# Demand-Side Carbon Reduction Strategies in an Era of Electric Industry Competition

*With the national debate on the need for intensified research and development, supply-side mandates, and carbon taxes likely to continue for some time, the authors propose a five-point, integrated demand-side plan that is compatible with marketplace forces and can be implemented now.*

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A century ago, a newspaper editorialized, "Everyone talks about the weather, but nobody does anything about it."[1] Today, we humans seem to be doing plenty about changing the weather, but few nations want to move beyond talk and do something about climate change. A nation's well-being is perceived to be tied to its economy. Short-term concerns such as global recession (or worse), and, in the U.S., a desire to sustain the business cycle, have the upper policy hand over meaningful climate change initiatives.

Unless the world's climate becomes truly bizarre (beyond the extended 100-degree days, the droughts, freak snowstorms, floods, etc., that we have been experiencing), relatively painless, voluntary approaches to reduce climate change will initially be sought. This paper presents a five-point, integrated demand-side plan designed to be compatible with marketplace forces in the competitive electricity era, while our nation continues to debate the need for intensified research and development (R&D), supply-side mandates, and carbon taxes.

Among all the world's nations,

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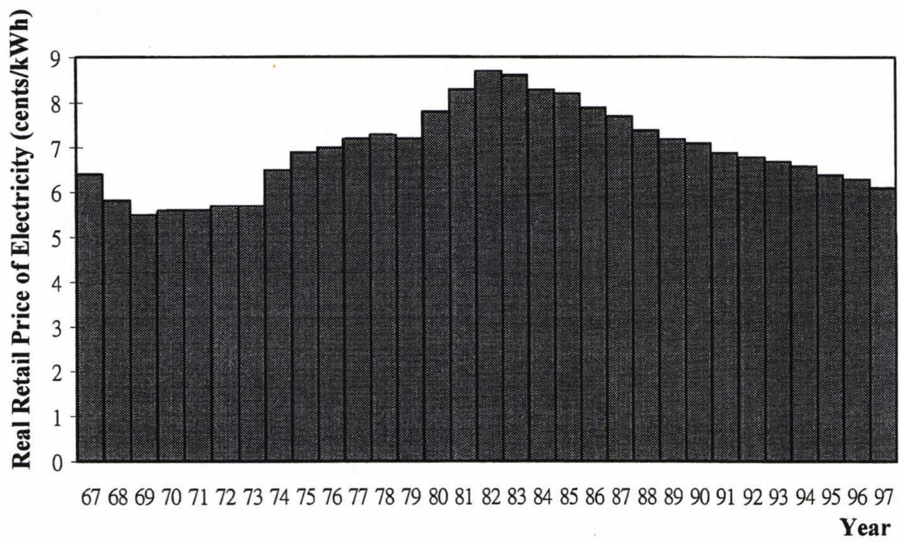
U.S. carbon emissions are ranked the highest. The nation's annual carbon emissions on a *per capita* basis are more than five times the world average—6.2 tons versus 1.1 tons.[2] U.S. *per capita* emissions are more than double the combined average for industrial countries of 2.8 tons.[3] While much of the disparity may be attributed to a strong U.S. economy and productivity, it is also clear that U.S. electricity consumers have not tapped all avenues of efficiency and conservation.

The Kyoto Protocol, if it is ever ratified by the U.S. Senate, would bind the United States to reduce emissions of three greenhouse gases (carbon dioxide, methane, and nitrous oxide) to 7 percent below 1990 levels by 2012. Three other pollutants[4] would also need to be reduced by 7 percent, but would have a 1995 baseline.

The President's Climate Change Action Plan, announced in 1993, recognized that investments in energy efficiency are the single most cost-effective way to reduce carbon dioxide emissions.[5] Whatever supply-side approaches are ultimately adopted, a balanced approach that builds in demand-side approaches will, in all likelihood, be necessary. After all, as projected by the Energy Information Administration (EIA) of the U.S. Department of Energy (DOE), carbon emissions for the United States in 2012 would be 44 percent more than the goals specified in the Kyoto Protocol if no policy changes affecting emissions are made.[6]

Real energy prices have been falling for 16 years (**Figure 1**).[7] Moreover, competition in the electric power sector will save consumers at least $20 billion a year, in the form of lower electricity bills.[8] These reduced energy prices over time, made possible by competition, can only increase energy consumption and carbon emissions, in the absence of countervailing supply-side and demand-side actions. Because of the magnitude of the carbon emission savings needed, all pragmatic strategies, including those influencing demand, must therefore be explored, especially those that are least burdensome to consumers. The challenge is to promote energy efficiency and greenhouse gas reduction while minimizing adverse economic impacts.




