Reducing the Cost of Addressing Climate Change Through Energy Efficiency

February 2009

Consensus Recommendations for
Future Federal Climate Legislation in 2009

Supporting Groups

Alliance to Save Energy
American Council for an Energy-Efficient Economy
American Institute of Architects
Environmental and Energy Study Institute
Environment Northeast
Johnson Controls, Inc.
National Association of Energy Service Companies
Natural Resources Defense Council
Sierra Club
Real Estate Roundtable

Contents

Executive Summary

National climate change legislation faces the challenge of achieving deep reductions in GHG emissions while limiting both national economic costs and consumer costs from the program. A carbon cap-and-trade program, most frequently discussed, would provide a much needed market price for carbon. However, since one of the principal aims of cap-and-trade programs is to lower the overall societal cost of greenhouse gas emissions reductions, it is crucial to design the national cap-and-trade system so that it inherently taps the lowest-cost emission reductions available to the economy.

Experience in numerous states shows that efficiency improvements on average cost about 3 cents per lifetime kilowatt-hour saved[1] compared to about 7 cents to over 13 cents per kilowatt-hour for conventional electricity generation.[2] Energy efficiency reduces the cost of cap-and-trade because less new energy facilities are needed and also because a smaller portion of existing facilities need to be upgraded to help meet emissions ceilings. A cap-and-trade program that maximizes the role of end-use energy efficiency in buildings, industry, and transportation systems, will, therefore, cost less and achieve more than a program that simply focuses on generators through a carbon cap and carbon price. Although a carbon cap is essential to ensure that the U.S. meets its emissions reduction goals, its impact on carbon price alone will not achieve sufficient reductions in energy use due to a number of well-known market barriers. Therefore, additional policies supporting energy efficiency must be implemented to achieve more rapid carbon reductions at a lower cost to consumers and the American economy.

This document focuses on how a cap-and-trade system can be designed to accelerate investments in energy efficiency. This summary provides an overview of recommendations which support the inclusion and advancement of energy efficiency in climate change legislation including suggestions on funding, complementary policies, low income programs, third-party and end-user programs, research, development and demonstration, and evaluation, measurement and verification.

I. ENERGY EFFICIENCY FUNDING IN A CLIMATE BILL: HOW MUCH TO WHOM

Investment is needed rising to about $15-20 billion each year for energy efficiency deployment programs and policies in the residential, commercial, and industrial sectors. While some of this funding could be provided from utility rates, most should be from auction or allocation of carbon allowances. This is in addition to more than $6 billion each year needed for low-income energy efficiency programs, $8 billion for transportation policies and programs, and $3 billion for clean energy R&D. [3]

Such funding should ramp up over about 5-7 years, and then remain at a sustained level. States and utilities should be provided funds to start and grow energy-efficiency programs as soon as possible, and before the cap has begun through appropriations and borrowing or early allocation of allowances.

---

[1] Kushler, York and Witte, 2004, *Five Years In: An Examination of the First Half Decade of Public Benefits Energy Efficiency Policies.* Report U042. Washington, DC: American Council for an Energy-Efficient Economy.

[2] Lazard. June 2008. *Levelized Cost of Energy Analysis — Version 2.0*: http://www.narucmeetings.org/Presentations/2008%20EMP%20Levelized%20Cost%20of%20Energy%20-%20Master%20June%202008%20(2).pdf

[3] A separate coalition is making recommendations for additional funding for transportation programs. This coalition also has recommendations for additional funding for energy efficiency research and development programs.

Initially, a substantial majority of the energy efficiency funding should go to states and utilities, allowing for a wide variety of energy efficiency policies and programs, with the balance going to specific federal and local government programs. State PUCs and consumer-owned utility governing boards should have oversight of funded utility programs, and should be able to redirect funding for utility programs to the state or to other efficiency providers. Funding should be distributed through a combination of size-based and performance-based allocation. State PUCs and consumer -owned utility governing boards should coordinate energy efficiency programs with State Energy Offices to maximize customer outreach and leverage available resources from the states.

The performance metric for states should be based on overall improvements in energy use over a specified period of time, if possible, or, alternatively, through verified energy savings from policies and programs. A portion of the performance-based allocation to states should require that states adopt and achieve compliance with strong building energy codes and that they adopt utility rate structures that reward utilities at least as well for energy efficiency as for energy supply.[4]

II. ENERGY EFFICIENCY COMPLEMENTARY POLICY RECOMMENDATIONS

Complementary energy efficiency policy recommendations could be included in either an energy bill or a climate bill. These policies, however, do not include short-term measures that might be included in an economic stimulus bill and do not specifically address the carbon cap or distribution of funds in climate change legislation and, as such, are complementary to the cap. We recommend the following:

- Implement an energy efficiency resource standard requiring utilities and states to meet 15% of electricity sales and 10% of natural gas sales by 2020 through energy efficiency programs, improved building codes and equipment efficiency standards, combined heat and power, and distribution efficiency.[5]
- Develop advanced building energy codes to reduce energy use of new buildings by at least 30% starting in 2010 and 50% starting in 2020, encourage states to adopt, implement, and enforce the codes, and provide greater technical assistance and funding for states and code-setting organizations.
- Clarify the process by which DOE revises appliance and equipment standards, including its authority to set multiple performance standards for a product; to consider the impact of carbon emissions and energy savings on energy prices; to strengthen the "rebuttable presumption test" for setting standards for highly cost-effective efficiency savings; to allow state building energy codes greater flexibility to address equipment in new buildings; and to set standards on "BR" reflector lamps.
- Extend and enhance federal tax incentives that promote energy efficiency to help introduce new technologies into the marketplace, increase the market share of energy-efficient products, and lower their cost for consumers.
- Expand the Home Performance with EnergyStar program nationwide and provide a performance-based rebate to homeowners to undertake comprehensive energy efficiency retrofits of existing homes.
- Establish a federal incentive program to encourage large scale, deep retrofitting of private and publicly owned commercial buildings, with incentives for building owners for efficiency

[4] This could, for example, be achieved with two threshold requirements for performance-based funding for states: 1) fully comply with the requirements in the codes legislation that was in Sec. 401 of H.R. 6899 (and Sec. 612 of the Boxer Substitute to Lieberman-Warner) in 2008, and 2) adopt electricity and natural gas rate structures and resource plans that DOE believes fully meet the goals of Sec. 532 of EISA.

[5] See Energy Efficiency Resource Standard (EERS) for Retail Electricity & Natural Gas Distributors, 2009, American Council for an Energy-Efficient Economy, available at http://aceee.org/energy/national/FederalEERSfactsheet_Jan09.pdf.

improvements based on demonstrated energy savings of no less than 20%, with incentives calibrated to encourage 30% savings or greater.

- Expand the existing Industrial Assessment Center program and establish a new Building Assessment Center program to train engineers, building scientists and technicians to identify and implement energy-efficiency improvements in commercial and institutional buildings.
- Develop a national model to implement coordinated building energy efficiency labeling and energy use disclosure programs for homes and commercial buildings and encourage and assist states, counties and local governments in using this national model in local programs.
- Develop a comprehensive energy-efficient mortgage program, through the use of interest rate buy-downs or other means as deemed appropriate, to motivate buyers to purchase more efficient homes or upgrade the efficiency of their newly-purchased homes.
- Implement a program to support the replacement of pre-1976 manufactured housing with ENERGY STAR-rated manufactured housing units.
- Ramp up funding to at least $500 million annually for investments dedicated exclusively to energy efficiency in multi-family housing within the HOME Investment Partnership Program (HOME), which supports construction of new and substantially renovated moderate-income housing.
- Expand the definition of energy service performance contracts (ESPCs) to include new construction and leased buildings, exempt ESPCs from the Enhanced Competition requirements included in the FY2008 National Defense Authorization Act, and add the use of alternative financing for energy projects to the Office of Management and Budget Energy Scorecard.
- Ensure the use of realistic fuel prices and current EPA label values in setting fuel economy standards and achieve an average of at least 42 miles per gallon by 2020.[6]

III. LOW INCOME PROGRAMS

The national Weatherization Assistance Program (WAP) network must be expanded to meet the goal of weatherizing 1,000,000 homes each year on a timeline that allows for orderly transition and ramp-up of staff and production. Funding increases for the WAP should be phased in over a three-year cycle, beginning at $1.5 billion, and then sustained at $5.0 billion per year.

Congress should establish a new program at DOE to offer competitive grants for innovative projects to improve the efficiency of multifamily and manufactured housing with funding authorization of about $50 million in the first year, rising to about $500 million in year 5. Follow-up programs should have authorizations above $1 billion. We also recommended that an additional $500 million be invested in the Home Investment Partnership Program annually, specifically for energy efficiency investments in rental housing. Additionally, grants should be provided to private owners who implement energy efficiency measures in housing assisted through project-based Section 8 and other similar subsidy programs.

For the low income transportation sector, we recommend a Crusher Credit which would offer the owner of an inefficient vehicle a voucher redeemable toward the purchase of an efficient vehicle (new or used) or for transit fare credit. Vehicles turned in under this program would be retired, accelerating the transformation of the U.S. vehicle stock into a more efficient one. A climate bill should also include funding for pilot projects that provide new, innovative transit services, or enhancements of existing services, for locations and populations that are currently underserved by transit. The FTA should administer the program, with funding beginning at $100 million per year and increasing over time.

[6] If EPA label values were the basis for measuring manufacturers' CAFE compliance, the target fuel economy for fuel economy in 2020 would be lower than 42 miles per gallon.

IV. THIRD-PARTY AND END-USER PROGRAMS

Well-designed, national, performance-based incentives are needed to accelerate dramatic improvement in whole-building energy efficiency. These national programs have particular value to owners of portfolios of buildings in multiple states, large developers, and national energy service companies. We propose the following two program structures:

1. A Super Efficient Buildings Incentive (SEBI) program that creates an incentive structure for existing privately and publicly owned buildings that undergo deep retrofits that significantly improve measured energy performance, and for new buildings that far exceed the required minimum code performance. In the case of residential buildings, the program may be administered through state/utility programs.

