANDARDS

## PROBLEM

For most types of energy-using equipment, many models are being sold that are much less efficient than many other models. A variety of market barriers inhibits sales of the more efficient equipment, including limited consumer knowledge about efficient products, split incentives (one party makes the purchase while another pays the energy bills—for example, a landlord and tenant), panic purchases (failed units must be replaced immediately with whatever is in stock), and bundling of efficiency with high-cost "bells and whistles." Substantial energy could be saved if all equipment sold had an efficiency at least equal to the average equipment now on the market.

## POTENTIAL BENEFITS TO STATES

A new analysis by ACEEE for the Appliance Standards Awareness Project (ASAP) estimated the savings from new standards at the state level. Results of this analysis, for all 50 states combined, are summarized in Table 1.

Savings in individual states, of course, will depend on the size of the state and the characteristics of the population and buildings. But for a typical average-sized state (e.g., with a population of about 5–6 million), the impacts at the state level can be approximated by taking the national impacts and dividing by 50. Using this approach, for the average state, adopting standards for the 18 products listed in Table 1 could reduce electricity use by 2 billion kilowatt-hours (kWh) (enough to power approximately 200,000 typical homes for a year), decrease peak electricity demand by 490 megawatts (MW) (equivalent to a large new power plant), and diminish carbon emissions by about 250,000 metric tons (MT) (equivalent to taking about 50,000 cars off the road). The net benefits (savings minus costs) would be about $1 billion in 2020—about $500/household (including business energy savings). Benefits statewide would be about three times greater than costs.

## APPLIANCE STANDARDSAS

State minimum-efficiency standards can be adopted that require that specified efficiencies be obtained for products to be sold or installed in a state. Such standards remove the least efficient products from the market, leaving consumers to choose among a variety of products with moderate to high levels of efficiency. Efficiency levels can be based on widely used qualifications such as industry standards, ENERGY STAR® specifications, or minimum-efficiency standards adopted by other states.

***Table 1: Energy, Economic, and Environmental Savings Possible in the United Sates from Efficiency Standards on Products Not Subject to Federal Regulation***

| Product | National Energy Savings in 2020 (GWh) | (bill. Btu) | NPV for Purchases thru 2030 ($million) | Benefit-Cost Ratio | Peak Load Reduction in 2020 (MW) | Carbon Reduction in 2020 (1,000 MT) |
|---|---|---|---|---|---|---|
| Battery chargers | 5,235 | 51,470 | 1,903 | 3 | 707 | 599 |
| Beverage merchandisers | 1,866 | 18,347 | 962 | 10 | 425 | 214 |
| Ceiling fans (with lights) | 19,932 | 195,954 | 8,034 | 3 | 6,392 | 2,282 |
| Commercial clothes washers | 322 | 8,526 | 803 | 3 | 103 | 84 |
| Commercial packaged A/C (over 20 tons) | 1,575 | 15,486 | 503 | 3 | 1,613 | 180 |
| Commercial refrigerators & freezers | 1,318 | 12,960 | 651 | 8 | 300 | 151 |
| Compact fluorescent lamps | 2,808 | 27,601 | 1,451 | 7 | 899 | 321 |
| Dry-type transformers | 4,562 | 44,847 | 2,567 | 5 | 616 | 522 |
| Exit signs | 1,933 | 18,999 | 1,124 | 9 | 261 | 221 |
| External power supplies | 12,544 | 123,325 | 6,533 | 4 | 1,694 | 1,436 |
| Ice-makers | 870 | 8,552 | 431 | 7 | 198 | 100 |
| Liquid immersed transformers | 4,861 | 47,788 | 2,148 | 3 | 897 | 557 |
| Digital cable and satellite TV boxes | 8,347 | 82,062 | 5,195 | 7 | 1,127 | 956 |
| Digital TV converter boxes | 11,338 | 111,462 | 7,056 | 7 | 1,531 | 1,298 |
| Torchiere lamps | 21,976 | 216,050 | 10,543 | 4 | 7,037 | 2,516 |
| Traffic signals | 1,290 | 12,686 | 400 | 2 | 174 | 148 |
| Unit heaters (natural gas) | NA | 44,933 | 2,643 | 8 | NA | 398 |
| Vending machines | 2,907 | 28,581 | 1,379 | 7 | 662 | 333 |
| TOTAL | 103,684 | 1,069,629 | 54,328 | 3 | 24,635 | 12,316 |

Source: Nadel 2003

## STATE EXPERIENCE

State efficiency standards have been in use for more than two decades. The first standards legislation was passed by the California Legislature in 1974 and signed by then Governor Reagan. California has gradually added to its list of standards and now regulates more than two dozen products, including 13 products for which standards were adopted in 2002.

In the 1980s, several other states (Connecticut, Massachusetts, New York, Rhode Island, Vermont, and Washington) adopted standards, which encouraged manufacturers to support federal efficiency standards for a variety of products, leading to passage of federal standards in 1987, 1988, and 1993.

The process is now repeating itself. As noted above, California has just adopted new standards on a variety of products. These include commercial reach-in refrigerators and freezers, refrigerated vending machines, refrigerated beverage merchandisers, commercial coin-operated clothes washers, torchiere lighting fixtures, exit signs, and traffic signals (CEC 2003a). California is now also beginning a rulemaking to consider new standards on a variety of additional products. In addition, Massachusetts, Minnesota**,** and New York have also recently adopted state standards on distribution transformers.

Building on these new standards and a variety of ENERGY STAR and industry specifications, the Appliance Standards Awareness Project (see "Resources" below) has developed model standards legislation that was proposed in more than a dozen states. As of this writing, the legislation passed in Maryland and is working its way through the legislative process in several other states. Information on these products and standards can be found in a series of reports by ACEEE and ASAP (also in "Resources" below) Several of the products included in this model legislation are also included in pending federal energy legislation, but states are pursuing these standards because it is unclear whether the federal legislation will pass due to controversies regarding other sections of the legislation. Furthermore, many of the products included in current and pending state standards are not included in federal legislation.

State standards are generally fairly easy to administer. Test procedures are available on a national basis for all products now subject to state standards, and lists of complying products are available on the Internet, as compiled by California, the U.S. Department of Energy/Environmental Protection Agency (DOE/EPA) ENERGY STAR program, the Consortium for Energy Efficiency (a consortium of efficiency program implementers), and others. States need to develop implementing regulations, but can base these on regulations already in place in California and other states. Standards on products installed in new buildings can be enforced as part of the building code enforcement process. For other products, existing state standard programs primarily rely on complaints from competing manufacturers, which trigger an investigation by state staff and if needed, testing of questionable products for compliance with the standards (testing can be done by a variety of independent laboratories, with costs often borne by the companies found to be out-of-compliance with the standards). Even in California, the state only devotes about four full-time equivalent staff to the standards program, including standard-setting, maintenance of product databases, monitoring and implementation, and enforcement. In other states, less than one full-time person is typically involved.

## RECOMMENDED STEPS FOR STATE ACTION

States should adopt standards on the highest priority products (in terms of energy savings and ease of implementation). This will generally require legislation, but in a few states, existing agencies have the authority to set standards via regulation. High-priority products are those already subject to standards in other states as well as some products covered by ENERGY STAR, for which detailed specifications and lists of complying products are available. For states interested in pursuing this option, a good point of contact is ASAP, which has compiled the model state legislation described above (covering ten high-priority products), a series of fact sheets on the particulars of the model legislation, and state-by-state analyses of costs and benefits of specific standards in specific states. States may also want to contact other states that have adopted and are implementing state standards, particularly California, which has the most extensive experience.

## RESOURCES

- A joint project of ACEEE, the Natural Resources Defense Council, and the Alliance to Save Energy, the **Appliance Standards Awareness Project** is devoted to the adoption of cost-effective efficiency standards at the state and federal levels. As noted above, ASAP has prepared model state legislation and a variety of fact sheets, and has available state-specific analyses of standards impacts (see www.standardsasap.org). Key contact: Andrew Delaski (617-363-9470).
- In 2001, the **American Council for an Energy-Efficient Economy** published *Opportunities for New Appliance and Equipment Efficiency Standards: Energy and Economic Savings beyond Current Standards Programs* (Kubo 2001), which became the foundation for many efforts to develop new standards. ACEEE recently released *Appliance & Equipment Efficiency Standards in the US: Accomplishments, Next Steps and Lessons Learned* (Nadel 2003), which summarizes U.S. standards efforts. ACEEE has worked on state and federal standards since the early 1980s and has conducted analyses of state standards for ASAP, the Northeast Energy Efficiency Partnerships (NEEP), and many states. ACEEE is also a good source of information on past and current activity at the federal level and in other states. Key contact: Steven Nadel (202-429-8873).
- The **California Energy Commission (CEC)** is responsible for the development and implementation of California's standards, which are available online as is a database of all products meeting the standards (see www.energy.ca.gov/appliances/index.html). Key contacts: Michael Martin (916-654-4039) and John Wilson (916-654-5056).
- The **Northeast Energy Efficiency Partnerships** is working closely with states from Maine to Maryland on the adoption of state efficiency standards. It published a report on the opportunities from standards in individual states (see www.neep.org/standards/index.html). Key contact: Isaac Elnecave (781-860-9177, ext. 23).
- Under contract with the **Pacific Gas & Electric Company (PG&E)** and other utilities, the **Davis Energy Group (DEG)** is developing case studies of products that California is now considering for new efficiency standards. Key contacts: Pat Eilert, PG&E (530-757-5261) and Leo Rainer, DEG (530-753-1100).

# POLICY CATEGORY TWO: BUILDING ENERGY CODES

## PROBLEM

Because buildings account for more than a third of U.S. energy use and carbon emissions, they are an important target for energy efficiency policies. The time of design and construction represents the greatest opportunity to build efficiency into the total building. Decisions made at this time often cannot be remedied later, or can be only at great cost, therefore the new buildings market is often referred to as a "lost opportunity" market. This heightens the importance of ensuring that energy efficiency is built into the building before and during construction.

However, the building construction industry contains several market barriers that chronically limit the realization of energy efficiency potential. For example, builders typically bear the capital cost of energy efficiency improvements, but homeowners and tenants see the benefits in lower energy bills. Since the majority of builders build speculatively, that is, they don't know who the occupant will be, they have no "feedback loop" to tell them to build in efficiency features.

The size and fragmentation of the building industry hobble technology advancement. While there are, for example, fewer than a dozen U.S. manufacturers of automobiles, home appliances, or light bulbs, there are approximately 150,000 home building companies in the United States. Similarly, buildings are resistant to industrialization. While most sectors of the U.S. economy are highly automated, building remains largely a craft industry, dependent on the integration of hundreds of components from various manufacturers by onsite crews and subcontractors. This limits the optimization of building design and performance, as components are rarely designed to work as a system and their performance depends on the competence and diligence of individuals whose motivations and accountability may be mixed.

Yet research and field experience have shown that substantial energy savings are realistically achievable in American homes. Voluntary programs, such as the EPA's ENERGY STAR Homes program (which requires 30% savings relative to minimum energy codes) and DOE's Building America program (which aims for 50% energy savings), have fostered the construction of more than 100,000 new homes at these advanced levels. While building energy codes don't seek to achieve these high levels of performance, they do set minimum building practice standards that raise the overall performance of the housing stock.

Moreover, codes and voluntary programs can work in tandem. Voluntary programs, by bringing advanced design and building practice into the market, can open the way for future code improvements. As codes are upgraded, they raise the baseline on which voluntary program standards are set. The long-term result is a series of "stair-step" improvements in building practice that over time can dramatically reduce the energy use in American homes.

## POTENTIAL BENEFITS TO STATES

Jones, Norland, and Prindle (1998) estimated the energy savings potential from residential building energy codes at 7 trillion Btu annually, or 3.25 quadrillion Btu (or Quads), over 30 years. The subsequent version of the IECC residential code created a new and significant provision for homes in the hotter climates. It set solar heat gain standards for windows: this requirement significantly reduces cooling energy use. Tribble et al. (2002) found that this solar heat gain standard, if adopted in ten Southern states, would save about another 2 Quads cumulatively over 30 years.

An "average" state could thus save about 65 trillion Btu, or about $650 million in homeowner energy bills, over 30 years from upgrading its residential building code. And if it were one of the 10 Southern states affected by the solar heat gain standard, it could save another 40 trillion Btu, or $400 million. Of course, each state's savings depends on many factors: the efficiency of its current building practice; the stringency of the code it adopts; its population, climate, and building construction activity; and the effectiveness of code enforcement.

In commercial buildings, the 1999 version of the ASHRAE 90.1 standards promises to save about 5% of the energy used by buildings meeting the 1989 version of the standard. Savings are especially significant in lighting, and more modest in heating and cooling equipment and the building envelope.

## ENERGY CODES AS A POLICY SOLUTION

Since the 1970s, states have used building energy codes to moderate the impact of new buildings on home energy bills, business costs, electricity grids, and even air pollution. California created the first state energy code in its Title 24 Building Standards, first issued in 1978. Florida followed with its own energy code in 1980. New York, Minnesota, Oregon, and Washington were also "early adopters" in creating their own energy codes in the ensuing years.

During the 1980s, the Council of American Building Officials (CABO) developed its Model Energy Code (MEC), which was adopted by several other states. By the early 1990s, about 14 states had adopted energy codes, including the leading states mentioned above (Howard and Prindle 1991).

State energy codes got a boost from the Energy Policy Act of 1992 (EPAct), which required states to study adoption of the MEC for their residential energy codes, and required adoption of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.'s (ASHRAE) 90.1 standard for commercial buildings. EPAct authorized DOE to support state energy code adoption through technical assistance and grants. Over the last decade, this has channeled about $40 million to states.

During the 1990s, CABO evolved into the International Code Council (ICC), a merger of three regional code official organizations. Under the ICC system, the MEC was renamed the

International Energy Conservation Code (IECC). Also during this period, a network of education and technical support developed for code adoption and implementation. DOE's grants program, supported by national laboratory technical assistance, and the nonprofit Building Codes Assistance Project have provided a web of information, training, technical tools, conferences, and other support services.

National model energy codes address basic thermal performance ratings for such components as windows, ceiling, wall, and basement insulation; and heating and cooling systems. Because most major energy-using equipment in the home, such as furnaces, air conditioners, water heaters, and major appliances, are covered by federal appliance standards, building energy codes typically defer to federal law on these requirements. Nor do model codes typically address advanced design and practice innovations, though these can often be used to document code compliance through performance-based code compliance options.

Administratively, energy codes are typically adopted legislatively or administratively at the state level, but are enforced at the local level by municipal or county code officials. Some states have legal structures that preclude the state government from imposing building codes or other regulatory requirements on local governments. These "home rule" states are in the minority, but they can prevent the implementation of energy codes without special legislation. Most states adopt a version of the national model codes, but several states (including California, Florida, Massachusetts, Minnesota, Oregon, and Washington) have developed their own energy codes.

### Status of State Energy Codes

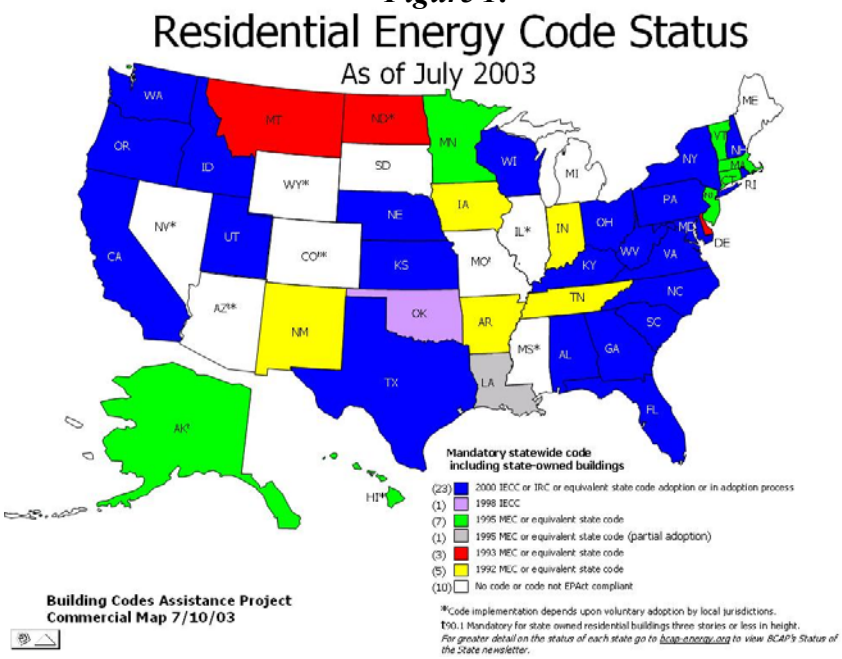
Today, 37 states use a version of the MEC, the IECC, or their own equal-or-better energy codes for residential buildings, and 32 use the ASHRAE 90.1 standard for commercial buildings. (See Figures 1 and 2 for illustrative maps.) This demonstrates substantial progress in the last two decades, but problems remain.

- Only 20 states are using the latest IECC version or better for residential, and only 18 are using the latest ASHRAE standard or better for commercial. So the majority of states are not up to date on their energy codes.
- Code implementation remains a problem. A recent Massachusetts study (XENERGY 2001) found that less than half of new homes are fully in compliance with the state's energy code. It is important to note that this occurred in a state with active training and technical assistance available, and relatively consistent code enforcement. Many states lack consistent enforcement and support programs, and thus could be expected to show even worse compliance rates. In many cases, the average shortfall in energy performance is not large in absolute numbers, but because of the volume of U.S. housing starts (currently between 1.5 and 2 million annually), the total energy wasted can be substantial.

## STATE EXPERIENCE

Although most states have an energy code of some description on the books, relatively few states stand out on the key indicators of effective energy codes:

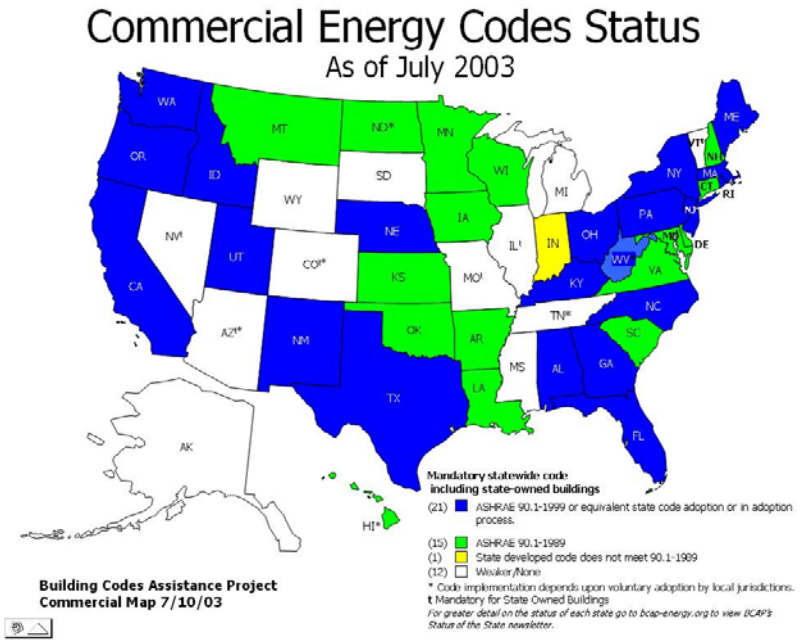
***Figure 1:***




Source: BCAP 2003

- Stringency—stiffer-than-average efficiency requirements
- Administration—ongoing support and funding for implementation and enforcement
- Innovation—designing codes and code implementation systems that support flexibility and acceptance among key audiences

***Figure 2:***




Source: BCAP 2003

This section highlights states that have distinguished themselves as leaders in the energy code arena.