**Note:** Prices in 1992 Dollars. Source: EIA Anunal Energy Review 1997.

**Figure 1:** Thirty-Year Trend (1967–1997) in the Real Retail Prices of Electricity

Achieving the carbon reduction goals of the Kyoto Protocol implies a reduction of emissions from a current policy level of 1,803 million metric tons of carbon (MtC) to 1,252 MtC by 2012, a reduction of 551 MtC.[9] The Administration's plan thus far is designed to achieve a 25- to 40-MtC reduction by 2010, which is only about 5 to 7 percent of the Kyoto Protocol goals for the reduction of carbon emissions.[10] To move beyond this minimal start, energy efficiency should be aggressively pursued in all sectors, including upgrades of building codes, the introduction of new or strengthened efficiency standards for equipment, lighting, windows, and appliances, and the promotion of energy service company (ESCO) strategies to achieve demand-side reductions. All of these measures and a rate design strategy (discussed under step three of the plan, below) can help achieve the Kyoto carbon reduction goals in minimally disruptive ways.

## Traditional versus "New" Demand-Side Management

Traditional demand-side management (DSM) is characterized by regulator-driven, large-scale, shotgun-style, customer rebate programs, often involving payments to utilities as compensation for lost revenue. At their peak, DSM programs produced 61,800 gigawatt-hours (GWh) of savings per year (a 2.0 percent energy savings) and achieved a 29,900-megawatt (MW) peak demand reduction.[11] The peak load reduction translates into about 60 power plants of 500 MW each that could have been built, but which were no longer needed.

However, as electric power companies prepare for a competitive era, corporate expenditures are being pared to bare-bones levels, and traditional DSM programs are being significantly reduced. According to the EIA at DOE, DSM expenditures declined from $2.7 billion in 1994 to about $2.4 billion in 1995.[12] In 1996, DSM costs further declined to $1.9 billion, a reduction of 30 percent in just 2 years.[13]

Exceptions to the DSM cutbacks are initiatives that help power companies retain or expand their customer base. These new DSM measures include customer-driven, value-added services that increase customer choice and enhance an energy company's competitive position. The goal today is to transform the energy consumption market to the point where energy efficiency is the norm and where inefficient end-use applications are phased out. DSM that produces market transformation is a significant improvement over traditional DSM, since an initial public investment or other stimulus encourages consumers, on their own initiative, to want, seek out, and buy energy-efficient, environmentally friendly applications. Under a revised DSM strategy, when the initial investment is withdrawn, a transformed market of energy-efficient applications will thrive on its own, without the need for a constant stream of new inducements. Our five-part plan, presented below, illustrates how this nation can transition from traditional, programmatic, quasi-governmental DSM to new DSM strategies that influence marketplace decisions in lasting ways.

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**Step One: Public Benefits Fund**

The first step is to assure that funds to stimulate energy efficiency and other public benefits are available. After all, the market may not provide public benefits (such as energy efficiency, low-income programs, R&D, and renewables) in a competitive electric industry environment unless some substitute for the regulatory provision of public goods is encouraged.

Some states are beginning to establish public benefit charges placed on local distribution systems to fund energy efficiency, research and development, renewable energy, and low-income energy assistance initiatives. Thus far, Arizona, California, Connecticut, Idaho, Illinois, Maine, Massachusetts, Montana, New Hampshire, New York, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, and Wisconsin have developed public goods charges.[14] These wires charges are placed on distribution systems, and are non-bypassable; that is, a relatively small charge of perhaps 1 to 3 mills (0.001 to 0.003 dollars per kilowatt-hour [kWh]) is placed on all sales of electricity, regardless of who sells or buys electricity in the state.[15]

The Administration's Comprehensive Electricity Competition Plan, proposed on March 25, 1998, includes a Public Benefits Fund (PBF) of up to 1.0 mill per kWh (or $3 billion a year) to finance energy efficiency and other public benefit programs. The PBF would encourage and support states to ensure that the current level of funding for these programs, estimated by DOE at about $6 billion in 1996, is preserved.[16]

The states, and not the Federal Government, are the governmental units that are initiating wires charges, since (1) the distribution systems of electric power companies will remain, for an extended period, as natural monopolies; (2) states are viewing the wires charge as a state prerogative, in exchange for lessened

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state regulatory control over the generation and transmission components of vertically integrated utilities; and (3) many states that highly value environmental quality and low-income support programs may choose to be more aggressive than some nationally mandated average level of funding of efficiency and low-income support programs.