For existing buildings, in order to receive federal incentives, a building would need to demonstrate no less than 20% improvement in efficiency from a deep energy efficiency retrofit and from changes to building operation. New buildings would receive a federal incentive for meeting established above-code energy goals for building type and size.

2. A "Super-Efficient Equipment and Appliances Deployment Program" that establishes incentives for retailers, manufacturers and distributors in the United States as reward for increasing market share of high efficiency building equipment, high-efficiency consumer electronics, and high-efficiency household appliances with the goal of minimizing life-cycle costs for consumers and maximizing public benefit.

V. RESEARCH, DEVELOPMENT & DEMONSTRATION

We recommend an immediate increase in regular appropriations for energy efficiency and renewable energy technology RD&D in the federal budget, in advance of the enactment of any climate change legislation, together with supplemental funding derived from allowance value in a future climate bill. We recommend an initial doubling within a three year time frame of funding for clean energy RD&D, starting with the FY 2010 appropriations cycle for the Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE), DOE Office of Science; and DOE Office of Electricity Delivery and Energy Reliability.[7]

In addition to increased standard appropriations funding, $3 billion annually funded through a climate change program should be allocated to clean energy RD&D to develop the technologies required to reduce GHG emissions and reduce the cost of lowering emissions. Congress should also provide greater definition to ARPA-E to ensure that the focus of research will be in clean technology programmatic areas and to ensure that ARPA-E is structured to serve the competitive diverse energy sector.

VI. EVALUATION, MEASUREMENT AND VERIFICATION

Climate legislation should include a directive to EPA to develop rules for evaluation, measurement and verification of changes in energy use and greenhouse gas emissions induced by energy efficiency policies, programs and projects in a manner that balances evaluation costs and benefits and takes into account existing domestic and international evaluation protocols. We specifically propose that EPA provide direction related to challenging issues such as additionality, market effects and measure persistence.

[7] This funding should be specifically targeted for use towards Energy Efficiency in these offices.

VII. TRANSPORTATION

A section which discusses policy recommendations regarding transportation systems, including CAFE standards and reduced vehicle miles traveled, and additional funding recommendations is currently under development with a number of transportation policy advocate groups. This section will either be included in a later version of this working paper or it will be issued as a separate document.

VIII. CONCLUSION

The most cost-effective method of reducing greenhouse gas emissions is through energy efficiency which provides "avoided tons" of carbon at the lowest cost. Incorporating the suggested energy efficiency programs and policies into climate change legislation will accelerate emissions reductions while reducing the costs associated with a carbon cap. The recommendations discussed above will reduce energy use on the order of two percent per year after an initial ramp up period, reaching approximately 30% energy savings by 2030.[8] The full report provides in-depth details on all of the above recommendations.

[8] Savings values are based on approximately 1.5% savings per year with additional savings achievable through building codes, equipment efficiency standards, an EERS, and other policies, with comparable savings in the transportation sector.

ENERGY EFFICIENCY — THE CORNERSTONE OF A U.S. CARBON CAP-AND-TRADE PROGRAM

Overview

National climate change legislation faces the challenge of achieving deep reductions in GHG emissions while limiting both national economic costs and consumer costs from the program. A carbon cap-and-trade program, most frequently discussed, would provide a much needed market price for carbon. However, since one of the principal aims of cap-and-trade programs is to lower the overall societal cost of greenhouse gas emissions reductions, it is crucial to design the national cap-and-trade system so that it inherently taps the lowest-cost emission reductions available to the economy. Efficient end-use technologies in buildings, industry, and transportation systems will provide the lowest-cost resources available to lower GHG emissions – *thus a central aim of cap-and-trade design must be to deliver end-use efficiency in diverse applications across buildings and industry, and in transportation systems nationwide.*

Efficiency is a key part of cost containment in a national cap-and-trade program.

This document focuses on how a cap-and-trade system can be designed to accelerate investments in energy efficiency, which would permit more rapid carbon reductions at a lower cost to consumers and the American economy. The discussion follows four key points:

(1) Energy efficiency is the low-cost equivalent of a "carbon scrubber" for homes and commercial buildings[9] and for the electric power sector. Improved vehicle efficiency is also the lowest-cost means of reducing emissions from the transportation sector. It is the most important resource to look to as the bridge fuel to the low-carbon economy we need in coming decades;

(2) Energy efficiency is the *key to cost containment* in a GHG cap-and-trade program. Although adding a carbon price signal to the cost of electricity and heating fuels is necessary and will have some energy-efficiency benefits, cap-and-trade programs that try to reduce emissions through price alone will be much more costly per ton reduced than a cap-and-trade program that includes proven techniques to deliver low-cost efficiency resources. At the consumer level, there are a number of well-documented and very serious market barriers to the cost-effective deployment of efficiency investments across the economy. For this reason, many low-cost savings opportunities remain untapped and higher power and fuel prices alone will not reduce demand nearly enough to meet our carbon goals. At the generator level, only a very high carbon price would make a meaningful change in the dispatch of the existing generation fleet. At the level of consumer demand and generation high prices required in the absence of efficiency programs to produce the deep reductions now called for by climate scientists would impose unnecessarily high costs on consumers and the economy[10];

(3) Careful cap-and-trade designs can contain the cost of GHG reductions by allocating allowances for consumer benefit and investing allowance values in programmatic efficiency measures. Congress should build on this state and regional experience by (a) auctioning

[9] "Energy efficiency" in buildings and industry also includes well-designed combined heat and power (CHP) applications. Since CHP systems use the waste heat from electric generation to provide thermal energy for heating, cooling, or industrial systems, they can reduce the building's total emissions burden, as compared with stand-alone systems for electric generation and thermal load. The difference between those separate energy demands and the CHP energy demand is an improvement in end-use efficiency and a reduction in total emissions.

[10] For more detail on these points see Richard Cowart, "Carbon Caps and Efficiency Resources: How Climate Legislation Can Mobilize Efficiency and Lower the Cost of Greenhouse Gas Emission Reduction," 33 Vermont Law Review 201-223 (2008).

allowances and investing auction revenues to improve the energy fitness of homes and businesses across the nation; (b) creating an "efficiency allocation" of carbon credits to the states and utilities, a portion of which is performance based; and (c) enacting complementary policies to promote cost-effective energy efficiency investments.

The Efficiency Reservoir is Large and Can be Tapped at Low Cost

National climate legislation will necessarily cover power and fuel use in buildings as major components of the move to a lower-emissions economy. Energy consumption in buildings, including direct consumption of electricity and fossil fuels, accounts for nearly half of all of the nation's GHG emissions.[11]

The *emissions reduction potential from efficiency* in these sectors is also significant. Intergovernmental Panel on Climate Change (IPCC) studies reveal that across many sectors, the efficiency potential is quite large; in particular, the buildings sector provides one of the largest sources of GHG emission reductions occurring through efficiency actions.[12] A recent study by the McKinsey consulting firm found that by 2030 energy efficiency from buildings, transportation and industry could account for 40% of the U.S. carbon dioxide emissions reduced by that year.[13] There are now many studies documenting that with policy commitments, aggressive efficiency investments can meet most of the expected growth in U.S. energy demand.[14] Accelerated energy efficiency technology development and deployment can arrest the growth in GHG emissions that would otherwise occur with continuing demand growth, especially in the power sector.[15]

In addition to being quite large, the efficiency reservoir *can be tapped at low cost.* In electricity markets, the efficiency savings potential has been shown to be on the order of 25% of total electricity usage[16] at a levelized cost of about three cents per kilowatt-hour (kWh).[17] Using efficiency efforts with levelized costs above three cents per kWh but below the average cost of supply would yield additional savings. This is much less than the average national retail price of electricity, currently more than 8 cents per kWh.[18] This is also less than the marginal generation cost of new power plants, estimated, depending on the technology, to cost 5 to 10 cents per kWh or more.[19] Energy efficiency reduces the cost of cap-and-trade as less new energy facilities are needed

---

[11] Architecture 2030, *The Building Sector: A Hidden Culprit*, available at http://www.architecture2030.org/current_situation/building_sector.html.

[12] Intergovernmental Panel on Climate Change (Working Group III to the Fourth Assessment Report of the IPCC), Climate Change 2007: Mitigation 9, 10 tbl.SPM.3 (Bert Metz et al. eds. 2007), available at http://www.ipcc.ch/ipccreports/ar4-wg3.htm (follow "Chapter 11: Mitigation from a cross-sectoral perspective") [hereinafter Mitigation]. This is partly attributable to the fact that the IPCC's methodology includes electricity generation related GHG emissions in the end-use sectors rather than in the energy supply sector. *Id.* at 10

[13] McKinsey and Company, "Reducing US Greenhouse Gas Emissions: How Much At What Cost?" available at http://www.mckinsey.com/clientservice/ccsi/pdf/Greenhouse_Gas_Emissions_Executive_Summary.pdf

[14] *Id*.

[15] *Id*.

[16] *See* Maggie Eldridge, et al. *Energy Efficiency: The First Fuel for a Clean Energy Future — Maryland's Resources for Reducing Electricity Needs*, ACEEE, *available at* http://aceee.org/pubs/e082.htm.

[17] *See* Martin Kushler et al., *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies*, 29, 30 tbl.5 (2004), *available at* http://www.aceee.org/pubs/u041.htm (stating that the efficiency programs in the aggregate are very cost-effective, with savings ranging from $0.023 to $0.044/kWh).

[18] Energy Information Administration, Total Electric Power Summary Statistics (Aug. 25, 2008), http://www.eia.doe.gov/cneaf/electricity/epm/tablees1a.html.