**California**

California's Title 24 standards are generally accepted as the most stringent and best-enforced energy code in the United States. Over the last 25 years, the standards have been a key element of California's success in becoming one of the most energy-efficient states overall. Californians' use has stayed flat since 1976 at an average of 7,000 kWh/person/year, while Americans' overall per-person electricity use rose from 8,000 kWh to 12,000 over the same period (Rosenfeld 2003). The California Energy Commission attributes about 25% of the state's electricity savings to the Title 24 program: the remainder is attributed to appliance standards and utility energy efficiency programs.

California's Title 24 standards stand out for the following reasons.

- They are stringent. The Title 24 standards typically exceed IECC and ASHRAE efficiency levels, depending on the building component or system and climate zone involved. The standards also evolve over time, adopting new technologies as they become reasonable to include. For example, Title 24 now allows credit for duct sealing, and requires residential air conditioners to include certain features that improve field performance.
- They achieve field performance. Field verification studies for Title 24-compliant buildings showed that 88% of homes met code requirements, which compares favorably with results from states like Massachusetts, where more than 50% of homes did not comply (RER 2002).
- They offer flexibility. California is one of a few states whose building code is primarily performance-based. That is, a level of energy performance is set based on a reference set of specifications, and most builders use approved simulation software to find the most cost-effective set of efficiency features that meet the performance target. This has helped create a support industry of building energy consultants and home energy raters, who often give builders additional energy design advice, helping to further improve efficiency and field performance.
- They are actively supported. The California Energy Commission maintains an expert staff to manage the code development process, and to provide technical assistance to code officials, builders, and designers in code interpretation and enforcement. The Commission also pays for expert technical support in code development and field verification. This continuing support has been a key element of the technical quality of California's code documents, their acceptance throughout the state, and the effectiveness of code enforcement.

**Florida**

Over the last two decades, Florida's energy code has developed along similar lines to California's Title 24 standards. Florida's code is relatively stringent compared to other states;

includes new, innovative compliance options; is performance-based; and is well-supported with research, software, training, and certified field personnel.

Florida's energy code is performance-based, using a standard reference home to set the performance target. Unlike California, which approves a number of privately developed software packages for code compliance, Florida uses a single software package, developed under state support, for performance compliance calculations. Through the Florida Solar Energy Center and other organizations, training and technical support are available on the use of the code compliance software. Home energy raters are regularly certified to use this software, and builders typically use their services in determining whether their homes comply with the code.

The Florida energy code has been effective in improving typical energy efficiency in new homes. A 1995 study showed that for a sample of 299 homes, the average score on the rating scale used to determine code compliance was 9% better than the required score. While 23% of homes did not comply, a greater proportion over-complied, bringing the average score well below the required compliance level (Quantum Consulting 1995).

The Florida code has also kept up with technology progress in new homes. It offers credit, for example, for duct sealing, radiant barrier systems, and low-heat-gain roofs.

**Minnesota**

Minnesota has long had one of the more stringent energy codes in the Midwest; its first energy code was adopted in 1976 and updated periodically through the 1980s. In 1994, a two-tier set of code requirements was adopted; the higher tier, based on the Canadian R-2000 program, was voluntary, though the stated intent was to adopt the R-2000 criteria by 1998. Political opposition stalled the move to adopt R-2000 standards, but resulted in a new two-tier set of criteria, both of which are relatively stringent.

A key issue in the late-1990s debates was indoor air quality and mechanical ventilation requirements. Minnesota was one of the earlier states to try to address this issue, and the process generated extended debate. The current result is a choice of two code compliance paths, effective in 2000, with different approaches to mechanical ventilation. These approaches are being studied for their field impact, and may result in a consensus approach. The result so far, however, has been overall advancement in code requirements, and increased knowledge about air quality and ventilation issues.

A 2002 field evaluation study found that homes built to the standards adopted in 2000 are saving 25% of the heating energy used by comparable homes built in 1994 (ShelterSource, Inc. 2002). These savings were achieved at an incremental cost averaging 1–2% of total new home construction costs. Heating bill savings outweigh added costs substantially; 20-year savings in one typical scenario are $4,740 compared to added construction costs of $2,000 (MN DOA 2002). For the typical homeowner paying a mortgage, the added mortgage payment would be $12–13, compared to average energy bill savings of $19–20, so the efficient home actually costs less to own as well as to operate.

**Oregon and Washington**

These two states' energy codes emerged from a similar source: the Model Conservation Standards (MCS) developed in the Northwest region during the 1980s under the mandate of the Northwest Power Planning Act, which Congress passed in 1980 to require consideration of energy efficiency and renewable energy in the Bonneville Power Administration region. The Act created the Northwest Power Planning Council (NWPPC) to administer its provisions; one of NWPPC's first efforts was development of the MCS.

The MCS were originally disseminated as voluntary standards under Bonneville-supported utility programs. The Super Good Cents Program evolved to market these building practices, offering incentives, education, and other support to builders. As builders came to accept the MCS, states in the region moved to incorporate them into building codes.

Oregon and Washington have been the most successful in working the MCS into their building energy codes. They have chosen a very different implementation route than California or Florida, relying primarily on a simplified, prescriptive approach rather than a performance approach that relies more on computer simulation. Simplicity and consistency across local jurisdictions has apparently brought a relatively high level of compliance with the codes.

A recent construction practice survey found that 94% of homes surveyed in Washington and 100% in Oregon met or exceeded code requirements for the building envelope (Ecotope 2001). Idaho and Montana, which have been less aggressive with energy codes, exhibited compliance rates of 52 and 87%, respectively. Since many homes over-complied, the average thermal loss factors in residential envelopes in both states were lower than code requirements.

**Texas**

Texas adopted the IECC in 2001—the largest southern state to adopt this code. The IECC is particularly significant for southern states because it contains a solar heat gain standard for windows that creates major cooling energy savings, and thus major electricity and peak demand savings. Texas' action in adopting the IECC is especially impressive for the following three reasons.

- The IECC's cooling energy savings are substantial. A 2001 analysis showed that the electricity savings from the solar heat gain standard alone would total 1.8 billion kWh over 20 years, and avoid 1,220 MW of peak demand in year 20 (Tribble et al. 2002).
- Texas has several severe non-attainment areas for air pollutants (most notably ozone) for which power generation is a major source of precursor nitrogen oxides (NOx) emissions. Texas is a "home-rule" state, in which state government has limited ability to impose regulatory requirements on local jurisdictions. So for the state to impose a single statewide energy code is a major political event.
- Electricity savings from the IECC translate into significant NOx emissions reductions. The energy code was adopted in legislation whose purpose is controlling air pollutant

emissions. Texas faces severe non-attainment problems for ozone, and this legislation was designed to help the state implement a plan to attain national air quality standards. The Texas energy code has been approved for 0.5 tons/day in NOx emissions credits from EPA in the state implementation plan. Including an energy code in this bill marks the first time that an energy code has been adopted by a state specifically to improve air quality.

Early field experience indicates that the state energy code is having significant impacts on Texas building practice. The IECC's most significant new requirement is the solar heat gain standard for windows. A recent field survey shows that the great majority of windows sold into the new housing market meet the new code requirements (RLW Analytics 2002). This amounts to a market transformation effect of major proportions.

## RECOMMENDED STEPS FOR STATE ACTION

States interested in upgrading their energy codes should consider the following.

- Evaluate current building energy code laws, as well as implementation and enforcement infrastructure. If there is no state energy code, if it is more than 5 years old, or if there is no evidence of consistent enforcement, the state may be ripe for action. Also assess home builder experience with and attitudes toward energy codes, as well as builder association's capabilities for training and other forms of technical support. If builders are actively opposed to energy codes, this might make code adoption harder. On the other hand, if they are neutral or supportive, and have training and technical capabilities, they could become allies in such an effort. Develop a quick assessment of the state's energy code status and potential for improvement.
- Consult technical experts. The Building Codes Assistance Project, the New Buildings Institute, and DOE and its support contractors at the Pacific Northwest National Laboratory can assist in charting a course of action. This may include quantitative assessments of potential benefits, baseline building practice studies, legislative and regulatory assessments, training and technical assistance for builders and code officials, and other services.

## RESOURCES

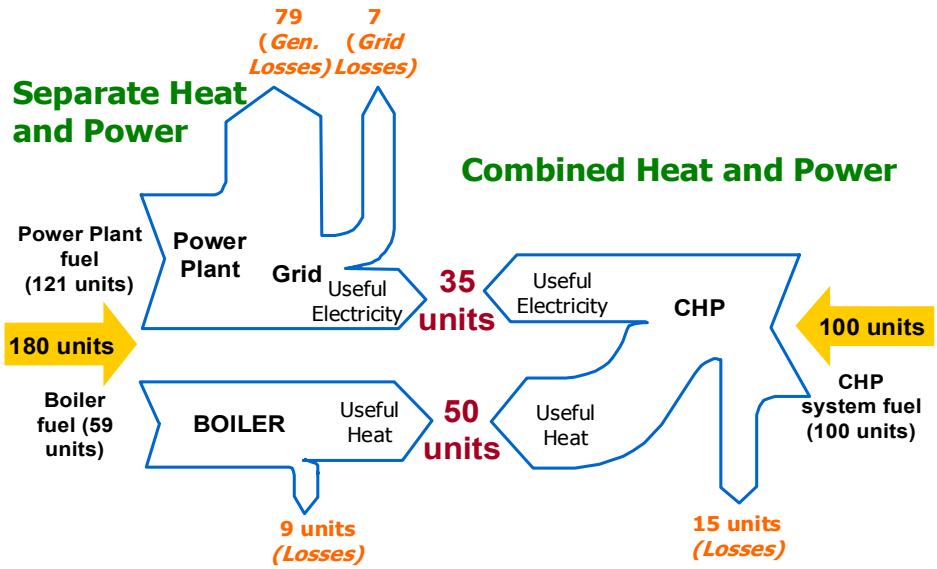
- **The Building Codes Assistance Project** has concentrated on residential energy codes. See www.bcap-energy.org. Key contact: David Weitz: dweitz@ase.org
- **The New Buildings Institute** is the most experienced with commercial energy codes and guidelines. See www.newbuildings.org**.** Key contact: Jeff Johnson: jajohnson@newbuildings.org
- **The DOE's codes program** sponsors an annual conference on state energy codes and offers a wide range of tools and services. See www.energycodes.gov.

# POLICY CATEGORY THREE: COMBINED HEAT AND POWER

## PROBLEM

U.S. electricity generation from central-station power plants wastes on average about two-thirds of its raw energy input. CHP systems offer the promise of cutting this waste by at least half. Because they produce both useful heat and power from one fuel source, much of the waste from power generation can be avoided, as shown in Figure 3. Analysis indicates that U.S. national CHP potential totals an additional 152,000 MW by 2020; this is almost half the forecast need for new power plants. This level of CHP development would save more than 4.5 Quads, which is over 4% of current U.S. energy use, and would prevent the emissions of 140 million metric tons (MMT) of carbon, which is almost 10% of current U.S. emissions (Elliott and Spurr 1999).

***Figure 3:***
***Schematic Comparing Separate and Combined Heat and Power Systems***




Source: Elliott and Hedman (2001)

While many barriers to an open market for the installation of more CHP have been broken down, several important barriers remain and new barriers have emerged.

- Utility Practices. Many electric utility monopolies, reluctant to open their systems to outside generators, have created barriers that make the interconnection of CHP and other new power facilities prohibitively expensive. These barriers include requiring needlessly expensive transmission feasibility studies, extending study schedules for years, imposing high exit fees, and creating needlessly high rates for supplemental and standby power for CHP facilities. Standby power is needed when the CHP system is not functioning due to an outage or scheduled maintenance, while supplemental power is purchased to meet the

needs of the facility that exceed the capacity of the CHP system. The National Renewable Energy Laboratory categorized the barriers for distributed power projects (NREL 2000). As explained recently by Brown, Scott, and Elliott (2002), many of these technical barriers have been reduced or overcome. Limited progress has been achieved at the federal level through Congress and the Federal Energy Regulatory Commission (FERC); while some states have acted to reduce these barriers, many have not moved far enough (Elliott, Shipley, and Brown 2003).

- Environmental Regulations. A general problem in air quality policy is that current regulations determine emission allowances based on the facility's fuel input, not its power output. This penalizes high-efficiency systems such as CHP. If allowances were based on power output, air quality regulations would encourage efficiency throughout the power industry. The federal New Source Review (NSR) program, intended to ensure that older power plants meet new emissions standards if they expand or upgrade, has had the unintended consequence of preventing many facilities from being converted to CHP. NSR doesn't take the full benefits of CHP into account, and thus penalizes it. Many states and local permitting processes also fail to recognize the overall net benefits of CHP, and can impose added costs on CHP project development (Freedman and Watson 2003).
- Tax Treatment. The most promising and most underdeveloped market for CHP lies in medium and smaller projects less than 25 MW. These projects often need favored tax treatment to be viable, because their transaction costs are often as high as for much larger projects. Federal tax credits have been proposed, but as currently structured would not help many smaller projects because of extended depreciation periods. If federal credits were enacted to target these smaller systems with appropriate depreciation rules, the CHP market would enjoy a significant boost. It would be important for states to complement these credits with state-level incentives as was successfully done with wind energy (Elliott 2001).

While much of the focus on CHP as been at federal level for the past few years, many of the market barriers to CHP exist at the state level. As a sign of the maturing of the CHP market, a number of states are beginning to address barriers to CHP. State action is important due to the following reasons.

- State and local utility regulators oversee connection to the distribution grid, utility tariffs, and environmental permitting.
- State legislators and agency staff know the needs of their states best, and so can best tailor policies and programs to local conditions.
- Some states already have programs or incentives (typically for renewable power facilities) that can be adapted to create gateways for CHP development.

## POTENTIAL BENEFITS TO STATES

The potential for CHP varies significantly by state and market segment. The Energy Information Administration commissioned an assessment of CHP potential in the commercial/institutional sector by state (Onsite Sycom 2000b)—see Table 2. Unfortunately, similar data is not available for the industrial sector, which nationally has a technical potential of more than 88,000 MW compared to a technical potential of 77,000 MW in

commercial/institutional sector (Onsite Sycom 2000a, 2000b). Several states, such as New York (NYSERDA 2002) and Texas (Elliott and Hedman 2001), have had detailed CHP assessments completed. These benefits are significant enough to warrant serious state-level attention to CHP development in most states.

***Table 2: Technical Potential for Additions to CHP Capacity by State***

| State | Total | State | Total |
|---|---|---|---|
| Alabama | 1,132 | Montana | 226 |
| Alaska | 219 | Nebraska | 428 |
| Arizona | 1,443 | Nevada | 1,117 |
| Arkansas | 548 | New Hampshire | 287 |
| California | 7,475 | New Jersey | 2,720 |
| Colorado | 1,120 | New Mexico | 418 |
| Connecticut | 981 | New York | 6,092 |
| Delaware | 236 | North Carolina | 2,408 |
| District of Columbia | 590 | North Dakota | 181 |
| Florida | 5,339 | Ohio | 3,075 |
| Georgia | 2,355 | Oklahoma | 818 |
| Hawaii | 284 | Oregon | 1,014 |
| Idaho | 376 | Pennsylvania | 3,426 |
| Illinois | 2,773 | Rhode Island | 289 |
| Indiana | 1,491 | South Carolina | 1,194 |
| Iowa | 682 | South Dakota | 171 |
| Kansas | 768 | Tennessee | 1,167 |
| Kentucky | 901 | Texas | 5,831 |
| Louisiana | 1,316 | Utah | 537 |
| Maine | 300 | Vermont | 179 |
| Maryland | 1,711 | Virginia | 1,858 |
| Massachusetts | 1,960 | Washington | 1,640 |
| Michigan | 2,563 | West Virginia | 424 |
| Minnesota | 1,165 | Wisconsin | 1,420 |
| Mississippi | 854 | Wyoming | 160 |
| Missouri | 1,639 | **Totals** | **77,281** |

Source: Onsite 2000b

## CHP AS A POLICY SOLUTION

No single policy or program will resolve market barriers to CHP. What is needed is a sustained and comprehensive set of state policies that effectively addresses key barriers. These typically include utility regulatory policies, environmental policies, and financial incentives.

### Utility Policies

As noted above, utility practices have represented the most significant barrier to expanded use of CHP (Brown, Scott, and Elliott 2002). Since most CHP systems (and most renewable system as well) are connected to the utility system as retail customers, federal law dictates that the relationship between utility and customer is governed at the state or local level. Many CHP supporters had hoped that utility restructuring at the state level would address this barrier, but as this process has slowed, it falls to state utility regulators to address these

market inequities. There are three clear areas that state regulators can address that will create a more favorable environment for CHP.

- Interconnection Standards. CHP developers, like other distributed generation providers, need to be able to interconnect to the power grid without unduly expensive, time-consuming, or otherwise burdensome requirements imposed by incumbent electric utilities. Especially for smaller facilities, interconnection studies, safety requirements, and related requirements should be appropriate to the real needs of protecting the reliability and safety of the grid, and based on the real costs incurred by utilities. Small facilities, sometimes defined as representing less than a percentage of the load on the affected utility feeder circuit (and that thus have little or no impact on grid operation), should be allowed to follow streamlined, low-cost interconnection rules that allow them to move forward on a reasonable timeframe.
- Exemption from Exit Fees. Several states, in the course of their restructuring process, created exit fees or "competitive transition fees" designed to recover utility costs when large customers elect to purchase power from other providers. They can be fatal barriers to potential CHP projects. States need to exempt desirable projects such as CHP from these fees, especially for smaller systems. These fees can be designed to limit undue economic impacts on incumbent utilities (Brown and Elliott 2003).
- Standby and Supplemental Power Tariffs. The tariffs or rates that utilities charge for these necessary services can determine the financial viability of a CHP project. Some utilities have set their rates at levels that discourage CHP and other non-utility power generation; such practices are arguably discriminatory and anti-competitive. State utility commissions, because they directly regulate such tariffs, can help remove such barriers by reviewing and if appropriate, changing standby and supplemental rates.

