Governor's Task Force on Energy Conservation and Efficiency

Final Report

December 15, 2001

ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

Through Executive Order, Governor Parris Glendening created the Task Force on Energy Conservation and Efficiency and charged the Task Force with investigating barriers to energy efficiency and conservation in the State of Maryland. As discussed in the Executive Order, energy efficiency and conservation are of the utmost importance to Maryland for a myriad of economic and environmental reasons. Energy efficiency programs can produce significant benefits, including improving electric system reliability by reducing strain on our electric grid, recirculating funds through the Maryland economy, saving money, improving human health, enhancing the environment (especially the Chesapeake Bay), diversifying energy use, promoting sustainability and reducing sprawl and promoting smart growth.

The paramount goal of the Task Force was to develop a long-term strategy to overcome these barriers and achieve energy reduction in Maryland. Relying on a newly created baseline of current energy use in Maryland's residential, commercial, industrial and transportation sectors that identified opportunities for energy savings in these sectors, as well as the vast wealth of knowledge of Task Force members and expert speakers, the Task Force formulated a list of recommendations. These recommendations are presented below. With legislatively mandated rate caps on electricity prices coming off starting July of 2002 for the larger energy use customers, and starting in 2004 for residential customers, the time to move forward with these energy efficiency and conservation measures is now. As President Theodore Roosevelt said, "Nine-tenths of wisdom consists in being wise in time."

The Task Force recommends:

1. Maryland establish a public benefits program addressing electricity and natural gas for residential customers, and electricity in small and medium commercial and industrial customers to provide comprehensive energy efficiency and conservation benefits through investments and programs. The General Assembly should enact a public benefits program similar to those in effect in the northeastern states. The State should also pursue energy efficiency through codes and standards and extensions of existing tax credits.

2. Energy efficiency programs be targeted to residential, and small and medium commercial and industrial customers, as highlighted by the *Maryland Energy Efficiency and Conservation Baseline*

3. A public benefits program be funded by a wires surcharge on residential, and small and medium commercial and industrial customers that begins at a rate of 0.25 mills/kWh in year one, and ramps up to 0.5 mills/kWh in year two, 1.0 mill/kWh in year three, and 1.5 mills/kWh in year four. A comparable surcharge should be collected from residential natural gas customers. The amount of money generated by the surcharge shall be in accordance with the program plan and budget submitted by the program administrator and approved by the Public Service Commission.

4. Maryland, in addition to using funds from the surcharge, should further utilize general

state funds in the form of tax credits, including extending the Clean Energy Incentive Act sales tax credit to additional Energy Star appliances and the Green Buildings Tax Credits to residential buildings. Further, the state should ensure that energy equipment standards and building codes promote higher energy efficiency. Education and training for local government officials in code enforcement should be a fundamental component of the program.

5. Resource acquisition programs, such as rebates, should be demonstrated as cost-effective based on a test that reflects the new electricity market structure. Market transformation programs (e.g., education programs) should be demonstrated to be effective based upon previous experience in Maryland and other states.

6. Energy efficiency services be provided to the extent possible by the private sector, contracted through a competitive bid and proposal process developed by the program administrator. While the non-regulated affiliates of the utilities are encouraged to participate, no utilities are required to offer direct efficiency services. Ten percent of the funds in each program year will be reserved for administrative expenses.

7. The Maryland Energy Administration be designated as the current program administrator.

8. The Governor and General Assembly should eventually transfer energy efficiency program administration to a newly created agency. This new department will coordinate and oversee all energy efficiency and conservation activities, including low-income energy efficiency programs in the existing Universal Service Program and the federal-funded Weatherization Assistance Program. The new department should have independent procurement authority as provided in state law.

9. The Maryland Energy Administration file program proposals for the energy efficiency section of the Constellation, Allegheny, and PEPCO/Conectiv settlements. The Public Service Commission should hold a proceeding to determine the process to ensure energy efficiency programs are offered to those customers not covered by previous agreements.

10. The Maryland Department of Transportation (MDOT) staff conduct a study of the energy conservation and efficiency opportunities that may be available through non-traditional, demand-management measures. Measures included in the study should range from measures the MDOT has begun reviewing--such as variable pricing--to untested measures such as emission fees, vehicle miles traveled fees, pay-at-the pump insurance, etc. The Task Force further recommends that the MDOT assess what state-level institutional mechanisms would be best suited to the task of accessing the conservation and efficiency opportunities that may be available through these measures.

11. The MDOT conduct this study in consultation with a small advisory body that reflects a cross-section of public interest and technical expertise in the discipline of transportation demand management. The MDOT may select the members of this advisory body, but the MDOT's selections should, to the extent possible, reflect representation of the following

viewpoints: environmental; energy efficiency; economic growth and development; economic efficiency; smart growth; and academic/technical expert.

12. The state should recommend adoption of programs that promote the use of rated structures that could include metering and submetering of water-use, which can produce sizable water and energy savings.

13. Promotion of clean distributed generation and renewables are beneficial to the state and should be encouraged where commercially viable.

14. The public benefits programs proposal should closely coordinate with the research and development activities undertaken at the universities within Maryland.

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INTRODUCTION

As directed by Governor Parris N. Glendening in Executive Order No. 01.01.2001.07 when establishing the Task Force on Energy Conservation and Efficiency (Task Force),[1] the Task Force is to provide a report which recommends strategies to overcome institutional and market barriers to increasing energy efficiency in Maryland. Additionally, the Task Force must "determine the most effective elements of an energy conservation program, including removing bureaucratic restraints, providing technical assistance, increasing conservation incentives and creating public awareness." Many of these recommendations are based upon the findings of the energy baseline for the State of Maryland developed as part of this Executive Order. Stated within the preamble of the Executive Order, Governor Glendening declared as a matter of policy that "...in order to develop and design a statewide energy efficiency initiative, it is necessary to assess the current trends in energy use which will allow the State to identify cost-effective opportunities for energy efficiency and conservation in all sectors."[2] To this end, the Task Force developed the *Maryland Energy Efficiency and Conservation Baseline* (see Appendix B). The appendix provides an initial energy conservation and efficiency baseline analysis for four sectors of the Maryland economy: commercial businesses, industrial manufacturing, residential consumers, and transportation.

Maryland's demand for energy increased by 11 percent from 1990 to 1999, an average annual rate of 1.1 percent. While economic growth has outpaced the increasing demand for energy, growing at 2.6 percent annually over the past ten years, the current rate of energy growth is unsustainable over the long term. The challenge is to continue our economic growth while decreasing the overall rate of increase in demand for energy. The objective is to attain the same standard of living or produce the same, or greater, level of services and products with less energy. The key to achieving this objective is energy efficiency.

In addition, the contributions to Maryland's economy and environment from an aggressive energy efficiency program are direct and numerous. By reducing the overall demand for energy, Maryland will enhance national security by lessening the dependence on imported petroleum products. Reductions in the rate of growth in electrical demand will help assure electric grid system adequacy as well as promote reliable and reasonably priced electricity. Investments in energy efficiency promote state-based jobs and infrastructure development by recirculating money that would be spent on energy acquisition costs. Further, a stable and reasonably priced electricity market is crucial for Maryland's continued growth as a high technology economy.

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[1]Governor of Maryland – Parris N. Glendening, State of Maryland Executive Orders and Proclamations – 2001, Executive Order 01.01.2001.07: Task Force on Energy Conservation and Efficiency, June 1, 2001

[2]Ibid.

Beyond the direct economic benefits of energy efficiency, the reduction in emissions of environmental pollutants is a prime incentive for increasing energy conservation actions. Environmental pollutants degrade the health and quality of life of Maryland's citizens. Pollutant prevention is a more cost-effective strategy than pollution remediation. Reduction of emissions will protect the health of people suffering from asthma and other respiratory conditions and can reduce further cases. For future generations, reduced energy usage and its consequent reduced emissions of pollutants will preserve and enhance Maryland's natural resources, in particular, the national estuarine treasure, the Chesapeake Bay. Programs can also serve to diversify energy use, promote sustainability, reduce sprawl and promote smart growth. Energy efficiency investments now are wise for Maryland's economy and environment, and therefore its citizens and its future.

For example, nationwide, energy use is responsible for approximately 85% of sulfur dioxide emissions that contribute to acid rain and fine particulate matter, 95% of smog-forming nitrogen oxide emissions, and 82% of global warming emissions. Approximately one-quarter of the nitrogen entering the Chesapeake Bay comes from nitrogen oxides released into the air by smokestacks and tail-pipes. Reducing these energy-related emissions would help Maryland to meet the goals of the Chesapeake Bay Agreement. Additionally, investments in energy conservation and efficiency tend to increase employment by keeping more money in a state's economy and shifting expenditures away from energy consumption into other sectors that provide more employment per million dollars spent.

There are significant barriers to consumer investment in energy efficiency, including, but not limited to, lack of awareness, "first-cost" problems and energy price volatility. While the market does provide many opportunities for energy efficiency investments, targeted programs can help promote greater use of energy efficient products by providing resources for overcoming market barriers. The Task Force recognizes that energy efficiency opportunities are being lost in Maryland. Due to the lack of a comprehensive public benefits program, similar to those that exist in the surrounding states of New Jersey, Delaware, Pennsylvania, the District of Columbia, and most of New England, Maryland is at risk of not protecting the future for our taxpayers, consumers and ratepayers.

In contrast to the current situation, Maryland has had a long commitment to energy efficiency to conserve natural resources, enhance environmental quality, reduce peak demand of electricity, and save consumers money on energy expenditures. Prior to the enactment of Electric Competition Act of 1999, electric utilities delivered energy efficiency programs through demand- side management (DSM) programs and policies. Utility expenditures for conservation programs for the period 1991-2000 were in excess of $500 million dollars. That equates to over $50 million annually. Now with the generation and distribution of electricity provided through separate corporate entities, the rationale for utilities as the delivery mechanism of energy efficiency no longer applies. However, the benefits to the state's economy and environment from the efficient use of energy through lower power plant emissions and the recirculation of funds through the economy by energy efficient investments still exist.

The 1999 Act expressed the General Assembly's desire to maintain the benefits of energy efficiency and conservation. It specifically requested the Public Service Commission (PSC), in conjunction with the Maryland Energy Administration (MEA), to report on an approach to maintain that commitment in a restructured electric market. The PSC's report to the General Assembly endorsed the importance of energy efficiency for environmental quality, the state's economy, individual consumers, and system reliability and adequacy. The PSC has authority and responsibility under current Maryland law to order energy efficiency activities by companies under their jurisdiction and to authorize pre-existing programs as agreed to in various settlements as part of utility stranded cost litigation.

1.1 RECOMMENDATIONS

1.1.1 FUNDING

The Task Force members agree that all ratepayers benefit from the implementation of an energy efficiency program, either directly or indirectly, and therefore reached consensus on the need for a public benefits fund, used in conjunction with energy codes and standards, and tax credits, to increase energy efficiency in Maryland. A majority of the Task Force recommends a funding authorization ceiling of 1.5 mills/kwh in the fourth year of the program, with a ramp-up that starts at 0.25 mills/kWh in year one, 0.5 mills/kWh in year two, and 1 mill/kWh in year three.[3] For example, this equates to a cap of $0.20 per month in year one and $1.13 per month for the average residential ratepayer in year four. The kWh charge will be applied to all residential customers and commercial and industrial customers that consume less than 1,000,000 kWh per year. A comparable natural gas charge (estimated to be $0.0024 cents per million BTU in year one, $0.0048 in year two, $0.0096 in year three, and $0.0144 in year four) will be applied to residential consumers. Year one of the program would be designated for program development. Electricity and residential natural gas customers should be included in a comprehensive program, and as mentioned previously, natural gas customers should be charged at a rate that makes the contribution by the average residential household the same regardless of their mix of electricity to gas.

The competitive market should be encouraged to provide energy efficiency services through tax credits that stimulate the purchase of more energy efficient appliances and programs that are bid out into the market. Programs bid out to the marketplace by the program administrator, through a competitive bid selection process, will facilitate the development of a private sector market for energy efficiency services in the residential sector and for small and medium commercial and industrial businesses.

While the Task Force acknowledges the constraints on the state's budget at this time, should funds become available, the Task Force recommends that funding for energy efficiency programs should also be incorporated from general funds in the form of an extension of existing

[3] One mill is equal to 1/10 ($0.001) of one cent.

tax credits. The General Assembly has made significant strides in furthering energy efficiency through, for instance, the Maryland Clean Energy Incentive Act which offers sales tax relief on Energy Star air conditioners, clothes washers and refrigerators. This tax credit could be extended to other Energy Star appliances. Additionally, the Green Buildings Tax Credit for commercial green buildings could be extended to residential buildings. Furthermore, energy efficiency equipment standards and building codes should be considered because they will lead to permanent market transformation. Both measures offer incentives that decrease energy bills, freeing-up income for other purchases and stimulating the economy.

1.1.2 SECTOR PARTICIPATION

The Task Force recommends that energy efficiency programs be targeted to the residential, small and medium commercial, and small and medium industrial sectors, as indicated by the *Maryland Energy Efficiency and Conservation Baseline* (Appendix B). The Maryland Energy Administration should work closely with the utilities to determine how best to identify these accounts. Existing low-income energy efficiency programs contained in the Universal Service Program, federally-funded Low-Income Home Energy Assistance Program, and the Weatherization Assistance Program should be coordinated with the programs discussed herein. In addition, these programs should work more closely with community housing organizations to promote energy efficiency opportunities. The programs presently administered by separate departments should eventually be incorporated into a state-wide energy efficiency program. Water conservation programs are currently being considered by the Water Conservation Task Force. Their recommendations should be incorporated, as they will also conserve energy across all sectors.