However, the state wires charge, by itself, may not contribute sufficiently to ambitious carbon reduction goals. State regulators have been concerned that there would eventually be a "race to the bottom" to keep such distribution charges (and hence electricity prices) low, as each state competes for industry and commerce. The Administration thus proposed a *national match*, dollar for dollar, for each state's public goods charge collections.

### Step Two: Energy Efficiency Standards

If the nation ever embraces the ambitious nature of the Kyoto Protocol's carbon reduction goals, policymakers at some point may choose to move beyond voluntary measures made possible by the state wires charges and the PBF. Electric power plants were responsible for 35 percent of carbon emissions in the United States in 1996.[17] Adoption of reasonable minimum standards for energy efficiency would produce a major breakthrough in the achievement of carbon dioxide reduction goals. For example, DOE announced new refrigerator standards in April 1997, which will produce energy savings of 20 to 30 percent per refrigerator, leading to savings of 23,600 GWh by 2015. By itself, this one reform will save about 14.3 MtC by 2015.[18]

Energy efficiency standards are the ultimate market transformation tool. National energy efficiency standards for buildings, heating, ventilation, and air-conditioning (HVAC) systems, lighting, windows, industrial motors, and other appliances would dramatically reduce carbon emissions. Mass production, the key to cost-efficient production, would be made possible by uniform standards. On a national level, with a few strokes of the pen by Congress and the President, the United States can prevent the release of millions of tons of carbon. The nations of the world can also join together for global efficiency standards, that could be adjusted to account for variations in their current and voltage standards, to achieve truly massive levels of carbon reduction.

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***Industrial Motors.*** Motors account for approximately 57 percent of total electricity use in the United States.[19] High-load motors account for most of the energy consumption; 20 percent of motors consume 80 percent of the energy in the motor market. In general, the Energy Policy Act (EPACT) of 1992 set motor efficiency standards that are considered adequate at this stage. Further energy efficiency gains can be achieved by updating standards for premium efficiency motors and by identifying which motors can best be moved to premium efficiency.

***Lighting.*** Lighting accounts for approximately 19 percent of U.S. electricity use. EPACT requires DOE to determine by this year whether standards are justified for general-service incandescent lamps. A standard for these "regular lightbulbs" would significantly improve the nation's energy efficiency. However, a reasonably priced, efficient bulb has not been developed. Compact fluorescent lamps (CFLs) are priced too high for the average consumer, and consumers often find CFLs awkward to use. However, with the benefit of a new national standard, millions of CFLs or other efficient intermediate applications (with lower prices than CFLs but with greater efficiency than general-service incandescent lamps) would be produced, and the price per unit would tumble. Inevitably, easy-to-use designs would be developed in response to consumer demand.

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***HVAC Systems.*** To the dismay of clean-air advocates, the United States currently has no standards for entire HVAC systems. Federal standards are set at the equipment level rather than the system level so that there are no efficiency standards for distribution (or duct) systems, to take one example.

***Windows.*** Windows are responsible for about 25 percent of heating and cooling requirements in our nation's buildings.[20] "Low-emissivity" windows that minimize heat leakage have been around for more than 10 years, and account for about 40 percent of the market for new windows. Newer innovations that only admit half of the sun's heat are attractive in the South. A National Fenestration Rating Council (NFRC) was established in 1989 to develop and implement uniform energy-performance test procedures, certification, and labeling programs for windows. A few states require NFRC labels on all windows sold in their jurisdiction. Labeling requirements along with national window standards (as a part of building codes or as separate standards) are logical next steps.