**Air Quality Permitting Policies**

- Output-Based Permitting. The key to creating a permitting system that recognizes the environmental benefits of greater efficiency is to move to output-based permitting standards. That means basing a generator's emissions allowances on its useful energy output, not its raw energy input. This output-based approach encourages energy-efficient generation. EPA has promulgated guidelines for output-based regulations, and a number of states have begun to implement these rules. Committing to output-based standards is the first and most important step a state can take toward creating a favorable air-quality permitting environment for CHP (Freedman and Watson 2003).
- Permit by Rule for Small Systems. Permitting smaller CHP systems can represent a hurdle because of the cost, delay, and uncertainty these processes can create. Since permitting processes were typically designed for large and complex generating stations, it is possible to develop streamlined permitting rules for smaller and simpler systems that do not require the same level of technical review. Several states have begun to look at a permit-by-rule process in which smaller systems that make use of standard components can avoid some of the project-specific analysis that is normally required.

### Financial Incentives

Perhaps the most direct way a state can encourage CHP is through financial incentives. ACEEE cataloged these incentives in 2002 and has since updated the report (Brown and Elliott 2003). These incentives can take the form of direct financing, or tax and tariff considerations.

- Grants and Loans. The most direct incentive approach is to provide either grants or low-cost loans for new CHP systems. Grants are more appropriate to emerging and non-commercialized technologies that show substantial promise for efficiency improvement and/or improved environmental performance. Loans are more effective for systems that are commercially available, but need help with financing in markets that are not yet served by commercial financing providers.
- Investment Tax Credits. Tax credits for investments in new equipment have been a successful policy used for both energy efficiency and renewable energy investments. Congress has considered offering an investment tax credit for CHP for several years, though the credit has yet to pass. States have also used this approach successfully, particularly to leverage the federal tax.
- Exemption from State and Local Taxes or Special Utility Rates. Another approach to encouraging CHP is to exempt projects from various state and local taxes, including sales taxes on fuels, property taxes, and other taxes. States can also work through their utility regulatory commissions to provide special, low-cost utility rates for natural gas, the fuel of preference for most CHP systems.
  - New Jersey has a tax credit for the purchase of cogeneration equipment and a release on gas tax for fuel that is to be used in cogeneration (NJ Tax 2002).
  - Recently the New York State Public Service Commission ordered that local gas distribution companies offer a special tariff for CHP systems (NY PSC 2001b).

## STATE EXPERIENCE

### Utility Policies

- Interconnection Procedures. California (CEC 2003b), New York (NY PSC 2000), and Texas (PUCT 1999) have implemented procedures. These states' leadership should be emulated, with the Texas rule considered as a model.
- Exit Fee Exemptions. Texas has exempted systems less than 10 MW, while California, Massachusetts, New Jersey, and Illinois have exempted CHP from these charges to encourage installation of these systems. In Massachusetts and New Jersey, the exemptions are capped at 10 and 7.5% of total system capacity that can exit without fees (Ferrey 2000).
- Standby and Supplemental Rates. California has implemented a rule that is viewed as favorable to CHP (CPUC 2001). In New York, proceedings are underway to set the tariffs for each of the state's investor-owned utilities (NY PSC 2001a, 2001b).

### Environmental Policies

- Output-Based Permitting**.** Texas (TNRCC 2001) and California (CARB 2002) have implemented output-based permitting standards for power production facilities. Connecticut, Massachusetts, New Hampshire, New York, and New Jersey are taking a different approach. In these states, a NOx budget program accounts for energy efficiency improvements in electricity production (Freedman and Watson 2003). The Ozone Transport Commission released a report that could be used as a model for output-based standards that encourage energy efficiency and clean CHP (Keith and Biewald 2002).
- Permit-by-Rule Systems. Texas has been the leader in this process. In Texas, a standard permit rule for small engines and turbines has been established (TNRCC 2001). ACEEE and other clean DG advocates worked to establish 100% credit for the thermal output of CHP systems. The rule was passed with these provisions. This rule served as the basis for the model rule developed by the Regulatory Assistance Project (RAP 2002) that includes output-based emissions levels and full credit for thermal output (Elliott, Shipley, and Brown 2003).

### Financial Incentives

- Grants and Loans. The New York State Energy Research and Development Authority (NYSERDA) funds the Power Systems Program that has strived over the last 2 years to promote emerging DG technologies. Eighty percent of the program funding has been allotted to CHP demonstration programs. In exchange for being allowed to showcase the technology, NYSERDA co-funds the project (Elliott, Shipley, and Brown 2003).[1] In California, CPUC runs a Self-Generation Incentive Program, which offers incentives to clean DG up to 1 MW. These incentives are equal to $1.00/watt up to 30% of the project cost in the case of CHP (Gallaway 2001).[2]
- Investment Tax Credits. Oregon and California offered state tax credits for renewable energy that complemented federal credits, and are credited with helping to develop the renewable energy market (Elliott 2001). This same credit structure can be applied to CHP technologies.
- Exemption from State and Local Taxes or Special Utility Rates. New Jersey has a tax credit for the purchase of cogeneration equipment and a release on gas tax for fuel that is to be used in cogeneration (NJ Tax 2002). Recently the New York State Public Service Commission ordered that local gas distribution companies offer a special tariff for CHP systems (NY PSC 2001b).

## RECOMMENDED STEPS FOR STATE ACTION

There are two, concrete steps that states can take to advance CHP: assess the current state of CHP in the state and identify areas for future development; and organize or support a state or regional CHP initiative.

[1] More information on the program can be found at http://www.nyserda.org/dgchp.html.
[2] For more information, see http://www.pge.com/selfgen/pdf/Program_Handbook_R2_Final_05-06-02.pdf.

### Commission a State CHP Potential and Barrier Study

The market for CHP in each state is different, so it is important to understand the current status in order to target efforts most effectively. An important first step is to commission a study, which should look at:

- The base of installed CHP system in the state, identifying the market segments, system size and technologies used in the current applications.
- Regulatory or market barriers or other hurdles to installation of new CHP systems. These can include utility, environmental, or financial barriers as described above.
- The market potential for CHP, identifying market segments and estimating energy, environmental, and economic impacts from expanded use of CHP.

Examples of studies addressing these issues include:

- ACEEE's study for Texas funded by DOE (Elliott and Hedman 2001).
- NYSERDA's study for New York State that was prepared by the Pace Energy Project and Energy Nexus Group (NYSERDA 2002).

### Form or Support a State or Regional CHP Initiative

The formation of a regional CHP initiative allows diverse stakeholders (including state officials, CHP system owners, efficiency and environmental advocates, equipment suppliers and system developers) to coordinate their efforts. These stakeholders can work together to determine what the specific regional needs are to promote CHP and overcome regional barriers. Regional analysis and teamwork allow networking on a localized level as well as larger impact on local policies.

The first such regional effort, the Midwest CHP Initiative, grew out of a regional road-mapping workshop held in the fall of 2000. Since then, this initiative has expanded (Elliott, Shipley, and Brown 2003). Currently, there are five regional groups, spanning nearly the entire United States. The U.S. Combined Heat and Power Association (USCHPA) provides support and coordination among these regional initiatives, and is encouraging development of new initiatives. Information and links to the initiatives are available on the USCHPA regional CHP Efforts webpage at http://www.nemw.org/uschpa/regional.htm.

## RESOURCES

A number of key websites provide links to the important online CHP resources.

- The **U.S. Combined Heat and Power Association** website at http://uschpa.org provides a treasure trove of information on CHP technologies and policies.
- **ACEEE's** CHP webpage at http://aceee.org/chp provides links to key research reports and analysis.
- **DOE's Distributed Energy Resource (DER)** program supports all manner of distributed energy resources including CHP. See http://www.eere.energy.gov/der.

- **EPA's CHP Partnership** provides support to encourage the deployment of more CHP nationally. Its website at http://www.epa.gov/chp has extensive resources that can be used to assist individuals and groups in considering application of CHP.

# POLICY CATEGORY FOUR: ENERGY EFFICIENCY IN STATE FACILITIES

## PROBLEM

Buildings—and the energy-consuming appliances and products in them—account for two-thirds of the nation's electricity use. They also account for approximately 36% of natural gas and 6% of oil use. Current forecasts indicate that energy use in residential and commercial buildings will increase by nearly 20% by 2010. State-owned buildings account for about 28% of U.S. publicly owned building floorspace, and about 5% of total non-residential floorspace, and thus represent a substantial portion of the buildings market.

Some of the barriers that limit energy investment in privately owned buildings also apply to publicly owned buildings. Lack of information on efficiency technology, lack of capital for efficiency investment, separation of procurement and facility management, and lack of technical and management capacity for project development all operate to limit the realization of efficiency potential in state-owned facilities. In addition, many state procurement laws and accounting practices prevent the use of innovative energy service options such as performance contracting, because these laws and practices limit the terms of contracts, require narrow low-bid selection criteria, and do not recognize the link between facility capital investments and operating budget savings.

## POTENTIAL BENEFITS TO STATES

As in privately owned buildings, the energy saving potential in public facilities is large. New construction offers opportunities to reduce energy use by 30% or more compared to common practice in many states. Even in existing buildings, savings of 20% in energy use have been realized in many states. These savings free up dollars for use in the core missions of state agencies.

On a national-average basis, state facilities account for about 5% of non-residential building space. If a state were able to reduce energy use in its facilities by 20% overall, that would reduce non-residential building energy use by about 1%. For an average state, that would produce about 1.15 trillion Btu annually in energy savings, reducing energy bills by about $16 million.

## FACILITY ENERGY EFFICIENCY AS A POLICY SOLUTION

States can improve efficiency in facilities through such measures as the following.

- Setting Advanced Energy Standards for New Buildings**.** Some states require state-owned facilities to meet higher energy performance standards than those embodied in the building energy codes that apply to privately owned facilities. These advanced standards can be set in terms of percentage improvements in total energy consumption, or in prescriptive terms for specific components and systems. An increasingly popular

approach falls under the general rubric of green building; green building standards include energy performance, usually as a percentage target for energy use beyond a reference code, but also address the environmental impact of materials used, water consumption, indoor air quality, renewable energy, and other factors.

- Setting Performance Targets for Existing Buildings. The Federal Energy Management Program has set a series of performance goals for federal buildings, usually expressed as percentage reductions in energy use per square foot compared to baseline usage in a specified year. A key issue here is expressing energy usage in "site" energy terms vs. "source" energy terms. Source energy uses a primary-energy value for electricity that captures the energy lost in generation and transmission, rather than limiting the energy value of electricity to what is delivered to the building site. Since electricity end-uses have a tendency to expand over time as more and more power-using devices saturate the buildings sector, using source energy analysis tends to force a more aggressive level of energy savings. It also tends to correlate better with air pollution impacts, since power generation has a disproportionate share of pollutant emissions.
- Providing Financing for Efficiency Improvements. States have innovated with several financing methods, from revolving loans to tax-exempt bonds and performance contracting in order to enable capital-strapped state agencies to tap various outside capital sources for project investment. With most states now experiencing significant fiscal challenges, these financing innovations are all the more important to consider as tools for encouraging efficiency investment.
- Providing Technical Assistance and Training. Evaluation results show that energy performance is strongly related to the qualifications and performance of facility management staff (Synectics Group, Inc. 1983[3]). Many states, however, under-invest in facility staff and their education. Qualified and well-trained staff can return benefits to the state treasury far beyond their direct payroll costs by generating and expanding energy savings year after year. Creating energy-management positions in facility-owning agencies, offering training programs to facility staff, and otherwise investing in the human capital of energy efficiency can lead to large payoffs in energy savings, facility performance, and even employee comfort, morale, and productivity.

## STATE EXPERIENCE

### Arizona

In its 2003 session, the Arizona legislature passed a bill (H.B. 2324) that requires state-owned facilities to achieve energy efficiency targets and take other energy-use reduction steps. The bill requires state agencies and universities to achieve a 10% reduction in energy use per unit of floor area by 2008, and a 15% reduction by 2011. It is expected that these reductions will be achieved partly through the use of performance contracting with outside energy service companies. The bill also requires state institutions to purchase energy-efficient equipment in regular procurement operations, using standards set by the federal ENERGY STAR® program and the Federal Energy Management Program. Finally, the bill

[3] The report found that institutions with facility personnel rated "excellent" in energy management achieved 20% average savings with their federal grants, compared with 9% average savings in all other institutions (95% confidence level).

sets new energy efficiency standards for newly constructed state buildings, to be developed by the state energy office based on national model codes.

The Southwest Energy Efficiency Project (SWEEP) was instrumental in building support for this bill, sponsored by Rep. Randy Graf (R-Green Valley). SWEEP estimated that energy savings from the bill would total $90 million over the 2004–2015 period. For more information, visit SWEEP's website at www.swenergy.org or call 303-447-0078.

**Hawaii**

The state requires its agencies to use performance contracting for energy-saving retrofits in state buildings. Energy savings activities in Hawaii's public facilities are guided by the Revised Statute 196, which establishes broad guidelines for "Energy Efficiency in State Facilities." It sets goals for energy efficiency improvements and promotes the use of several innovative mechanisms, including performance contracts, utility energy efficiency service contracts, and purchasing energy-efficient products. The legislation directs agencies (including counties, the judiciary, and the University of Hawaii) to evaluate and identify energy-efficient retrofits that can be implemented through performance contracting. The legislation also states that cost savings from retrofits must be returned to the implementing agency; this provision is important, because otherwise energy bill reductions would be deducted from future agency budgets, and this would limit agencies' ability to pay energy service companies under performance contracting agreements.

This program has generated seven state and county building projects. The Hawaii Department of Business, Economic Development & Tourism estimates that annual energy savings for these projects equal approximately $6,041,000 (over 2,557,000 square feet of building space). Estimated annual energy savings are 40,723,600 kWh, with approximately 613 jobs and $23,325,000 in state income created.

**Illinois**

The state facilities efficiency program started in 1982 with detailed studies of facilities to identify low cost or no cost operational and/or maintenance items. Baselines were established and follow-ups documented savings. These ranged from 10 to 30%. Some facilities documented dollar savings over $100,000. The program is ongoing at a lower level of effort.

The state construction oversight agency, the Capital Development Board (CDB), has through administrative action adopted the latest ASHRAE 90.1 standard for state buildings. The agency hopes to do a pilot program in fiscal year 2004, incorporating the U.S. Green Building Council's Leadership in Energy and Environmental Design (USGBC's LEED) rating system into four to six major projects, with a parallel effort to document costs and savings. To get energy credits under LEED, a building has to demonstrate significant savings compared to ASHRAE efficiency levels.

The state conducted a pilot project with performance contracting-based retrofit projects in the 1990s. This included seven facilities that used $20 million in private financing, with the result of reducing their energy bills by $2.6 million/year, or 27% of historical bills. However,

the program also illustrates the risks involved in performance contracting. Two energy service companies in the program have written checks to the state because savings guarantees were not met. The University system has continued to use this mechanism to finance energy efficiency projects, but other state agencies have not used it to any significant degree since the pilot.

**Iowa**

Iowa has been a leader in state financing innovation for public facilities since the 1980s. Legislation passed in the 1980s enabled a range of financing and related services for state and local facilities. The two main options used today are the Iowa Energy Bank and the State Facilities Program.

*Iowa Energy Bank.* This energy management program uses energy cost savings to repay financing for energy management improvements, and targets public and nonprofit facilities (public schools, hospitals, private colleges, private schools, and local governments). The Iowa Energy Bank is enabled to channel more than $250 million in improvements using private funds in combination with minimal state and federal support.

To start the process, a preliminary energy assessment is completed for the facility. This assessment may be an extensive energy audit, or for small facilities, a simpler assessment of energy consumption and potential improvements by Energy Bank program staff. If necessary, an engineering analysis is completed for the facility by a qualified consultant. A 6-month, interest-free loan pays the upfront expense of the energy audit and engineering analysis.

Finally, municipal lease-purchase agreements or capital loan notes from private lending institutions finance the project at interest rates negotiated for the client by the Iowa Department of Natural Resources (IA DNR). All clients of the program are eligible for financing of cost-effective energy management improvements.

*State facilities program.* The program revolves around the State of Iowa Facilities Improvement Corporation (SIFIC), a nonprofit corporation that helps state agencies implement cost-effective energy efficiency improvements. SIFIC was incorporated in 1986 under Chapter 504 of the Code of Iowa. Energy conservation revenue bonds amounting to $12,245,000 were sold on September 18, 1986. The proceeds from the sale were used to acquire energy improvements for buildings managed by the Departments of General Services, Human Services, Corrections, and Veterans Affairs. In fiscal year 1989, three additional state agencies—the Departments of Public Safety, Transportation, and the Department for the Blind—were added to the program using remaining funds.

The program reached an important milestone in 1999 by paying off its original bond issue a year early, saving taxpayers $130,000 in interest. In the same year, IA DNR signed a memorandum of agreement with the Iowa State Penitentiary, representing the first new project with the Department of Corrections since the original SIFIC improvements in the late

1980s. Heating, ventilating, and air conditioning (HVAC) and lighting projects are expected to save the facility more than $43,000 annually.

Taken together, Iowa's public facilities programs have helped bring about $140 million worth of investment in energy management improvements. These costs are offset by program participation fees, and by more than $23 million/year that the state's taxpayers save on their energy bills.

SIFIC has also generated significant pollution prevention benefits. Since it began, the program has avoided:

- 426,000 tons of carbon dioxide ($CO_{2)}$ emissions
- 9,300 tons of sulfur dioxide ($SO_2$) emissions
- 830 tons in NOx emissions
- 1,000 tons in particulate matter

The Energy Bureau website provides more information on these programs at http://www.state.ia.us/dnr/energy/programs/bem/index.htm.

**Maryland**

State Agency Loan Program (SALP). This program was established in 1991 using funds from the Energy Overcharge Restitution Fund (EORF). Through this revolving loan program, the Maryland Energy Administration (MEA) provides loans to state agencies for cost-effective energy efficiency improvements in state facilities. Approximately $1,000,000 in new loans are awarded each fiscal year. State agencies pay no interest, with a 1% administration fee. Since its inception, SALP has funded over $6 million to upgrade lighting and other components in almost 2.5 million square feet of state building space.[4]

*Executive Order 01.01.2001.02.* In March 2001, Maryland Governor Parris Glendening issued this order, *Sustaining Maryland's Future with Clean Power, Green Buildings and Energy Efficiency.* It required the creation of a commission to make recommendations and set criteria for constructing and maintaining energy-efficient and environmentally responsible state facilities, setting goals for the purchase of "green power," and outlining a comprehensive energy conservation strategy. The overall efficiency goal for state facilities is to reduce energy consumption per gross square foot 10% by 2005 and 15% by 2010, relative to a year 2000 baseline.