[19] Lazard, Levelized Cost of Energy Analysis – Version 2.0 at 2 (2008), *available at* http://www.narucmeetings.org/Presentations/2008%20EMP%20Levelized%20Cost%20of%20Energy%20-%20Master%20June%202008%20(2).pdf.

and a smaller portion of existing facilities need to be upgraded to meet emissions ceilings. Energy efficiency is thus the equivalent of a low-cost "carbon scrubber" for the power sector.

And the efficiency resource grows with time, as new technologies become feasible in the market due to programs that overcome market barriers. These new technologies go beyond the potentials documented in the studies mentioned here[20].

Investing Carbon Credits in Efficiency – a GHG Cost-Containment Strategy

Recapturing and recycling generator and fuel price increases to consumers will lower the consumer cost of a carbon capture program. But in what form should those benefits be returned to consumers? Some consumer advocates propose that revenues from the sale of carbon credits should be returned to consumers in the form of rate rebates. For low-income households in particular, some form of direct transfer payments to offset increased costs may be a necessary component of the climate program. However, overall, direct consumer payments alone will not produce the best long-term results for consumers.

The best outcome for consumers as a whole, and the best way to lower the societal cost of carbon reduction, is *to invest substantial carbon credit revenues in low-carbon resources*—especially low-cost energy efficiency measures. There is solid evidence for this conclusion. As a general matter, well-designed efficiency programs can deliver five to seven times more GHG savings for a given rate increase, than the rate increase alone would have delivered.[21] At the same time, it reduces the burden on consumers of higher costs by lowering bills. Modeling runs conducted for the Regional Greenhouse Gas Initiative revealed that increasing the region's spending on energy efficiency was the key to lowering the overall economic cost of RGGI's planned carbon reductions. That study found that doubling investments in energy efficiency throughout the RGGI region would lower projected load growth by two-thirds by 2024.[22] Efficiency would also reduce carbon emissions, holding them roughly constant during the same period—compared to a 15% rise in the base case. Recycling carbon revenues through efficiency investments was found to greatly reduce the cost of meeting the RGGI cap, actually reducing the average annual household power bill by over $100.[23]

The RGGI cost models and efficiency proposals have been examined in numerous state rulemakings and legislative and administrative decisions across the 10-state RGGI region. It is instructive that in every RGGI state, energy efficiency is the primary use chosen to receive RGGI allowance proceeds. As of December 2008, across the ten-state RGGI region, approximately 90% of total allowances will be auctioned, with as much as 80% of auction revenues dedicated to investments in end-use energy efficiency.

Similarly, a study by the American Council for an Energy-Efficient Economy in December 2007 found that energy efficiency and renewable energy investments could reduce the wholesale price of

---

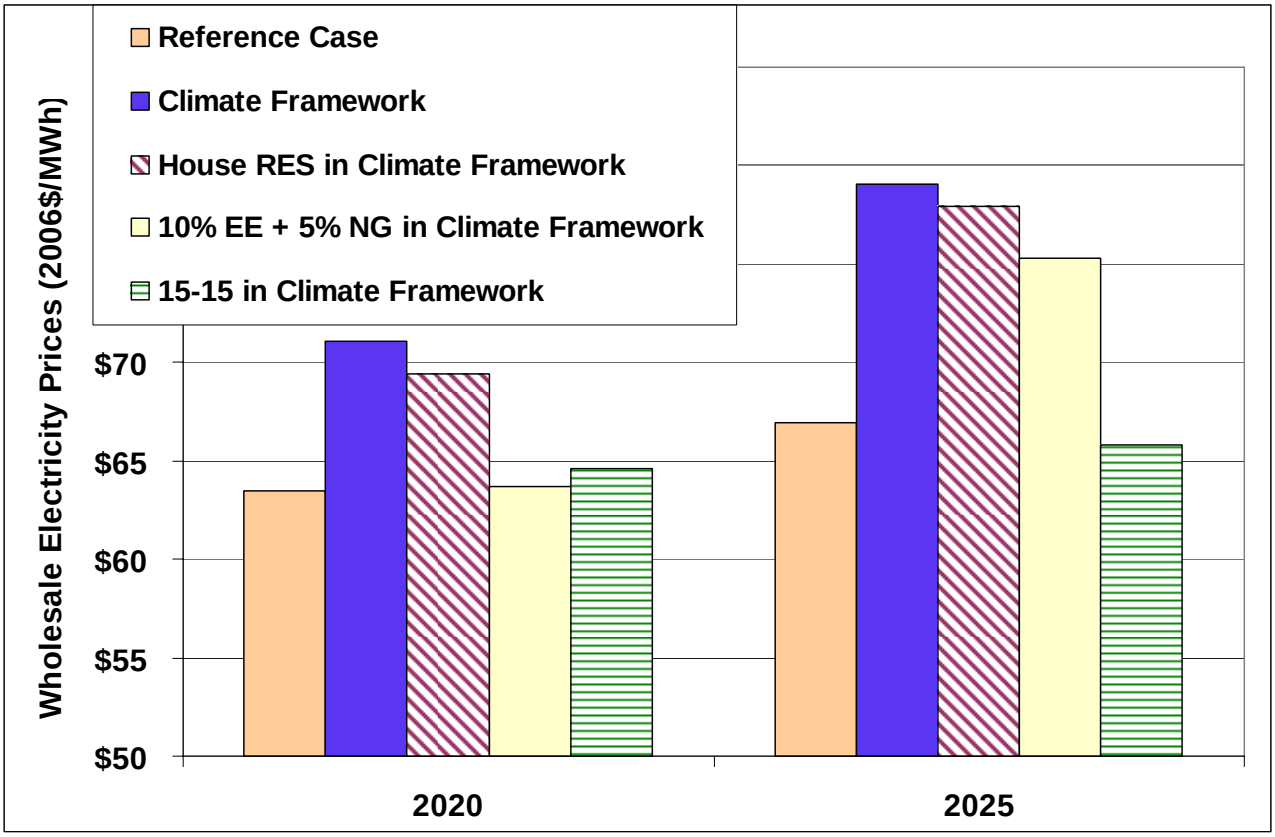
[20] D.Goldstein. " Extreme Efficiency: How Far Can We Go If We Really Need To." Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings

[21] Richard Cowart, *supra* note 2 at pp.212-215. This is a dramatic difference, but the explanation is straightforward. Demand for electricity is relatively inelastic, and market barriers to end-use efficiency block investments by building owners, tenants, and even industrial customers. On the other hand, efficiency standards and programs by utilities, governments, and industry consortia can deliver significant savings at costs well below the marginal cost of new power sources. Thus, consumer response to a given carbon price premium is relatively weak compared to reductions from codes, standards, and efficiency programs.

[22] William Prindle, et al., Energy Efficiency's Role in a Carbon Cap-and-Trade System: Modeling Results from the Regional Greenhouse Gas Initiative iii (2006), *available at* http://aceee.org/pubs/e064.pdf?CFID=1812522&CFTOKEN=798299427.

[23] *Id*.

electricity under a greenhouse gas cap-and-trade system, since these investments, reduce demand for conventional resources, allowing more expensive projects to be deferred or canceled. Moreover, efficiency as a zero-carbon resource also lowers the *demand for carbon permits*, lowering both the direct and indirect costs of carbon allowances on the power system. ACEEE's findings are summarized in the figure below. The study revealed that the proposed "Climate Framework" would raise wholesale power rates (second bar) above the reference case (first bar), but that a 15% Renewable Electricity Standard plus a 15% Energy Efficiency Standard would offset those costs, and by 2025 could actually lower wholesale power costs slightly below the reference case levels (fifth bar).[24]



Notes: Reference cast is EIA's 2007 Annual Energy Outlook reference case. Climate framework is the Bingaman-Specter proposal from 2007. House RES is a 15% renewable energy standard by 2020, of which 4% can be efficiency. 10%+5% are energy efficiency performance standards in 2020 for electricity and natural gas respectively. 15-15 is a 15% renewable energy standards and a 15% energy efficiency standard in 2025.

Conclusion

In sum, cap-and-trade (and the price signal this will generate) addresses a market failure called externality costs, but other barriers to energy efficiency will cause underinvestment in energy efficiency. Additional market interventions will still be necessary to address other market barriers, such as split incentives and lack of information. Since energy efficiency is a low cost carbon abatement resource[25], the overall cost of abatement will be much lower if market barriers that lead

[24] W. Prindle, et al., December 2007, *Assessment of the House Renewable Electricity Standard and Expanded Clean Energy Scenarios*, ACEEE, available at http://www.aceee.org/pubs/e079.htm.
[25] McKinsey and Company, *supra* note 6.

to underinvestment in energy efficiency are addressed.[26] Program designs to accomplish this are described in the following sections.

[26] *See*, for example, W. Prindle et al., December 2007, *supra* note 18 (finding that in a cap and trade environment, wholesale electric prices are lower with extensive policy-driven energy efficiency investments than if we just relied on the market to drive efficiency improvements).

Recommendations

The following recommendations discuss a number of specific elements of energy efficiency and how such elements can be an effective method of reducing the cost of climate change. Recommendations on how much funding, and how to allocate it, are also included. These recommendations are in no particular order of priority as all are important aspects deserving consideration. In addition to funding, complementary policies are also a necessary component to successful climate change policy. Such complementary policies could be included in a climate change bill or broken out into various provisions of an energy bill.