1.1.3 COST-EFFECTIVENESS

The Task Force recommends that the resource acquisition[4] programs be demonstrated as cost-effective based on a cost-effectiveness test that reflects the new market structure (see Appendix D). The Task Force also recommends that information and education programs be targeted, but notes that determining the cost-effectiveness of these types of programs is difficult. The effectiveness of market transformation[5] programs which include energy efficiency education programs--a central component of any statewide energy efficiency initiative-- are more difficult to quantify in the short term. Cost-effectiveness guidelines for resource acquisition programs

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[4]Resource acquisition programs utilize market intervention strategies that target specific market participants, usually via a cost savings mechanism (i.e., rebate or incentive), to ensure that energy efficient products are quickly adopted for a short term effect.

[5]Market transformation programs use broad-based marketing strategies where program participants are not always specifically identified and the objective is to reduce market barriers over the long term.

should be established prior to initiation of the program. Any programs that are no longer cost-effective should be discontinued. Programs should also be monitored and evaluated annually.

1.1.4 ADMINISTRATION

An energy efficiency and conservation investment program or public benefits program should be administered by the appropriate state government authority. This would include oversight by the General Assembly, appropriate Executive departments and the Public Service Commission (PSC). The Task Force agrees with the conclusion of the PSC in its report to the General Assembly on energy efficiency programs: that the Maryland Energy Administration is the appropriate existing state agency to oversee the energy efficiency and conservation program. To maximize the benefits of various energy related programs, including a public benefits program, the Task Force recommends eventually consolidating all state energy activities in a cabinet level department. In order to facilitate development of the competitive market, the agency overseeing the public benefits programs should have independent procurement authority as provided in state law.

The Task Force recommends that the energy efficiency and conservation program be administered by the Maryland Energy Administration now, with future consideration of a cabinet level department as mentioned above, to coordinate all energy efficiency, conservation and other related activities. An agency that administers a public benefits program should have independent procurement authority.

Utilities should not be required to offer energy efficiency and conservation services through government mandates. Any surcharge mechanism established to develop an energy efficiency fund should be a direct pass-through collection mechanism in line with existing Public Service Commission surcharges and should not impose additional costs on utilities. The Task Force recommends that utilities and their unregulated affiliates be encouraged to participate in the energy efficiency programs, but that they not be required to provide direct program services.

As a result of settlements of "stranded cost" proceedings in response to electric utility restructuring (Constellation and Allegheny) and corporate reorganization (Potomac Electric Power Company (PEPCO)/Conective), agreements were reached among the parties for limited energy efficiency programs. According to the Constellation Energy and Allegheny Power agreement, an energy efficiency program for residential consumers funded by a 1 mill/kwh surcharge, as approved by the PSC, was deemed appropriate. In the case of the PEPCO/Conective merger, the tentative agreement provides a one million dollar fund for energy efficiency programs developed by MEA and approved by the PSC. As an initial step to examine energy efficiency opportunities prior to the enactment of a wires charge, the Task Force recommends that the Maryland Energy Administration file program proposals to implement the energy efficiency sections of the Constellation, Allegheny, and PEPCO/Conectiv settlements. The Task Force further recommends that the Public Service Commission hold a proceeding to examine the most expeditious manner to extend energy efficiency to those customers not covered by previous agreements. The Task Force recommends that the General Assembly enact an

energy efficiency program as described above (similar to those in effect in some northeastern states) utilizing a wires charge for the residential, and small and medium commercial and industrial sectors.

1.1.5 TRANSPORTATION

The Task Force recommends that the Maryland Department of Transportation (MDOT) conduct a study of the energy conservation and efficiency opportunities that may be available through non-traditional, demand-management measures. Measures reviewed should range from measures the MDOT has been considering, such as variable pricing, to untested measures (e.g., emission fees, vehicle miles traveled fees, pay-at-the-pump insurance, etc.).

The Task Force further recommends that the MDOT assess what state-level institutional mechanisms would be best suited to accessing the conservation and efficiency opportunities that may be available through these measures.

Finally, the Task Force recommends that the MDOT conduct this study in consultation with a small advisory body that reflects a cross-section of public interest and technical expertise in the discipline of transportation demand management. MDOT may select the members of this advisory body, but the MDOT's selections should, to the extent possible, reflect representation of the following viewpoints: environmental, energy efficiency, economic growth and development, economic efficiency, smart growth, and academic/technical expertise.

2. APPROACHES TO ENERGY EFFICIENCY

2.1 TRANSPORTATION SECTOR

Transportation-related efficiency and conservation initiatives, already in place in Maryland to decrease vehicle miles traveled and energy useage in the transportation sector, include doubling transit ridership by 2020 and related transit initiatives; commuter choice and tax credit promotions; transit oriented development; live near your work initiative; a tax credit for hybrid electric vehicles; intelligent transportation systems; and many green energy programs to promote alternative fuels. Demand-side management initiatives discussed by the Task Force include variable pricing; cost recovery on Vehicle Emission Inspection Program (VEIP); MPG Standard; Pay at the Pump Insurance; and gas tax increases.

2.2 RESIDENTIAL, COMMERCIAL AND INDUSTRIAL SECTORS

The approaches to energy efficiency described below were developed through a careful analysis of energy use and energy efficiency opportunities in the State of Maryland as presented in *The Maryland Energy Efficiency and Conservation Baseline (Baseline*). The *Baseline* presents energy consumption data, broken down by sector and end use, as well as economic and demographic data for the state. The data compiled in the *Baseline* allowed the Task Force and the Maryland Energy Administration staff to draw certain conclusions about the need for energy efficiency programs in each of the selected sectors, residential, commercial and industrial.

As recommended by the Task Force, a user fee will be assessed on a per kilowatt hour (kWh) basis on electricity for the residential, commercial and industrial sectors.[6] A comparable charge to the kWh charge will be assessed on residential natural gas consumers. Table 1 provides a breakdown of the funds to be collected in years one through four from these charges. The table assumes that the collections are carried out as recommended by the Task Force for a 0.25 mill charge in year one, a 0.5 mill charge in year two, a 1.0 mill charge in year three, and a 1.5 mill charge in year four.[7]

Since the fees collected for the implementation of energy efficiency programs will be collected directly from electricity users in the residential, commercial and industrial sectors, the energy efficiency programs developed under this initiative have been designed to benefit these sectors directly.

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[6]Commercial and industrial users consuming more than 1,000,000 kWh per year have been classified as large users and will be exempted from the electricity charge.

[7]One mill is equal to 1/10 ($0.001) of one cent.

Table 1: Funds Collected Under the Proposed Public Benefits Charge

	mills/kWh	Residential	Residential Gas (mmBtu)*	Commercial & Industrial	Streetlighting	Total
1999 MWH Sales		20,989,136	78,996,981	29,561,716	316,151	129,863,984
Year 1	0.25	$ 5,247,284	$ 1,928,637	$ 2,473,368	$ 63,230	$ 9,712,520
Year 2	0.5	$ 10,494,568	$ 3,857,274	$ 4,946,737	$ 126,460	$ 19,425,040
Year 3	1	$ 20,989,136	$ 7,714,549	$ 9,893,474	$ 252,921	$ 38,850,080
Year 4	1.5	$ 31,483,704	$ 11,571,823	$ 14,840,211	$ 379,381	$ 58,275,120

* An equitable charge on gas has been determined to be $0.0244/mmBtu for .25 mill/kWh

An outline of the expenditures by sector is presented in Table 2. More detailed information will be provided in conjunction with specific energy efficiency programs.[8] The sample budget represents the funding level in the second year of the statewide effort. The second year will be the first full year of program implementation. Year one will include mostly start-up expenses, detailed market analysis, and pilot programs.

Table 2: Program Costs and Estimated Energy Savings

Energy Efficiency Programs	Year 2 Budget (0.5 mil charge)	Number of participants (homes, businesses, etc.)	Annual Energy Savings (Tbtu)	Annual Economic Savings $
Residential	$ 11,700,178	258,315	1.18	$ 20,694,139
Commercial	$ 3,255,200	2,290	0.05	$ 861,420
Industrial	$ 2,297,900	260	0.03	$ 486,087
GRAND TOTAL	$ 17,253,278	260,865	1.25	$ 22,041,646

The following recommendations are based on *The Maryland Energy Efficiency and Conservation Baseline* (see Appendix B) and The Energy Conservation and Efficiency Task Force discussions.

[8]The economic benefits presented in this table only represent direct benefits to participants in the program. Indirect reliability, health, environmental, and economic benefits have not been included.

2.3 RESIDENTIAL SECTOR

2.3.1 RESIDENTIAL SECTOR BARRIERS

With average energy expenditures in the range of $1400 per year, most Maryland homeowners have a strong interest in improving the energy efficiency of their residences. Nevertheless, a number of barriers keep them from doing so. These barriers, mentioned below, were discussed in Task Force meetings, as well as the recent DOE report, *Scenarios for a Clean Energy Future*.[9]

Lack of information limits the ability to evaluate options. Information on energy efficiency and cost impact is not easily available or understandable to the consumer and sales personnel. Although the total energy bill is a significant part of the household budget, adequate information is not readily available to a utility customer as to how much energy is used by a particular appliance, and hence they cannot set priorities or evaluate options properly.

Inability to recognize lifecycle economics. The incremental energy cost of operating a device or building usually appears to be only a small fraction of its total cost. Energy use of the entire life of the device or building is not usually considered, so energy efficiency is rarely a determining characteristic in the decision to own or use the item. For example, for most existing refrigerators the lifetime energy cost will exceed the initial purchase price. (A 1993 vintage refrigerator uses about 800 kWh/year, down about half from the typical 1973 model, but nearly twice the best currently available.)

Financial concerns. Energy efficiency options may (but do not always) have a higher initial cost. Even though that expense can be recovered over the product lifetime, the lack of capital may push consumers to the choice that is initially cheaper, or postpone the purchase of a more efficient replacement item.

Split incentives. This particular problem occurs when the person making the decision to purchase or operate an piece of equipment or building is not the same as the person paying the energy bill for it. For example, a landlord who pays the energy bill has no control over his tenant's energy use. On the other hand, a renter who pays the bill is at the mercy of the building owner whose interest in energy efficiency may be only indirect, such as remaining competitive or increasing resale value. Because about one-third of households are renters, this barrier is significant. In the construction of new homes, the builder makes many choices that affect energy efficiency. However, his concern is primarily being cost competitive; the owner will be the one paying the energy bills.

For manufacturers, builders, designers, and supplier, additional major barriers are:

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[9]DOE, Interlaboratory Working Group. *Scenarios for a Clean Energy Future*. ORNL/CON-476 and LBNL-44029, November 2000.

Industry Fragmentation. The residential building industry is highly fragmented, consisting of many small builders and a complex chain of suppliers. In 1997 there were an estimated 92,521 establishments involved in new single-family construction nationwide. Of those, 94% built fewer than 25 houses, accounting for 39% of the total housing starts during the year.[10] These small builders often do not have the resources to do research and development or to learn about more innovative techniques. There are no financial incentives for them to build more energy efficient houses.

Inability to capture all benefits of Research and Development. Expenditures on R&D by the residential construction industry are low. Innovations that are made by one firm can be easily copied by others, resulting in the loss of any competitive advantage. This reduces the firm's incentive to perform R&D.

Reluctance to change. It is normal in the construction industry, as elsewhere, to want to "stick with what you know" and with practices that have worked in the past. Change requires extra effort and probably additional investment, and may raise questions of reliability. Customers may not even recognize the improvements.

Design and production cycles. Industry is reluctant to make changes in production facilities until the existing product investment has been recovered. This can mean a delay in the introduction of a new product.

Perverse fee structures. Fees for architects and engineers that depend on the capital cost of a project discourage innovation. Not only is there no compensation for the extra effort to design a more efficient heating or cooling system, for example, but the lower cost due to its smaller capacity would actually reduce the fee.

2.3.2 RESIDENTIAL ENERGY EFFICIENCY

Many proven methods exist to overcoming these barriers. Better consumer information and associated education/awareness outreach, energy labeling (including the Energy Star label), and efficiency standards help to overcome consumer's inability to evaluate options. Better consumer information helps customers make more informed choices and can overcome the inability to recognize lifecycle costs. Energy efficiency standards mandate market shifts that assist in eliminating this problem. Creative financing schemes that take into account the lower operating cost associated with higher efficiency help alleviate the higher initial costs. Programs for builders and purchasers of Energy Star new homes or the Home Energy Rating System can assist with this effort.

The split incentives issue between builders and homeowners can be reduced through

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[10]U.S. Census Bureau, *1997 Economic Census– Construction Sector, Special Study, Housing Starts Statistics – A Profile of the Homebuilding Industry*, July 2000.

minimum efficiency standards, such as the Maryland Building Performance Standards for new homes, and encouraging home builders to build energy efficient homes at the same time that consumers demand energy efficient homes. Over the past several years, the home building market in Maryland has been very active, allowing builders to drive the market. Builder education presenting the value of energy efficient construction is a critical component to any new homes initiative in the state. Championing the efforts of builders that build to the Energy Star Standard or other green buildings standards will demonstrate the sales and business benefits of building more energy efficient homes. While new homes make up only one percent of the total housing market in Maryland, improving the energy efficiency for the entire life of a home, 50 or more years, can provide significant energy efficiency benefits.

Table 3 provides a summary of selected energy efficiency opportunities as described in the residential sector of the *Baseline*. In total, these program opportunity areas represent maximum potential cumulative energy savings of nearly 400 TBtu after ten years. Many current programs are proving to be effective in reducing energy use in the residential sector in other states engaged in comprehensive energy efficiency programs. By modeling programs after these efforts or creating new programs that complement or leverage existing state and federal strategies, there is a vast potential for efficiency improvements waiting to be tapped.