Section B: "High Efficiency Green Buildings Program" established the Maryland Green Buildings Council to develop a program that will guide the design, construction, operations, and maintenance of all new state-built facilities, as well as the renovations of existing state-owned and leased buildings. For example:

[4] See http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MD08F&state=MD&CurrentPageID=1.

> "Upon acceptance of the appropriate criteria, standards, and a numeric rating system, the High Efficiency Green Buildings Program shall be fully adopted in the design, construction, operations, maintenance and deconstruction of new State owned and leased facilities…For all existing State owned, leased and operated buildings, reasonable efforts shall be made to maximize the use of energy efficiency and resource conservation techniques."

Section C: "Additional Energy Efficiency Goals" also encouraged reducing state building total energy consumption, using renewable energy components, and procuring energy-efficient office products (USGBC 2002).

An example of how the executive order works in practice is the new Hammerman Area Beach Services Building. It is being developed for MD DNR to replace an existing aging facility. Energy savings of up to 40% over a conventionally designed building are expected due to the use of geothermal heat pumps, motion sensors for lighting, and daylighting.

Maryland also promotes energy performance contracting to help facilities implement energy efficiency improvements through private investment, using the energy savings as a means of repaying the cost of the project. A report by the Leonardo Academy quantifies the economic, environmental, and public health benefits from 14 of Maryland's performance contracts and estimates savings of 1.2 million tons of $CO_2$, 3,400 tons of NOx, 7,300 tons of $SO_2$, 100 tons of particulates, 36 pounds of mercury, 6 pounds of cadmium, and 76 pounds of lead. According to the Academy, this translates to an equivalent environmental benefit of removing 240,000 mid-sized automobiles from the road or planting 3.7 million trees (Leonardo Academy Inc. 2002).

The Community Energy Loan Program (CELP) provides local governments and nonprofit organizations in Maryland with the opportunity to reduce their operating expenses by identifying and installing energy conservation improvements by leveraging the cost savings realized through efficiency improvements. Originally funded with $3.2 million in EORF seed money, the program provides loans to eligible nonprofits (including hospitals and private schools) and local governments (including public school systems and community colleges). The program funds approximately $1 million in new projects each fiscal year; projects must have a simple payback of 7 years or less. Up to $400,000 may be awarded as part of a single loan each year. To date, MEA has made 36 loans providing over $7.5 million for energy efficiency improvements.

**Massachusetts**

*Sustainable design principles.* The Division of Capital Asset Management (DCAM) has developed guidelines for incorporating principles of sustainable design into building construction and major renovation projects. The Conservation Team advises DCAM project staff and consulting design teams on strategies to prevent pollution in construction and renovation projects. The team works with project engineers and project managers and, through research and life-cycle analysis, offers project-specific information and design specifications on materials, designs, and technologies that increase efficiency and reduce a

building's impact on occupants and the environment. When cost effective, these materials, practices, and technologies are incorporated into the projects.

*Energy Conservation Improvement Program.* This program provides grants to public schools to fund capital improvements that reduce energy consumption and help cut energy costs. Grants fund eligible energy conservation projects identified through an energy audit provided by the Division of Energy Resources. Based on the results of the technical assistance, the division awards grants for cost-effective energy improvements from state bond funding.

**Minnesota**

*Public facility loan program.* Statute 216C.37 (1983) allows the commissioner of public service to approve loans to municipalities (including school districts) to finance energy conservation investments. The loans may cover all capital expenditures for conservation measures identified through an energy analysis. The cost of these measures must be recouped within 10 years. To date, according to the Department of Commerce (DOC), approximately 240 schools have been benchmarked. While one staff person characterized the results as disappointing, beginning on July 2002, all new HVAC efficiency upgrades must be commissioned to optimize performance. The DOC believes this development will provide increased efficiency savings, and it intends to demonstrate this by monitoring results.

*Facility benchmarking and savings goals.* In 2001, as part of the Buildings, Benchmarks, and Beyond (B3) initiative, the Minnesota State Legislature established a goal of reducing energy consumption by 30% in existing public buildings. The Legislature, in setting this energy savings goal, directed the state agencies to: (a) undertake an energy benchmarking for all public buildings to identify poorly performing buildings and (b) to create guidelines for designing new buildings that are cost effective and energy efficient. In response, the Minnesota Department of Administration and Department of Commerce initiated the Conservation Benchmarking Initiative, which covers over 10,000 public buildings in the state. Given the large number of buildings involved, the near-term focus is on collecting targeted information on selected categories of buildings in order to establish a list of poorly performing buildings (Orestes 2003a).

*Sustainable Design Guide.* The Minnesota Sustainable Design Guide (MSDG) also falls under the B3 umbrella. It is a tool for use in the construction, operation, and design of new and renovated buildings. The purpose of the MSDG is to ensure that annual energy costs are reduced by at least 30% (as required by the Minnesota Legislature) and that a whole building, comparative analysis is performed early in the construction process. This provision helps determine the energy conservation options with the lowest lifetime cost.[5] The Guide anticipates savings of greater than 30%, and up to 60%, for many building types. As a result, agencies are encouraged to seek savings above the minimum percentage.

By allowing a payback period of up to 15 years, the MSDG encourages a life-cycle cost accounting approach. This feature increases the decision-making "weight" attributed to

[5] See The State of Minnesota Sustainable Building Guidelines (MSBG) website at http://www.csbr.umn.edu/B3/e_1.html.

energy-efficient technologies, many of which are more expensive upfront than traditional equipment. The guide anticipates significantly shorter payback periods than the allowable maximum time frame: 3 years for a building over 120,000 square feet; 4 years for a building between 80,000 to 120,000 square feet; 5 years for a building between 50,000 to 80,000 square feet; 6 years for a building between 30,000 to 50,000 square feet; and 7 years for a building less than 30,000 square feet. Other functions of the Guide are to establish sustainable design priorities and goals, to develop sustainable design strategies for building projects, and to assess and determine performance indicators and related measures (Orestes 2003b).

**New York**

*EnVest Program.* The NYSERDA EnVest Program provides a no-cost mechanism to promote energy efficiency in state-owned buildings. The program is a joint partnership between state government and private sector energy performance contractors, which act under contract to NYSERDA to install energy-efficient equipment and secure other energy-related capital improvements. EnVest is capitalized with a $65 million off-budget tax-exempt municipal lease. Financing for energy-efficient capital improvements is arranged so that all annual costs (including project financing, monitoring, and a savings guarantee) are less than the energy savings realized from the project, resulting in a positive cash flow for the state.[6]

According to NYSERDA, EnVest participants typically reduce energy consumption in state facilities by up to 20%. A state-sponsored analysis indicated that more than $8.5 million in savings is realized annually from nine select projects for which data was available (Barone 2003).

**Oregon**

*Low-interest loans.* Initiated under OR Rev. Stat. 470 in 1980, the loan program provides low-interest, long-term loans for energy conservation (as well as renewables, alternative fuels, and recycling). To date, the energy loan program has awarded more than 500 loans totaling $285 million. It is estimated that projects produce energy savings worth $41 million annually (Rewey 2001).

While the loans are available to individuals, businesses, and nonprofits, the majority of funding has gone to state and local governments. The energy loan program is self-supporting, meaning that general obligation bonds are sold to fund the loans, and that other lenders in the state are approached to facilitate multi-source financing. Demonstration-project loans are eligible to finance all project costs from study through commissioning, not just the energy-saving measures themselves.

*Public Benefit Funds program.* This program in Oregon requires that PG&E and PacifiCorp collect a public purpose charge from consumers within their service areas equal to 3% of the total revenues from electricity services. Ten percent of these public purpose funds must go

[6] See DOE's Energy Efficiency and Renewable Energy website at http://www.eere.energy.gov/buildings/state_energy/connections/cu/cu_12_97.html.

towards energy efficiency efforts in public schools, and the administration of this public purpose fund is handled by the Oregon Office of Energy and the Education Service Districts, as well as individual school districts.[7]

*Facility energy standards.* The use of Energy Conservation Measures (ECMs) in state facilities was established in 1991 by ORS 276.900-915. It directs state agencies to work with the Office of Energy to ensure efficient, cost-effective strategies are included in new and renovated state buildings. The statute says: "It is the policy of the State of Oregon that facilities to be constructed or purchased by authorized state agencies be designed, constructed, renovated and operated so as to minimize the use of nonrenewable energy resources and to serve as models of energy efficiency."[8] This has been interpreted as an authorization to take a life-cycle benefit and cost accounting approach that permits the long-term savings of energy-efficient equipment to be factored into decision-making (Hansen 2003).

In 1998, the statutes were amended to implement the State Energy-Efficient Design (SEED) Program, which puts less emphasis on analysis requirements and more emphasis on successful implementation of ECMs. The amendments give state agencies and their design teams the option of selecting an efficient design that meets program requirements without hiring an energy analyst to perform extensive building modeling.

**Pennsylvania**

*Executive Order 1998-1.* In March 1998, Pennsylvania Governor Tom Ridge issued Executive Order 1998-1 creating the Governor's Green Government Council (GGGC). The purpose of the council was to: "cooperatively across agency jurisdictions, facilitate the incorporation of environmentally sustainable practices, including Strategic Environmental Management, into the Commonwealth government's planning, operations, and policy making and regulatory functions, and to strive for continuous improvement in environmental performance with the goal of zero emissions. Strategic Environmental Management includes an environmental management system with a strong pollution prevention and energy efficiency program, effective community involvement, measurable economic and environmental performance goals, environmental accounting, and life cycle analysis."

The order also creates Office Leasing Specifications: the facility must receive at least a Silver Level Certification from the USGBC's LEED rating system and meet the performance standards on page three of the Model Green Office Leasing Specifications.

More than 20 projects are currently registered under the program, including Pittsburgh's David L. Lawrence Convention Center. Pennsylvania has also now produced six educational documentary videos as part of the Building Green in Pennsylvania program. The breadth of GGGC's continued green building efforts are described online at www.gggc.state.pa.us/building, including promotion and demonstration of high-performance

[7] See the Oregon Office of Energy's website at http://www.energy.state.or.us/sb1149/Schools/index.htm.
[8] See the Oregon Office of Energy's website at http://www.energy.state.or.us/gov/SEEDhome.htm.

green buildings at comparable first cost along with public education on the benefits to building users and Pennsylvania's environment.[9]

**Texas**

*Texas LoanSTAR.* The Texas LoanSTAR (Saving Taxes and Resources) Program[10] is a revolving loan program for energy efficiency retrofits in state and local government facilities. It was created in 1993 under the Texas Government Code Ann. 2305.32 ey seq., using federal Petroleum Violation Escrow (PVE) funds. The Texas State Energy Conservation Office (SECO) used PVE funds to capitalize a revolving loan fund and to provide extensive technical assistance for project development and monitoring.

Projects financed by the program include energy-efficient lighting systems, high-efficiency HVAC systems, computerized energy-management control systems, boiler efficiency improvements, energy-recovery systems, and building shell improvements. Eligible applicants include state agencies, institutions of higher education, school districts, small and medium-sized businesses, and local governments. At least 85% of the loans must be awarded to state agencies, institutions of higher education, public schools, or political subdivisions.

SECO administers LoanSTAR. To ensure the success of each project, it is monitored at the specification and construction phases and at project completion. The program's revolving loan mechanism allows borrowers to repay loans through the stream of cost savings generated by the funded projects.

LoanSTAR was legislatively mandated to be funded at a minimum of $95 million. To date, $123 million has been loaned under the program, as revolving funds have allowed the original capital to be partly "recycled." SECO estimates that energy bill savings by these public institutions have saved Texas taxpayers more than $63 million since the program began. One hundred and ten loans to public institutions have generated more than $63 million in documented energy cost savings.

LoanSTAR allows bonds to be issued to cover the cost of efficiency upgrades. A bond is a certificate of debt issued by a government or corporation; it guarantees payment of the original investment plus interest by a specified future date.

Energy Savings: Energy savings exceed 18 million Btu, equal to the annual electricity use of 440,000 homes. Total energy cost savings top $125 million, and projected energy savings are expected to surpass $500 million over the next 20 years.

Emission Reductions:

- $CO_2$: 1,342,235 tons
- $SO_2$: 3,076 tons
- NOx: 4,699 tons

[9] For more information, see http://sites.state.pa.us/oa/Executive_Orders/1998-1.pdf and https://www.usgbc.org/Docs/ Member_Resource_Docs/toolkit_statelocal.pdf.
[10] Created under Texas Government Code Ann. 2305.32 et seq. (1993).

## RECOMMENDED STEPS FOR STATE ACTION

States interested in facility energy efficiency should:

- Set Standards for New Buildings**.** At a minimum, states should require their new facilities to meet the most recent version of ASHRAE 90.1 standard. However, more advanced standards are available from leading states, such as the California Energy Commission's Title 24 Building Energy Standards. Voluntary advanced building energy efficiency guidelines are available from the New Buildings Institute. Green building standards are also available, and have been applied in some states; the U.S. Green Buildings Council is leading this effort through its LEED certification program.
- Set Performance Targets for Existing Buildings. Typical targets have been set at 20% of current energy use, on a per-square-foot basis, using a recent base year and setting a compliance date about 5 years out. Accounting and reporting systems must be set up to monitor progress toward these goals. An important issue to resolve is whether to use "source" or "site" energy as the basis for performance measurement. Site energy values the British thermal unit content of both fuels and electricity as delivered to the building site. Source energy assigns a primary-energy value to each energy type; this applies especially to electricity, which has a site energy value of 3,413 Btu/kWh, but on a source basis including generation and transmission losses accounts for over 10,000 Btu/kWh. Source accounting not only accounts for full-cycle energy use, it also provides a closer approximation of air pollution and GHG emissions performance.
- Develop and Enable Financing Mechanisms**.** Make sure state law does not hinder the use of innovative financing such as performance contracting or revolving loans. Work with legislative and procurement staff to explore and resolve these issues. Develop financing methods appropriate to the state's other financing mechanisms and traditions.
- Provide Staffing, Technical Assistance, and Training. Make sure that facility management staff structures specifically include energy efficiency in key job descriptions and goals. Establish accountability structures within and between agencies so that procurement, facility management, and accounting departments are all engaged in a common effort to save energy. Provide technical assistance and training to staff as needed.

## RESOURCES

- The **California Energy Commission's Title** 24 Building Energy Standards: see www.energy.ca.gov/title24
- The **New Buildings Institute's** Advanced Building Guidelines: see www.newbuildings.org
- The **U.S. Green Buildings Council's** Leadership in Energy and Environmental Design program: see www.usgbc.org
- **DOE's** Buildings programs: see www.eere.energy.gov/buildings/partner.html
- **REPP-CREST**: see solstice.crest.org/efficiency/state-guides
- **Brown** (2000)

# POLICY CATEGORY FIVE: TAX INCENTIVES FOR EFFICIENT VEHICLES, BUILDINGS, AND EQUIPMENT

## PROBLEM

Persistent market barriers limit consumer and business investment in energy-efficient products and services. Two key barriers are lack of awareness and higher first cost for efficient technology. Consumers are often unfamiliar with high-efficiency equipment, and even if they are familiar with the technology, they may have trouble locating efficient equipment. Also, high-efficiency equipment is often more expensive than standard equipment, in part due to the costs of increasing efficiency, but also in part because price premiums are often charged for high-end niche products.

## POTENTIAL BENEFITS TO STATES

Oregon has the longest-running and most comprehensive state energy efficiency tax incentive program in the United States, so its efforts are a benchmark for other states' efforts. Oregon is also the only state that has conducted a detailed evaluation of its tax incentive programs. These programs combined have saved on the order of 530 million kWh of electricity and 580 billion Btu of natural gas. Using Oregon's population as a basis, one could make the rough estimate that an average state might expect to save 863 million kWh and 945 billion Btu of natural gas from a comparable tax incentive program.

## TAX INCENTIVES AS A POLICY SOLUTION

State tax incentives can lower the net cost of efficient products to consumers, making them comparable to standard-efficiency models. The availability of tax credits also increases consumer awareness of eligible products, and thus encourages manufacturers and retailers to more actively market these products. As sales increase, prices often come down, allowing the products to function in the market without tax incentives. Incentives can be offered on income taxes (as direct tax credits for individuals or businesses) or can take the form of sales tax waivers (reduced or eliminated sales tax on designated efficient products and practices).

## STATE EXPERIENCE

### Green Buildings Tax Credits

The concept of green buildings state income tax credits has emerged relatively recently. Since 1999, three states (New York, Maryland, and Oregon) have adopted a tax credit that encourages resource efficiency in buildings, including energy efficiency. A similar credit is pending in Massachusetts.

The New York State Income Tax Credit for Green Buildings, which was the first green buildings legislation, was adopted in 2000. The legislation instructed an advisory committee

to develop regulations. The regulations were finalized in June 2001 and the program began implementation in January 2002.

Under the legislation, builders who meet energy goals and use environmentally preferable materials can claim against their state tax bill up to $3.75/square foot for interior work and $7.50/square foot for exterior work. Each building must be certified by a licensed architect or engineer, and must meet specific requirements for energy use. In new buildings, this means that energy consumption cannot exceed 65% of permitted use under the New York State energy code, and in renovations, energy use cannot exceed 75%.

According to NYSERDA, green building projects in the program—including new construction and building renovation—total over 9.2 million square feet of floor area and, on average, exceed the energy code by 31% at an incremental cost of only 1%.[11] Not surprisingly, the $25 million tax credit initially allocated by the legislature has been fully subscribed. NYSERDA staff is evaluating the possibility of increased funding (DeCotis 2003).

Maryland passed a modified version of New York's green buildings legislation in 2001. In addition to requiring that the new building must be 35% more efficient than current efficiency levels indicated in the ASHRAE 90.1 1999 energy standard, Maryland requires that builders meet criteria published by MEA.

A coalition in Massachusetts introduced green buildings legislation to the legislature in 2001. The Massachusetts bill is similar to the language in the New York and Maryland laws but also includes an education element to enhance its effectiveness. Massachusetts conducted a cost/benefit analysis that estimated a public benefit payback period of 6 years, with a public profit from the credit of over 6 million dollars after 10 years. The private sector payback was projected at 2 years. This bill was headed for enactment in 2001 until derailed by a looming state budget deficit.

**Efficient Technology or Practice Tax Credits**

Indiana offers a state income tax deduction for home insulation, at full cost of labor and materials up to a limit of $1,000. To be eligible, materials must be installed in the taxpayer's principal residence. Homes less than 3 years old are not eligible. Materials must be new and represent net additions of insulation: i.e., replacement of existing insulation materials is not eligible. The deduction covers all forms of building shell insulation materials, plus caulking and weatherstripping, hot water pipe and water heater insulation, storm doors and windows, and thermal pane replacement windows. Taxpayers must submit copies of invoices with tax returns, documenting the cost of labor and materials and providing the names and addresses of installers. Self-installed materials are eligible for materials cost deductions only.