I. ENERGY EFFICIENCY FUNDING IN A CLIMATE BILL: HOW MUCH TO WHOM

Amount of Energy Efficiency Funding

Investment is needed rising to about $15-20 billion each year for energy efficiency deployment programs and policies in the residential, commercial, and industrial sectors. While some of this funding could be provided from utility rates, most should be from allocation or auction of carbon allowances. This is in addition to more than $6 billion each year needed for low-income energy efficiency programs, $8 billion for transportation policies and programs which will be detailed in a separate, forthcoming working paper, and $3 billion for clean energy R&D. [27]

It is important to capture as much cost-effective energy efficiency as possible in order to meet climate goals and reduce the cost of a cap-and-trade program. A carbon cap is essential to ensure that the U.S. meets its emissions reduction goals, but its impact on carbon price alone will not achieve sufficient reductions in energy use due to a number of well-known market barriers. Therefore, it also is necessary to fund energy efficiency policies and programs. We believe an aggressive but achievable long-term goal is new savings each year of 1.5-2% of electricity, direct natural gas, and fuel oil use (compared to a no-action baseline) through deployment programs and state codes and policies. The most aggressive state programs achieved verified savings of about 1.75% of electricity sales last year, and over 1% annual savings over longer periods. Several states have adopted targets of 2% annual savings or more. While there is less experience with natural gas and fuel oil programs and less estimated potential from such programs,[28] there is a large savings potential for these fuels through state building energy codes. We estimate that the combination of recommended programs and policies will cumulative achieve approximately 30% energy savings by 2030.

Assuming a reasonable ramp-up, such savings would yield an estimated reduction of 760-950 million tons of CO_2 in the year 2030. Of course this is in addition to savings that would be achieved through the carbon price due to the emissions cap. This would largely capture the cost-effective carbon abatement potential from energy efficiency found in the mid-range estimate of the widely-cited McKinsey study in the buildings and industrial sectors, which totaled about 950 MMT CO_2.

We can estimate the investment needed to achieve these savings based on extensive program experience. While they range widely, typical program costs[29] yield a total investment cost of $34-

[27] A separate coalition is making recommendations for additional funding for transportation programs. This coalition has recommendations for additional funding for energy efficiency research and development programs.

[28] *See* Joe Loper, Selin Devranoglu, Steve Capanna, and Mark Gilbert, *Energy Efficiency Potential in American Buildings*, May 2007, available at www.ase.org/files/3799_file_building_efficiency.pdf.

[29] Assumes estimates from ACEEE based on reviews of electricity and natural gas programs, and of fuel oil opportunities: typical investment cost for electricity of $0.40/annual kWh, for natural gas of $4/annual therm, and for fuel oil of $8.20/annual gallon (note these are one-time costs for yearly savings over, typically, 10-20 years), Also assumes that government and utility programs will need on average to pay for about 40% of the cost (with customers

44 billion per year. Government programs would only need to pay a portion of this, yielding an annual requirement of $17-22 billion. But building codes and other policies usually have somewhat lower government costs per unit of energy saved. Not all of this amount needs to come from carbon allowances. It would be reasonable to assume substantial funding from utility rates, as customers would receive most of the economic benefits through reduced utility bills. Such ratepayer funding of energy efficiency programs currently is an estimated $3.7 billion per year, and rising.[30]

We count low-income energy-efficiency assistance separately as these programs are much more expensive per amount of energy saved (in part because the government typically pays all the costs), but they are vital to help low-income households afford increased energy costs due to a carbon price. The National Association for State Community Services Programs (NASCSP) has estimated that weatherization programs could weatherize one million low-income homes for $3.8 billion each year. We believe roughly an additional $2 billion each year is needed for other low-income energy-efficiency programs, as specified below in Section III regarding Low Income Programs.

Large Scale Program Ramp Up

Funding for energy efficiency programs should ramp up over about 5-7 years, then remain at a sustained level. States and utilities should be provided funds to start and grow energy-efficiency programs as soon as possible, and before the cap has begun. Appropriations for energy efficiency programs should be increased immediately to allow earlier growth. In addition, funds from a carbon cap can be used for efficiency as soon as a bill is passed either through early allocation/auction of credits or through borrowing credits from future allocations.

We are proposing energy efficiency programs roughly 4-5 times the size of current state and utility programs. The trained personnel, specialized equipment, and program designs needed to effectively invest such a level of new funds effectively simply do not exist today and need time to be created. Thus we suggest that funding for the energy efficiency programs be ramped up to our recommended levels over about 5-7 years (if the levels are reduced, then less time will be needed). The weatherization program already has a presence in all areas and an established training program, and is expanding under FY09 appropriations; thus it may need less time to ramp up.

Receipt and Use of Energy Efficiency Funding

Initially, a substantial majority of the energy efficiency funding should go to states and utilities, with the balance going to specific federal programs and to local governments. State PUCs and consumer-owned utility governing boards should have oversight over funded utility programs, and should be able to redirect any funding for utility programs to the state or to other providers. The state and utility funding should be allowed for a wide variety of energy efficiency policies and programs that are shown to reduce energy use and greenhouse gas emissions. State PUCs and consumer-owned utility governing boards should coordinate energy efficiency programs with State Energy Offices to maximize customer outreach and leverage available resources from the states.

Historically in this country most energy efficiency deployment programs have been run by utilities and state agencies. They have extensive experience in some parts of the country, including with evaluating and improving programs. They also have established relationships with their customers or citizens, and knowledge of local conditions. In addition, investor-owned utilities have oversight

---

paying the balance), and adds 25% onto the government and utility investment to pay for marketing, technical assistance, evaluation and other program administration costs,.

[30] Consortium for Energy Efficiency, 2008. See http://www.cee1.org/ee-pe/2008/us_combo.php.

from public utility commissions. States have the potential to achieve much more cost-effective savings through building codes and other policies. We urge that most funding be provided through these established mechanisms, and that funding be available to both states and utilities.

Federal programs are needed for purposes that are most effectively addressed nationwide. We also support funding for local governments, with focus on demonstrated performance in achieving energy efficiency as discussed below.

To allow needed innovation, states and utilities should be given broad discretion in deciding how best to use the funds for energy efficiency, with strong incentives for demonstrated reductions in energy use. It is important that funding be available to help states adopt, implement and enforce building energy codes and other policies, as these policies are often the most effective way of achieving energy savings, as well as for deployment programs. Even if the funding is distributed based on achieved savings, we believe there still should be a requirement that the funds be used for energy efficiency.

Funding Distribution Among States/Utilities

Funding should be distributed through a combination of size-based and performance-based allocation. Funding in the first three years should be entirely based on population and on use of electricity, natural gas, and fuel oil in an appropriate baseline period. Funding should then transition to be based three-fourths on demonstrated reductions in energy use, and the remaining fourth on population and historical energy use.

The performance metric for states should be based if possible on improvement in macroeconomic indicators of energy use in that state (such as overall energy use in a sector normalized for weather and economic activity) over the previous three years. Verified energy savings from policies and programs could also be used as the metric. There also should be a cap on funding per unit of energy saved.

A portion of the performance-based allocation to states should require that states adopt and achieve compliance with strong building energy codes and that they adopt utility rate structures that reward utilities at least as well for energy efficiency as for energy supply.[31]

States and utilities must have a strong incentive to maximize energy and cost savings and greenhouse gas emission reductions. Otherwise they may focus on other goals in using this money. However, in the first few years many states and utilities will have a limited track record, and implementers who perform poorly should have some ability to improve their record and "get back in the game." In order not to create an incentive to increase energy use, the size metric should be energy use in a base period corrected for changes in population and/or economic activity.

While a performance-based distribution will use funds most effectively, accurately measuring the reductions in energy use and greenhouse gas emissions that are due to efficiency policies and programs can be difficult, especially for innovative approaches to transforming entire markets. Almost all such programs (but not most policies) are evaluated today, but the protocols and savings estimates vary. Thus the performance measurement may be most accurate and effective if the state

[31] This could, for example, be achieved with two threshold requirements for performance-based funding for states: 1) fully comply with the requirements in the codes legislation that was in Sec. 401 of H.R. 6899 (and Sec. 612 of the Boxer Substitute to Lieberman-Warner) in 2008, and 2) adopt electricity and natural gas rate structures and resource plans that DOE believes fully meet the goals of Sec. 532 of EISA.

actions collectively can be tied to overall indicators. However, as energy use is affected by many other factors, state distributions may be highly variable and have little to do with what the states did, and it may be necessary to use estimated program and policy savings. If funds are directed both to states and to utilities, then the distribution to utilities should be based on estimated savings from their programs, and the utility savings should then be subtracted from the savings attributed to states.

The performance-based distribution should give credit for state and utility programs funded from other sources and for policies that do not require funding. Besides rewarding beneficial actions, this will give a strong incentive to use ratepayer funds as well as allowance funds.

II. ENERGY EFFICIENCY COMPLEMENTARY POLICY RECOMMENDATIONS

Note: These recommendations pertain to an energy or climate bill and do not include short-term measures that might be included in an economic stimulus bill. Short-term recommendations are provided on a complementary list prepared by many of the same organizations.