Table 3: Summary of Likely Program Opportunities for the Maryland Residential Sector

Program Opportunity Area	1999 Primary Energy (TBtu)	Cumulative Energy Savings after 3 years (Tbtu) Min - Max	Cumulative Energy Savings after 10 years (Tbtu) Min - Max	Approach
Lighting	21.2	0.1 - 1.4	2.0 - 20.0	Replace incandescents with CFLs, dimmers, sensor controls, task lighting.
Space Heating	117.4	0.3 - 2.8	4.0 - 40.4	Replace aging equipment with high efficiency and Energy Star models.
Space Cooling	35.8	0.3 - 3.1	4.5 - 44.7	Replace aging equipment with high efficiency and Energy Star models.
Water Heating	53.7	0.3 - 3.2	4.7 - 47.1	Replace aging equipment with high efficiency and Energy Star models.
Refrigeration (Refrigerator and Freezer)	32.2	0.04 - 0.4	0.5 - 5.2	Replace aging equipment with high efficiency and Energy Star models.
Cleaning Appl. (Washer/Dryer and Dishwasher)	17.6	0.06 - 0.7	1.0 - 9.7	Replace aging equipment with high efficiency and Energy Star models.
Cooking (Stove/Oven/Range and Microwave)	16.5	0.03 - 0.4	0.5 - 5.3	Replace pilot ignition with electronic ignition system, higher efficiency microwaves.
Home Insulation	358.5 (entire sector)	0.4 - 4.3	6.3 - 63.2	Upgrade insulation from R-11, typical of pre-1970 homes, to R-38 or R-49.
Window Replacement	358.5 (entire sector)	0.3 - 2.7	3.9 - 39.0	Replace single pane windows with double or triple pane with Low-E coatings.
Duct Repair	358.5 (entire sector)	0.4 - 4.2	6.1 - 61.1	Repair older homes that have leaking ducts or retrofit entire system.
Energy Star and EEM Homes	358.5 (entire sector)	0.07 - 3.4	1.0 - 50.2	Encourage construction and financing of sound energy efficient whole-home integrated design.
Total		2.4 - 26.6	34.6 - 385.7	

Source: Table 2.12 of the *Maryland Energy Efficiency and Conservation Baseline*

Programs for Existing Homes

Programs to encourage energy efficiency in existing homes are perhaps the most difficult to implement. The energy efficiency rating of a home built in 1950 is very different than that of a home built in 1980. Programs and measures designed to improve upon the energy efficiency of a home will vary in cost and complexity depending on the age and condition of the home. According to the *Baseline*, more than 40 percent of Maryland homes were built before 1950, which most likely means that without significant retrofits the home is lacking sufficient insulation, has old, drafty windows and leaking ducts. The age of the housing stock has significant implications for residential energy efficiency.

The *Baseline* demonstrated that there are five main areas of focus that will provide over 75 percent of the possible efficiency gains: heating, cooling, insulation, ducts, and windows. Heating and cooling improvements included the replacement of inefficient systems. Experience shows that even with substantial subsidies, most home owners are not likely to replace HVAC equipment that is still functioning. For this reason, our programs emphasize the operation and maintenance of HVAC equipment and duct systems and the replacement of windows and insulation. Table 3 outlines the potential direct costs and benefits of implementing energy efficiency programs for existing homes in the residential sector. The cost estimates are based on the first year of programs, at which time there will be a $0.0005/kWh charge applied to residential users.

Table 4: Existing Homes Costs and Energy Savings

Program Description	Year 2 Budget (0.5 mil charge)	Number of Homes Participating	Annual Energy Savings (Tbtu)	Annual Economic Savings $
Hot Water Heater Insulation	$ 258,500	10,000	0.01	$ 149,957
HVAC Tune-Up	$ 390,500	7,000	0.03	$ 578,382
Retrofits	$ 952,188	5,000	0.05	$ 958,110
Energy Check-Up/HERS Program	$ 1,685,750	14,000	0.36	$ 6,295,750
SUBTOTAL EXISTING HOMES	$ 3,286,938	36,000	0.45	$ 7,982,199

I. Operations and Maintenance (Hot Water Heaters and HVAC)

Operations and Maintenance Programs offer the ability to reduce energy consumption with little or no client investment. These programs require consumer education initiatives and partnerships with community organizations and vendors of technologies and services.

Barriers addressed by this program include a lack of consumer education, lack of training and experience by HVAC technicians, and split incentives of owners and renters. The strategy to encourage improved operations and maintenance of water heating and HVAC systems include a combination of marketing, training, and direct incentives. The following programs may be included:

- To encourage the insulation of hot water heaters, local governments and community organizations will be supplied with water heater insulation blankets and pipe insulation to give away to their residents. Distributed with the insulation will be a small, easy-to-read pamphlet of energy saving tips for the home. The goal is to distribute yearly 10,000 water heater blankets, pipe insulation, and pamphlets.

- A media campaign will be designed to encourage consumers to have their HVAC system tuned up. The media campaign will have a dual focus. Part of the media campaign will be designed to create sales and marketing materials for use by HVAC contracts. These pieces will emphasize the value of energy efficient HVAC systems and will stress the importance of tune-ups and repairs. The second component to the media campaign will be much broader, focused on informing consumers and promoting the HVAC tune-up program.

- HVAC companies will be encouraged to enter into a formal partnership with the administrator. All HVAC partners will be provided with free software and training for HVAC technician certification. Included in the training will be information on the appropriate sizing of heating and cooling equipment and the latest developments in energy efficient heating and cooling systems for the residential sector.

- To encourage HVAC service companies to expand their service offerings, training for technicians in performing duct tests and duct sealing will be offered. Additionally, HVAC service companies interested in performing duct tests will be able to purchase the duct test equipment with a 50 percent cost share.

II. Retrofits

Chapter II, the Residential Sector, of the *Baseline* shows the large potential for energy savings with retrofits in insulation and windows. Unless seeking to improve upon the energy efficiency of their home, homeowners rarely look to replace these products without some incentive or guidance. Also, both windows and insulation are well suited to stimulate "real" energy savings due to the lack of a secondary market for used products. These programs will encourage residential customers to take steps beyond the simple weatherization of the home by assisting homeowners with the up-front capital costs associated with these retrofits.

The barriers to retrofit a home with more efficient windows and insulation are the

availability of information and funds. There are also significant split incentive barriers when the renter pays the utility bill and the owner provides maintenance on the home. Also, a third party installer is most often the purchaser of equipment, whereas the homeowner is the beneficiary of lower utility bills.

The strategy for residential retrofits is to inform consumers who are buying new or replacement windows to upgrade to Energy Star qualified products. Economic incentives for contractors and homeowners will help overcome the split incentives barrier. The program might be designed as follows:

- A "split-incentive" program will be put into place where a sales tax credit is available for Energy Star windows, attic insulation of R-38 or higher, and wall cavity insulation of R-11 or higher. The sales tax credit will encourage contractors to purchase Energy Star windows. An additional rebate will be available to the homeowner in the amount of ten percent of the costs of installation with a maximum of $200 per household. The installer incentive will encourage homeowners to install Energy Star windows. Of course, the homeowners would also benefit from the sales tax exemption if they purchase their windows directly instead of working through a contractor/installer. This type of double incentive program would address directly the split incentive barriers.

- A marketing campaign for residential customers will highlight the importance and potential savings of energy efficienct windows and insulation.

III. Energy Check-Up and Home Energy Certification Program

An energy rating measures the energy efficiency of a home by evaluating all of the components of the home, including structure, insulation, heating and cooling systems, air tightness, windows, lighting, and appliances. An energy rating determines how much energy is needed to operate the home on a scale of 0-100 with 100 being the most energy efficient. Home Energy Rating Systems (HERS) provide a standardized evaluation of a home's energy efficiency and expected energy costs. The evaluation is conducted in accordance with uniform standards and includes a detailed home energy use assessment, conducted by a state-certified rater using an advanced set of nationally accredited energy and economic analysis procedures and verified software tools. This process is important to ensure Maryland residents get the most cost-effective energy efficiency measures recommended, as well as to ensure these products are properly installed in their homes. At this time Maryland has very few certified energy raters and there is virtually zero awareness of the opportunities provided through energy ratings. A home energy rating can qualify a homeowner or homebuyer for an Energy Efficient Mortgage (EEM) or an Energy Improvement Mortgage (EIM).

The strategy for developing a Home Energy Rating System program is to create a pool of qualified raters and energy efficiency experts while simultaneously creating a market for the rater's services. The program will provide field technical training and support for new raters

while providing incentives for homeowners interested in completing an energy rating. A HERS program should incorporate the following:

- An energy rating training program which will provide training for rater certification at a low cost to raters.

- Provide zero interest loans for rating equipment payable over three years. Rating equipment (blower door tests, software, etc.) is estimated to be $7500/rater. The loan will be forgiven if the rater completes 40 home ratings/year.

- In the existing home market place, encourage the use of the Energy Check-Up model of training home inspectors to conduct an energy audit to the Residential Energy Services Network (RESNET) standards. This model helps home inspectors to add energy audit information to their normal home inspection reports at a cost of $75 per home. An Energy Check-Up is a lower cost energy audit than a full HERS audit.

- An incentive structure that underwrites part of the costs of energy ratings and energy audits will encourage homeowners to seek this service. A rebate of $75 will be made available to homeowners. This amount will cover the entire cost of the energy Check-Up audit and about one-quarter of the cost of a full rating with blower door test.

- A marketing campaign to realtors and mortgage lenders will be developed to better inform the real estate industry of the value of energy ratings.

New Construction

According to the National Association of Home Builders statistics, there are approximately 25,000 new homes constructed each year in Maryland. While this number represents only one percent of the total number of homes in Maryland, it represents a significant opportunity for energy efficiency. If a home is constructed with energy efficient design initially, the added expenses of retrofits provides energy savings over the life of the home are avoided. According to the residential section of the *Baseline*, an energy efficient home (Energy Star or a home with a Home Energy Rating of 86 or higher) is 30 percent more efficient than a non-energy efficient home. With an average energy cost of $1400 per year and a minimum life of 30 years for a home, cumulative economic savings would equal $12,600 per home, or the equivalent of approximately .7 billion BTUs per home.

The programs described below strive to create an environment where every new home is built to existing code at a minimum and with a long term goal of 25 percent of new homes built to Energy Star standards or higher. Table 5 provides information on the anticipated costs of the programs in year two of the statewide initiative on energy efficiency.

Table 5: New Homes Costs and Energy Savings

Program Description	Year 2 Budget (0.5 mil charge)	Number of Builders, Developers and Contractors Participating	Annual Energy Savings (Tbtu)	Annual Economic Savings $
Building Codes Program	676,500.00	7,000	-	
Model-Builder Program	297,550.00	15	0.01	$ 134,856.18
Builder Education Program	358,600.00	300	0.02	$ 271,083.60
SUBTOTAL NEW HOMES	1,332,650.00	7,315	0.02	$ 405,939.78

I. Building Codes Program

Building codes are an effective and widely used strategy for ensuring that new buildings are relatively energy efficient. Maryland's residential building standards are based on the 2000 International Energy Conservation Code. However, while Maryland's energy codes are up to date, there is good evidence that many of the new homes being constructed are not up to code. A study in Massachusetts found that only 46 percent of newly constructed houses met the overall thermal performance requirement. Education and training programs provided for developers, builders and codes officials will help ensure that new homes are built to code and that they are as energy efficient as possible.

The primary strategy is to promote the enactment and implementation of existing building energy codes through outreach, technical assistance and education, in order to reduce energy consumption in buildings.

- Advocacy and outreach will provide analysis and information about the impact of energy-efficient building codes. These efforts will include periodic evaluations of the current rate of compliance in Maryland and nationwide as well as coordination with national energy codes organizations. Articles on the impact of energy codes will be prepared for trade journals, and an annual conference for Maryland code officials, builders and developers will be organized.

- On-site technical assistance will be available to local jurisdictions and builders to ensure understanding of current codes as well as monitor compliance and changes to the current codes. Three full-time "codes experts" will be available for site visits and technical assistance. These will not be codes enforcement officials. Instead, they will help open the lines of communications between builders,

developers and the codes experts.

- Educational programs for builders and code officials will expand upon current efforts of the Maryland Energy Administration and the Department of Housing and Community Development. Training programs for use of code compliance tools such as MECcheck and COMcheck will be included. Training will be advertised in trade journals and through local industry associations. There will be one workshop a month.

II. Builder Model Home Program

The Builder Model Home Program will work with builders and developers to provide information and incentives for the construction of energy efficient model homes. Building energy efficient model homes and developing a sales and promotional package to see energy efficient options in new home construction will encourage the construction of energy efficient homes and will educate home buyers on the value of energy efficiency.

The strategy to encourage the construction of more energy efficient homes will incorporate the use of a direct incentive aimed at builders and the development of a marketing campaign for energy efficiency that will be carried out by builders and developers.

- To help cover the incremental costs of building and marketing energy efficient homes, incentives of up to $10,000 will be offered to builders and developers who build an energy efficient model home. Energy Star homes and homes with an energy rating of 86 or higher will qualify for $10,000. Additional marketing incentives ranging from $1,000 to $10,000 will be available to builders who build Energy Star Homes. ($1,000 for a builder that builds one Energy Star Home and $10,000 for a builder that builds ten or more Energy Star Homes.)