Maryland enacted legislation in 2000 that waives the sales tax for purchases of energy-efficient appliances, heating and cooling systems, and passenger vehicles. Eligible products include ENERGY STAR appliances, air conditioners, and heat pumps; hybrid cars; and high-

[11] See U.S. HUD's website at http://www.hud.gov/offices/cpd/energyenviron/energy/local/ny.cfm.

efficiency water heaters and fuel cells. The sales tax legislation was specifically targeted to substitute for discontinued utility funding. Two important components are missing from the Maryland legislation: it does not include funding for program implementation or evaluation. Due to these limitations, marketing of the program and tracking of product sales are limited, but interviews with retailers indicate that the program is helping to sell efficient products. The waiver is estimated to be costing the state $1–2 million/year.

Minnesota enacted a sales tax exemption for energy-efficient products in 2001. Products included are compact fluorescent light bulbs, and highly efficient electric heat pump water heaters (HPWHs), natural gas water heaters, and natural gas furnaces. These products were selected through a political process that considered current market penetration, energy use at peak times, and lost revenue. The Minnesota Department of Revenue, tasked with implementing the program, indicated that it will do so through mass mailings to retailers. Implementation began in the late fall of 2001.

Oregon has operated residential and business tax credit programs since 1979. The Oregon Residential Tax Credit program was initially focused on renewable energy and offered tax credits for products such as solar water heaters and geothermal heat pumps. The program was expanded to include appliances (including furnaces and heat pumps), alternative fuel vehicles, and compressed natural gas fueling stations. Oregon's Business Energy Tax Credit (BETC) program's focus is comparable to the residential program's focus on renewable resources and conservation, with recycling and energy efficiency becoming priorities in the 1980s. Initially, the state legislature set a 40 million dollars/year cost cap on the program. The most recent session of Oregon's state legislature removed the cost cap completely, allowing unlimited use of the credit by residents and businesses. Current estimates are that the incentives are costing the state about $20 million annually.

Based on state evaluation efforts, the business credit has resulted in 3,655 projects from 1981–2001, saving 512 million kWh in 2001 plus 548 billion Btus of natural gas, oil, and other fuels. The residential credit has been claimed for more than 65,000 products from 1998–2001, saving 17 million kWh and 33 billion Btus of natural gas (Stephens 2002). A survey of residential program participants found that the 63% of respondents said that the Oregon tax credit influenced which appliance they purchased and 97% said they would use the program again. Eighty-five percent of respondents indicated that they received information on the program from the retailer where they purchased their appliance, indicating the importance of involving retailers in program outreach (Stephens 2003).

Hawaii offers tax credits for the private sector that cover both renewable energy and energy efficiency. The Hawaii Energy Tax Credit, extended to the end of 2003, provides an income tax credit for individual or corporate resident taxpayers of up to 20% of the price of an installed HPWH unit. Since 1979, over 25,000 have been installed in single-family residences while over 35,000 have been installed in multi-family residences.

## RECOMMENDED STEPS FOR STATE ACTION

In today's economy, most states have budget deficits; these conditions make it difficult to propose revenue-reducing measures. However, as state fiscal situations improve, energy efficiency tax credits merit serious consideration. A good place to start is a 2002 ACEEE report that profiles existing tax credit programs, discusses lessons learned, and provides model legislation based on bills enacted in key states. This report recommends two types of tax credits—green building tax credits for commercial buildings and sales tax waivers for efficient residential equipment and vehicles. States interested in considering tax credits should also contact states with current programs, such as Oregon, to obtain updated information on how existing programs are working.

## RESOURCES

- **Charlie Stephens**, Oregon Office of Energy, 503-376-4298, charles.m.stephens@state.or.us
- **Christina Mudd**, Maryland Energy Administration, 410-260-7184
- **Craig Kneeland**, New York State Energy Research and Development Authority, 518-862-1090 ext. 3311, cek@nyserda.org, www.nyserda.org/green.html
- **Mike Taylor**, Minnesota Department of Commerce, 651-296-5175

# POLICY CATEGORY SIX: TRANSPORTATION EFFICIENCY MEASURES AT THE STATE LEVEL

## PROBLEM

The transportation sector accounts for over two-thirds of U.S. oil consumption and 28% of our total energy use—a figure that is projected to grow at an average annual rate of 2%, to 40 Quads in 2020. Approximately 60% of transportation energy consumption is by passenger cars and light trucks (EIA 2003). GHG emissions from the transportation sector, which currently represent about one-third of the national total, are projected to increase at a higher rate over the next two decades than emissions from any other sector (Smith et al. 2002).

There are significant opportunities to increase energy efficiency and reduce GHG emissions, criteria air pollutants, and oil dependence at reasonable cost by increasing the fuel economy of passenger vehicles. Technologies to improve efficiency are continually emerging, but increasing vehicle size, weight, power, and acceleration have more than offset the efficiency gains. As a result, average fuel economy of passenger vehicles has declined over the past decade and a half.

Passenger vehicle energy use can also be reduced by reducing vehicle miles traveled (VMT). At present, VMT continues to outpace population growth and drives the rapid increase in transportation energy use. Rising rates of vehicle ownership and sprawling growth patterns have lengthened both work and non-work trips and curtailed the use of non-auto modes of travel.

The low cost of driving is an additional factor contributing to rising transportation energy use. Vehicle taxes, registration and licensing fees, and gasoline are significantly cheaper in the United States than in many other industrialized countries. Moreover, much of an individual's cost of automobile use is fixed (i.e., independent of the kind of vehicle driven and the number of miles driven). Increasing the driving public's awareness of the consequences of the vehicle and travel choices they make will be essential to reducing energy use in the transportation sector.

## POTENTIAL BENEFITS TO STATES

Because of the variety of state policy options that can affect transportation, it is difficult to estimate the overall energy savings potential for state-level transportation policies. As a rough guide, policy analyses indicate it is reasonable to project that with known technology improvements supported by comprehensive and sustained policies, the United States should be able to reduce forecast transportation energy consumption by about 25% in the year 2020. For an average state, that would be about 200 trillion Btu in energy savings, and about $2.4 billion in motor fuel savings.

## TRANSPORTATION STRATEGIES AS A POLICY SOLUTION

The role of states in promoting technology-based advances in vehicle efficiency has been limited historically, due to the federal government's dominant role in fuel economy and research and development initiatives. The ongoing decline in fuel economy in the face of cost-effective technology advances is prompting some states and local governments to enter this arena, however. Such initiatives include the following.

- Tax Incentives. States can offer tax credits, sales tax exemptions, and other tax-related inducements to encourage consumers to purchase high-mileage and/or low-emission vehicles.
- State Fleet Requirements. Every state owns a fleet of vehicles, whose fuel economy they can prescribe. As fleet managers, states can make policies regarding state vehicle fuel economy.
- Vehicle Labeling. This is a voluntary approach in which vehicles that meet pre-defined fuel economy and/or tailpipe emissions performance levels receive labels designed to draw consumer attention to these environmentally friendly models.
- Feebates. While states cannot regulate fuel economy, they can offer incentives, disincentives, and information to influence buying practices. Among the available tools are "feebate" programs, under which vehicle purchasers either pay an extra fee or earn a rebate based on whether the vehicle has a low or a high fuel economy.

With regard to managing growth in VMT, many strategies are inherently local or regional, and states and municipalities are the acknowledged leaders in these areas. One of the key principles that has emerged in efforts to slow growth in vehicle travel is that people tend to drive less in areas that incorporate the principles of smart growth: higher residential density; a mix of jobs, stores, and housing; high-quality transit service; transit-oriented development; good street connectivity that makes neighborhoods pedestrian friendly; and strong activity centers where destinations are close together (see, for example, Holtzclaw et al. 2002). States have undertaken a wide range of initiatives in this general area, often based on a comprehensive approach to land use and transportation planning. Pricing of transportation services, linking insurance payments to mileage driven, and other options have also been considered.

Several states have addressed transportation energy use indirectly, in the context of broader plans to reduce GHG emissions.

## STATE EXPERIENCE

### Tax Incentives

California has established an Efficient Vehicles Incentives Program that provides financial incentives for the purchase of high fuel economy vehicles. The Maryland Clean Energy Incentive Act, which offers a series of tax incentives for energy efficiency to residents and businesses, includes an excise tax exemption of up to $1,500 for qualifying hybrid vehicles. Oregon offers a $1,500 state income tax credit for hybrid electric vehicles through the state's

residential energy tax credit program. Colorado, New Jersey, New York and Pennsylvania have opened their alternative fuel vehicle tax credit programs to hybrid vehicles.[12]

**State Fleet Efficiency**

Several states have established programs to improve the environmental performance of their fleets and reduce fuel costs by purchasing the most efficient, clean vehicles possible. Maine requires that new cars have highway fuel economy of at least 30 miles per gallon (mpg), and hybrids are to be purchased whenever cost-effective. Washington and Minnesota have defined special categories of "High MPG" vehicles in state bid specifications to promote purchase of efficient vehicles that might not ordinarily appear in state vehicle contracts. In California, fleet vehicles must be "ultra-low emission vehicles," and the legislature is investigating the feasibility of reducing fleet energy consumption by 10%. Since 1999, Missouri has required that, with few exceptions, vehicles purchased by state agencies must meet or exceed the federal standards for average fuel economy under EPA's corporate average fuel efficiency (CAFE) standards of 27.5 mpg for passenger cars and 20.7 mpg for light duty trucks. Missouri counts "flex-fuel" vehicles, which can run on ethanol or gasoline, as having very high fuel economy, regardless of whether they are in fact fueled by gasoline. This detracts from the efficacy of the fuel economy requirement.

**Vehicle Labeling**

In 1999, the state of Maine launched a voluntary labeling program in which dealers place "Clean Cars for Maine" stickers on vehicles that achieve at least 30 mpg and meet the California Low Emissions Vehicle standard. New Hampshire has since adopted a similar program.[13]

**Feebates**

Various states have attempted to institute feebates or "gas guzzler" taxes, without success to date for a variety of reasons. In the case of Maryland, the federal government expressed its opposition to the state's plan for implementing feebates, saying the program would effectively preempt federal fuel economy standards. There is renewed interest in the concept, however, which is under consideration in some form in Arizona, California, Iowa, Maine, Massachusetts, Maryland, Oregon, Rhode Island, and South Dakota (RI GHGSP 2002).

**Smart Growth and VMT Management**

High vehicle efficiency and clean fuels cannot ensure a sustainable transportation system in the long term if growth in VMT goes unchecked. Strategies adopted to manage growth in

[12] For more information, see www.epa.gov/OMS/market/rpt914.htm, www.energy.state.md.us/cleanincentives.html, or www.energy.state.or.us/trans/hybridcr.htm.

[13] For more information, see http://www.nrcm.org/air/Clean_and_dirty.htm or http://www.des.state.nh.us/gw/gw_archive/gw0202.htm.

VMT include rationalizing the pricing of transportation facilities and services, investment in alternative transportation modes, and better land use management.

Pilot projects are underway to determine the efficacy of pricing strategies such as time-of-day pricing and "cash-out" parking (in which employees are offered the cash value of their paid parking spaces to find another means of getting to work). Other measures aim to transfer the fixed costs of driving to variable costs to provide an incentive to drive less. Examples include Pay-As-You Drive Insurance, which has been authorized by the legislature in Texas, and is under consideration in Georgia, Massachusetts, Oregon, Pennsylvania, and Washington. Pay-As-You-Drive Insurance programs have the potential to reduce vehicle travel by more than 10%, in addition to reducing traffic congestion, road and parking facility costs, accident risk, pollution, consumer costs, and sprawl (Litman 2001).

Land use management is among the most widespread and promising approaches to curbing VMT growth and has the advantage of addressing multiple environmental, economic, and quality-of-life issues simultaneously. Several states have adopted "smart growth" policies that explicitly address transportation.

*Delaware: Executive Order 14.* Delaware Governor Ruth Ann Minner signed an executive order in 2001 outlining a "Livable Delaware" strategy to address sprawl, congestion, and related growth issues. The executive order directs new growth to areas where the state and local governments have planned for it. It also requires state agencies to align their policies, budgets, and programs in accord with the objectives of Livable Delaware. For example, the Delaware Department of Transportation now lists among its responsibilities the need to prioritize funding to existing communities and designated growth areas through its Capital Improvement Program and Corridor Capacity Preservation process.[14]

*Maryland: Priority Funding Areas; Smart Growth and Neighborhood Conservation Program.* Maryland statute establishes Priority Funding Areas that are targeted for economic development and new growth. Since October 1, 1998, the state has been prohibited in general from funding infrastructure-related projects outside of Priority Funding Areas. Prohibited projects include industrial development incentive programs; state leasing for office and other uses; major transportation projects such as roads, bridges and transit; and water supply projects.[15]

One area designated for priority funding is Baltimore's Digital Harbor, a redevelopment zone located in the city's Inner Harbor.[16] The project is expected to reduce the region's total daily VMT by up to 1%, which will provide concomitant GHG reduction benefits. The Maryland Department of Planning estimates that the Digital Harbor project will save 670,216 VMT/day by 2005 and 1,458,461 VMT/day by 2025 (MDE 2003).[17]

[14] For more information, see http://www.state.de.us/governor/orders/eo_14.htm#TopOfPage.

[15] See Maryland Department of Natural Resources' website at http://www.dnr.state.md.us/bay/tribstrat/monitor/ss/smart_growth.html.

[16] The Maryland Office of Planning reports that while overall program air quality and VMT data are not available, some project-by-project information exists (Noonan 2003).

[17] For more information, see http://www.mdp.state.md.us/smartgrowth/pdf/PFA.PDF.

Maryland's Smart Growth and Neighborhood Conservation Program improves livability by making streets safer and more attractive for pedestrians and bicyclists. To support development in older towns and cities, the state has steered $150 million in transportation dollars to downtown "streetscaping" projects. The program has built more than 50 miles of sidewalks in older communities and helped nearly 300 private-sector employees buy homes closer to their work (NGA 2002).

*North Carolina: SB 953.* During the 1999 legislative session, the North Carolina legislature and Governor James Hunt enacted an aggressive transportation policy that included a mandate "to reduce the growth of vehicle miles traveled in the State by at least 25%" by the year 2009." To meet this goal, the state will consider a number of transportation demand measures (TDM), including road pricing, VMT pricing, fuel pricing, and land use measures (Dale 2000).[18]

*Oregon: Transportation Planning Rule.* Oregon's Transportation Planning Rule (TPR) (Oregon Revised Statutes 660.12) required local governments to demonstrate reductions in VMT per capita of 10% below 1995 levels by 2015 and 20% by 2025. The Oregon Department of Transportation is currently working on 20-year plans for public transportation, including improvements for those traveling by rail and bicycle, and on foot. Retrofitting arterials and major collector streets with bike lanes and walkways in urban areas is a major focus of the plan. Planning for narrow local streets and pedestrian facilities are two other key elements local governments must undertake when completing a Transportation System Plan in compliance with the Oregon rule. In addition, the plan also calls for minimum requirements that ensure compatibility of intermodal facilities and systems (Dale 2000).[19]

Implementation of the TPR has been inconsistent, and the 2003 Benchmark Performance Report by the Oregon Progress Board to the state Legislative Assembly states that: "Metro drivers are driving more, despite efforts to increase use of alternative modes of transportation."[20] Some local governments have made significantly more progress than others (Rostoff 2003). Portland, for example, greatly increased public transportation ridership in the 1990s, and total ridership in the metropolitan area has increased five-fold over the last 30 years. Ridership in 2002 was up 4.3% from 2001, and the city's trains and buses eliminate 187,000 car trips daily.[21]

*Washington State: commute trip reduction.* Though the Clean Air Act Amendments of 1990 required large employers to reduce employee work-related vehicle trips and increase ridership per vehicle, Congress amended the law in 1996 to make the Employee Trip Reduction program voluntary. Washington opted to continue the mandatory program for nine counties in the heavily populated region around Seattle. The goal of the nine-county program was a 35% reduction of employee commute trips by 1999. When it became apparent that

[18] For more information, see http://www.geo.appstate.edu/bulletin/ EPA_projects/NCaction/chapter_7.pdf and http://www.ncga.state.nc.us/html1999/bills/ allversions/senate/s953vc.html.

[19] See Oregon's Department of Land Conservation and Development website at http://www.lcd.state.or.us/ tgm/publications.htm.

[20] See Oregon's Progress Board website at http://www.econ.state.or.us/opb.

[21] See Trimet's website at http://www.trimet.org/inside/pdf/factsheet02.pdf or for more information see http://arcweb.sos.state.or.us/rules/OARS_600/OAR_660/660_012.html.

many employers would not meet this goal, the legislature voted to extend the program through 2003. In support of the law, the state conducts surveys every 2 years to evaluate progress toward the trip reduction goal. Many companies have met this target, and others are expected to do so by 2003.

Washington State University's Energy Program supports a focused effort to make teleworking standard good practice in the state. A 35-member coalition of state legislators, legislative staff, state agency staff, business representatives, and environmental and public interest groups is working to complete recommendations for further state policy to encourage teleworking (Dale 2000).

**Transportation-Related Climate Change Initiatives**

While there has been little action on the national level to address climate change, many state and local governments have developed plans to begin addressing the issue. Due to the transportation sector's large contribution to overall U.S. GHG emissions, transportation measures play a key role in such plans. For other examples of states' response to the threat of climate change, see the appendix.

*California: AB 1493.* In 2002, California became the first state to adopt measures to regulate GHG emissions from the transportation sector. Under AB 1493, the California Air Resources Board will adopt by 2005 regulations that would achieve "the maximum feasible reduction" in emissions of GHGs, including $CO_2$, from cars and light-duty trucks (including sport utility vehicles). The regulations will not affect vehicles before the 2009 model year. The statute does not dictate how vehicles' emissions should be reduced, though it prohibits certain approaches, and contains a provision allowing carmakers to meet requirements in part by reducing pollution from non-auto sources (e.g., factories).

This legislation could become a model for other states interested in moving towards regulation of tailpipe GHG emission. In his 2003 State of the State address, Governor Pataki announced that New York would follow California's lead on vehicle GHG emissions. Four states—Maine, Massachusetts, New York, and Vermont—have adopted the "California Car" criteria air pollutant emissions standards, which could set the stage for the adoption of California's transportation GHG program once it is established.[22, 23]

*New Jersey: GHG reduction target.* In 1998, New Jersey became the first state to publicly announce a statewide GHG reduction target (SB2769/HB2428). One-third of the reductions are to come from improvements in transportation efficiency. Department of Environmental Protection Administrative Order 1998-09 requires reductions of GHG emissions to 3.5% below 1990 levels by 2005. The state is pursuing a number of initiatives to promote voluntary participation from the private sector (Rabe 2002).[24]

[22] The Clean Air Act Amendments (CAAA) of 1990 allowed California to establish separate, more stringent automobile pollution standards to help the state address unique and severe air quality problems. Other states may adhere to federal standards, or they can adopt California standards (Dale 2000).
[23] For more information, see http://www.assembly.ca.gov/acs/acsframeset2text.htm.
[24] For more information, see http://www.state.nj.us/dep/dsr/gcc/gcc.htm.