***Building Standards.*** EPACT requires states to review and update code energy efficiency provisions. For residential buildings, the provisions are encouraged to meet or exceed the Council of American Building Officials (CABO) Model Energy Code (MEC), 1992. For commercial buildings, the energy efficiency provisions are required to meet or exceed American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standard 90.1-1989. ASHRAE includes the code specifications in the areas of building envelopes, heating, air-conditioning, water heaters, lighting power densities, and maximum watts per square foot. The residential CABO MEC code of 1992 includes the code specifications in the areas of building envelopes, walls, windows, ceilings, and heating and cooling equipment.

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EPACT primarily introduced stronger standards for new commercial buildings. While other standards are largely voluntary, mandatory standards for all buildings—new and old, commercial, industrial, and residential—would prevent the release of many million tons of carbon. Enforcement of building codes on a state-by-state basis is a major concern, particularly as there is no adequate federal incentive or penalty to assure code compliance. For example, some states have received DOE grants to explore code upgrades while not yet complying with the EPACT building code requirements.

Upgrading or revising building codes is a decentralized process. National codes, regional codes, and state codes may conflict for a given state. State energy codes, including design criteria and code specifications, vary greatly from state to state. Code officials cite time and budget constraints along with the complexity of standards as barriers to compliance and enforcement. Simplifying the codes, providing checklists to building officials, and providing education and training to building professionals and code officials can improve compliance and enforcement.[21]

New standards for buildings, with incentives for ESCOs and building owners, could provide abundant opportunities for ESCOs to retrofit buildings, producing a job creation strategy as well as an energy savings strategy.

***Impact of Efficiency Standards on U.S. Carbon Reduction Goals.*** Adoption by the United States of new efficiency standards for appliances, lighting, industrial motors, distribution transformers, windows, HVAC systems, and buildings could save approximately 3 to 4 percent of energy use by 2010,[22] which could result in reduction of about 53 MtC. This reduction could account for nearly 10 percent of the Administration's carbon reduction goal of 551 MtC by 2010 to 2012.[23]

The proportion of the Kyoto reduction goal for metric tons of carbon to be achieved through energy efficiency is especially impressive when one considers that the electric power industry currently accounts for at least 35 percent of carbon emissions. Therefore, taking a broad perspective, one could expect the electric power industry to achieve 35 percent of the Administration's reduction goal of 551 MtC, or a 193-MtC reduction by 2012. The approximate reduction (subject to further refinement) expected from new and strengthened energy efficiency standards and building codes of 53 MtC would represent 27 percent of the total amount of carbon emissions reduction that could be expected from the electric power industry. The remainder would be achieved by supply-side technologies, fuel switching, and other market-oriented DSM strategies.

**Step Three: Rate Design**

Rate design in the competitive era is often considered an anachronism, since the market—and not the Federal Energy Regulatory Commission and the states—will set prices. A variety of contractual and spot-buy price options, customized to buyer needs, will replace utility commission rate schedules.

Rate design policy can build a national consensus on what it means to have an energy-efficient building. EIA's 1992 Commercial Buildings Energy Consumption Survey, and EIA's National Energy Modeling System, help calculate building stock efficiency levels. Nonetheless, at present, states lack a practical means of determining whether their building stock meets what they might consider adequate efficiency levels. Notwithstanding this lack of consensus and knowledge, the building stock in the states is far below economically optimal levels of efficiency. Moreover, the efficiency level of the building stock is inconsistent with our nation's goals for carbon reduction and environmental quality.

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Residential, commercial, and industrial customers spend approximately $212 billion a year on electricity.[24] Market surveys and pilot projects indicate that some consumers are willing to pay a premium for energy efficiency. For example, in a 2-day town meeting of 250 randomly selected electric utility consumers in Arkansas, Louisiana, and Texas, more than 70 percent indicated their willingness to pay at least $1 more per month than they were currently paying for improved efficiency, and well over one-third were willing to pay $5 more per month.[25] However, today we not only lack a societal consensus on the definition of an "efficient building," we also lack incentives to encourage building owners to achieve efficiency.

We also lack an easily communicated means of tracking the progress of states in meeting the societal consensus on building efficiency. DOE has established long-term goals so that, by 2010, the energy efficiency of the nation's new homes can be improved by 50 percent, new commercial buildings by 30 to 50 percent, and existing buildings by 20 percent.[26] These energy efficiency goals will be hard to achieve simply through voluntary "Energy Star" programs or even through tough new national building codes.