- Builders and developers will also be provided materials for use in the sale and marketing of energy efficient homes. Sales representatives will be instructed in how to sell energy efficiency as an important attribute in a new home.

- The program will be advertised through appropriate industry associations and trade journals.

III. Builder and Subcontractor Energy Efficiency Education Program

An education program targeting builders and subcontractors will provide information on the design and construction of energy efficient homes. This education program will cover a broad number of topics including a review of new technologies in home construction, appropriate sizing of technologies and practices for construction of an energy efficient home.

The program will include a session on how to make the home more energy efficient without raising the cost to the homebuyer.

Efforts will focus on the development and distribution of educational materials and the development of an educational curriculum to be offered to builders and subcontractors at no cost. The following activities may be part of the homebuilder education program:

- An energy efficiency expert will write articles for periodicals such as the Home Builders Association of Maryland's bi-monthly magazine.

- Tools already available will be purchased and distributed to interested home builders and contractors (e.g., the Energy Efficient Building Association's *Building for Performance* video, a video series on energy efficient building practices, and *Builders' Guide* booklet, a field guide to energy efficient construction).

- A curriculum for builder education will be developed for use in the Maryland community college system. Courses such as *Duct Design, Equipment Sizing and Selection, Installation Standards, Retailer Window Training*, and *House as a System* will be created and made available at minimal cost to homebuilders. This curriculum development will also benefit realtors, lenders and others in the home construction and sales business.

Residential Appliances Programs

The appliance market presents perhaps the largest opportunity for energy efficiency savings in the residential sector due to the ability to achieve relatively fast market penetration. According to the *Baseline*, the average lifetime expectancy of an appliance ranges from ten to thirteen years. Electronic and home office equipment have shorter life spans of three to ten years. The rate at which homeowners purchase new appliances is an important indication of the opportunities for energy efficiency in the residential sector. With each new appliance purchase there is an opportunity to purchase a product that performs the same task with less energy. The objectives of the programs listed below are: to change the consumers purchasing habits; to have consumers place a higher value on energy efficiency when shopping for appliances; and to have 50 percent of appliances purchased be Energy Star models. The key to seeing the shift in the market is education. The table below indicates estimated costs and benefits of the residential appliances programs. Table 6 provides an estimate of the costs and energy savings attributed to the residential appliances program for year two of the state wide initiative for energy efficiency, the first full year for energy programs.

Table 6: Residential Appliances Costs and Energy Savings

Program Description	Year 2 Budget (0.5 mil charge)	Number of Homes Participating	Annual Energy Savings (Tbtu)	Annual Economic Savings $
Energy Star Promotion	$ 4,884,000	200,000	*	*
Appliance Retirement	$ 2,196,590	15,000	*	*
Standards	$ -	2,100,000		
SUBTOTAL APPLIANCES	$ 7,080,590	215,000	0.7	$ 12,306,000

* Both programs work towards an overall increase in Energy Star appliances

I. Energy Star Marketing Campaign

The program will promote the sale and purchase of Energy Star appliances and consumer products primarily through marketing, consumer education, and related activities. The program will be designed to compliment the appliances receiving tax incentives under the Clean Energy Incentive Act, as well as the promotion of the Energy Star label. The long-term goal will be to transform the appliance and consumer producers market to one in which efficient products are the market standard.

Key market barriers to overcome through this initiative are the lack of consumer awareness on the benefits of efficient models; the limited availability of efficient models in key retail outlets; the lack of retailer understanding of the efficiency ratings of appliances; and how to "sell" more efficient appliances with higher up-front costs.

The program will employ several strategies to address these barriers:

- Consumer education on the benefits of Energy Star appliances and consumer products;
- Marketing to raise the market visibility of these products, focusing particularly on promotion of the Energy Star brand integrated with Energy Star marketing in other product areas (e.g. lighting, windows and new homes) to the extent appropriate;
- Retail sales training and point-of-sale materials to help sales people more easily and effectively identify and market the benefits of efficient products; and
- Promotion of existing Energy Star tax incentives.

II. Appliance Retirement Program

Encouraging the sale and use of energy efficient appliances is only half of the equation of changing consumer energy use habits. There are significant secondary markets for used appliances. In particular, larger appliances such as refrigerators, room air conditioners, and clothes washers end up for sale in garage sales or as an additional appliance in the home. To fully appreciate the energy reductions of Energy Star appliances, it is important to use these appliances to replace older models. The appliance retirement program strives to remove older, inefficient appliances from the market place and to provide appropriate recycling and disposal of appliances.

The strategy of the appliance retirement program is to encourage consumers to retire older inefficient models and replace them with Energy Star models. The following activities will support the program:

- The program will work with recycling centers to arrange appliance drop-off dates and find the appropriate use of retired appliances.

- On designated days, residential customers can bring their old refrigerator, room air conditioner or clothes washer to the appropriate location, or pick-up will be scheduled in conjunction with the program administrator. Instead of having to pay a "dumping fee," the customer will be awarded a bounty of between $50-$100 for each appliance. In order to qualify for the bounty, the customer must show the receipt of the replacement appliance along with the accompanying Energy Star label. Energy Star models will not be eligible for the bounty.

- The program will be marketed along with other Energy Star promotional efforts.

III. Expansion of Energy Star Tax Credit

Under this initiative, legislation to expand the *Clean Energy Incentive Act* which provides a tax credit for additional Energy Star appliances and equipment sold in the State of Maryland, would be proposed. As with the existing legislation, the state sales tax would be forgiven at the time of purchase. Appliances considered for the tax credit would be carefully analyzed to evaluate the impact of the tax credit of sales in the state, as well as the cost to the state in revenues lost. The Energy Star label and its implications will be promoted through the Energy Star Marketing campaign. Suppliers of Energy Star products would be informed of the tax credit program and would be offered point-of-sale marketing materials developed specifically to promote the tax incentive.

IV. State-Level Appliance and Equipment Efficiency Standards

The non-profit Northeast Energy Efficiency Partnerships, Inc. (NEEP) has organized a multi-state effort to review the energy efficiency standards for 16 different products and to

analyze the effects of raising the standards. The Maryland Energy Administration has been participating in the Energy Efficiency Standards Project and will continue to participate in these activities on behalf of the State. The appliances for which energy efficiency standards are being considered are:

- Residential central air conditioners and heat pumps*
- Torchieres
- (Ceiling fans)
- Furnace and heat pump fans*
- Electronic equipment and power supplies (standby energy use)
- Unit and duct heaters
- Dry-type distribution transformers
- Refrigerated beverage vending machines
- (Commercial refrigerators and freezers)
- Traffic lights
- Exit signs
- Commercial coin-operated clothes washers
- (Beverage merchandisers)
- Ice-makers
- Commercial air-source packaged air conditioners and heat pumps (< 20 tons)*
- Large packaged commercial air conditioners and heat pumps (>20 tons)

While the state would have to seek an "exemption from federal preemption" to establish state-level standards for the products marked with an asterisk (*), and those enclosed in parentheses are not yet "ripe" for the establishment of a standard, the other ten products are candidates for immediate enactment of an efficiency standard--one that economic analysis has shown to be highly cost-effective. A detailed analysis of the energy, economic, and environmental benefits that the state could achieve shows potential energy savings in the year 2010 of 1,170 GWh, demand reductions in 2010 of 240 MW, and net economic savings by 2020 of approximately $700 million. This analysis assumes state-level standards go into effect in 2004 and 2005. All of the recommended standards are based on some kind of existing standard or program specification, such as standards recently adopted in California; specifications of the Federal Energy Star or Federal Energy Management Program; or an industry standard such as ASHRAE.

The Maryland Energy Administration will continue its work with NEEP on the development of state and regional energy efficiency standards. Where appropriate, MEA will make recommendations for specific appliance standards. These efforts will not duplicate standards-making at the federal level and will only supplement existing energy efficiency standards where practical.

2.4 LOW-INCOME RESIDENTIAL SUB-SECTOR

Maryland currently undertakes limited energy efficiency and conservation programs

targeted to low-income consumers. Under the Maryland Electricity Competition Act of 1999, the Electric Universal Service Protection (EUSP) program was established in the Department of Human Resources (DHR), Office of Home Energy Programs. As envisioned in the statute, a portion of the universal service was devoted to low-income weatherization for EUSP customers for electric usage reduction only. The Public Service Commission determined that the weatherization assistance available would only include traditional weatherization structural activities and exclude lighting and appliance replacement. Because of administrative problems, the program is not expected to deliver services until 2002. The program's effectiveness is further limited by the per customer approach which precludes multi-family dwellings.

The Weatherization Assistance Program (WAP) is a federally funded program to assist qualified homeowners regardless of the type of home heating fuel used. It is currently administered within the Department of Housing and Community Development (DHCD). Although significant increases were provided in the federal appropriation this year in response to last winter's rise in home heating costs, the current rate of deployment will require decades to complete eligible homes.

The Task Force recommends that all existing state programs for low-income energy efficiency and conservation be incorporated with a state-wide energy efficiency program. Under the coordinating agency/administration, programs should be designed to leverage combined funds to address low-income consumer education and access, appliance replacement, multi-family dwellings through community housing organizations, and home heating efficiencies regardless of fuel source. The Public Service Commission should facilitate the effectiveness of fund expenditures within current law with the coordinating agency/administration, and jointly recommend any legislative actions needed to assure delivery of energy efficiency programs to Maryland low-income consumers.

2.5 COMMERCIAL SECTOR

The commercial sector represents 17 percent of total state energy consumption and over 40 percent of the state's electricity useage. According to the energy baseline for the commercial sector, in small commercial enterprises 75 percent of energy used is in the form of electricity. Lighting and space conditioning are the largest source of demand for energy in the commercial industry and are, therefore, the focus of the sample programs listed below.

There are over 85,000 commercial firms in Maryland, the majority of which conduct business from single locations. The vast majority of firms provide employment to a small number of people and are likely to operate in facilities that are only two to three times the size of an average single family detached home. These facts, combined with the recognition that energy costs typically represent less than five percent of the total operating costs, suggest that energy conservation and energy efficiency improvements may not be viewed as being as important as other aspects of business operations and management to commercial owners.

Given the limited size and resources of the typical commercial endeavor in Maryland,

such commercial firms tend to operate on personal (private) knowledge and have limited resources with which to seek out information regarding energy conservation and efficiency improvement opportunities. When this is the case, many of the market barriers dominating the residential market will be prevalent within the small commercial markets.

Lighting, space heating, space cooling, and water heating consume the majority of energy within the commercial sector, and electricity and natural gas represent the predominant energy sources.

2.5.1 COMMERCIAL SECTOR BARRIERS

Some of the most important barriers to energy saving products, services, and practices are presented below.

Energy Costs are Relatively Small. The cost of electricity and natural gas are a small percentage of the total costs required to provide most commercial services. For most merchant wholesalers, retail trade, and service industries, energy costs typically account for less than five percent of total operating costs. Even energy-efficiency investments having high internal rates of return may represent absolute savings too small to attract attention.

Access to funds. Commercial businesses, especially small operations, have limited funds and few reserves to make purchases. Energy efficiency investments may not be a high priority for enterprises, and available capital will likely support other investments that maintain or induce greater productivity from the businesses. Small firms may not have the credit rating required to borrow capital from lending institutions. Lenders may have difficulty gauging the risk and returns necessary to extend credit towards energy efficiency projects since they do not possess the technical expertise. Instead of lending for capital projects, energy efficiency projects ask the lender to lend against the potential savings in energy cost.

Reliability and Risk Aversion. A commercial firm is focused on operating to provide products and services. Retrofits to currently operating equipment that only plays a supporting role may have a significant impact on profitability. Potential energy savings may not be worth risking the loss in profitability or may not represent an acceptable substitute for current equipment that reliably serves the firm.

Information. The superior quality of a product may not be observable to the purchaser. Energy bills do not present line items for the level of energy consumption attributable to each piece of end-use equipment, and savings attributable to specific energy efficiency projects may be difficult to immediately identify. Therefore, the ability to transfer the relative benefits of measures via word of mouth is inhibited. Firms interested in saving energy are therefore largely reliant upon manufacturers' data or contractor knowledge which may be viewed skeptically or assessed to be incomplete. Government agencies, trade associations, consumer guides, and utilities can also provide information.

Lack of Skilled Personnel. Most commercial firms hire personnel to focus on the primary scope of work. Most commercial firms in Maryland have fewer than ten employees. Commercial firms, therefore, may not have knowledgeable personnel on hand to select, install, and maintain the new energy-efficient equipment. Additionally, small commercial firms may not be able to afford additional personnel to focus on the businesses' energy requirements.

Split Incentives. In building leasing arrangements, there are different interests that may provide an incentive for one party to act opportunistically. A building owner whose tenant pays the utility bills has little incentive to supply equipment retrofits since the savings will accrue to the tenant. Likewise, a tenant that pays to occupy building space on a square foot basis has little incentive to act frugally in regards to energy consumption.

2.5.2 COMMERCIAL SECTOR ENERGY EFFICIENCY

Table 7 provides a summary of some energy efficiency opportunities for the commercial sector. In total, these program opportunity areas represent maximum potential cumulative energy savings of 355 TBtu after ten years. All programs can be designed on an incremental basis, and most have the opportunity for significant leveraging with existing efforts. The program descriptions that follow represent a sample of energy efficiency programs that can be incorporated into a Maryland Energy Investment Program. Table 8 provides an estimate of the cost and benefits of these programs in year two with a .5 mills/kWh charge on electricity.