## RECOMMENDED STEPS FOR STATE ACTION

States interested in transportation efficiency initiatives should consider the following steps:

- Conduct an inventory of state policies and practices that affect, or should affect, vehicle purchasing. Keep records of the specifications, usage, and full life costs of fleet vehicles. Coordinate vehicle procurement and management functions so that purchase decisions can be made on the basis of full life costs, rather than on purchase price alone.
- Convene a stakeholder group to explore feebate and labeling options for the state.
- To pursue demand reduction strategies, states should consult the extensive resources now on the Internet; e.g., see http://www.epa.gov/otaq/transp.htm.

## RESOURCES

- **CCAP** (2002)
- **NGA** (2002)
- **Dowd** (2000)
- **Langer** and Williams (2002)
- See **www.fueleconomy.gov** and **www.greenercars.com**.

# POLICY CATEGORY SEVEN: STATE-LEVEL EFFICIENCY PROGRAMS FUNDED THROUGH UTILITY SYSTEMS

## PROBLEM

Electric and gas utilities, and the larger generation and transmission systems in which they operate, are vulnerable to price increases, reliability problems, and pollution emission increases. Therefore, many states have created a policy context that seeks to minimize these risks through a balanced resource planning process. As a result, in many states utilities have delivered a number of different services that provide broad benefits to the utility system as a whole, including programs to reduce energy use (energy efficiency or demand-side management [DSM] programs); research and development (R&D) efforts to develop clean and efficient energy technologies; programs to support the needs of low-income customers; and projects to promote renewable resources and support environmental quality. In the regulated utility environment, these ratepayer-funded programs were often managed by utilities with oversight from their state regulatory commissions.

As utilities began to anticipate competition in the electric industry in the mid-1990s, many of these programs became increasingly vulnerable. Utilities became concerned that paying for such programs would increase their rates and put them at a disadvantage relative to competitive suppliers. Furthermore, if traditional rate of return regulation and integrated resource planning were to be abandoned, it would become economically advantageous for most utilities to sell more and more electricity rather than reduce consumption through energy efficiency programs. Together, these factors resulted in a substantial decline in utility energy efficiency/DSM program activity. Whereas in 1992, utility spending on energy efficiency programs was projected to increase by over 50% from 1994 to 1998, actual spending took a "u-turn" and went **down** by 50% from 1994 to 1998 (Kushler and Witte 2001). Similarly, electric utility expenditures on R&D declined by one-third from 1993 to 1996 (GAO 1996). While there has been a small increase in state funding in recent years, total spending remains well below early 1990s levels.

## POTENTIAL BENEFITS TO STATES

Based on the experience of leading states, utility system-based energy efficiency programs of the kinds described in this chapter are estimated to be able to save 0.5 to 1% of total energy sales annually. For an average state, that would range from 350 to 700 million kWh annually. Over 10 years, those savings would cumulate to almost 40 billion kWh.

## STATE-LEVEL EFFICIENCY PROGRAMS AS A POLICY SOLUTION

In the face of a restructuring utility industry, states have responded to the continuing need for energy efficiency programs by creating new ways to plan and fund these programs. By far the most widely used approach, this is variously referred to as "system benefits charges" "system benefits funds," "public benefits funds," and "public goods charges." We will use

the term "systems benefits charges" or SBC for all programs of this type. Some states have also explored Energy Efficiency Portfolio Standards and Portfolio Management.

***SBCs*** collect small funds, typically set in terms of tenths of a cent (or "mills") per kilowatt-hour. This is usually assessed as a non-bypassable charge on the distribution service. All customers in affected classes typically pay the same charge; SBC charges are separate from the utility's basic rates, and flow into dedicated funds. The funds collected are then used to deliver a variety of services that provide benefits to the utility system as a whole. The most common categories are energy efficiency programs and programs to provide assistance to low-income customers. These funds are usually administered by the utility companies themselves, but in some cases are administered by government agencies or nonprofit organizations.

In the ***Energy Efficiency Performance Standard (EEPS)*** approach, a jurisdiction sets a numerical energy savings and calendar target for affected utilities, allowing them to determine the means by which the savings are achieved. For example, a state might require that energy savings equal to a defined percentage of a utility's forecast or historical energy sales be obtained, typically with a fixed calendar target.

The ***Portfolio Management*** approach is also gaining acceptance, particularly among states that have opened their retail markets to competition. The first several years' experience with retail competition has resulted in the major of customers remaining on some sort of default service for electricity supply, with the local distribution utility typically left with the ongoing responsibility of providing the default service. Several states, recognizing the ongoing need for policy guidance to manage the various risks in this type of situation, have adopted a Portfolio Management approach in which the distribution utility is asked to follow certain planning and procurement practices to obtain the best mix of resources to serve customers. Energy efficiency programs can be included as a resource option in the portfolio of resources managed by local utilities under state utility commission guidance and review.

## STATE EXPERIENCE

### System Benefit Charge Policies

Twenty-four states (Arizona, Arkansas, California, Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Michigan, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Virginia and West Virginia) and the District of Columbia have formally passed electric restructuring policies.

Of these 25 jurisdictions, 15 states have adopted the SBC approach. Specified funding levels for energy efficiency range from a low of 0.1 mills/kWh to a high of 3.0 mills/kWh. Another three states have used an approach where the funding is either embedded in rates or provided through a flat monthly fee, rather than a per kilowatt-hour charge. Finally, two states have included approaches that are thus far somewhat unique. Illinois (in addition to a very small requirement for utility funding of some state-administered programs) has established a large

"Clean Energy Trust Fund" (funded with $250 million from Commonwealth Edison as part of a larger agreement on restructuring-related issues) that will be used, in part, for energy efficiency. Texas did not establish a funding amount but rather established an annual energy savings goal that must be met by the utilities (see the "EEPS" section below).

The mechanisms selected by states for administering their public benefits energy efficiency programs can be sorted into three basic categories: (1) utility administration; (2) independent administration by a government or other non-utility entity; and (3) some type of "hybrid" approach.

Of the 19 states that have proceeded far enough to allow an assessment, a total of 7 states can be categorized as having individual utilities administering their energy efficiency programs (albeit often with some type of collaborative advisory process). Seven additional states have chosen some type of independent entity (six use a state government agency of some sort and one has competitively selected an independent contractor). Finally, five states fall into a "hybrid" category,[25] where utilities have some administrative role, but the approach can't really be categorized as simple utility administration. In that group, approaches range from utility administration within a system of regulatory-appointed planning input and requirements for certain "statewide" programs, to a system whereby utilities get "credit" for any programs they run themselves and only need to remit any remaining portion of the total spending requirement to a state agency for administration.

It should be noted that although it is possible to sort states into three general categories, most states have various elements and features that make their approach somewhat unique. This is truly an area where a lot of interesting experimentation is occurring.

*California.* The state of California was unquestionably a prominent pioneer in this area, both for electric restructuring in general, and for the concept of public benefit funding in particular. California was among the first states to pass comprehensive restructuring legislation and one of the first to create a specific non-bypassable wires charge to support energy efficiency. (It also included a wires charge to support other public benefits, including renewable energy, R&D, and low-income programs.)

California created an initial 4-year period for its "Public Goods Charge" (PGC), and specified a funding level for energy efficiency that is nominally the largest in the nation, with an average annual funding of approximately $218 million/year. (On a per kilowatt-hour basis, this charge is equivalent to approximately 1.3 mills/kWh—about in the middle range of states with energy efficiency public benefit funding.)

The initial intention in California was to "bid out" the administration of the energy efficiency programs. However, after encountering a variety of legal and administrative obstacles, the California Public Utilities Commission eventually decided to allow the individual utilities to continue administering the programs through the initial 4-year authorization period.

[25] California, Connecticut, Maine, Montana, and Pennsylvania are categorized as being in the "hybrid" group.

California began its PGC energy efficiency programs in 1998, and has implemented a wide variety of energy efficiency approaches. Originally there had been a particular emphasis on market transformation, and in pursuit of that objective a number of statewide programs were developed and coordinated among the major utility companies. The California Board for Energy Efficiency (CBEE 2000) reported that total electric energy efficiency PGC spending for 1999 was $200 million, with estimated annualized savings of 825 million kWh and 156 MW of peak demand, producing net benefits (benefits in excess of program and customer costs) of about $140 million.[26] In 2001, partially in response to the widespread electric system reliability problems experienced in the state, California enacted legislation to extend its public goods charge for an additional 10 years.

*Massachusetts.* Massachusetts passed restructuring legislation in 1997, which included public benefits funding for energy efficiency, renewable energy, and low-income programs. In Massachusetts the PBF, which began operating in 1998, is administered by distribution utilities, in accordance with plans filed with and approved by state agencies. Energy efficiency programs include a mixture of traditional DSM programs operated by individual utilities and regional market transformation programs in which many utilities from New England hired a single program contractor to serve many utility service areas. In the first year of PBF operation, according to an analysis by the Massachusetts Division of Energy Resources (the state energy office), energy efficiency programs reduced participating customer energy use by 6–13% (varying by customer class), saving customers $19 million annually in electricity costs (MA DOER 2000). Over the lifetime of these measures, benefits are projected to be $265 million, exceeding the cost to achieve these savings (including investments by participating customers and the PBF) by about $140 million (i.e., the benefit-cost ratio is over 2:1).[27]

*New York.* New York started its PBF in July 1998. The program is largely administered by NYSERDA, a semi-independent organization established by the state government in 1975. NYSERDA developed a plan calling for about 30 complementary energy efficiency programs addressing different sectors, measures, and market niches. Programs are run by independent contractors selected by NYSERDA through competitive solicitations. The programs fall into five categories—energy efficiency, renewable energy, low-income, R&D, and environmental protection. Energy efficiency accounts for 70% of the budget and is divided into market transformation, standard performance contracting, and technical assistance programs.

After nearly 2 years of work, NYSERDA had gotten 25 programs operational, with additional programs under development. Measures already installed are projected to save consumers and businesses $12.5 million annually, providing a 1.4-year payback on the $17 million spent to date. Furthermore, experience to date is that for each $1 NYSERDA invests, customers, energy service companies, and others are investing $3, providing good leveraging of the public fund. By the end of year 3, NYSERDA expected the programs that were already

[26] Note that California also has natural gas energy efficiency programs, funded through gas rates rather than a separate PGC. In 1999, the gas programs spent about $43 million, saved 14 million therms, and also produced benefits in excess of program and customer costs.
[27] Note that these estimates are undiscounted; discounted figures are not readily available.

in operation to reduce energy bills by more than $100 million annually, providing an approximately 0.7 year payback on public funds invested.

**EEPS**

Energy Efficiency Portfolio Standards, which begin by setting an energy-savings target rather than an SBC level, were pioneered in Texas and have been explored in the states of Colorado and Washington. Texas passed its restructuring legislation in 1999 (Senate Bill 7), and began retail competition in January 2002. SB 7 requires utilities to field efficiency programs sufficient to save 10% of forecast energy demand growth. The state utility commission is overseeing implementation of the efficiency programs: several categories of programs were established in stakeholder negotiations, and current funding levels are running in the $80 million range, collected through an SBC in the 0.33 mills range.

A Colorado EEPS bill was introduced in 2003 by State Senator Reeves. SB03-129 requires larger investor-owned utilities in the state (Xcel is the only company affected in practice) to achieve energy savings equal to 0.3% of sales in 2004, 0.65% of sales in 2005, and 1% of sales in 2006 and each year thereafter through 2020. Eighty percent of the savings must come from customer energy efficiency and other demand-side management resources. This bill died in committee. For more information, check the Southwest Energy Efficiency Project website at http://www.swenergy.org/policies/index.html or call 303-447-0078.

However, the municipal utility in Fort Collins, Colorado instituted its own EEPS policy in 2003. As a municipal, this utility is not dependent on utility commission or legislative mandates, so it undertook this policy as part of a broader sustainability policy. The efficiency policy sets a goal of reducing per capita electric consumption 10%, from a 2002 baseline, by the year 2012. The 10% per capita consumption reduction target is expected to reduce overall electric consumption about 17% by 2012. These energy savings will amount to about 1.7 billion kWh of electricity, and will avoid the emission of over 1.8 million tons of $CO_2$.

In Washington, House Bill 1544, sponsored by Representative Hudgins, requires utilities to save 0.75% of their 2004 retail load from 2005 through 2009, and 0.85% of their 2009 load from 2010 through 2012. The program continues thereafter in 3-year cycles. While savings must come from the utilities' Washington retail customers, 5% must come from low-income customers, and up to 15% may come from high-efficiency combined heat and power projects. This bill also did not survive the legislative process in the current session.[28]

**Portfolio Management**

The term "portfolio management" was adapted from the world of investment and finance by the Regulatory Assistance Project in an attempt to define a new framework for public policy oversight of electric utilities. Given the current status of partial restructuring of the U.S. electricity industry, RAP was moved to provide guidance to state utility commissioners grappling with new and unfamiliar conditions.

[28] For more information, visit http://www.leg.wa.gov/wsladm/billinfo/dspBillSummary.cfm? billnumber=1544.

RAP's report, *Portfolio Management: Protecting Customers in an Electric Market That Isn't Working Very Well* (EF 2002*),* describes a new paradigm for managing electricity system resources in states with restructured or partially restructured markets. The report puts local distribution utilities in the role of portfolio managers, with the task of procuring a portfolio of resources to serve customer needs while reducing the risks of price spikes, power outages, and abuse of market power.

Energy efficiency is viewed as a vital part of the resource portfolio approach, along with renewable energy and a mix of generation sources, contract lengths, and other attributes. Several states are exploring the portfolio management approach, though few have taken action far enough to observe its effects in the market. Leading states include Arizona, California, and Montana.

California's Public Utility Commission 02-10-062 outlines the process planned for California utilities. It can be viewed at http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/0249.htm.

The Arizona Corporation Commission has launched a process requiring the state's utilities to procure a mix of resources on behalf of customers. The Commission's Decision 65743 on this topic can be found at http://www.cc.state.az.us/utility/electric/Track-B-03-19-03.pdf.

In Montana, the proposed new default service guidelines can be seen at http://www.psc.state.mt.us/pdf/38-2-170%20Default%20Supply%20Rules.pdf.

States interested in pursuing Portfolio Management should contact RAP at 177 Water St., Gardiner, ME 04345, telephone 802-223-8199, website www.raponline.org.

## RECOMMENDED STEPS FOR STATE ACTION

States that want to consider utility-system efficiency programs should take the following steps:

- Conduct a Potential Study. Document current and forecast sales of electricity and natural gas through utility systems. Determine the level of planned supply system investment needed to serve demand forecasts. Also estimate energy efficiency potential from various end-use efficiency improvements. Assess risks of price spikes and/or shortages based on projected supply and demand forecasts. Document current and forecast air pollution emission and compliance issues, as well as GHG emissions. Integrate the analysis into an assessment of the role energy efficiency can play in keeping prices affordable, supply stable, and emissions within bounds.
- Form a Stakeholder Coalition. Engage a range of affected parties, both in planning and reviewing the potential study and in advocating policy and program implementation. The earlier such a group is formed, and the broader its constituency, the more likely it will lead to real action.
- Draft Policy/Program Documents. To move high-priority initiatives forward, it is important to draft the basic documents required. These can include legislative language,

administrative rules, or program plans. The more "actionable" a document, the easier it is to get concrete responses from decision-makers.

## RESOURCES

- System benefits charges: visit the **ACEEE** website for an online table and several reports on this topic at http://www.aceee.org/utility/index.htm.
- Energy Efficiency Portfolio Standards: **v**isit the websites listed above in the **EEPS** section, or contact **ACEEE** staff at 202-429-8873.
- Portfolio management: contact the **Regulatory Assistance Project** at 177 Water St., Gardiner, ME 04345, telephone 802-223-8199, website www.raponline.org.

## CONCLUSIONS

The policies highlighted in the preceding chapters document an impressive area of policy and program tools that states have used successfully to serve their energy and environmental needs. They cover residential and commercial buildings, industrial facilities, transportation, and the utility sector. They range from straight regulatory approaches such as appliance standards to voluntary programs based on public benefits funds.

These leading examples show that state energy efficiency policy can make a substantial difference in making the U.S. energy economy more efficient, more affordable, cleaner, and more sustainable. The success stories highlighted in this report demonstrate the enormous potential for energy savings and the enormous ingenuity of state agencies, utilities, advocates, and other stakeholders.

Determining the potential energy, environmental, and economic benefits of energy efficiency policies for an individual state requires a level of detailed analysis beyond the scope of this report. However, we have made rough preliminary estimates of potential savings in each policy area as an initial guide for state decision-makers. To illustrate the potential benefits of state efficiency policies, an average-size state could save almost 400 trillion Btu annually, or about 20% of current total energy usage, in the year 2020 through aggressive application of these policies. These potential savings are summarized in Table 3 below.

***Table 3: Typical State Savings Potential***

| Policy | Savings Potential (TBtu in 2020) |
|---|---|
| Appliance Standards | 21.4 |
| Building Codes (Residential) | 4.8 |
| CHP | 57.2 |
| State Facilities | 23.0 |
| Tax incentives | 10.0 |
| Transportation | 200.0 |
| Utilities | 74.2 |
| **TOTAL** | 390.7 |

These savings estimates are very rough, and are not based on a single analytical modeling approach. More precise estimates of potential savings for a given state require much more detailed data on existing baseline conditions and other forecasting inputs. They are, however, sufficient to provide a first-order estimate of the potential benefits of energy efficiency policies. Given this substantial potential, state efficiency policies should be a major focus for analysis and advocacy in the coming years.

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# APPENDIX: CLIMATE CHANGE INITIATIVES AT THE STATE LEVEL

## PROBLEM

Research and analysis on the effects of human activity on the global climate have determined that man-made GHG emissions are having a discernible impact. In response, some states have launched special efforts to address global climate change. Some have considered climate change mitigation explicitly while in others it has been an incidental benefit.

Energy use and climate change are closely linked, and there is often substantial convergence between energy and climate policy objectives. Therefore, state GHG reduction efforts focus primarily on limiting or slowing the rate of fossil fuel combustion, which accounts for 84% of U.S. emissions of $CO_2$. Action is currently being taken at the state level to promote renewable energy, limit air pollution from power plants, capture methane from waste management, and reduce transportation demand.

State policies to integrate concerns about climate and energy can reverse the trend of increasing $CO_2$ emissions. In addition, under future GHG reduction regimes, state actions taken now may reduce compliance costs for early actors.