Perhaps a market-oriented rate design approach could overcome all of these market deficiencies. First, we need a definition for energy efficiency. A standard for minimum levels of energy efficiency could be developed for each building type (single-family residential, multi-family residential, small commercial, large commercial, various industrial buildings, etc.) for each U.S. region.[27] The elements constituting an efficient building could be included in the standards. If a building meets enough of the standard's criteria (i.e., if the building achieves a certain threshold level), then the building would be considered efficient.

Second, a process is needed to measure each building against the building standard for that building type in a given region. Energy service companies help owners improve the efficiency levels of their buildings through installation of a variety of energy-efficient applications. ESCOs could be certified by state energy agencies. The state energy agencies could be charged with working with certified ESCOs to develop a plan for assessing a given building's efficiency level against the standard, to assure fairness and uniformity within each building type and region.

Rate design, combined with a building-by-building energy efficiency assessment, would provide a stimulus toward energy efficiency. If a building meets enough of the energy efficiency standards (i.e., if it achieves a high enough score on an energy scorecard for the given building type in that region), then the building would be considered efficient.

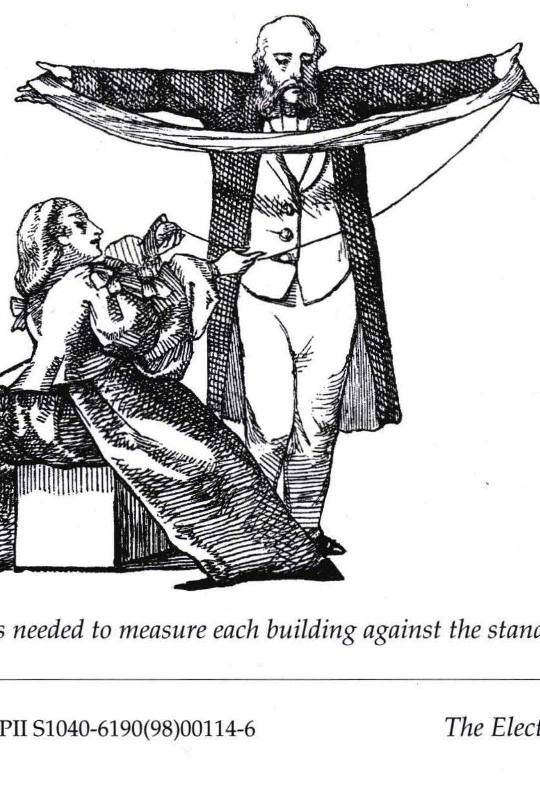
An ESCO could provide owners of inefficient buildings with an estimate of the work to be performed and the cost to achieve an efficient rating. As an inducement to building owners to bring their buildings to efficient levels, those buildings that were rated as efficient would be eligible for discounted electric rates.[28] Granted, building owners could shop for the best energy price, under competition, whether their buildings were efficient or not. After an owner obtained the best price through the marketplace, the owner of an efficient building would receive a further price discount from a state's wires charge, supplemented by a national public benefits fund. The electricity price discount would have to be large enough to convince building owners to make the revisions necessary for their buildings to meet energy efficiency standards.

The state wires charge (supplemented by the national PBF) would be the vehicle to deliver the subsidies that would produce the discounted electricity prices to owners of efficient buildings. All producers and consumers of electricity would pay into the state wires charge for public benefits such as energy efficiency, low-income support, R&D, and renewables, as several states are already beginning to provide.

In essence, under this concept, owners of energy-efficient buildings would pay lower electricity rates than would owners of inefficient buildings, thus stimulating a market transformation to greater efficiency levels in America's building stock. Owners of efficient buildings would receive a credit from the state wires fund that would be large enough not only to offset the wires charge altogether, but to lower their electricity rates and bills absolutely.

Owners of efficient buildings would therefore *draw from* the state wires fund. Under this plan, owners of inefficient buildings would *pay into* the wires charge fund and thereby would subsidize owners of efficient buildings—until such time as the owners of the inefficient buildings grew sufficiently weary of this arrangement and took the steps to assure that their buildings became efficient. If enough owners took this step, the nation's building stock would be transformed to a far greater level of efficiency than we have today.

This approach, which can lower electricity bills, should have more



*A process is needed to measure each building against the standard.*

consumer appeal than a carbon tax, which would increase bills. For example, a Pacific Research Institute report estimated that a $40 per ton tax on carbon dioxide associated with fossil fuels used to generate electricity would increase electricity rates 38.4 percent in California.[29] A serious response to climate change may well involve carbon taxes; however, for the moment, voluntary incentives should be an easier sell.