Table 7: Summary of Likely Program Opportunities for the Maryland Commercial Sector

Program Opportunity Area	1999 Primary Energy (Tbtu)	Cumulative Energy Savings After 3 Years (Tbtu)	Cumulative Energy Savings After 10 Years (Tbtu)	Approach (1)
Technical assistance and information	165.6	.2 - 1.5	2.2 - 21.3	Audits and training; fact sheets, case studies, manuals, awareness
Lighting	28.0	.6 - 4.1	5.2 - 53.0	Replace/retrofit aging equipment with high efficiency and Energy Star models.
Space Conditioning	63.6	.2 - .7	3.0 - 128.9	Replace/retrofit aging equipment with high efficiency and Energy Star models.
Space Heating	44.9	.1 - .32	1.3 - 51.9	Replace/retrofit aging equipment with high efficiency and Energy Star models.
Space Cooling	12.8	.1 - .33	1.5 - 66.6	Replace/retrofit aging equipment with high efficiency and Energy Star models.
Ventilation	6.0	-	.2 - 10.4	Duct work, multi-speed motor replacements, variable-air-volume systems (if appropriate) and operational controls
Energy Star Buildings	165.6	.03 - 1.57	.46 - 23.2	Encourage construction and financing of sound energy efficient whole-building integrated design
Total		1.2 - 8.5	13.8 - 355.3	
Other program opportunities and approaches exist in addition to the ones identified in the Table.				

Source: *The Maryland Energy Efficiency and Conservation*

Table 8: Commercial Sector Costs and Energy Savings

Program Description	Year 2 Budget (0.5 mil charge)	Number of Businesses Participating	Annual Energy Savings (Tbtu)	Annual Economic Savings $
Operations and Maintenance	$ 539,000	90	0.01	$ 158,220
Small Commercial Performance Program	$ 1,111,000	100	0.02	$ 316,440
Small Commerical Lighting	$ 1,287,000	100	0.01	$ 246,120
Street Lighting Program	$ 318,200	2,000	0.01	$ 140,640
SUBTOTAL COMMERCIAL	$ 3,255,200	$ 2,290	$ 0	$ 861,420

I. Operation and Maintenance

The goal of this program is to create sustainable, market-driven improvements in the resource efficiency of operation and maintenance ("O&M") practices in existing commercial buildings in Maryland. Operations and maintenance would include HVAC systems, whole buildings systems, sensors and controls, and lighting. This program will be designed to reach out to the small commercial business owner, as well as owners of rental properties. The objectives of the program are: to build market awareness and demand for resource efficient building O&M practices; build the capability for the implementation of such practices; and increase the use of resource efficient O&M in buildings.

Market barriers, which this program addresses include: limited customer awareness and information on the benefits of energy efficiency; internal structural and financial issues within customer organizations; and a lack of skills of building managers.

The program initially employs two key strategies to address these barriers:

- Develop and establish an ongoing program for building operator training and certification in resource efficient O&M practices. Such a program will lay the groundwork for subsequent O&M initiatives and help building owners and managers recognize the value of good building O&M practices. Scholarships for small commercial businesses will be made available.

- Test market intervention initiatives that help customers increase the resource efficiency of their O&M activities in buildings and prepare local case studies for

specific business sectors.

II. Small- and Medium-Sized Commercial Performance Program

Energy services companies (ESCOs) provide energy efficiency upgrades for business entities and help to provide financing agreements to help pay capital costs. The financing agreements can be performance based, where the ESCO is paid depending on the amount of energy saved; or fee-based, where the ESCO is paid a specific fee for specific services. The energy services industry has grown over the past several years, spurred on in part by large government contracts for services in state and federal facilities. With the exception of school systems, which are large enough to command the attention of energy service companies, most local governments have been left out of the energy services market due to their small size and more limited opportunities in energy efficiency. Likewise, the small commercial business does not command the attention of energy services companies. While there are still significant opportunities for energy savings in small- and medium-sized commercial enterprises, the scale of energy savings is generally not sufficient to attract investment by energy services companies. However, as noted in the *Baseline*, over 75 percent of commercial businesses are run from small-sized buildings and offices and with less than ten employees.

The objective of this program is to encourage both suppliers and consumers of energy services to invest in the installation of energy efficiency equipment within their facilities. The program will provide an incentive to energy services companies working with small sites. A small site is defined as a business entity with electricity consumption of one million kWh per year or less.

The participating ESCO would enter into a contract with the Administrator and will receive performance based incentives for eligible energy savings in small businesses. The contract between the ESCO and the business entity will be negotiated independently and can be performance-based or fee-based. Eligible energy efficiency measures must reduce electric energy consumption, and the reduction must be measurable and verifiable. Eligible measures can include lighting, motors, heating and cooling. Ineligible measures would be technologies below federal and state minimum standards and energy savings through operational changes (i.e., changing hours of operation).

The strategy to encourage energy efficiency in small commercial businesses may include:

- Energy efficiency incentives paid to the ESCO for one full year of energy savings. The incentive structure may be a flat rate (five cents per kWh), or it may be determined by technology as in the New York program[11].

[11]The NYSERDA version of this program provides incentives in the range of 10-28 cents. A specific rate would be determined afer a more detailed market analysis of what incentives may

- Monitoring and verification reporting will be required to validate energy savings.

- Aggressive marketing will accompany the program to inform businesses of the value of energy efficiency and to promote the incentive program.

III. Commercial Lighting Program

Modeled after a program already in place in New York, the Small Commercial Lighting Program can help owners and managers of small commercial spaces improve the effectiveness and efficiency of their lighting. The program will provide tools and resources to businesses for lighting upgrades.

The program will employ a strategy that provides information and resources targeted to the small commercial business owner. Program elements may include:

- Tools and resources that give guidance on designing and installing effective, energy-efficient lighting that meets specific needs and provides better illumination;

- Training sessions for distributors and contractors on effective lighting design and implementation;

- Access to participating distributors and contractors who have been trained in the design concepts of effective, energy-efficient lighting; and

- Recognition for projects completed through the Small Commercial Lighting Program, including cash awards for best design and best energy efficiency upgrade.

IV. Traffic Light Program

By replacing old incandescent bulbs in traffic lights with light-emitting diodes, or LEDs, a local government can drastically reduce the amount of electricity needed to illuminate traffic signals. Furthermore, LEDs dim rather than burn-out like incandescent bulbs, thus increasing public safety. LEDs use roughly 85 to 90 percent less electricity than an incandescent bulb and last up to ten years. Traffic lights usually use 150 watts per hour, but LEDs only need 15 watts. The average cost of an LED bulb is $140. Adding in the cost of replacing the bulbs, the total cost per traffic signal is approximately $175. A program partnering with local governments will offer a cost-share initiative where the local government will pay for half of the cost to change the traffic lights and the statewide energy efficiency program funded through electricity charges will

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be required to encourage ESCOs to provide services to small- and medium-sized businesses.

pay for the other half of the costs.

2.6 AGRICULTURAL SUB-SECTOR

Farming in Maryland is as varied as the state itself: truck crops and poultry in the East; dairy and beef in Central and West; and grain, swine, and other products throughout. Because of this diversity there are many different opportunities to save energy and to help farmers increase profit margins. These opportunities range from simple efficiencies of cropping methods that reduce the need for operating heavy equipment in the field, to technologically based solutions such as methane-to-energy projects that can reduce the consumption of propane for heating or for electricity when the gas is used to power on-farm generators. Heating chicken houses for which propane is used even in summer months; pumping for irrigation; running equipment in dairies and feed lots; 24-hour per day grain drying; lighting both indoor operations and outdoor lots; and refrigerating milk and other products are just some of the energy consuming processes that provide energy efficiency opportunities.

Maryland continues a decades long trend of losing not only farms but the total number of acres used in agricultural production. To the degree energy efficiency can make farming more profitable, it can help maintain land in agricultural production, thereby enhancing efforts of the state's Smart Growth Program.

Many of the energy efficiency solutions have associated direct benefits. Manure, or methane-to-energy processes, can divert manure from overburdened soils and help avoid harmful run-off from polluting streams and rivers, and ultimately the Chesapeake Bay. These processes can also solve many of the odor problems that have caused the curtailment of some hog operations. While photovoltaic solar electricity is still more expensive for grid-tied consumers, it is cheaper for some remote applications. In applications where water is pumped for livestock, in addition to providing economical power, it also allows the farmer to fence livestock out of available surface water and avoid both water pollution and bank erosion.

Agriculture is also a potential source of renewable energy. Biomass fuels can be used for heat or electricity production. Some waste products such as manures or toppings from timber are biomass byproducts. Others, such as switch grass, willows, etc., can be grown specifically as a biomass fuel. Grains can be used for ethanol to displace gasoline and diesel in motor vehicles. Biomass fuels are often cleaner than the fuels they displace, thus reducing air pollution. Renewable energy from farms can help reduce our dependence on foreign oil and provide new markets for overabundant commodities. Working with Maryland elected officials, the Department of Agriculture should urge the U.S. Congress to develop a national solution to MTBE that should include repealing the Clean Air Act’s 2% oxygen by weight mandate and establishing a renewable fuel program.

2.7 INDUSTRIAL SECTOR

The major energy-consuming industries in Maryland include chemicals, primary metals, food processing, and paper, with additional large amounts of energy used by many establishments engaged in diverse types of product manufacturing. According to the *Baseline*, the major energy end-uses are process heating (including steam systems), electric motors for machine drives, process cooling and refrigeration, electrochemical processes, facility space conditioning, and facility lighting.

2.7.1 INDUSTRIAL SECTOR BARRIERS

In comparison with the residential and commercial economic sectors, it is widely felt by researchers that the fewest barriers to energy efficiency investment lie in the large industrial sector whose managers are typically motivated by cost minimization and market forces. In general, large industries have more financial and technical resources to identify and address energy issues. Nevertheless, there are a number of barriers to the adoption of energy-efficient technologies in industry, specifically in small- and medium-sized sized businesses.[12] The most important of these are identified below:

Relative importance of energy cost. Although energy is a crucial requirement of production, the cost of energy is a small percentage of the total cost of production of most goods. Therefore, for most industries it is a relatively small cost, although still significant. A possible greater concern is the reliability of energy supply.

Willingness to invest. Energy projects compete with other capital projects for management approval, and even with good past experience using proven technologies, a project to expand production, or for some other purpose, may be chosen over an energy project.

Access to funds. When energy prices are low, there is less incentive to invest in energy efficiency. In addition, energy prices may be subject to large fluctuations affecting the perceived risk of an investment. This may result in higher hurdles for project approval, if it is felt that the energy price might decrease over the lifetime of the project. On the other hand, if price increases or supply shortages are anticipated, an energy efficiency project may be evaluated against a less severe hurdle rate.

Lack of skilled personnel. Firms may find it easier to simply keep purchasing more energy than to find the personnel to select, install, and maintain the new energy-efficient technology. Energy service companies can play an important role by assuming these responsibilities.

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[12]DOE, Interlaboratory Working Group. *Scenarios of U.S. Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond*. LBNL -40533 and ORNL/CON-444, September 1997.

Reliability and aversion to risk. A plant manager's primary concern is to keep the plant operating and producing a high-quality product. The cost of an unscheduled disruption or slip in product quality is great. Whatever its potential energy-savings impact, an innovation would not be accepted unless there was a high level of confidence that it would not decrease reliability.

Invisibility. Unlike investments that increase production capacity, energy-efficiency projects tend to be unseen in the plant or in the product. It may be difficult to demonstrate and quantify their actual impacts.

Information and transaction costs. An energy efficiency project cannot be identified and will not be approved without adequate information upon which to evaluate it. Probably the best information is objective evaluation of its performance in a similar situation. However, these data are usually not readily available except from within the company itself, and manufacturer or contractor data alone are less credible. Access to information is particularly a problem in smaller firms which do not have the staff resources to track new techniques. Government agencies, trade groups, and utilities can be helpful sources of information.

Possible regulatory conflicts. Although energy efficiency technologies generally cause reduced emissions due to the reduction in fossil fuel burned, industry may be reluctant to adopt new technologies that could have unforeseen negative impacts on environmental and occupational health and safety requirements. Also, these other regulatory concerns may reduce the management attention and financial resources that could be applied to energy improvements.

2.7.2 INDUSTRIAL SECTOR ENERGY EFFICIENCY

Various types of program approaches are available for promoting improved energy efficiency in Maryland industry. Notably, many can be leveraged with existing, ongoing programs and efforts by state and federal agencies and private-sector organizations. These include development and demonstration of technology, information dissemination, supporting existing voluntary market promotion programs (e.g., Energy Star), investment-enabling measures, and various types of regulation (i.e., codes and standards). Programs also can be developed or adapted to meet changing conditions or address new markets.

Criteria for selecting potentially cost-effective energy efficiency programs are energy savings potential, need for assistance, and expected benefits for the effort to be expended. Of course, the largest industrial firms that consume a significant fraction of the energy also often have the best ability to analyze, educate, and implement efficiency approaches. Consequently, the smaller firms may be in need of more information and technical assistance with a great deal of untapped potential energy savings. The most likely opportunities for potential programs are outlined in Table 9 below.

Table 9: Summary of Likely Program Opportunities for Maryland Industry

Program Opportunity Area	1999 Primary Energy (TBtu)	Maximum Annual Energy Savings After 3 Years (TBtu)	Maximum Annual Energy Savings After 10 Years (TBtu)	Approach
Technical assistance and information	277.4 (entire sector)	0.5	2.5	Continue/expand existing audits and training; fact sheets, case studies, manuals, awareness
Industrial steam systems	90.0	3.6	18.0	Leverage participation in DOE Steam Challenge, MEA program
Electric motor systems	17.6	0.6	3.0	Leverage DOE Motor Challenge, industry-based Motor Initiative
Industrial lighting	2.7	0.2	1.0	"Green Lights" type promotion campaign
Combined heat and power	21.0 (in 2010)	2.0	10.0	Leverage participation in Federal CHP Challenge
Technology Demonstrations	N/A	N/A	N/A	Partnership in DOE Industries of the Future

Source: Table 4.10 of *The Maryland Energy Efficiency and Conservation Baseline*

In total, these programs could save over 34 TBtu after ten years, or about 12% of current industrial primary energy use. All can be designed on an incremental basis, and most provide the opportunity for leveraging of existing efforts (federal or state).