Energy efficiency resource standard

Congress should establish an energy efficiency resource standard (EERS) for electric and natural gas utilities, both investor- and consumer-owned. An EERS is a performance standard requiring utilities and states to meet a portion of their customers' needs through energy efficiency instead of by constructing new generation, transmission and distribution facilities. The EERS should require utilities to achieve energy savings increasing to 15% of electricity sales and 10% of natural gas sales by 2020, through efficiency programs, improvements to building codes and equipment efficiency standards, combined heat and power, and distribution efficiency. The EERS policy is modeled after the renewable electricity standard (RES), which is a performance standard used to promote the use of renewable energy. This would build on President Obama's platform to set a target to reduce electricity use by 15% by 2020 and the Schumer-Landrieu proposal from the 2007 Senate energy bill debate. Obama's 15% by 2020 goal, which we endorse, and Schumer-Landrieu's 10% by 2020 goal are similar, as Obama's proposal and our proposal include savings from building codes and equipment efficiency standards, while the Schumer-Landrieu proposal does not.[32]

Advanced building energy codes

Congress should establish targets for the residential and commercial model energy building codes to increase their energy efficiency savings by at least 30% by 2010 and 50% by 2020. The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) is responsible for developing the commercial model energy code, and the most recent version is ASHRAE 90.1-2007. The residential energy code is developed by the International Code Council (ICC) and the most recent version is the 2009 International Energy Conservation Code (IECC). The states should be encouraged to adopt and enforce the updated codes. Congress should provide the DOE sufficient resources to provide technical assistance and funding for the adoption, implementation and enforcement of the codes. Congress should direct DOE to assist ASHRAE and ICC in publishing voluntary building codes that are more stringent than the model energy building codes -- or "stretch code" -- so that states that want to use a more aggressive code than the model codes will have a technically robust code to use. Code development requires significant resources and technical capacity that many states do not have.[33]

Appliance and Equipment Standards

Federal minimum efficiency standards have been set by Congress on more than 40 products. New legislation should add a few additional products, based on negotiations now underway with industry to develop consensus recommendations on several products. New legislation should also clarify aspects of the process by which DOE periodically revises these standards including: clarifying DOE's authority to set multiple performance standards for a product (this was in the House and Senate 2007 energy bills, but dropped from the final bill); directing DOE to consider the impact of carbon emissions and the impact of the energy savings on energy prices when setting standards;

---

[32] *See* Energy Efficiency Resource Standard (EERS) for Retail Electricity & Natural Gas Distributors, 2009, American Council for an Energy-Efficient Economy, available at http://aceee.org/energy/national/FederalEERSfactsheet_Jan09.pdf.

[33] For more information on Advanced building energy codes, see the Building Codes Assistance Project at http://www.bcap-energy.org/.

strengthening the "rebuttable presumption test" for setting standards when efficiency savings are highly cost-effective; allowing state building energy codes greater flexibility to address equipment in new buildings; and setting standards on "BR" reflector lamps, a major loophole in current DOE standards.

Energy efficiency tax incentives
Congress should extend and enhance certain federal tax incentives that promote energy efficiency. Tax incentives are commonly used at the federal level to influence consumer and business purchasing decisions. The incentives can help introduce new technologies into the marketplace and increase the market share of energy-efficient products by lowering their cost for consumers. Tax incentives also lower manufacturers' production risks and effective investment costs. As production volume and sales increase, the technologies become more readily available and affordable, allowing the tax incentives to be phased out. And by attracting the attention of manufacturers, distributors, retailers, and consumers through a multi-year and nationally consistent program, tax incentives can help markets embrace new energy-saving technologies.

Congress should adopt long-term extensions of the tax credit for energy-efficient gas and electric heating and cooling equipment, the tax credit for energy-efficient new homes, and the tax credit for purchase of heavy-duty hybrid vehicles. A new tax credit for efficiency upgrades to existing homes should also be established that is based on the amount of energy saved. The amount of the efficient commercial buildings tax deduction should be increased from $1.80 to at least $3 per square foot. Congress should also make certain policy changes to the energy efficiency tax incentives that will increase their effectiveness.

Energy efficiency home retrofits
Congress should establish a program that provides a rebate to homeowners or any party obtaining an owner's consent to undertake an efficiency retrofit of an existing home. The rebate should be performance based, rewarding higher levels of energy efficiency savings with higher rebates under a good (10% savings), better (20% savings) and best (30% savings or more) model. The program would utilize existing effective retrofit programs to the greatest extent practicable. The program would be administered by the states, with EPA providing program direction, and include support for the training of contractors and home energy auditors/raters who would help implement the program.

Commercial building efficiency retrofits
Congress should establish a program administered by EPA that would encourage the near term launch of large scale, deep retrofitting of private and publicly owned commercial buildings or portfolios of buildings. The program would provide an incentive to building owners for efficiency improvements based on demonstrated energy savings of no less than 20% with incentives calibrated to encourage 30% savings or greater. An established benchmarking program designated by EPA would be utilized to document and verify performance and the incentive would take the form of a rebate per square foot. A loan guarantee, proportional to the targeted energy savings level, would be established to enable upfront investment in energy efficiency projects. Payment of the incentive would be granted annually upon completion of the efficiency project and would be conditioned on verification of actual performance over a three year period.

Industrial and Building Assessment Centers
In order to help train the engineers, building scientists and technicians who are needed to identify energy-efficiency improvements in today's factories and commercial and institutional buildings, the existing Industrial Assessment Center (IAC) program should be expanded, and a new program of Building Assessment Centers (BAC) established. The IAC program, which trains industrial

engineers at universities and provides them with practical hands-on experience by providing free energy audits to industrial firms should be expanded to include additional centers and to establish a new program of satellite centers based at community colleges. A similar BAC program should be established based at universities (for training engineers, architects and building scientists) and satellite community colleges (for training technicians and trades). Today's commercial and institutional buildings have increasingly sophisticated controls and need trained building scientists and technicians to help design and operate them.

Building labeling

Congress should develop a national model to implement coordinated building energy efficiency labeling and energy use disclosure programs for homes and commercial buildings and encourage and assist states, counties and local governments in using this national model in local programs. Such programs would require all buildings to have publicly accessible certificates or other disclosure showing the building's energy efficiency potential compared to a reference building, the individual building's performance among similar buildings as determined by a national benchmarking tool, and/or the availability of transit services within walking distance of the building. The Dingell-Boucher discussion draft includes language discussing this subject.

Energy-efficient mortgages

Congress should direct the program administrator to work with the Government Sponsored Enterprises (GSEs) (e.g. Fannie Mae and Freddie Mac) to develop a comprehensive program, through the use of interest rate buy-downs or other means as deemed appropriate, to motivate buyers to purchase more efficient homes or upgrade the efficiency of their homes. The program should include incorporating the impact of energy efficiency into the mortgage underwriting process and their appraisal practices. The administrator should develop guidelines to ensure that the program gives priority to low and middle-income consumers and that the incentives are proportionate to the cost of the efficiency improvements.

Multifamily and manufactured housing

Retirement of old manufactured homes

Congress should implement a focused program supporting the replacement of pre-1976 manufactured housing with ENERGY STAR-rated manufactured housing units or more energy efficient site-built ENERGY STAR housing. There are approximately 2.2 million pre-1976 manufactured housing units still in use. These units waste an inordinate amount of energy. Direct interest rate subsidies and subsidies on the delivery price of the new ENERGY STAR homes would be instituted, with these incentives being scaled with the level of energy savings achieved beyond Energy Star. In general, these housing units are primarily rural and low-income.

HOME Investment Partnership Program

The HOME Investment Partnership Program (HOME) supports construction of new and substantially renovated moderate-income housing. Investments dedicated exclusively to energy efficiency investments in multi-family housing would target an important under-served part of the population. The normal 25 percent match for the program would be eliminated for energy efficiency improvements in order to facilitate quick investments. Congress should enact funding authorization, ramping up to provide at least $500 million annually.

Additional recommendations included in the low-income section could, alternatively, be considered complementary policies.

Energy service performance contracting in the federal government

Congress should 1) expand the definition of energy service performance contracts (ESPCs) to include new construction and leased building; 2) exempt ESPCs from the Enhanced Competition requirements included in the FY2008 National Defense Authorization Act, since these contracts are "pre-competed;" 3) add the use of alternative financing for energy projects to the Office of Management and Budget Energy Scorecard.

Vehicle fuel economy

Congress should ensure the use of realistic fuel prices in setting fuel economy standards; achieve an average of at least 42 miles per gallon by 2020. Base Corporate Average Fuel Economy (CAFE) standards on current EPA label values rather than 1975 testing protocol—the label values, which are roughly 20% lower than CAFE values on average, better reflect typical performance.[34]

[34] If EPA label values were the basis for measuring manufacturers' CAFE compliance, the target fuel economy for fuel economy in 2020 would be lower than 42 miles per gallon.

III. LOW INCOME PROGRAMS

Overview

The focus of the following low-income recommendations is on developing program concepts that address low-income energy efficiency in the context of a climate bill. Recommendations relate to three general areas: weatherization assistance program (with primary focus on owner-occupied, single-family homes), rental, multifamily and manufactured housing and transportation.

Weatherization Assistance Program

The national Weatherization Assistance Program (WAP) network must be expanded to meet the goal of weatherizing 1,000,000 homes each year. This expansion must occur on a timeline that allows for an orderly transition and ramp-up of staff and production. We suggest that the funding increases for the WAP be phased in over a three-year cycle and then sustained for the duration of the project. In fiscal year 2008, the WAP will use about $665 million in total funding to weatherize 150,000 homes.

A three-year funding increase would be as follows:[35]

Year (in Program Year e.g. PY 2009 is April 2009 to March 2010)	Funding level	Increase in Number of Local Agencies	Increase in Work Force – i.e. direct staff positions in all disciplines	Increase in Production[36]
Year One (PY 2009)	$1.85 billion	from 900 to 1,100	from 13,000 to 21,000	from 150,000 to 370,000 homes
Year Two (PY 2010)	$3.2 billion	from 1,100 to 1,300	from 21,000 to 33,000	from 370,000 to 631,000 homes
Year Three (PY 2011)	$5.0 billion	from 1,300 to 1,500	from 33,000 to 46,000	from 631,000 to 1,000,000 homes

The expenditure for each home is determined by the selection of measures allowable, the attention to health and safety measures during the Weatherization process, and the types of housing stock identified and included in the production scenario. Currently, the WAP spends an average of $4,000 to complete a full scope of energy efficiency and health and safety protocols. The figure will need to be adjusted to $5,000 per unit to allow for a full array of shell retrofit and baseload measures to maximize the reduction of carbon emissions while reducing the added burden of climate change legislation on the poorest families in America. Either funding levels or production could vary as the costs per home allowance are altered to include other measures.