An efficient building, of course, does not guarantee sound conservation practices by building occupants. Indeed, once America's building stock becomes more energy-efficient, consumers might discontinue their conservation efforts (e.g., thermostat and lighting control), in response to the lower energy costs made possible by efficiency. An enhanced education outreach effort should be designed to encourage long-term energy conservation practices, especially among occupants of newly efficient homes and buildings.

### Step Four: ESCO Incentives

In summary, in this integrated plan, state wires charges and a PBF would provide incentives for energy-efficient applications. Rate discounts for efficient buildings would be provided from the PBF. State energy departments would determine the criteria for qualification as an efficient building. ESCOs would be involved because they could provide certification of each building's efficiency and would provide a quote for the services and equipment necessary to upgrade the building to "efficient" standing so that the building would be eligible for rate discounts. **Figure 2** depicts the various relationships.

Admittedly, Figure 2 looks only slightly less convoluted than the much-maligned Clinton Health Plan. Nonetheless, these relationships basically rely on *influencing*—rather than *controlling*—market prices. Most of the interrelationships operate behind the scenes to support price incentives that are readily understood by consumers. These simple incentives are far less complex than the "least cost plans" of many states that have been adopted by utility commissions over the years to fund traditional DSM.

Low-cost financing of ESCO services is a missing piece of the equation. Low-cost financing can enable an ESCO to guarantee a positive cash flow to a greater number of building owners than it is currently able to do. Under the positive cash flow guarantee of an ESCO, the building owner's monthly cost of a loan to retrofit a building for energy efficiency would be less than the monthly savings on the energy bill. An ESCO would guarantee a positive cash flow by compensating the owner for any deficiency between the guaranteed energy savings level and the weather-adjusted level actually experienced. With a positive cash flow guarantee, there would be no rational reason for a building owner to prefer an inefficient building over an efficient one. This bill reduction approach also contrasts with tax add-ons.

The state wires charges, infused with PBF funds, could serve as a type of insurance fund to back such guarantees. To remain certified by state energy agencies, an ESCO would have to perform in such a way that its reliance on the "positive cash flow insurance fund" of the wires charge would be minimized. If an ESCO dipped into the fund excessively, this ESCO would be decertified by the state energy department (or wires charge fund administrator).

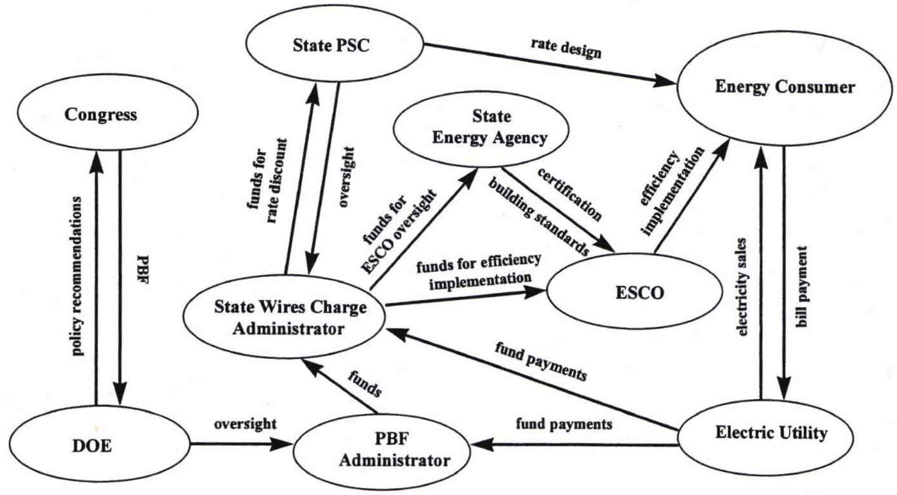



**Figure 2:** An Integrated Approach to Energy Efficiency

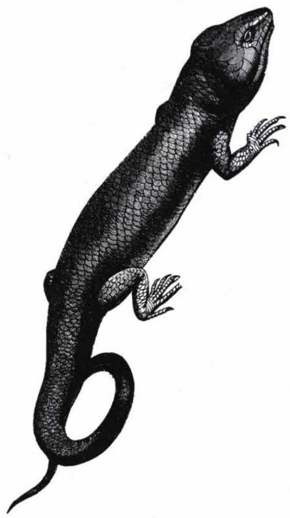
  

### Step Five: Added Incentives for Low-Income Residential Structures

Owners of low-income residential properties may not currently be able to afford, may not have sufficient cash flow, or may not have sufficient incentives to achieve qualifying efficiency levels in their properties so that they may receive the subsidized, discounted electricity rates. They need extra encouragement to bring their buildings to greater levels of efficiency.