Regardless of specific program approaches, it is critical that programs emphasize generic, cross-cutting technologies and practices that are broadly applicable to industry, cost-effective, and environmentally favorable. Where possible, these should be coordinated or combined with existing state and federal programs, in partnership with industry and public interest groups. Note that many topics applicable to the industrial sector, such as HVAC improvement, are also applicable to the commercial sector. The estimated costs and benefits for energy efficiency programs in the industrial sector are provided in Table 10.

Table 10: Industrial Sector Costs and Energy Savings

Program Description	Year 2 Budget (0.5 mil charge)	Number of Businesses Participating	Annual Energy Savings (Tbtu)	Annual Economic Savings $
Small Industrial Performance Program	$ 709,500	50	0.01	$ 193,380
Motor Efficiency Program	$ 339,900	150	0.01	$ 92,295
Technical Assistance	$ 1,248,500	60	0.01	$ 200,412
SUBTOTAL INDUSTRIAL	2,297,900	260	0.02765	$ 486,087

Note: The Motor Efficiency Program energy and economic savings do not include savings from motor optimization.

I. Small and Medium Industrial Performance Program

This program is similar in scope to the Small and Medium Commercial Performance Program described above. As with the commercial sector, small industrial businesses do not attract much investment from energy services companies (ESCOs).

The objective of this program is to encourage both suppliers and consumers of energy services to invest in the installation of energy efficient equipment within their facilities. The program will provide an incentive to energy services companies working with small sites. A small site is defined as a business entity with electricity consumption of one million kWh per year or less.

The participating ESCO would enter into a contract with the Administrator and will receive performance-based incentives for eligible energy savings in small businesses. The contract between the ESCO and the business entity will be negotiated independently and can be performance-based or fee-based. Eligible energy efficiency measures must reduce electric energy consumption and the reduction must be measurable and verifiable. Eligible measure can include lighting, motors, heating and cooling. Ineligible measures would be technologies below federal and state minimum standards, and energy savings through operational changes (i.e. changing hours of operation).

The strategy to encourage energy efficiency in small industries may include:

- Energy efficiency incentives paid to the ESCO for one full year of energy savings. The incentive may be a flat rate (e.g., five cents per kWh) or it may be determined by technology as in the New York program (e.g., lighting improvements for five cents per kWh).

- Monitoring and verification reporting will be required to validate energy savings.

- An aggressive marketing campaign will accompany the program to inform businesses of the value of energy efficiency and to promote the incentive program.

II. Premium Efficient Motors Program

In the past, conservation efforts by electric utilities focused on providing rebates and incentives for efficient motor purchase directly to the industrial electric consumer. There is no doubt this approach was effective, albeit temporary. Unfortunately, often as soon as these rebate programs ended, many users and distributors of electric motors returned to their former habits of purchasing (and selling) the least expensive (and least efficient) motor to meet their needs.

Therefore, instead of simply getting industrial and commercial customers to buy premium-efficient motors, this program will educate the consumers so they understand why they should buy a premium efficient motor.

The program has a dual focus. On the sales side, the program will provide sales incentives to electric motor distributors and resellers, as well as training for sales staff. On the purchasing side, there will be training for plant engineers on motor system optimization and for design engineers on how to optimize systems. The activities of this initiative may include the following:

- For each qualifying motor sold, the distribution company will receive $40. For every 15 qualifying motors sold, the company will receive an additional $600 voucher to be used to actually install a premium-efficient motor for the customer of their choosing.

- Sales training will be provided to interested distribution companies.

- Basic training for plant engineers on motor system optimization opportunities and on the use of available software tools, such as Motor Master, will provide a basic understanding of motor efficiency.

- Advanced training for design engineers will provide information on how best to optimize different types of systems.

III. Industrial Technical Assistance

The lack of information and knowledge of available resources is a pervasive barrier in the industrial sectors. The multi-faceted strategy of the Industrial Technical Assistance Program will provide the following training and informational resources to Maryland industries:

- Specialized training will be designed to meet the needs of Maryland industries. The training will include information for plant managers as well as corporate decision-makers and financial officers. Training sessions will include development of an energy management plan, energy efficiency training for specific end-use technologies (e.g., steam systems, process heat, motors, pumps, etc.), and guidance for financing energy efficiency projects.

- A partnership with Maryland universities will model an initiative after the national Industrial Assessment Center process which helps subsidize universities that provide energy audit and efficiency services to small- and medium-sized industries at little or no cost. There are currently no Assessment Center universities in Maryland. Participating universities will receive an annual grant to support a faculty leader who will guide students through energy efficiency audits at little to no cost to the customer. These activities have been highly successful, benefitting both the students and participating companies. The experience under a state program would also give Maryland universities an opportunity to become a national Industrial Assessment Center when the Department of Energy solicits proposals in 2005.

- A marketing campaign will be directed towards industry to publicize the vast array of resources available from the U.S. Department of Energy. These resources include CD-ROM tools, best practices case studies, research and development funding, and technology verifications.

2.8 WATER MANAGEMENT SUB-SECTOR

The process of evaluating energy usage within the state should include study of the energy needs required by vital infrastructure components such as water supply and treatment facilities, and the water distribution infrastructure. The Energy Conservation and Efficiency Task Force notes that the recommendations designed to conserve water issued by the Governor's Water Conservation Advisory Committee will also help reduce energy expenditures required to produce potable water and treat wastewater. The Task Force commends the work done by the Advisory Committee and State Government partners such as the Maryland Department of Environment for its potential for positive energy and environmental benefits.

In addition to those recommendations, as approximately two-thirds of the state's population is reliant upon public and private facilities to obtain water, the Task Force recommends that the state consider energy efficiency programs focusing on public water providers. Programs that promote conservation and efficiency in private water systems that utilize energy, such as well pumps, are also encouraged. Improvements in the existing water distribution infrastructure and possible methane reclamation from waste treatment facilities hold the potential for sizable water conservation and energy savings as well.

The state should also recommend adoption of programs that promote the use of metering and submetering of water use which can produce sizable water and energy savings.

Appendix A

Terms and Definitions

Various ideas circulate when discussing energy conservation, energy efficiency, and market transformation efforts.[1] To provide greater understanding, the following definitions for particular energy-related and market-related terms are extended and employed throughout the Report and *Baseline* study.

Energy-related Terms

Energy Conservation: The case where energy use and the productive output or service decrease in unison.

Energy conservation identifies instances where, through a change in behavior, the actual use of equipment is reduced. The result is that less energy is consumed and the resources providing energy are saved. Importantly, however, the benefits from using the equipment or appliance can be reduced as well.

Energy Efficiency: When either the energy used as an input is reduced while still maintaining a given level of service, or there is an increase in the productive output of a piece of equipment while the same amount of energy is used as an input.[2]

Energy efficiency, therefore, provides a gauge by which similar building and system components, similar pieces of equipment, and various owner/operator practices can be compared to the amount of energy consumed. When the service from the appliance or equipment continues to be produced and utilized while the appliance or equipment uses less energy as an input, an increase in energy efficiency exists. As always, it is important to note that at least the same level of reliability is maintained whenever individual components are replaced within a building or a new piece of equipment is purchased and installed.

Changes in energy consumption nonetheless are also influenced by several interrelated weather, behavioral, and structural effects. These additional effects can make it difficult to specifically measure gains in efficiency. As a consequence, increases or decreases in energy efficiency are assessed and analyzed in a general manner according to energy use rates. Energy use rates, known as energy intensities, are commonly used to provide useful measures of energy

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[1]For a discussion on the concepts of energy conservation, energy efficiency, energy intensity, one source is the following: Department of Energy (DOE), Energy Information Administration (EIA), *Measuring Energy Efficiency in the United States' Economy: A Beginning*, *DOE/EIA-0555(95)/2*, (Washington, DC: U.S. Government Printing Office, 1995), 3-6.

[2]Ibid, 3.

efficiency.

Energy Intensity: The relationship between serviceable output and the energy consumed during use.

Accordingly, energy intensities are ratios between the amount of energy consumed and a "unit" of service or activity, that is, serviceable output. Serviceable output can be measured in a variety of ways, including square feet for building floor space, lumens for lighting, or horsepower for motors. In the residential sector, often the house itself is used as a measurable unit--which results in an amount of overall energy consumption. The energy amounts can be measured using a variety of widely accepted and recognized units including millions of cubic feet (natural gas), barrels (oil), tons (coal), British thermal units or Btus (applicable to a wide variety of fuels) or kilowatt-hours or kWh for electricity. Btus are often used to make comparison across the different fuel sources and virtually all energy measurement units are convertible into Btus. For instance, a measure of energy intensity can be presented as Thousand Btu per square foot of building space.

Market-related Terms

Conserving energy and implementing energy efficiency measures reduce the market demand for energy so that less money is expended on fuels, other things equal. Purchasers of energy that incorporate economical conservation and efficiency measures do not have to spend as much money on energy and can put their freed funds to use towards other goods and services.

The actual level of investment in the marketplace for these energy efficiency measures is less than what is generally considered cost effective. The term "market barrier" is used to explain a set of conditions that result in this energy efficiency gap, the magnitude of which is a source of considerable discussion.[3]

Market Barrier: Any characteristic of the market that helps to explain the gap between cost effective and beneficial levels of investment versus the actual level of investment.[4]

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[3]The term "market barrier" is commonly related to the economic concept of a market failure; however, behavioral and organizational models can also explain this efficiency gap. A market failure results when one of the underpinnings within the theoretic economic construct known as the perfectly competitive market is relaxed. It is within the ideal of a perfectly competitive market that private exchange between buyers and sellers in order to realize personal gains occurs; while, at the same time, the whole welfare of society is maximized by distributing scarce resources to their most productive end uses through the price mechanism. When one of the supports to perfect competition falters and does not hold, then a market failure results.

[4]Joseph Eto, Raph Prahl, and Jeff Schlegel, *A Scoping Study on Energy -Efficiency Market Transformation by California Utility DSM Programs,* Report# LBNL-39058, UC-1322, (Berkeley: Lawrence Berkeley National Laboratory, 1996), 7.

Market barriers may be represented as market failures, organizational failures, or may represent rational behavior (Table 1).[5] Information barriers and transaction costs maybe be the most important of the market barriers. Information is a valuable commodity that tends to be under-provided in the private sector since information has certain public good attributes; the availability or supply of information does not diminish with use; and it is difficult to exclude people from the benefits. Other public goods, in addition to information, are regularly supplied by the government.

Full, or reasonably full, information allows the consumer to be a rational decision-maker. Obviously, there are costs associated with searching and learning about energy efficient products or services or of efficient practices. A decision-maker must be able to weigh the positive and negative attributes of similar, but distinct and substitutable, goods in the marketplace. Perfect information, therefore, allows decision-makers to understand and evaluate any performance uncertainty related to various products, services, and practices. Nonetheless, gathering information on reliability, reputation, and quality to assess claims and compare products may not be feasible, resulting in information asymmetries between buyer and seller.

A separate set of questions, apart from determining the existence and magnitude of any barriers in the market, involves deciding when, to what degree, and for what time period intervention in the market is warranted. An important goal, when designing efforts to stimulate marketplace change, is to ensure that the results of any set of programs continue to exist even after the programs end or are modified--a concept known as market transformation.

> *Market Transformation*: A means by which a market intervention strategy reduces barriers in the market and results in a set of positive market effects. The market effects moreover continue to exist after the intervention strategies are altered or withdrawn.[6]

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[5]A.B. Jaffe and R.N. Stavins, "The Energy Efficiency Gap: What Does It Mean?", *Energy Policy,* May 1994, 804-810, as presented and extended by Steve Sorrell et al, *Barriers to Energy Efficiency in Public and Private Organizations,* Project JOS3CT970022, (Brighton, England: Sussex University, 2000), 22-26.

Joseph Eto, Raph Prahl, and Jeff Schlegel, *A Scoping Study on Energy -Efficiency Market Transformation by California Utility DSM Programs,*10.