The replacement of old and inefficient heating and cooling equipment is allowable within the scope of the current WAP. Often this measure is left untreated because of cost factors and insufficient funding. Climate change funding should be used to promote this and other targeted measure known to have a high payback for investment and/or significant energy savings - like refrigerator replacements, attic and sidewall insulation, and re-lighting. The caution is that all allowable measures should be installed when at the home so that no missed opportunities occur.

[35] A more rapid ramp-up was recently proposed in the *Weatherization Assistance Program Economic Stimulus Expansion Plan Discussion Paper*, The National Association for State Community Services Programs, December 2008.
[36] This is based on an average cost per home of $5,000.

Rental, Multifamily and Manufactured Housing

National Grants to Improve Efficiency in Multifamily and Manufactured Housing

Congress should establish a new program at DOE to offer competitive grants for innovative projects to improve the efficiency of multifamily and manufactured housing. Saving energy is more difficult in multi-family and manufactured housing and such housing is disproportionately used by low- and moderate-income families. There are some successful local programs, but the number of programs being operated are few and far between. For example, creative programs could be developed to encourage retirement of old manufactured homes, to invest in efficiency upgrades for new or existing publicly assisted housing, or to institute multifamily building heating system retrofits. Given the limited experience to date, now is the time to encourage a variety of innovative approaches, to evaluate these approaches, and based on these evaluations to then develop broader programs. Congress should enact a funding authorization of about $50 million in the first year, rising to about $500 million in year 5. Follow-up programs should have authorizations above $1 billion.

Efficiency-specific Funding for Home Investment Partnership Program

The Home Investment Partnership (HOME) Program is a grant program administered by states and cities mainly for the rehabilitation and construction of rental and owner-occupied homes for low-income families. HOME has a highly successful 15-year track record and strong bipartisan support in Congress and among governors and mayors. We suggest that an additional $500 million be invested in the Home Investment Partnership Program annually. This additional funding should be dedicated exclusively to energy efficiency investments in rental housing. The 25 percent match normally required for this program should be eliminated for these energy efficiency improvements.

Grants for Energy Efficiency in Section 8 Housing

Grants should be provided to private owners who implement energy efficiency measures in housing assisted through project-based Section 8 and other similar subsidy programs. The grants should go only to owners who agree to continue participation in the housing subsidy program during the useful life of the improvements. $500 million per year should be provided for this purpose.

Transportation Sector

Crusher Credit

A Crusher Credit would offer the owner of an inefficient vehicle a voucher redeemable toward the purchase of an efficient vehicle (new or used) or for transit fare credit. Vehicles turned in under this program would be retired, accelerating the transformation of the U.S. vehicle stock into a more efficient one. A program of this kind has been proposed for the years 2009-2012.

For purposes of a climate bill, we propose an extension of the Crusher Credit, for low-income vehicle owners only. Defining features of the program would include:

- Vehicles eligible for crushing would be model year 2007 and earlier vehicles having a fuel economy of less than 18 miles per gallon.
- The value of vouchers would range from $1,500 to $4,500, depending on the vintage of the vehicle to be retired and whether the voucher is used to purchase a new vehicle, a used vehicle, or transit fare credit.
- Vehicles to be purchased must:
    - be of model year 2004 or newer and meet emissions standards that are average or better under EPA's Tier 2 program and
    - have fuel economy (when new) that exceeded the applicable CAFE standard for the relevant vehicle class by at least 25%.

The full Crusher Credit program for 2009-2012 has been estimated to cost $1-2 billion per year. Assuming ten percent of voucher recipients are from low-income households, the cost of the low-income program would begin at $100-200 million per year and decline gradually over time as the stock of pre-2008, inefficient vehicles declined.

Transit assistance

A climate bill should include funding for new, innovative transit services, or enhancements of existing services, for locations and populations that are currently underserved by transit. Dispersion of both residential and employment sites over many decades has led to widespread car-dependence, even among those who can ill-afford vehicle ownership costs. On the other hand, the demand for transit is growing at the same time that revenue restrictions are causing transit agencies to reduce service and increase fares.

A competitive program for local governments should be established to fund pilot projects that provide new or improved transit or paratransit service to low-income populations that currently have no viable alternative to commuting by car. The FTA should administer the program, which should be funded at $100 million per year to start, with an increase over time as the pool of high-quality project proposals expands.

IV. THIRD-PARTY AND END-USER PROGRAMS

Overview

The focus of the third-party and end-user program recommendations is on developing program concepts that ensure appropriate and effective national-scale incentives for mobilizing private investment to advance the deployment of significantly improved energy efficiency in existing and new buildings (including through the adoption of more efficient appliances and equipment used in buildings.) These national programs have particular value to owners of portfolios of buildings in multiple states for which the inevitable variation that comes with participating in dozens of different state and utility programs makes participation a challenge. These national programs also provide a vehicle to obtain energy savings in states and utility territories where programs are not yet extensive. Even in states with some building efficiency incentives, these national programs provide a useful model for performance-based incentives.

Recommendations are in two consolidated areas: 1) buildings, including energy service company (ESCO) provisions that are aimed at ensuring a nationally consistent approach and opportunity for private sector efficiency delivery and 2) appliances and equipment. In addition to these buildings and appliance efficiency programs, a program for the industrial sector is being developed; details will be provided in a later version of this document.

Energy Efficiency in Buildings

The following describes the overall policy framework envisioned to create incentives for more rapidly capturing greater energy efficiency in buildings—new and existing, commercial and residential.

Overall Policy Framework

The Super Efficient Buildings Incentive (SEBI) creates an incentive structure (which could include direct allocation of allowance value, tax deductions or credits, low interest loans, loan guarantees or other credit enhancements) for existing privately and publicly owned buildings to dramatically improve their efficiency. Such improvements would need to be substantial, verifiable, additional, and enforceable. The level of the federal incentive would be determined by the administrator. Building owners would choose between participating in this federal incentive program or participating in state/utility level incentives programs; "double-dipping" would not be allowed.

The opportunity to achieve efficiency potential in buildings is so great and the barriers so engrained that we need federal level incentives in addition to state and utility programs. Well-designed, national, performance-based incentives are needed to accelerate dramatic improvement in whole-building energy efficiency. Such incentives may also serve as models for state and utility programs and facilitate the kind of uniformity in metrics and benchmarking tools that will encourage companies with buildings in multiple jurisdictions to undertake comprehensive portfolio-wide upgrades.

Through an efficient buildings incentive program, commercial and residential buildings[37] that undergo deep retrofits that significantly improve measured energy performance and new buildings that far exceed the required minimum code performance would receive an economic incentive. In addition, a federal loan guarantee would be made available to facilitate the upfront investment needed for retrofit projects.

[37] In the case of residential buildings, the program may be administered through state/utility programs.

Existing Buildings
For existing buildings, in order to receive federal incentives, a building would need to demonstrate no less than 20% improvement in efficiency compared to that building in its previous state with reference to a base year. Existing building incentives would be available in two distinct ways:

(1) Incentive for demonstrated energy savings resulting from a deep energy efficiency retrofit. A federal incentive would be granted based on the percentage of annual energy consumption saved by a retrofit and not attributable to changes in building operations. Verification and documentation of achieved energy savings of no less than 20% would be required.

(2) Incentive for energy savings resulting in whole or in part from changes to both building hardware and operation. A federal incentive would be available to buildings that reduced their energy consumption in any year by more than 30% with reference to a base year's consumption, while accounting for other relevant factors (such as vacancy level and weather). An established energy benchmarking tool would be used to determine initial improvement and sustained improvement over each of the three years *[or other specified number of years]* following the base year. The incentive would be awarded in annual or periodic increments to ensure that improvements are being sustained.

New Buildings
New buildings would receive a federal incentive for meeting established above-code energy goals for building type and size. Metrics could be based on percent above code or percentile compared to similar projects.[38]

The amount and nature of the economic incentive would be established in such a way as to provide greater rewards to those projects that achieved the greatest improvements in energy performance. In addition, in distributing the incentives, priority shall be given to projects that result in measurable and verifiable greenhouse gas reduction benefits not encompassed within the metrics described above, including but not limited to benefits such as location efficiency, reductions in embodied energy of construction materials, and on-site renewable energy generation.

For both new and existing buildings, incentives contemplated by the SEBI would be fully assignable by building owners or their authorized agents (including relevant government agencies) to third party providers with responsibility for undertaking (or funding) the activity necessary for the owner to qualify for the incentives.

Incentives for Efficient Appliances and Equipment
The purpose of this program is to increase sales and market share of more efficient products that already exist in the market place. Depending on the product type, both retailers and manufacturers have a role to play in increasing sales of high efficiency products. Given the range of products that would be covered under a Super-Efficient Equipment and Appliances Deployment Program (SEAD), we believe there is merit in giving the administrator the discretion to establish awards for both the retailer/distributor and the manufacturer. Appendix A includes suggested legislative language and also describes further details on how this incentive program should be structured.

[38] A starting point may be 30% and 50% above 90.1-2004. This latter level now earns federal tax incentives.

Overview

A "Super-Efficient Equipment and Appliances Deployment Program" will establish incentives for retailers, manufacturers and distributors in the United States as reward for increasing the sales by the retailers and distributors of high efficiency building equipment, high-efficiency consumer electronics, and high-efficiency household appliances through marketing strategies such as consumer rebates, with the goal of minimizing life-cycle costs for consumers and maximizing public benefit.