Tax-exempt bonds have long stimulated industrial and economic development, especially in areas that would experience sluggish growth without recourse to such lower-cost financing. Similarly, air quality should be a sufficiently high-priority public purpose to warrant tax-exempt financing to stimulate energy efficiency. Access to tax-exempt bonds would make it easier for more buildings to experience positive cash flows from retrofitting and from efficient new building designs than would otherwise be experienced.

Tax-exempt financing and other subsidies are especially well suited to low-income building retrofits (e.g., apartment buildings), which might experience difficulty in passing energy scorecard tests and in obtaining ESCO guarantees of positive cash flows without this added level of assistance. Many low-and-moderate income residential buildings are owned by real estate investment trusts. Investors and their managing partners will only retrofit their buildings for energy efficiency if there is a financial incentive to do so. The fact that there are hundreds of thousands of poorly maintained, energy-wasteful buildings in low- and moderate-income neighborhoods would indicate that new market stimuli at least need to be examined. A positive cash flow guarantee, coupled with the opportunity for discounted energy rates as described above, could provide such incentive.



## III. Conclusion

The above five-point DSM plan provides examples of how DSM can thrive in a competitive era. All of these five steps—or variations on these five basic themes—can be adopted concurrently, for maximum impact. Some rate-influencing policy, using state wires charges, can be designed to lower the price of energy for owners of efficient buildings. A PBF of some type can make state wires charges more effective, at a low per-kWh cost. Some incentives for the broadened use of ESCOs can be developed. As demonstrated above, efficiency standards can be extraordinarily effective in improving air quality and in lowering the risk of climate change.

Our nation and nations around the world have grown excessively tolerant of polluted air, filthy rivers, species slaughter, forest depletion, and overpopulation. In affluent societies, people prefer comfortable interior environments, achieved at the expense of the real environment. Today most of the world's people, or at least their governments, even seem tolerant of climate change and the potential for ever greater levels of ecological disaster. We still only talk about climate change, but, so far, are doing little about it.

Major lifestyle changes must inevitably be considered at some point. For the present, however, a "no regrets" strategy can include voluntary, market-driven DSM. Such a strategy can influence energy consumption patterns and create jobs, until a societal and global consensus can be built for the full range of supply- and demand-side actions. ■

**Endnotes:**

1. Hartford *Courant*, Aug. 24, 1897, with an assist (perhaps) from Mark Twain.

2. U.S. total emissions are based on data from the Energy Information Administration (EIA), EMISSIONS OF GREENHOUSE GASES IN THE UNITED STATES, *1996*, DOE/EIA - 0573(96)

(Washington, D.C., Oct. 1997) at 18. The world total carbon emissions are based on data from EIA, INTERNATIONAL ENERGY OUTLOOK, 1998, DOE/EIA-0484(98) (Washington, D.C.: April 1998) at 142.

**3.** The industrial countries' average is based on data from F. KRAUSE, WILFRID BACH, AND JON KOOMEY, ENERGY POLICY IN THE GREENHOUSE, International Project for Sustainable Energy Paths (IPSEP), Sept. 1989.

**4.** The six greenhouse gases are produced from a broad range of human activities that are dominated by burning fossil fuels. Carbon dioxide emissions are highest among the six.

**5.** President's Climate Change Action Plan, Oct. 1993.

**6.** This percentage is computed from the data presented in EIA's ANNUAL ENERGY OUTLOOK, 1998, DOE/EIA-0383(98) (Washington, D.C.: Dec. 1997) at 75.

**7.** EIA, ANNUAL ENERGY REVIEW, 1997, DOE/EIA-0384(97) (Washington, D.C.: July 1998) at 233. In 1992 dollars, the real price of electricity dropped from 8.7 cents/kWh in 1982 to 6.1 cents/kWh in 1997.