Table 1. A classification of market barriers to energy efficiency

Perspective	Sub-division	Barrier	Claim
Economic	Non market failure	Heterogeneity	While a particular technology or measure may be cost effective on average, it may not be so in all cases. This may explain the non-adoption of some technologies within sectors.
		Hidden costs	Engineering-economic analyses fail to account for either the reduction in benefits associated with energy efficient technologies, or the additional costs associated with them. As a consequence, the studies tend to overestimate efficiency potential. Examples of hidden costs include overhead costs for management, disruption, inconvenience, staff replacement and training, and the costs associated with gathering, analyzing and applying information.
		Access to capital	If an organization has insufficient capital through either internal funds or borrowing, energy efficient investments may be prevented from going ahead. In the public sector, additional borrowing may be inhibited by public sector rules. In the private sector, companies may be reluctant borrow due to concerns about the associated risks, the overall restrictions on borrowing and that the financing of projects usually considers other ventures before energy efficiency projects. Where internal funds are available, other priorities may take precedence, thereby also preventing the energy efficient investment.
		Risk	The short paybacks required for energy efficiency investments may represent a rational response to risk. This could be because efficiency investments represent a higher technical or financial risk than other types of investment, or that business and market uncertainty encourages short time horizons.
Economic	Market failure	Imperfect information	Lack of information may lead to cost effective energy efficiency opportunities being missed. This may be considered a market failure in that information has public good aspects, which make it likely that it will be under-supplied by markets. Furthermore, unlike energy supply, energy efficiency can consist of a wide range of complex technologies and services, which are purchased infrequently and for which it is difficult to determine their quality either before or after the purchase. As a consequence, the transaction costs for obtaining and processing information on energy efficiency are higher than for energy supply. Overconsumption of energy may be the result.
		Split incentives	Energy efficiency opportunities are likely to be foregone if the party cannot appropriate the full benefits of that investment. For example, individual departments in an organization may not be accountable for their energy use and therefore have no incentive to improve efficiency.
		Adverse selection	Suppliers know more about the energy performance of a good than purchasers. The latter face difficulties in both obtaining information prior to purchase and verifying performance subsequent to purchase. As a result, purchasers will tend to select goods on the basis of visible aspects such as price, and be reluctant to pay the price premium for high efficiency products. In some cases, inefficient products will drive efficient products out of the market.
		Principal-agent relationships	Principal-agent relationships occur when the interests of one party (the principal) depend on the actions of another (the agent). This type of relationship is pervasive in hierarchical firms. It is characterized by information asymmetry, since the principal lacks detailed information about the activities and performance of the agent and, in particular, about the merits of individual investment projects proposed by the agent. Such monitoring and control problems can lead principals to require stringent investment criteria to ensure that only unambiguously high value projects are undertaken.

Sources: A.B. Jaffe and R.N. Stavins, The Energy Efficient Gap: What Does It Mean?," *Energy Policy*, May 1994; and Steve Sorrell et al, *Barriers to Energy*

Efficiency in Public and Private Organizations, June 2000

Table 1. A classification of market barriers to energy efficiency (Continued)

Perspective	Sub-division	Barrier	Claim
Behavioral	Bounded rationality	Bounded rationality	Actors do not make optimizing decisions in the manner assumed in standard economic models. Instead, constraints on time, attention, and the ability to process information lead to reliance on imprecise routines and "rules of thumb." These economize on scarce cognitive resources. A consequence of this type of decision-making is that that actors may not maximize utility, even when given good information and appropriate incentives. Hence, bounded rationality may be considered as an additional barrier that does not fit into conventional economic models.
	The human dimension	Form of information	The cost of acquiring information is only one aspect of decision-making. Research demonstrates that the form of information is critical. To be effective, information must be specific, personalized, vivid, simple and available close in time to the relevant decision.
		Credibility and trust	Also critical is the credibility of the source and the trust placed in the source. Trust is particularly encouraged through interpersonal contacts. If these factors are absent from information on energy efficiency, inefficient choices will be made.
		Inertia	Agents resist change because they are committed to what they are doing and justify inertia by downgrading contrary information. Individuals also treat gains differently from losses, thereby undervaluing opportunity costs; give greater weighting to certain outcomes than uncertain; and have a strong desire to minimize regret. All these factors cause individuals to favor the status quo. Inertia creates a bias against energy efficiency since (unlike energy purchasing) this involves investing in hardware with uncertain outcomes and represents a departure from the status quo.
		Values	Energy efficiency has clear environmental benefits. Individuals motivated by environmental values may therefore give a higher priority to efficiency improvements than those that are not. Efficiency improvements are most likely to be successful if 'championed' by a key individual within top management. Hence, the environmental values of key individuals is a relevant variable in explaining or organizational performance on energy efficiency.
Organization theory		Power	Organization can be viewed as political systems, characterized by conflicts between groups with divergent interests. The influence of a particular group depends upon its formal authority, the control it has of scarce resources (particularly finance) and its access to information. It is commonly the case that energy management has a relatively low status and is viewed as a peripheral issue by top management. Lacking power, funds and management support, the scope for effective action may be circumscribed. This may constitute an organizational barrier to efficiency improvement.
		Culture	Organizations may encourage efficiency investment by developing a culture (values, norms and routines) that emphasizes and values environmental improvements. This is more likely to be successful if 'championed' by a key individual within top management. Hence, organizational culture is a relevant variable in explaining organizational performance on energy efficiency.

Sources: A.B. Jaffe and R.N. Stavins, The Energy Efficient Gap: What Does It Mean?," *Energy Policy*, May 1994; and Steve Sorrell et al, *Barriers to Energy Efficiency in Public and Private Organizations,* June 2000

Appendix B

Maryland Energy Efficiency and Conservation Baseline

Appendix C

Background and History of Energy Conservation Efforts

Initial efforts to encourage end-users to modify their energy consumption patterns were largely established in the 1970s in response to heightened public awareness of conservation issues, environmental issues, and the rising costs associated with energy production. The public's awareness for the need to conserve energy in part stemmed from rising petroleum demands that outstripped production capabilities and the subsequent oil embargo by the Organization of Petroleum Exporting Countries (OPEC) to achieve economic and political objectives. Conservation and efficiency efforts were also considered an instrument to combat pollution since electricity production, industrial processes, and transportation are the sources of roughly 90 percent of the nitrogen oxides and sulfur dioxides, and roughly 80 percent of carbon dioxide.[1] Moreover, the 1970s were a time of high interest and inflation rates which contributed to the relatively higher capital costs associated with the investment, financing, and construction of new electric power facilities. The construction of a new high cost power plant served to increase the utility's rate base, comprised largely of older, less costly, and largely depreciated assets. The significant rate base increases associated with new plant construction during this period provided a strong financial incentive to explore methods to minimize the need for new plant construction.

Conservation and energy efficiency efforts were fostered and developed within markets and economic sectors through state and federal executive mandates and legislation efforts. Executive mandates and legislative efforts can require minimum fuel consumption standards; require government offices to attain specific energy use reduction goals; or require energy efficiency and conservation efforts to be considered within specific energy markets, such as the natural gas and electric markets. (In large part, similar direct support of energy saving measures in the coal and petroleum energy markets has not occurred since these markets are predominantly competitive and unregulated.)

The efficient use of motor gasoline within the petroleum-dependent transportation sector began with the federal Corporate Average Fuel Economy (CAFE) Standards, which were put in place in 1975, following the 1973-74 OPEC oil embargo, and first took effect in 1978. CAFE standards provide a minimum vehicle fuel economy performance for passenger cars and light trucks. An array of tax incentives and deductions to help defer the costs of alternative fuel vehicle (AFV) purchases was established through the Energy Policy Act of 1992. Federal efforts have also been established with respect to AFVs within local government and private fleets.

In addition to regulatory efforts to improve energy usage within the transportation sector, on-going improvements in the technical efficiency of motor vehicles have also transpired. Over the last decade, engine specific power, that is, horsepower per cubic inch, has improved by

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[1]Environmental Protection Agency, Office of Air Quality Planning and Standards, *National Air Quality and Emissions Trends Report, 1996*, as cited by Alan Nogee et al, *Power Solutions,* Union of Concerned Scientist, (Cambridge: UCS Publications, 1999), 5.

nearly 50 percent.[2] It should be noted, however, that vehicle size over this period has tended to increase, thereby at least partially eroding the gains in engine efficiency.

Regulatory efforts to improve energy efficiency also occur with the implementation of minimum efficiency codes, standards and guidelines for appliances, building equipment, and building envelopes.[3] Federal, state, and local energy codes provide an approval and compliance process for the construction of new residential and commercial buildings. Building codes related to energy use allow for the construction of buildings that use only one-third as much energy through the use of technically feasible and cost effective practices and building materials.[4]

The efficiency standards for major household appliances were first established with the passage of The Energy Policy and Conservation Act (EPCA) of 1975. The Energy Policy Act of 1992 extended EPCA's coverage to commercial applications, including heating and air conditioning equipment, water heaters, certain lamps, distribution transformers, and electric motors.[5] As old equipment wears out and is replaced by new equipment, standards move marketplaces toward higher overall efficiency, and encourage some manufacturers to provide appliances and commercial equipment that surpass the minimum requirements. Greater efficiency over time, which contributes to an upward trend in energy savings, is partially supported by the codes or standards that apply to appliances, building equipment, and building envelopes.

Demand-side management (DSM) programs, typically managed by regulated electric and natural gas utilities, were also established throughout the United States. Consequently, demand-side and supply-side resources were evaluated in tandem so that the set of programs best suited to serve the energy requirements of customers at the lowest cost could be selected. The integration of DSM programs into the utility resource planning process came to be known as Least Cost Planning or more formally as Integrated Resource Planning (IRP). A formal IRP process was implemented in Maryland for the electric industry, designed to select the best portfolio of options to meet anticipated load growth and provide reliable service over a ten- to twenty-year time frame.

Generally, DSM programs are programs implemented by a regulated utility solely within that utility's franchised service territory in order to modify a rate-payer's (i.e., customer's) energy consumption. State regulators initially evaluate the cost effectiveness of DSM programs

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[2]John DeCicco, *It's Not (just) Technology, It's the Market (stupid!): Consumer Information for Promoting Greener Cars,* (Washington, DC: ACEEE, 2000), 6.

[3]DOE, Office of Building Technology, State and Community Programs, "Codes & Standards," Available: http://www.eren.doe.gov/buildings/codes_standards/, (September 25, 2001).

[4]DOE, Office of Codes and Standards, "About the Office – Background," Available: http://www.eren.doe.gov/buildings/codes_standards/aboffbck.htm (September 25, 2001).

[5]Ibid.

and compare these costs with the additional costs of building new facilities. With the introduction of technological and regulatory changes generally in place by the mid-1990s, DSM and utility-sponsored energy conservation activities, as evaluated by commonly used cost-effectiveness tests, became less attractive relative to supply-side options as a means of meeting growth in the demand for electric power.

Establishment and History of Maryland Utility DSM Efforts

DSM programs are principally divided into load management programs and conservation programs. Electric utilities have tended to emphasize load management programs rather than conservation programs, though electric utilities have tended to provide the bulk of the conservation programs.[6] Natural gas utilities principally focus upon conservation programs.

Load management programs target and shift a customer's electric usage away from those times when energy is demanded by customers at a level close to the system's maximum capacity. Typically, energy use is greatest in the late afternoon of a hot summer day or on a cold winter day. Utilities experience seasonal and daily peak energy demands which is when consumers require the largest amount of energy from the utility's system. Load management programs serve to shift energy usage to off-peak time periods, allowing the existing plant facilities to provide energy more steadily and, therefore, more efficiently. The total amount of energy usage is generally not substantially affected and certain load management activities may actually cause slightly more energy to be consumed than would otherwise be the case.

Conservation programs affect energy usage; they are designed to reduce the customer's overall energy consumption. Conservation programs also reduce the amount of energy a utility can sell. The principal focus of utility-run conservation programs is to lower energy consumption during periods of peak demand. While allowing utilities to forestall the construction of new facilities, conservation programs also decrease total energy use.

Natural gas DSM efforts are largely limited in both their breadth and their scope when compared with electric DSM efforts (differences in the technological requirements necessary to provide energy largely accounts for this variation). Electric utilities operate DSM programs particularly to defer investments in new power plants. Natural gas utilities can use DSM programs to defer new storage facilities and transmission system/distribution system expansion. Natural gas DSM efforts were also limited in their time span of operation, when compared to the electric industry, because the natural gas industry undertook restructuring efforts several years before to similar efforts within the electric industry.

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[6]Electricity, unlike most other commodities, must be produced instantaneously in the amounts demanded by consumers. Consequently, electric utilities must build facilities (or enter into contracts for power purchases) to cover periods of peak demand, and hence utilities tend to have excess capacity during the off-peak usage periods. Load management programs provide the utilities with a method to reduce the amount of capacity needed to serve on-peak loads and, to some extent, shift loads to off-peak periods, thus permitting more intensive use of total generating capacity.

Efforts to conserve and utilize energy sources more wisely have been promoted within Maryland since the early 1970s when the Maryland General Assembly: (1) required electric utilities to include provisions for energy conservation in their long range plans; and (2), required the Maryland Public Service Commission (PSC) to evaluate annually the plans on the basis of cost effectiveness. Maryland's electric utilities were specifically required to include "adequate provisions to promote energy conservation in order to decrease or moderate electric demand from the customer."[7]

In the late 1980s, rapid technological improvements in energy efficient end-use technologies (e.g., windows, lighting, heating, and cooling) resulted in the PSC's reemphasis on demand-side resources to moderate demand without affecting customer satisfaction.[8] As well, in 1990, the PSC's review of Maryland's electric utilities' long-range plans indicated that planned DSM programs would, on average, reduce peak load by 9 percent (and peak load growth by 29 percent); however, the DSM programs were only projected to reduce energy consumption by one percent or less.[9] The Potomac Electric Power Company (PEPCO), which serves Maryland's Washington, D.C. suburbs, was an exception with energy savings expected to reach five percent by 2004.[10]

In 1991, a new requirement was established by the Maryland General Assembly that both gas and electric utilities develop and implement programs and services that would encourage the efficient use and conservation of energy by consumers and utilities. Furthermore, the PSC was "empowered to require a utility to establish any such program or service the Commission [found to be] both appropriate and cost effective."[11] Electric utilities prepared and submitted formal integrated resource plans, while natural gas utilities submitted gas purchase and conservation plans.

Regarding the electric industry, Conservation Collaboratives were established from 1991 to 1994 with each of the electric utilities in the state, except Delmarva Power & Light Company (DP&L) which took a slightly different route and explored DSM efforts through its Challenge

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[7]Section 59A of Article 78 (The Public Service Commission Law) of *The Annotated Code of Maryland*, as cited within the PSC, *Ten-Year Plan (1992-2001) of the Maryland Electric Utilities,* (1992), 3.