Focusing the incentive upstream at the retailer and manufacturer levels is the cheapest way to design the program. Consumers overall benefit more from an efficiently designed program than a program that is limited to only giving a subset of consumers direct rebates. Retailers and manufactures have core expertise in marketing and selling products; they also have greater ability to influence product manufacturing decisions than do individual consumers. By targeting incentives towards retailers and manufacturers, we can leverage a range of marketing strategies to increase market share of these highly efficient products. For example, retailers and manufactures have the flexibility to use price reductions, rebates, creative promotion strategies or a combination of these to achieve greater sales of more efficient products. The benefit to consumers is getting efficient appliances into their hands, which saves them money, reduces global warming pollution, and can decrease energy prices. As happens today, efficiency programs can decide to continue to offer consumer rebates as an additional way to drive purchase of efficient products, as long as they deem that to be cost-effective.

The determination of whether the incentive is directed to the retailer, manufacturer or a combination of the two, depends on the product type and the characteristics of the product's supply chain. For example, incentives for residential and commercial HVAC equipment should be available to manufacturers to pass on through their distribution channel partners, since there are no retailers in these markets and the distribution channels can be quite complex.

The size of each reward for each product-type shall be determined by the Administrator, in consultation with the Secretary of Energy, State and utility efficiency program administrators, and national laboratories.

Each retailer and distributor participating in the program will be required to report on a confidential basis for program-design purposes—
(1) the number of products sold within each product-type; and
(2) wholesale purchase-price data.

The Administrator will make cost-effectiveness[39] a top priority in distributing incentives pursuant to this section. The Administrator will also establish procedures to ensure that the combined incentives under this program and those offered at the state and local level are not combined to exceed cost-effectiveness targets.

[39] In this context the term ''cost-effectiveness'' means a measure of aggregate savings equal to the product obtained by multiplying—(i) the net number of highly-efficient pieces of equipment, electronics, and appliances sold by a retailer, manufacturer or distributor in a calendar year; by (ii) the savings during the projected useful life of the pieces of equipment, electronics, and appliances, including the impact of any documented measures to retire low-performing devices at the time of purchase of highly-efficient substitutes.

Additional Principles for Incorporation in the National Super Efficient Appliance Deployment Program

Potential criteria for determining what products/product categories would be included:

The following are factors that should be considered in determining the product categories that would be included in this incentive program.

- What percentage of overall energy use does product represent? Prioritize based on this.
- What is the energy savings opportunity? i.e. what is the range between most efficient vs. least efficient/baseline.
- Products that already have energy rating systems like Energy Star, Energy Guide or FEMP.

Potential incentive criteria:

- The following are potential criteria that could be used in determining the incentive level for each product category.
- Top 10% most efficient products in each category based on commercially available products – reassessed annually. Or top 5 -10% of most efficient products based on units shipped – reassessed every 3 years.
- Efficiency criteria should be based on a relatively broad size category e.g. for refrigerators category sizes compare all full size refrigerators against each other.

Potential guidelines for determining incentive amounts:

The following are areas where additional research and guidance will need to be developed to ensure effective implementation of this program.

- Based on scale of energy savings, i.e., how much energy does this save?
- Shall not exceed x% of product price. This amount shall be determined based on further research and analysis.
- Mechanism to ensure that no single product within a category receives all of the benefit. This may be achieved by limiting the number of distinct products eligible for each category.
- The administrator will need to establish procedures to ensure that there is no “double-dipping” of incentives between state/utility programs and this federal program. These guidelines could establish, for example, procedures to communicate updates regarding the federal program on a regular basis to local efficiency programs, and a requirement for local efficiency programs that offer incentives for product categories covered by the federal program to submit justification confirming that these additional incentives are cost effective.

Program Administration:

- EPA in consultation with DOE

V. RESEARCH, DEVELOPMENT & DEMONSTRATION

Overview

Clean energy technology research, development, and demonstration (RD&D) should have a prominent place in climate legislation. Past investments in energy RD&D have produced significant advances in energy efficiency and other clean energy technologies. Public investment in energy-related RD&D, however, has not kept pace with the need for new technologies that will help us achieve the ambitious goals of a greenhouse gas (GHG) emission reduction program.

A major commitment to RD&D, at least on the scale of magnitude of the investment in RD&D following the oil embargo of the early 1970s, must be undertaken immediately in order to develop advanced clean energy technologies. We advocate an immediate increase in standard appropriations for energy efficiency and renewable energy technology RD&D in the federal budget, together with supplemental funding derived from allowance value and auction proceeds in a future climate bill.

Recommendations

Due to years of under-funding of energy RD&D in the federal budget, we believe it is critical that appropriations for RD&D for energy efficiency, renewable energy and clean distributed generation technologies be increased starting with the FY 2010 budget cycle, ***in advance*** of the effective date of any climate legislation. We believe the immediate increase in standard appropriations is necessary to "ramp up" energy RD&D in anticipation of supplemental RD&D funding in the future climate legislation.

Thus, we strongly recommend an initial doubling within a three year time frame of funding for RD&D, starting with the FY 2010 appropriations cycle for the following program categories:

- Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE);
- DOE Office of Science; &
- DOE Office of Electricity Delivery and Energy Reliability.[40]

The increase in RD&D funding commencing with FY 2010 appropriations should be sustained and predictable in the budget notwithstanding the enactment of a climate bill containing funding for RD&D, i.e. funding for RD&D under a climate bill should not replace regular appropriations in the future. We strongly urge the incoming Administration to reflect the increase in RD&D funding in its FY 2010 and subsequent budget requests.

Beyond the increase in funding through standard appropriations, we recommend that a portion of future allowance value under a climate change program be allocated to energy RD&D. Because of the importance of RD&D to our ability to develop the technologies that will be required to reduce GHG emissions and reduce the cost of lowering emissions, we recommend that a percentage equivalent to $3 billion annually, over and above standard appropriations (and assuming the increase recommended above in RD&D appropriations will have already occurred), be set aside for climate related RD&D for the same programs previously identified within DOE, namely EERE; the Office of Science; and the Office of Electricity Delivery and Energy Reliability; and for a new RD&D entity within DOE such as ARPA-E.

[40] This funding should be specifically targeted for use towards Energy Efficiency in these offices.

We estimate, based upon figures provided in the Boxer Substitute (S. Amdt. 4825) to the Lieberman-Warner bill that the figure of $3 billion annually for RD&D will be approximately 2% of total allowance value and/or auction proceeds. We emphasize that this level of funding is supplemental to standard appropriations and assumes the increase recommended above.

Our recommended figures for clean energy RD&D investment would bring us to the investment levels achieved during the energy crisis of the 1970s. These figures are similar to what experts have been recommending using other methods.

ARPA-E Component

With regard to ARPA-E, we welcome the opportunity for the DARPA success story to be replicated within the context of DOE. We strongly recommend that the Congress provide greater definition to ARPA-E, in order to ensure that the focus of research will be in clean technology programmatic areas set forth above as well as to ensure that ARPA-E is structured to serve the competitive energy sector as opposed to DARPA which provided technologies only to DOD. Attracting the right people will be critical to the success of ARPA-E in the future, and we are confident that DOE will be careful to select program managers who are capable of overseeing an entity that has the ability to span multiple stages, from very basic to applied research, and in areas that are otherwise too cross-cutting or multi-disciplinary to fit within the DOE system. ARPA-E should put emphasis on high risk, high reward and exploratory research that has not been adequately funded by DOE up to this time.

Limited Deployment Intended

RD&D does not include full deployment; the RD&D activities supported by this allocation would include only limited deployment activities. Entities capable of deployment, such as the private sector, states or utilities tasked with deployment under a GHG regime or similar, should be involved at an early stage in any applied R&D programs for smooth transition. This is an effort to avoid the "valley of death" and, concurrently, eliminate any overlap with other efforts under a climate bill.

Emission Reduction Goals

Only energy efficiency and renewable energy RD&D consistent with emission reduction goals should be supported by the RD&D allocation under a climate bill. Energy research that is not focused on reduction of greenhouse gas emissions should not be part of the investment portfolios supported by this funding.[41]

Oversight

Instead of creating a separate entity to oversee the RD&D funds, these funds could be channeled, through a multi-year appropriations process. We strongly recommend that the RD&D programs described herein be funded similar to the way in which programs in the Transportation and/or Farm bills are funded, and subject to authorization only once every five years.

We recommend that DOE report to Congress by June 30, 2010 proposing a mechanism for the National Academy of Sciences and other organizations to undertake third party evaluation of RD&D programs.

[41] Efficiency and renewable energy research that supports greenhouse gas reductions indirectly such as smart grid and energy storage technologies should be included in the scope of investment.

Methodologies

In arriving at the recommendation for supplemental RD&D funding in the climate bill, we have considered a number of sources and reports. Most of these methods do not readily fit our purposes because they evaluate total RD&D investment including deployment programs, do not separate investments in clean energy technology RD&D from other energy technology investments and some, such as the Schock method, require assumptions that would require further justification.

Another possible method is using the incremental approach which is to double funding and then see whether the spending can be absorbed effectively. If the conclusion (by the National Academy of Sciences or a comparable organization) is that the money is being spent effectively, the incremental method would advocate doubling the funding for RD&D again.

Another method is to use a historical approach to calculate how successful past RD&D efforts have been and allocate funds to current RD&D efforts accordingly. The National Research Council report, "Energy Research at DOE: Was it Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000," concludes that $30 billion in economic benefits accrued from the $1.6 billion of DOE investment in energy efficiency RD&D. The report concluded that energy efficiency RD&D had a benefit to cost ratio of 19. We could determine how much funding we would need to achieve the current climate change goals by looking at the historical success of clean energy programs. This inevitably requires us to assume the same amount of success from future RD&D efforts, which will not necessarily be the case.