## POTENTIAL BENEFITS TO STATES

Climate policy is such a sweeping topic, state GHG emissions vary so much, and policy responses vary so greatly that it is difficult to predict the benefits that climate change action holds for an individual state. However, the benefits targeted by leading states serve as a benchmark for estimating the potential. For example, several states have set a goal of reducing carbon emissions levels to 10% below 1990 levels by the year 2020. On a national basis, that would mean a reduction on the order of 900 MMT from business-as-usual projections. For an average state, that would translate into 18 MMT of carbon.

## STATE CLIMATE CHANGE AS A POLICY SOLUTION

State actions to address climate change vary from one another in detail but are linked by common design characteristics. For example, they are often initiated through bipartisan coalitions and supported with input from a broad range of stakeholders. Governors who are Democrats, Republicans, and Independents have signed state climate change policies into law. These policies are typically structured so as to create economic development opportunities, which has enhanced their broad base of support. This characteristic has helped state-level climate policies spread from state to state, and has helped clusters of contiguous states initiate cooperative efforts.

The sections that follow highlight state experience with a range of policy options. A cross-cutting section at the end goes into more detail on states that have taken a more comprehensive approach to climate change policy.

## Voluntary Approaches

*Greenhouse Gas Inventories*

**Background.** Inventories summarize annual GHG emissions for a given state by sector, source, and gas, and also typically catalog negative emissions or "sinks." Inventory methodology is usually based on activity data, such as electricity use, and emission factors derived for specific activities and gases. The inventory usually represents a state's first step in preparation for developing a climate change policy response. This information is a necessary prerequisite in developing a well-targeted mitigation strategy.

**State activity**. According to EPA, 40 states have prepared or are completing a GHG inventory, typically based on EPA's methodological guidance. The International Council for Local Environmental Initiatives (ICLEI) reports that a total of 76 local jurisdictions have completed an inventory and 11 are in the process of doing so.

*Climate Change Action Plans*

**Background.** A climate change action plan is a document that describes how a state, county or city can reduce its GHG emissions, and analyzes the potential cost and impact of those reductions. These action plans are often the state's principal guide to the policies, programs, targets, and partnerships that could be undertaken. The plans typically include a list of options and recommendations and an economic evaluation of each.

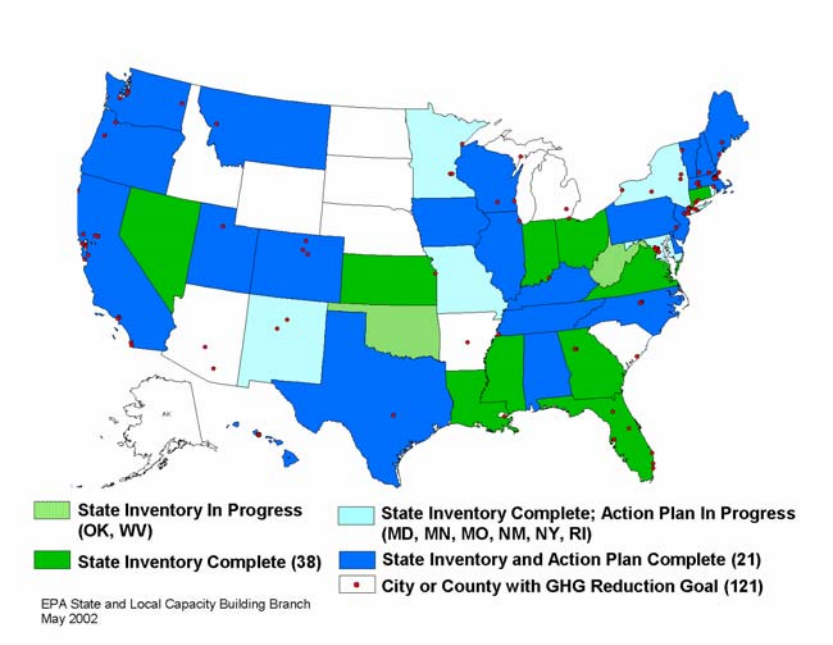
Most state action plans serve mainly as guidance for policy implementation when and if serious climate change action becomes a priority in the state legislature or the administration. They are not usually binding strategy documents. Most of the action plans have not been translated into actual legislative or programmatic actions, except for those programs that were already in progress at the time of the writing of the plans.

**State activity.** Twenty-one states have completed plans, and six other states are in the process of doing so. Many of the documents date from the 1990s and appear to have limited relevance in the current policy environment, though some states are working on updating action plans. Hence the plans themselves do not provide a clear indicator of actual climate change reduction activity in the state.

***Greenhouse Gas Emission Reduction Targets***

**Background.** One of the most proactive measures a state, city, or company can undertake is to publicly declare a target for reducing GHG emissions levels. The targets can either be voluntary or mandatory and, in general, two kinds of GHG emission reduction targets can be used: *emissions intensity*-based targets or *absolute* emission reduction targets.

Emissions intensity-based reduction targets are goals based on the ratio of GHG emissions to a unit of economic output, such as the Gross Domestic Product (GDP) of a country. This approach was used by the Bush Administration to set the current U.S. target of reducing emissions intensity by 18% by 2012.




Absolute GHG emissions reduction targets specify actual emissions levels in a defined timeframe (often expressed in MMT of $CO_2$ equivalent, or MMTCE).

**State activity.** All state and local government targets set to date in the United States have been voluntary, non-binding, and based on absolute reduction goals. Although the targets are voluntary, the public announcement of such targets has proven to be effective in mobilizing efforts to meet the stated goals. Eight states have set and two states are considering a specific statewide GHG reduction target.

These targets are distinguished from the nominal targets included in typical climate change action plans, because they have received official recognition at a high level of government and thus represent real policy goals.

*Maine*. On June 26, 2003, Gov. John Baldacci signed into state law specific goals and a timeline to reduce $CO_2$. While neighboring states like Massachusetts, New Hampshire, and Rhode Island have developed action plans, and Vermont has issued an executive order to reduce GHG emissions, Maine is the first to set its action plan into law. The measure expresses the state's intent to reduce $CO_2$ emissions to 1990 levels by 2010, and to 10% below those levels by 2020. It directs Maine's DOE to work with state agencies, individuals, businesses, and others to come up with ways to reduce $CO_2$ emissions, but does not specify a regulatory, voluntary, or mixed approach to achieve the targets. The legislation is consistent with the New England Governors and Eastern Canadian Premiers targets, including language that specifies reductions on the order of 75–80% over the long term. Other provisions of the law, titled "An Act to Provide Leadership in Addressing the Threat of Climate Change," require that the action plan be in place by July 2004 and that Maine demonstrate leadership by inventorying and reducing $CO_2$ emissions from state-funded programs and facilities.

Because the state has no coal-fired power plants, future cuts in emissions will likely come from sectors other than electric power generation.[29]

*New York.* On June 11, 2002, the New York State Energy Planning Board adopted a statewide goal to reduce GHG emissions to 5% below 1990 levels by 2010 and 10% below 1990 levels by 2020. The goal, which was included in the *New York State Energy Plan*, stemmed from recommendations of the Center for Clean Air Policy (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 included representatives from the business community, environmental organizations, state agencies, and universities.[30]

*New Jersey.* The New Jersey Department of Environmental Protection (DEP) has set a voluntary goal to reduce New Jersey's GHG emissions by 3.5% below 1990 levels before 2005. The goal was established 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.[31]

*New England Governors and Eastern Canadian Premiers.* 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 and energy efficiency. The short-term goal of the NEG/ECP is to reduce regional GHG emissions to 1990 levels by 2010 and by 10% 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 75–85% below current levels.[32]

*Washington (local government).* On July 23, 2001, Seattle 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% 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 carbon sequestration.[33]

[29] See the Natural Resources Council of Maine website at http://www.nrcm.org/Energy/climate_change_PR.htm.
[30] For more information, see www.nyserda.org/sep.html and http://www.ccap.org/pdf/State_Actions.pdf.
[31] For more information, see www.state.nj.us/dep/dsr/gcc/gcc.htm and http://www.ccap.org/pdf/State_Actions.pdf.
[32] For more information, see www.cmp.ca/CCAPe.pdf and http://www.ccap.org/pdf/State_Actions.pdf.
[33] For more information, see www.ci.seattle.wa.us/light/climatechange.

*Utah (local government*). Salt Lake City Mayor Rocky Anderson announced the development of a *Local Climate Action Plan* to reduce municipal GHG emissions to 7% 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% 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% 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.[34]

*Texas (local government)*. In 1996, the city of Austin established a GHG reduction goal of 20% 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% of its electricity demand with renewable energy by 2010. Accordingly, the municipal utility is investing in wind, solar, and landfill methane resources.[35]

### *Greenhouse Gas Registries*

**Background.** A GHG registry is a repository for reporting and tracking emissions and emission reduction and sequestration activities. It typically consists of a database to which entities report on their GHG related activities. The scope of the registries varies significantly depending on a number of factors such as whether reporting to the registries is voluntary or mandatory. None of the registries introduced in the United States, either at the national or state level, currently require mandatory participation.

The national EIA 1605(b) Voluntary GHG Reporting Program has been flexible in terms of the requirements for reporting. However, following a March 2002 mandate from President Bush, the rules are being revised and strengthened and it is expected that more detailed guidance is being developed. Other programs such as the California registry require that companies undertake a corporate inventory before reporting emissions and emission reduction activities. Registries differ mainly in terms of inclusiveness and rigor; before they become truly useful as implementation mechanisms, they must reach common thresholds of baseline definition, monitoring, and verification methods.

The relative stringency of registry reporting will have a bearing if the activities reported under such programs are to be used as compliance tools, or are to be traded in a domestic or international market. Especially with regard to international GHG trading markets, the credibility, transparency, and independent verification of claimed reductions will be crucial if the credits are to be fungible with other measures.

*California.* The California Climate Action Registry was established by SB 1771. Technical changes were made to the statute in SB 527. Senator Byron Sher was the author of both bills. SB 527 was signed by Governor Gray Davis on October 13, 2001, finalizing the structure for

[34] For more information, see www.ci.slc.ut.us/mayor/pressreleases/kyoto%20protocol.htm.
[35] For more information, see http://www.ci.austin.tx.us/sustainable/co2.htm.

the CA Registry. It officially launched its operations on October 24, 2002, and is currently accepting voluntary registry of GHG emissions from a broad spectrum of participants, including utilities, businesses, industry, government agencies, educational institutions, nonprofit organizations, and other entities. CA Registry responsibilities created in AB 1493 are to ensure that the information reported to the CA Registry is credible; to convene stakeholders to agree on how to measure GHG emissions from vehicles; and to establish the effectiveness of strategies such as lower rolling resistance tires, more effective coolants, lighter materials, better aerodynamics, and other measures vehicle manufacturers can take to reduce GHG emissions.[36]

*New Hampshire.* In July 1999, Governor Shaheen signed into law the New Hampshire Greenhouse Gas Reduction Registry. This registry is intended to quantify and submit GHG emissions reduction actions to a state database for safekeeping against some future federal requirements. This approach was developed through a collaborative of business, government, and environmental leaders to encourage early reductions in GHG emissions. The NH Registry was developed to ensure to the greatest extent possible appropriate recognition of voluntary actions taken by New Hampshire businesses, industries, and individuals to reduce GHG emissions. In the event that future GHG reduction targets are implemented, the NH Registry would help New Hampshire entities establish a baseline against which future federal GHG reductions may apply. Rules were promulgated under the New Hampshire Code of Administrative Rules, Chapter Env-A 3800 (Voluntary Greenhouse Gas Emissions Reductions Registry).[37]

*Wisconsin.* In 1999, the legislature directed WI DNR to establish a multi-pollutant, voluntary emission registry, which included six GHGs: carbon dioxide ($CO_2$), methane ($CH_4$), nitrogen oxides ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride's ($SF_6$). The rules for the registry were adopted in the late spring of 2002 and WI DNR is working on developing a website for outreach and reporting. The registry is scheduled to be operational by January 2003. Wisconsin has secured interest in participation from the largest power companies in the state as well as three other industrial companies. In addition to the establishment of a voluntary GHG registry, the state is also considering measures to directly limit $CO_2$ emissions from power plants.[38]

*Maryland.* Under 1999 electric utility restructuring legislation, Maryland added provisions for the disclosure of fuel mixes and emissions by all retail suppliers of electricity in the state. Starting in July 2000, electric bills must list electricity supplied by percentage for coal, natural gas, nuclear, oil, hydroelectric, solar, biomass, wind, and other resources. The list may also include a regional fuel mix average. Rules also require utilities to disclose emissions (of pollutants identified by the MD Public Service Commission) information on a pound-per-MWh basis (Orestes 2003a).

[36] See http://www.ccap.org/pdf/State_Actions.pdf.
[37] See http://www.des.state.nh.us/ard/climatechange/ghgr.htm.
[38] For more information, see http://www.dnr.state. wi.us/org/aw/air/HOT/climchgcom.

## Mandatory Approaches

### *Sector Targeted Caps*

**Background.** A cap on GHG emissions refers to setting an absolute ceiling on the amount of GHG gases a given sector, industry, or company can emit. This is usually accomplished by determining an absolute amount that a given entity or unit can emit.

Given the political sensitivity of real GHG regulation, any cap that has been imposed or that is being considered typically allows for maximum flexibility in meeting the target. The caps are often combined with specifications for how to meet the caps, such as through emissions trading, technology improvements, offsets activities, or a combination of these.

**State activity.** To date only two states and one county have imposed such caps (Massachusetts, New Hampshire, and Suffolk County, New York), but it has been suggested in other states, and is under serious consideration in New York. In Massachusetts and New Hampshire, caps were introduced within the last year, indicating a new trend towards adopting mandatory measures to reduce emissions. These caps target large emitters in the power sector.

The three additional states (Illinois, New York, and Washington) that are considering imposing emission caps also focus on the power sector. The Washington state legislation also includes transportation and other emitters, though it should be noted that these non-utility-sector provisions probably have the least likelihood of being adopted.

*New York.* 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%. Under this measure, the initial allowable emission rate is 1,800 pounds of $CO_2$/MWh. In each subsequent year, the rate is reduced by 1% for each 100 MW of new generating capacity added in the county, until a 20% 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/ton of $CO_2$ above the limits in the first year and \$1/ton in following years.[39]

### *Sector-Targeted Intensity Standards*

**Background.** While caps typically imply an absolute limit on the amount of a given pollutant to be allowed for a specific sector, intensity standards set a minimum efficiency in terms of GHG emissions per unit of economic output or energy produced.

In the case of the power sector (which currently only applies to Oregon), the unit produced is kWh of electricity, so the standard would be expressed in terms of $CO_2$ emitted/kWh produced. Like emission caps, these mandatory regimes are likely to be made more flexible with the inclusion of offset programs, emissions trading, and other GHG-reduction activities.

[39] For more information, see www.co.suffolk.ny.us/legis/resos2000/i2286-00.htm.

**State activity.** Of the three sector-targeted minimum standards introduced by California, Massachusetts, and Oregon, the latter two focus solely on reducing GHG emissions from the power sector. California is the only state that has adopted measures to regulate emissions from the transportation sector—however, the specifics of this California regulation have yet to be defined and may not end up as a clear cut minimum standard.

The emissions standards introduced by Massachusetts are part of a "package" that also includes the state's power sector cap. The efficiency standards for new natural gas-fired plants in Oregon therefore provide the most pure example of a targeted minimum standard for reducing emissions.

*Massachusetts.* 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 NOx, $SO_2$, $CO_2$, 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 pounds/MWh, resulting in an estimated 10% 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 1 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.[40]

*New Hampshire.* 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-fueled 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.[41]

*New Jersey.* New Jersey and EPA negotiated a voluntary agreement with Public Service Electric and Gas Power (PSEG) to achieve a 15% 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 NOx, and $SO_2$, were entered into New Jersey 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.[42]

*Oregon.* 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, non-baseload power plants, and non-generating energy facilities. The level for base-load plants is set at 17% 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,

[40] For more information, see www.state.ma.us/dep/bwp/daqc/files/regs/729final.doc.
[41] For more information, see www.gencourt.state.nh.us/legislation/2002/HB0284.html.
[42] For more information, see www.pseg.com/media_center/pressreleases/articles/press_2002-01-24a.html.

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.[43]

### *Emissions Disclosure*

**Background.** Emissions disclosure requires certain emitters to disclose to the state, the public, or their customers information regarding the amount of emissions generated as a result of their activities.

**State activity.** Connecticut, Maryland, Massachusetts, Nevada, and North Carolina all require disclosure at the industry or state level. In general, the emphasis of these disclosure requirements is on emissions from the power sector. Massachusetts and Nevada, in particular, require state utilities to regularly disclose information on generation mix and GHG emissions to their customers.

In June 2002, North Carolina passed a three-pollutant bill (Clean Smokestacks Bill) instructing the state government to conduct a study of $CO_2$ emissions in the state, focusing on emissions from the power sector. The Maryland legislature also commissioned a study to examine potential changes to the GHG emissions burden after electricity deregulation, and Connecticut instructed its state government to study and report annually on the amount of $CO_2$ emissions produced by the state.

*Wisconsin.* Since May 1993, Wisconsin has required any facility that emits more than 100,000 tons of $CO_2$ to report its emission levels to the Department of Natural Resources. It is the only state with such a requirement. Unexpectedly, dozens of sources that fall well below the threshold voluntarily report their emissions annually, providing the state with a detailed, multi-year profile of its major $CO_2$ sources. In 2000, for example, 183 Wisconsin-based sources reported a total of 30,244,900 million tons of $CO_2$ emissions. This included most major electric utilities in the state, a wide range of large industries, and a mixture of smaller sources. In May 2000, Republican Governor Tommy Thompson signed into law legislation authorizing the creation of an emissions registry, with the intent of allowing Wisconsin firms to report reductions of $CO_2$ or other GHGs. In the event of new national or state legislation calling for emission reductions, firms would receive credit for their past reduction efforts.[44]

*Nevada.* The state of Nevada has been less active in the area of addressing the issue of climate change. A GHG inventory was completed in 1998, however, a climate change action plan has not yet been developed and no legislative measures have been introduced to directly encourage GHG emission reductions. However, last year, the Nevada legislature passed a unique requirement (AB 197) that utilities disclose to their customers information about the average $CO_2$ emissions associated with the electricity sold in that particular area. No other state in the country has introduced similar disclosure requirements.

[43] For more information, see www.energy.state.or.us/climate/climhme.htm and www.climatetrust.org.
[44] See http://www.pewclimate.org/states/results_detail.cfm?climateprogramid=39.

*North Carolina.* Its 14 coal-fired power plants are exempt from current air quality standards under the federal Clean Air Act. SB1078, the Clean Smokestacks Bill, aims to reduce NOx and $SO_2$ emissions from these coal-burning plants by more than half over the next decade. In addition, the law requires the N.C. Division of Air Quality to conduct a study of mercury and $CO_2$ emissions in the state.