**8.** U.S. DEPARTMENT OF ENERGY, COMPREHENSIVE ELECTRICITY COMPETITION PLAN (Washington, D.C.: March 25, 1998).

**9.** Computed from data presented in *supra* note 6, at 75. We do not have an MtC estimate for 2012, and thus we use the EIA estimate for 2010.

**10.** U.S. DEPARTMENT OF ENERGY, COMPREHENSIVE ELECTRICITY COMPETITION PLAN, at 21.

**11.** EIA, U.S. ELECTRIC UTILITY DEMAND-SIDE MANAGEMENT, 1996, DOE/EIA-0589(96) (Washington, D.C.: Dec. 1997), Table 1.

**12.** EIA, ELECTRIC UTILITY DEMAND-SIDE MANAGEMENT, 1995 (Washington, D.C.: Jan. 1997), Tables 1, 2, and 21.

**13.** EIA, U.S. ELECTRIC UTILITY DEMAND-SIDE MANAGEMENT, 1996, DOE/EIA-0589(96) (Washington, D.C.: Dec. 1997), Table 1.

**14.** J. Eto, C. Goldman and S. Nadel, *Ratepayer-Funded Energy-Efficiency Programs in a Restructured Electricity Industry: Issues and Options for Regulators and Legislators*, LBL and ACEEE, May 1998.

**15.** *Ibid.*

**16.** U.S. DEPARTMENT OF ENERGY, COMPREHENSIVE ELECTRICITY COMPETITION PLAN (Washington, D.C.: March 25,

1998) at 18–19. Richard H. Cowart, *Restructuring and the Public Good: Creating a National System Benefits Trust*, ELEC. J., April 1997, at 52–7, was instrumental in advancing this plan in the national regulatory community and beyond.

**17.** This percentage is computed from EIA, EMISSIONS OF GREENHOUSE GASES IN THE UNITED STATES, 1996, DOE/EIA-0573(96) (Washington, D.C.: Oct. 1997) at 18.

**18.** Steven Nadel and David Goldstein, *Appliance and Efficiency Standards: History, Impacts, Current Status, and Future Directions*, ACEEE, June 1996, at 16.

**19.** Steven Nadel, *Minimum Efficiency Standards: Options for Federal and State Action*, ACEEE, June 1994, at 11.

**20.** L. A. Smith and Steven Nadel, *Energy Efficiency Codes and Standards for Illinois*, ACEEE, 1994, at 7–40.

**21.** L. A. Smith and Steven Nadel, Energy Code Compliance, ACEEE, August 1995, at 6–8.

**22.** Steven Nadel and David Goldstein, *Appliance and Efficiency Standards: History, Impacts, Current Status, and Future Directions*, ACEEE, June 1996, computed from pp. 13, 16.

**23.** Assuming no policy changes, the currently projected level for carbon emissions in the United States by the year 2010 is 1,803 MtC. The 1990 carbon emission level was 1,346 MtC, and 7 percent below that (as provided in the Kyoto Protocol) is 1,252 MtC. The difference between 1,803 and 1,252 is 551. Computed from *supra* note 6, at 75.

**24.** U.S. DEPARTMENT OF ENERGY, COMPREHENSIVE ELECTRICITY COMPETITION PLAN, at 1.

**25.** Mark Roberson, "Arkansas-Louisiana-Texas Town Meeting on Electricity Issues: What Do Customers Value?," a report to NARUC, Nov. 1996, at 9–13. He is vice president at Central and South West Services, Inc., a utility company.

**26.** U.S. DEPARTMENT OF ENERGY, BUDGET-IN-BRIEF FOR FISCAL YEAR 1999, DOE/EE-0156 (Washington, D.C.: Feb. 1998) at 4.

**27.** The National Energy Modeling System identifies 11 commercial building types. EIA/DOE, NATIONAL ENERGY MODELING SYSTEM, AN OVERVIEW 1998, DOE/EIA-0581(98) (Washington, D.C.: Feb. 1998) at 25.

**28.** Edward M. Meyers, *Making the Right Energy Choices in America*, PUBLIC UTILITIES FORTNIGHTLY, July 15, 1993, at 15.

**29.** PUBLIC UTILITIES FORTNIGHTLY, Oct. 1, 1998, at 70.