We also considered the Congressional Research Service report entitled, "The Manhattan Project, the Apollo Program, and Federal Energy Technology R&D Programs: A Comparative Analysis," which was written and updated on September 24, 2008 by Deborah D. Stine, Specialist in Science and Technology Policy at CRS. This report examined the national investment in R&D during critical periods when energy technology was at the forefront of public policy. The report noted that annual average long term (1974-2008) DOE energy technology R&D funding was approximately $3 billion (in 2007 constant dollars). In comparison, the annual average funding (in 2007 constant dollars) for the Manhattan Project was $4 billion and the DOE energy technology program at its peak (1975-1980) was $7 billion (also in 2007 constant dollars). The annual funding for the Manhattan Project and for the Apollo Project (in 2007 constant dollars) was higher as a percentage of gross domestic product than that for the average long term DOE energy technology program. At the time of peak funding, the percentage of gross domestic product spent on energy technology RD&D during the 1970s was only one fourth that spent on either the Manhattan Project or the Apollo program.

Conclusion

Looking at past RD&D efforts, we conclude that it is both feasible and desirable, at a minimum, to replicate the peak investment of 1970s and, beyond that, to augment our national investment in energy technology RD&D to meet the unprecedented challenge of climate change.

VI. EVALUATION, MEASUREMENT AND VERIFICATION

Overview

This provision, detailed in Appendix A, directs EPA to develop and enforce rules for evaluation of energy and greenhouse gas impacts from energy efficiency projects, programs and policies that receive free allowances or auction revenues from the climate legislation. It does not specifically address evaluation associated with the creation of carbon offsets, which is generally covered in other areas of climate cap-and-trade bills.

Good evaluation is important in order to verify the amount of energy savings and GHG abatement that states and utilities achieve, to verify cost-effectiveness of investments, and to help program planners and managers better understand how programs are working in practice and how they can be improved to increase energy savings, GHG abatement achieved, and improve cost-effectiveness.

We propose that climate legislation include a directive to EPA to develop rules for evaluation, measurement and analysis of changes in energy use induced by energy efficiency policies, programs and projects in a manner that balances evaluation costs and benefits and takes into account existing domestic and international evaluation protocols. We specifically propose that EPA provide direction related to challenging issues such as additionality, market effects and measure persistence. The rules would be due 18 months after enactment.

See Appendix A for proposed legislation language regarding evaluation, measurement and verification.

VII. TRANSPORTATION

A section which discusses policy recommendations regarding transportation systems, including CAFE standards and reduced vehicle miles traveled, is currently under development with a number of transportation policy advocate groups. This section will either be included in a later version of this working paper or it will be issued as a separate document. Further, additional ideas are being developed by a broad group of transportation experts. Additional funding recommendations will be forthcoming through these efforts.

APPENDIX A: PROPOSED LEGISLATIVE LANGUAGE

SEC. XXX. EVALUATING ENERGY AND GREENHOUSE GAS IMPACTS FROM ENERGY EFFICIENCY

(a) DEFINITIONS.—In this section:

(1) IMPACT EVALUATION.—The term ‘‘impact evaluation’’ means the determination of the changes in energy use and greenhouse gas emissions induced by a specific policy, program or project.

(b) RULES.—

(1) IN GENERAL.—The Administrator, in consultation with States, utilities, and other stakeholders, shall develop and enforce rules for evaluation, measurement and analysis of changes in energy use and greenhouse gas emissions induced by energy efficiency policies, programs and projects.

(2) SCOPE.—The rules shall be used by States, utilities, and other entities receiving allowances or allowance proceeds under this Act related to energy efficiency or energy use.

(c) REQUIREMENTS.—

(1) ENFORCEABILITY, ASSURANCE AND COST MANAGEMENT.—The Administrator shall develop rules under subsection (b) so that the rules—

(A) are enforceable;

(B) balance risk management, certainty of estimated impacts, and implementation costs; and

(C) provide sufficient direction relating to methodologies and assumptions, including measure persistence, market transformation impacts, and the extent to which the savings would have occurred without the allowances or proceeds under this Act, to ensure reasonable uniformity among various States and entities and consistency in results.

(2) USE OF EXISTING PROTOCOLS.—To the maximum extent practicable, in developing rules under subsection (b), the Administrator shall consider existing and evolving domestic and international protocols and guidelines.

(3) DEADLINE.—The Administrator shall promulgate the rules under subsection (b) not later than eighteen months after the date of enactment of this Act.

(d) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated such sums as are necessary to carry out this section.

SEC. XXX. SUPER-EFFICIENT EQUIPMENT AND APPLIANCES DEPLOYMENT PROGRAM

(a) IN GENERAL.—The Climate Change Technology Board shall establish and administer a program, to be known as the ‘‘Super-Efficient Equipment and Appliances Deployment Program’’, to distribute the emission allowances allocated pursuant to section 811 among retailers, manufacturers and distributors in the United States as reward for increasing the sales by the retailers

and distributors of high efficiency building equipment, high-efficiency consumer electronics, and high-efficiency household appliances through marketing strategies such as consumer rebates, with the goal of minimizing life-cycle costs for consumers and maximizing public benefit.

(b) SIZE OF INDIVIDUAL REWARDS.—The size of each reward for each product-type shall be determined by the Climate Change Technology Board, in consultation with the Administrator, the Secretary of Energy, State and utility efficiency program administrators, and national laboratories.

(c) REPORTING.—Each retailer and distributor participating in the program under this section shall be required to report to the Climate Change Technology Board, on a confidential basis for program-design purposes—

(1) the number of products sold within each product-type; and

(2) wholesale purchase-price data.

(d) COST-EFFECTIVENESS REQUIREMENT.—

(1) DEFINITIONS.—In this subsection:

(A) COST-EFFECTIVENESS.—The term ‘‘cost-effectiveness’’ means a measure of aggregate savings equal to the product obtained by multiplying—

(i) the net number of highly-efficient pieces of equipment, electronics, and appliances sold by a retailer, manufacturer or distributor in a calendar year; by

(ii) the savings during the projected useful life of the pieces of equipment, electronics, and appliances, including the impact of any documented measures to retire low-performing devices at the time of purchase of highly-efficient substitutes.

(B) SAVINGS.—The term ‘‘savings’’ means megawatt-hours of electricity or million British thermal units of other fuels saved by a product, in comparison to projected energy consumption based on the efficiency performance of displaced new product sales.

(2) REQUIREMENT.—The Climate Change Technology Board shall make cost-effectiveness a top priority in distributing emission allowances pursuant to this section.

APPENDIX B: COMMITTEE PARTICIPANTS

I. ENERGY EFFICIENCY COMPLEMENTARY POLICY RECOMMENDATIONS
(Jim Presswood, NRDC, coordinator)

ACEEE: Steve Nadel, Suzanne Watson, and Therese Langer
AIA: Andrew Goldberg
ASE: Lowell Ungar and Brad Penney
BSCE: Lisa Jacobson
Cascade Associates: Jennifer Schafer
EESI: Carol Werner
ENE: Derek Murrow and Sam Krasnow
Johnson Controls, Inc.: Mark Wagner
NASEO: Jeff Genzer
NRDC: Lane Burt
Real Estate Roundtable: Roger Platt
Sierra Club: David Hamilton

II. ENERGY EFFICIENCY FUNDING IN A CLIMATE BILL: HOW MUCH TO WHOM
(Lowell Ungar, ASE, coordinator)

ACEEE: Therese Langer and Steve Nadel
ASE: Joe Loper and Brad Penney
NASEO: Jeff Genzer
Cascade Associates: Jennifer Schafer
Environment America: Rob Sargent
ENE: Derek Murrow and Peter Shattuck
NAESCO: Don Gilligan
NRDC: Yerina Mugica and Jim Presswood
RFF: Karen Palmer
Sierra Club: David Hamilton

III. LOW INCOME PROGRAMS
(Yerina Mugica, NRDC, coordinator)

ACEEE: Steve Nadel and Suzanne Watson
ASE: Sally Larson, Joe Loper, Brad Penney, Kateri Callahan and Lowell Ungar
Environment America: Emily Figdor
ENE: Derek Murrow
NASCSP: Bob Adams
NASEO: Jeff Genzer
NEADA: Mark Wolfe
NRDC: Lane Burt and Jim Presswood
RAP: Rich Cowart
Sierra Club: Leslie Fields and David Hamilton

IV. RESEARCH, DEVELOPMENT & DEMONSTRATION
(Brad Penney, ASE and Suzanne Watson, ACEEE, coordinators)

ASE: Selin Devranoglu

ASERTTI: David Terry
Cascade Associates: Jennifer Schafer
EESI: Carol Werner
NRDC: Jim Presswood

V. EVALUATION, MEASUREMENT AND VERIFICATION
(Joe Loper, ASE, coordinator)

ACEEE: Marty Kushler, Therese Langer and Steve Nadel
BSCE: Lisa Jacobson
David Nemtzow
ENE: Derek Murrow
LBL: Ed Vine
NAESCO: Don Gilligan
NASEO: Jeff Genzer
NEEP: Julie Michaels and Elizabeth Titus
NRDC: Dale Bryk
RAP: Rich Cowart and Rich Sedano
Steve Kromer
Steve Schiller

VI. THIRD-PARTY AND END-USER PROGRAMS
(Yerina Mugica, NRDC, coordinator)

ACEEE: Laura Furrey, Suzanne Watson, and Steve Nadel
AIA: Andrew Goldberg
ASE: Joe Loper, Lowell Ungar and Brad Penney
BSCE: Lisa Jacobson
Cascade Associates: Jennifer Schafer
The Dow Chemical Company: Peter Molinaro
EESI: Ellen Vaughan
ENE: Peter Shattuck and Derek Murrow
Environment America: Rob Sargent
Johnson Controls, Inc.: Clay Nesler and Mark Wagner
NAESCO: Don Gilligan
NASEO: Jeff Genzer
NRDC: Dale Bryk, Jim Presswood, Lane Burt and Jennifer Henry
Real Estate Roundtable: Roger Platt
Sierra Club: David Hamilton
USGBC: Jason Hartke and Bryan Howard

VII. TRANSPORTATION
(Therese Langer, ACEEE, coordinator)