*Massachusetts.* In 1998, the Massachusetts Department of Telecommunications and Energy required electricity generators to provide a disclosure label showing electricity customers the price; resource mix; and emissions of $CO_2$, NOx, and $SO_2$ on electricity bills. Emissions must be shown as a percentage of the New England regional average emissions rate and in comparison to emissions from a new power unit.

**Hybrid Approaches**

These policies use a mix of mandatory and voluntary approaches to permit maximum flexibility in meeting specific emissions goals.

***Emissions Trading***

**Background**. The term "emissions trading" has been used in many different contexts. In the strictest sense of the word. it refers to the process of defining a market in emissions allowances and dividing these allowances among the participants (or emitters) included in the system. The emitters can then trade these allowances amongst themselves to comply with a certain pre-specified emission cap or efficiency standard.

Emissions trading is a market-based process that allows firms the flexibility to select cost-effective solutions to achieve established environmental goals. With emissions trading, firms can meet established emission goals by: (a) reducing emissions from a discrete emissions unit; (b) reducing emissions from another place within the facility; (c) securing emission reductions from another facility; or (d) securing emission reductions from the marketplace.

**State activity.** To date, no state has adopted binding rules for an emissions trading system. However, interest is growing in this policy option. Nine states, including the New England states/Eastern Canadian provinces, have made decisions that include language to consider emissions trading. Moreover, several legislative initiatives allow certain emitters to purchase emission reduction credits on the market, without specifying any rules for how this should be accomplished.

New Jersey is the only state that has attempted to develop a formal emissions trading program. The state's plans involve incorporating the program for GHGs into its pre-existing trading program for criteria pollutants. Moreover, no emissions allowances have been allocated among emitters and no standard or cap has been introduced forcing emitters to undertake reductions. As a result, no trades in GHGs have yet been registered with the program, although it has been in existence since June 2000.

The remaining states that are considering emissions trading are focusing on regional activities that would create a sizeable market for trading. Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont are all part of the NEG/ECP effort to consider a regional program and Maryland is considering emissions trading a possibility if a viable option for joining other regional efforts can be identified.

Most of the other states that are active in terms of addressing climate change are not considering development of statewide emissions trading programs, but are instead waiting for development of a national program. In this connection, it should be noted that companies in seven Midwestern states, including Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin, will be eligible to participate in GHG emissions trading on the Chicago Climate Exchange (CCX) beginning in 2003. As a result, there is no immediate rush for those states to develop their own trading programs.

*New Jersey.* New Jersey was one of the first states to institute a voluntary GHG registry through a 2000 amendment of its Open Market Emission Trading Program to include GHGs. The amendment adds new provisions to the Open Market Emissions Trading Rule for the generation, registration, and banking of GHG credits. The most specific guidance included in the rule addresses $CO_2$ emissions (general protocols for four GHG emission sources), although participants may freely register other GHGs, including $CH_4$, $N_2O$, $SF_6$, and certain HFCs and PFCs, using independent quantification measures. The amendment provides for voluntary registration of project-specific emission reductions, but does not include language on corporate inventory reporting, verification, or guarantee of acceptance under a potential future crediting scheme. The GHG registry component has been operational since June 2000, although participation in the program, which is voluntary, has been very limited.[45]

*Oregon.* Oregon's House Bill 2200 (signed July 6, 2001) was created as a verifiable $CO_2$ emissions offset program through the Forest Resources Trust, established by the state in 1993. The trust program provides financial and technical assistance to landowners for establishing new forested areas by operating like a venture capital arrangement between the state of Oregon and the landowner. While no trading program has yet been established to implement the program, House Bill 2200 authorizes the state forester to establish programs to market, register, transfer, or sell forestry carbon offsets on behalf of state forestland beneficiaries, the Forest Resource Trust, and other non-federal forest landowners.

### *GHG Offset Programs*

**Background.** In the absence of formal emission trading programs, states can also introduce offset programs that give emitters the option of "offsetting" emissions at their own facilities by purchasing the right to emission reductions undertaken elsewhere.

Offset programs are usually implemented to accompany some form of emissions cap or efficiency standard that forces emitters to meet a certain emission reduction goal. If they are unable to cost-effectively meet the particular target through technology improvements at their own facilities, they can then turn to outside entities to purchase emission reductions.

[45] For more information, see www.state.nj.us/dep/aqm/omet/.83.

The major difference between offsets programs and emissions trading is thus the absence of a formal allowance system whereby emissions rights are allocated among emitters. Unless the state specifies otherwise, an offset program enables the regulated entity to turn to any outsider to purchase emission reductions or sequestration activities.

**State activity.** A few states—include Massachusetts, New Hampshire, New Jersey, and Oregon—have passed legislation allowing energy companies to purchase GHG offsets from other entities to meet specified $CO_2$ targets. The rules for these offset activities vary. New Hampshire, for example, prefers that offsets are purchased from other entities within the state and thus raises the price for purchasing out-of-state offsets. Oregon has developed a separate fund (the Oregon Climate Trust), which invests in GHG reduction and sequestration projects on behalf of the companies interested in purchasing offsets.

*Washington.* 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%) in GHGs 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.[46]

*Oregon.* The Climate Trust came into existence in July 1997, and established the first GHG offsets program in the United States to control $CO_2$ emissions. A plant developer may choose to meet part or all of its reduction target by paying mitigation funds to a "qualified nonprofit" (the Climate Trust), which in turn must use the funds to carry out projects that avoid, sequester, or displace the $CO_2$ the plant will emit in excess of the required standard. Currently operators electing this option pay $0.85 per short ton of $CO_2$, although this price can change based on the cost of $CO_2$ offsets, but not by more than 50% in any 2-year period. To date, the Trust has invested in 7 projects, including wind energy, landfill gas, and forest sequestration that will offset more than 900,000 metric tons of $CO_2$. The law defines the characteristics of, but does not establish, a qualified nonprofit. The Climate Trust conforms to the requirements of the law and is recognized as a qualified nonprofit.

### *Other Mechanisms*

**Minnesota.** At least one state, Minnesota, is known to have established a $CO_2$ valuation per ton for new utility power plants related to estimated damage costs associated with $CO_2$ emissions. On January 3, 1997, the Minnesota Public Utilities Commission voted to accept a $0.30 to $3.10 per ton $CO_2$ valuation (in 1995 dollars) to offset potential global warming impacts and costs of carbon emissions from the development of new utility power plants. The decision was made on the basis of a damage-cost assessment conducted by the Minnesota Pollution Control Agency, and represented the first instance in the United States where economic valuation techniques were used to establish damage costs from $CO_2$ emissions.

[46] For more information, see www.efsec.wa.gov/Chehalis/adj/amendedsca.pdf.

## Comprehensive Approaches in Leading States

### *California*

California has been a leader in addressing climate change as part of a wide range of energy, transportation, agricultural, environmental, and other initiatives throughout the state. It is gradually moving towards developing a more strategic approach but has already realized significant achievements to date. California has been the first in a host of initiatives ranging from GHG accounting and reporting to renewable energy development, to regulation of GHG emissions from motor vehicles, to promoting innovative energy efficiency programs in power generation, industry, and green buildings.

Sixteen California state agencies are currently working to support the implementation of the state action plan or specific elements contained in it. In addition, several recent policy developments have pushed California into the spotlight for addressing climate change. The state legislature established the California Climate Action Registry in 2001, a nonprofit organization whose purpose is to support voluntary reporting and registration of GHG emissions from California businesses and other institutions with enough accounting rigor to ensure that GHG emission reductions reported to the Registry would be recognized under future GHG credit trading systems. The California Registry is among the most developed in the United States, and is recognized around the world.

In 2002, the state legislature passed AB 1493, a groundbreaking piece of legislation representing the first attempt by a state or the federal government specifically to reduce GHG emissions from mobile sources. The law will require the California Air Resources Board to adopt regulations that achieve GHG emission reductions from motor vehicles starting with model year 2009.

California's local governments have also demonstrated impressive leadership to address climate change, largely through participation in the Cities for Climate Protection campaign of the International Council for Local Environmental Initiatives. To date, eleven California cities, including Los Angeles and Santa Monica, have established GHG emission reduction targets. Through a local initiative, Santa Monica became the first city in the world to be 100% powered by renewable and geothermal energy (CGWC 2003). In turn, the Los Angeles Department of Water and Power offers its 3.6 million customers the option of receiving 100% of their energy from renewable resources at an added cost of only $3/month (CCAP 2002).

Important next steps for the state will include further development of the California Climate Action Registry to include project-base reporting and GHG accounting rules for transportation in connection with AB 1493. The state could also consider the possibility of taking the Registry's GHG accounting, certification, and registration system further by using it as the foundation for a new GHG trading system. In addition, the California Air Resources Board will be working on developing new rules for implementing AB 1493.

Moreover, the state may consider further developing its climate change strategy to include more targeted policy and programmatic measures that can provide a more coordinated basis for action taken to address climate change. Hundreds of state agency programs, municipal activities, and private sector initiatives, like those described in this report, are expected to continue in the coming years to both directly and indirectly address the state's GHG emissions and vulnerability to climate impacts.

***Minnesota***

Minnesota's response to climate change stems from an interest in promoting GHG mitigation or removals (through energy efficiency, reduced energy costs, or natural resource conservation), as well as from serious concerns about the projected impacts of climate change (SAIC 2003). Over 100 state agency programs have been identified in Minnesota as having some positive impact on controlling GHG emissions in a wide range of policy and programmatic areas, including forestry, agriculture, transportation and smart growth, electricity generation, green buildings, industrial production, waste management, and others.

Many of these programs originated with efforts to address conventional pollutants from electric utilities and industries, but the state has recently sought to broaden its efforts to include smaller stationary and mobile sources through measures to promote energy efficiency, clean fuel, and clean air technologies (SAIC YEAR?).

Minnesota's state government and many of its businesses have also demonstrated significant leadership in promoting energy efficiency and conservation in power generation and industry, developing renewables, promoting smart growth, encouraging the use of mass transportation of alternative fuel vehicles, landfill gas capture, sustainable agriculture, forest conservation, and education and outreach initiatives. An example of the various successes in the state is that since 1993, the city of Minneapolis has saved about $22 million and helped reduce or avoid 360,000 tons of $CO_2$ through reduction in vehicle fleets, adopting streetlight timers, and promoting green buildings.

Minnesota also maintains one the nation's leading efforts to promote green buildings, including a statewide conservation benchmarking legislation aimed at reducing energy consumption in over 10,000 public buildings in the state by an average of 30% (MEEE 2002). The state has also helped encourage, for example, model results in implementing biogas energy through anaerobic digester projects on farms.

***New England***

The New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) have been among the forefront states in the nation in recognizing the significance of global warming and adopting strategies to deal with it. All the states have developed GHG inventories and most either have, or are in the process of developing, comprehensive Climate Change Plans. However, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont all have elected first-time governors recently and this could change the direction of climate policies in the future.

Many initiatives that achieve GHG reductions have been undertaken for reasons other than climate protection, per se. Typically, the goals of these actions are cost savings from energy efficiency, reduction of local air pollutants, or some other local concern. In New England, there has been particular concern regarding air pollution resulting from power plant emissions. Acid rain, ozone transport, and mercury pollution have been issues of ongoing importance in this region. A new set of "Four Pollutant legislation" seeks to link NOx, sulfur oxides (SOx), and mercury pollution reductions together with $CO_2$ reductions[47] from power plants. Forecasts show that, left unchecked, Eastern Canada's $CO_2$ emissions would grow by 20% between 1990 and 2020 and New England's would grow by 30% (NEG/ECP 2001).

There are several important regional climate change initiatives being jointly undertaken by all or multiple states in the region. The most prominent among these is the Conference of New England Governors/Eastern Canadian Premiers, as mentioned above, which has set emission reduction targets and developed a Climate Change Action Plan for achieving these goals.

***Regional Goals of the NEG/ECP Climate Change Action Plan***

| | |
|---|---|
| Short-term goal | Reduce regional GHG emissions to 1990 emissions by 2010. |
| Mid-term goal | Reduce regional GHG emissions by at least 10% below 1990 emissions by 2020, and establish an interactive 5-year process, commencing in 2005, to adjust the goals if necessary and set future emission reductions goals. |
| Long-term goal | Reduce regional GHG emissions sufficiently to eliminate any dangerous threat to the climate; current science suggests this will require reductions of 75–85% below current levels. |

The New England region also has an active community of nongovernmental organizations organized around issues of environmental importance. Several are involved with climate-change related issues. These include Northeast States for Coordinated Air Use Management (NESCAUM), Northeast Advanced Vehicle Consortium (NAVC), Clean Air-Cool Planet (CA-CP), the Northeast Sustainable Energy Association (NESEA), and the Union of Concerned Scientists (UCS).There are several local universities and colleges that also undertake research on these subjects, including the Tufts University Climate Initiative and the University of New Hampshire Climate Change Research Center.

A leading example of independent state action to address climate change in New England is Massachusetts $CO_2$ "multi-pollutant" strategies. This legislation proposes an integrated strategy for $CO_2$, as well as NOx, mercury, and $SO_2$. While this approach is now moving forward in a number of states, Massachusetts was the first to take formal action for operational power plants. Republican Governor Jane Swift's multi-pollutant cap includes $CO_2$ for six major facilities, requiring each plant to achieve specified reduction levels for each of the pollutants, including a 10% reduction from 1997–1999 $CO_2$ levels before 2010.

[47] In fact, on February 20, 2003, the State Attorneys General of Connecticut, Maine, Massachusetts, New Jersey, New York, Rhode Island, and Washington filed a 60-day notice-of-intent to sue the EPA for excluding $CO_2$ from the list of pollutants regulated under the Clear Air Act. The federal government has resisted classifying $CO_2$ as an air pollutant. A recent example is President Bush's "Clear Skies" initiative, which contains mandatory reductions for three power plant pollutants (NOx, Sox, and mercury) but not $CO_2$.

Whereas Massachusetts has pursued $CO_2$ reductions through regulation, other New England states have begun enacting legislation to facilitate a multi-pollutant approach to air pollution that includes $CO_2$. For example, the New Hampshire Clean Power Act targets $CO_2$ and other emissions. It received bipartisan support and was signed into law by Democratic Governor Jeanne Shaheen on May 9, 2002.

***Oregon***

Oregon instituted North America's first formal standard for $CO_2$ releases from new electricity-generating facilities. This standard requires that any new or expanded power plant proposed for operation in the state attain a level of $CO_2$ releases of 0.675 pounds/kWh, which is 17% below the most efficient natural gas-fired plant currently in operation in the United States. Proposed facilities may meet this standard through either development of new technologies that achieve greater efficiencies than existing practice or purchase of $CO_2$ offsets through monetary contributions that underwrite carbon mitigation projects.

Oregon has a long history of involvement in making ambitious and explicit commitments to GHG reduction, ranging from strict energy codes to promote energy efficiency to efforts to reduce reliance on single-occupant vehicles. In turn, the state set a series of broad goals, linked in part to its "Oregon Benchmarks" program of performance management, to more carefully measure GHG releases and reduce emissions rates in coming decades.

The creation of a $CO_2$ standard 17% below best performance in the nation coincided with the creation of the Oregon Climate Trust (since renamed Climate Trust) to "purchase $CO_2$ offsets with funds provided by power plant developers." The Trust is a nonprofit organization governed by a seven-member board with representation from state government, industry, and environmental groups. The process for project review and fund distribution was designed to foster public trust and broaden control beyond a single state agency. The Trust is required to spend at least 80% of its funds on direct carbon reduction projects, with the remainder used to cover administrative costs and project monitoring and evaluation. Projects are approved through an open competition that can include proposals from other states and nations.

***New Jersey***

Barry Rabe, of the University of Michigan, characterizes New Jersey's approach to GHG mitigation as the closest thing in the United States to a comprehensive, multi-sectoral climate change strategy. It was the first state to establish an official GHG reduction goal and has actively involved all relevant sectors in attempting to attain that goal. This occurred in 1998, when NJ DEP issued Administrative Order 1998-09 establishing the goal of reducing the state's total GHG releases to 3.5% below 1990 levels by 2005. This order was supported by then-Governor Christine Todd Whitman and endorsed by an unusual coalition of industry representatives and environmental groups.

The state generated 136 MMT of $CO_2$-equivalent emissions in 1990 and was projected in 1998 to release 151.2 MMT by 2005. Attainment of the 3.5% goal requires a reduction to 130.8 MMT by 2005. To achieve this reduction, the state formally included goals for various

sectors, including energy, transportation, waste management, and natural resource conservation. The goal has also been formally incorporated into the DEP's Strategic Plan and Performance Partnership Agreement (PPA) with EPA under the National Environmental Performance Partnership System (NEPPS).

Pursuit of the GHG reduction goal has entailed a multi-faceted process, weaving together a diverse mixture of strategies. Perhaps the most visible of these initiatives has been the creation of "covenants," whereby organizations sign a pledge to reduce their GHG emissions in accordance with the state goal. To date, a series of New Jersey corporations and even a military base have signed such covenants. In one instance, the Public Service Enterprise Group (PSEG), the state's largest utility, signed the covenant in 2000 and further formalized this in a January 2002 agreement that expands its commitment to GHG reductions. In addition, a pair of state departments has signed a covenant and the state has pledged to purchase 15% of its electricity from renewable sources.

New Jersey has not, however, concentrated only on large industrial sources. The presidents of all of New Jersey's 56 colleges and universities have signed the covenant and are working toward implementation through the New Jersey Higher Education Partnership for Sustainability.

## RECOMMENDED STEPS FOR STATE ACTION

States interested in pursuing climate policy initiative should consider the following steps:

- Compile an Emissions Inventory**.** This is a first step and foundation for any climate action policy.
- Establish a GHG Registry. Develop a rigorous system that includes baseline definitions, attribution methods, and monitoring and verification procedures, so that it will be credible and useful at the time when actual emissions reductions must be documented.
- Develop a Climate Change Action Plan. Based on the inventory and registry, define a menu of policy and program options that will achieve the greatest emission reductions at the lowest net cost to society. This implies using technical analysis to define policy solutions and their impacts, and using economic analysis to evaluate policy options.
- Create a Climate Action Coalition. Seek out consumers, businesses, utilities, state agencies, and elected officials willing to support state climate action.
- Develop Action-Oriented Documents. Borrow legislative and regulatory language, program designs, and other actionable documents from other states and tailor them to state needs.

## RESOURCES

- **Pew Center:** see www.pewclimate.org/projects/states_greenhouse.cfm and www.pewclimate.org/projects/us_activities.cfm
- **Center for Clean Air Policy:** see www.ccap.org/pdf/State_Actions.pdf and http://www.ccap.org/pdf/statetransport_climat.pdf
- **Findsen et al.** (2001)