[8]PSC Staff Comments, *In the Matter of the Investigation by the Commission on its Own Motion of the Legal and Policy Issues Concerning Investments in Conservation and Energy Efficiency by Electric and/or Gas Utilities,* Case No. 8630, March 25, 1994.

[9]PSC, *Ten-Year Plan (1990-1999) of the Maryland Electric Utilities,* (December, 1990), VII.

[10]It should also be noted that load reductions and energy savings cannot be metered and are therefore provided as estimates.

[11]PSC, *Ten-Year Plan (1992-2001) of the Maryland Electric Utilities,* (December, 1992), 4.

2000 IRP process. The Conservation Collaboratives provided a forum for exchanging ideas in a cooperative environment.[12] The collaborative process included Maryland agencies and interested customers, and was used to evaluate existing programs, design new programs, and determine changes within the programs to address structural and market barriers. A goal of the collaborative process was to find as many cost-effective energy conservation and DSM measures as possible, including rebates to individual customers,[13] while providing all customer segments with an opportunity to participate.[14] In Maryland, utilities were compensated for lost revenues as well as provided with financial incentives for their conservation and DSM activities.

Implications of Technological Changes and Utility Industry Restructuring

The natural gas and electric industries can be broadly examined according to three physical functions: production (or generation), long distance transmission (or transportation), and local distribution. Restructuring and technological developments are presented within this framework.

Regulatory changes to restructure the relevant markets were designed to encourage competitive entry in production, to provide equal access to the monopoly transmission facilities, and to unbundle essential services necessary to facilitate competitive entry into the market. Competitive entry permits new supply options that are often presented with lower associated costs. Restructuring at the wholesale level allowed transmission system access on a non-discriminatory basis, among other things (facilitated by FERC Order No. 636 affecting the natural gas industry and Order Nos. 888 and 889 affecting the electric utility industry). Retail restructuring remains within the purview of the states, and movement towards retail open access has been uneven in the electric utility industry.

Technological changes within the electric industry gave rise to the possibility of new, low-cost options for the provision of electric power. The reduction in the size of plants needed to capture scale economies, along with the rise of new efficient modular generation technologies and low natural gas prices, established lower incremental costs associated with constructing and operating new generation facilities. The subsequent comparison of DSM programs and the new options in generation tended to weigh heavily in the favor of new capital projects. Programs designed to save energy contracted while energy supply sources expanded given the change in the economic paradigm.

Therefore, market restructuring within the natural gas and electric industries, as well the technological changes in electric generation, have resulted in the diminution of energy

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[12] PSC, *Ten-Year Plan (1995-2004) of the Maryland Electric Utilities,* (October, 1995), II-9.

[13] Rebates have been a controversial aspect of DSM programs, especially with large industrial customers that present the argument that the costs of the rebate are spread amongst all customers within a class--or even between competitors--while the benefits of the rebate largely accrue to the program participants.

[14] Ibid.

conservation DSM programs, particularly conservation programs that are designed to reduce energy use. At each stage of market restructuring, new low-cost power options availed themselves to the utilities. Moreover, cost-effectiveness tests comparing the cost of energy conservation against these lower cost power supply options generally resulted in the DSM and energy conservation alternative being shown not to be cost-effective. In the face of new and cheaper supply options, it often became less costly for the utility to increase, rather than reduce, generation given that the marginal cost of new generation is below the embedded cost associated with the older, depreciated, existing power plants.

Market restructuring efforts in both the natural gas and electric industry began at the wholesale level and focused on transmission. Restructuring efforts occurred first in the natural gas industry. In 1992, the Federal Energy Regulatory Commission (FERC) restructured wholesale natural gas pipeline service (Order 636). As a result, the owners of the pipeline system that provided transportation services were required to provide equal rates and terms for the transmission service, as well as for the resale of natural gas (i.e., non-discrimination). The wholesale gas market was consequentially open to new entrants who could provide services at lower rates.

Similar federal activity occurred within the electric industry in 1992 and 1996. The Energy Policy Act of 1992 expanded the FERC's authority to order mandatory wholesale transmission service, and in 1996 the FERC opened wholesale power sales to competition (Order Nos. 888 and 889). The actions promoted wholesale competition by limiting the control utilities held over transmission facilities and thus allowed competitors to avail themselves of the transmission system on an equal basis. Wholesale customers were, therefore, provided with new, potentially lower-cost power supply options.

As a result of competition among wholesalers, the utility no longer compared the cost-effectiveness of DSM programs solely to the construction of new power plants. Wholesale competition provided the utilities with alternative supply resources at potentially lower cost. Therefore, the cost effectiveness of DSM programs had to be compared to these newly available, lower-priced generation resources. To the extent that these new supply options were implemented, the economic effectiveness of DSM programs were constrained and reduced.

Retail restructuring efforts began first in the natural gas market in February of 1995 when the PSC and Maryland's three largest gas distribution companies (LDCs): Baltimore Gas & Electric (BGE), Washington Gas Light, and Columbia Gas of Maryland, conducted roundtable processes to unbundle services and implement restructuring within the retail gas market. Natural gas customer choice that allowed commercial and industrial customers the option of choosing their gas supplier was established in August 1995. Currently, all commercial and industrial customers served by these LDCs and over 80 percent of the state's residential customers can choose their gas supplier.[15]

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[15]EIA, *Status of Natural Gas Residential Choice Programs by State as of March 2000: Retail Unbundling - Maryland*, Available: http://www.eia.doe.gov/oil_gas/natural_gas/restructure/state/md.html (September 15, 2001)

Initial investigations into the role that retail competition could play within Maryland's electric markets were conducted in 1996 by the Maryland PSC (Case No. 8738). Three years later, in 1999, The Electric Customer Choice and Competition Act (The Act) was ratified and retail electric competition was launched within the State of Maryland. One requirement of The Act was that utilities sell-off or transfer their power plants to unregulated subsidiaries or unaffiliated entities. Local utilities would continue to provide transmission, distribution, and certain other services, while it was envisioned that end-users would purchase electricity from competing generators at various rates and in different packages.

The Maryland utilities consequently have embarked on selling their generation assets or transferring these assets to unregulated subsidies; as a result, the regulated portion of the utility now consists of the "wires" portion of the old companies: their transmission and distribution systems. The "wires" portion of the utilities now forms the sole basis of any comparison of cost-effectiveness with respect to DSM programs. The bulk of the costs associated with providing and delivering power to an end-user, however, stems from the generation of power. With the elimination of the generation functions from regulation, the PSC no longer determines the need for additional supply resources as was the case prior to implementation of restructuring, and therefore, the relevance and comparison of DSM programs within an integrated resource planning process is limited.

Current DSM Activities

Utility-sponsored DSM and energy conservation plays less of a role now than in the recent past due to changing regulatory policies, current market conditions, and technological innovations. DSM efforts in large part continue to exist in the form of electric load management programs. Most of the natural gas and electric distribution companies continue to provide conservation and energy efficiency information in newsletters, brochures, and on company websites. The section below discusses recent Maryland developments in electric conservation and energy efficiency programs.

DSM Working Group

During the transition to a restructured electric utility industry in the state, the role of electric DSM programs was taken up by the PSC when assembling the DSM Working Group. The PSC recognized the possibility of significant market barriers, particularly for the residential and small commercial customers, and that a public benefit funding (PBF) charges may have to be incorporated within customer rates to facilitate energy conservation and DSM programs.[16] A "PBF charge" is a charge paid by customers in proportion to their usage or through another assessment mechanism. PBF charges are generally measured in mills, i.e., tenths-of-a-cent. The DSM Working Group arrived at a consensus on two points: (1) "that DSM conservation programs, as they are presently justified, administered by regulated utilities and funded by ratepayers, should not be continued in a deregulated electric energy market,"[17] and (2) that future proposals to determine appropriate and cost-effective conservation programs should be

[16]PSC, *Report on Energy Efficiency and Conservation Programs*, (February 2001), 14.

[17]PSC, Hearing Examiners Division - Final Report Concerning the Generic Electric Industry Restructuring Roundtable. Case No. 8738, May 3, 1999, DSM-2.

considered. The DSM Working Group also concluded that existing direct load control programs, such as air conditioner cycling, should continue to be operated by the electric utilities.

The Act

The Electric Customer Choice and Competition Act of 1999 states that the Maryland PSC shall ensure that the adoption of electric choice "does not adversely impact the continuation of cost-effective energy conservation and efficiency programs."[18] The Act further required the PSC to offer a report to the General Assembly on the status of programs designed to encourage and promote the efficient use and conservation of energy, and recommend an appropriate funding level. Impacts on state employment levels, the environment, rates, and cost-effectiveness were also to be considered within the report. The findings of the PSC report are summarized later in this section.

Settlement Process

In 1999, the four investor-owned electric utilities in the state (BGE, PEPCO, Delmarva Power and Light, and Potomac Edison) reached settlement agreements with the PSC with respect to industry restructuring. The settlement agreements conformed with the Act, expedited competitive access, capped rates, provided for standard offer service, and created provisions for the utilities to recapture stranded costs. Standard-offer service is provided to customers that choose not to pursue service from an alternative provider. Stranded costs are utility costs which would be recoverable under regulation, but not within a competitive marketplace.[19] BGE and Potomac Edison, moreover, both agreed to a non-bypassable surcharge on residential customers of up to one mill per kilowatt-hour. The surcharge would fund conservation, renewable resources, and technical assistance programs. To date, that surcharge, and the programs that might be funded with that surcharge, have not been implemented.

The historic DSM surcharge implemented within a regulated utility setting have also been terminated for BGE and PEPCO, but will continue to be collected through 2003 within standard offer service rates.[20] Delmarva Power and Light's DSM surcharge will continue through May of 2002.[21]

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[18]Maryland General Assembly, Senate, 1999 Regular Session, Senate Bill 300, The Electric Customer Choice and Competition Act, April 8, 1999, 7-211(b)(3), Available: http://mlis.state.md.us/1999rs/billfile/sb0300.htm (August 21, 2001).

[19]These higher or "uneconomic" regulated utility costs which become "stranded" with the initiation of competition, can include the cost of uneconomic long-term power purchase contracts that the utility may have entered into long ago, and certain regulatory assets. The PSC verified that these costs were legitimate and prudently incurred under regulation, consequently, within Maryland the utilities have an opportunity to recover a level of stranded costs over a specific period of time.

[20]PSC, *Report on Energy Efficiency and Conservation Programs*, (February 2001), 25.

[21]Ibid.

Commission Working Groups & Report Associated with Restructuring

The PSC generated a report on the current status of programs designed to encourage and promote the efficient use and conservation of energy as required under The Act. PSC staff initially requested program proposals from interested parties. Staff's opinion regarding these proposals was that "the compilation [had] not achieved its purpose and an alternative strategy should be considered and adopted by the Commission."[22] It is noted that several participants in the process, including the Northeast Energy Efficiency Partnership (NEEP) in concert with the Maryland Energy Administration, the Department of Natural Resources, and the Public Service Commission staff (in its final report), each recommended program approaches to promote energy efficiency and conservation in Maryland.

Legislation

Maryland has also enacted the Maryland Clean Energy Incentive Act, which provides tax incentives to state citizens for the purchase of energy efficient vehicles, equipment, and appliances, along with incentives related to renewable energy. With respect to energy efficient equipment, the law provides full or partial sales tax exemptions for electric and hybrid vehicles, high-efficiency HVAC equipment, fuel cells used in buildings to generate heat and electricity, and energy efficient appliances that carry the Energy Star label.[23]

Additionally, the Income Tax Credit for Green Buildings provides a tax credit for buildings that meet certain "green" criteria, including a specified level of energy efficiency, as well as tax credits for solar photovoltaics, wind turbines, and fuel cells associated with these buildings.

Maryland Green Buildings Council

On March 13, 2001, Governor Glendening established by Executive Order, the Maryland Green Buildings Council, in part, to develop the High Efficiency Green Buildings Program to utilize "energy efficiency and environmentally responsible approaches in the design, construction, operations, maintenance, and deconstruction of all new and, to the extent possible, existing state-owned and leased facilities."[24] An additional responsibility of the standing council is to "consider additional state energy efficiency, energy production and sustainability issues and policies."[25]

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[22]PSC, Comments and Exhibits of the Staff of the Public Service Commission of Maryland, Case No. 8738, October 18, 2000, 2.

[23]Maryland General Assembly, Maryland Clean Energy Incentive Act, Available: http://mlis.state.md.us/2000rs/billfile/hb0020.htm, (September 20, 2001)

[24]Governor of Maryland – Parris N. Glendening, State of Maryland Executive Orders and Proclamations – 2001, Executive Order 01.01.2001.02: Sustaining Maryland's Future with Clean Power, Green Buildings and Energy Efficiency, March 13, 2001, Section B, (1).

[25]Ibid., Section B, (6), (b).

Energy Conservation and Efficiency Task Force

On June 1, 2001, Governor Glendening created by Executive Order, the Task Force on Energy Conservation and Efficiency to take up and re-address energy conservation and energy efficiency efforts within the State of Maryland. The Task Force is to provide a report to the Governor which in part would be designed to provide the basis for developing and establishing a set of programs that save energy, address market barriers, and transform markets.

Market Participants

Utility industry restructuring has provided a fillip for the development of energy service companies (ESCOs) that operate to reduce energy consumption for, generally, the larger commercial and industrial facilities. ESCOs can deliver energy improvements by incorporating particular products or services (e.g., high-efficiency lighting or HVAC) within the physical plant of these firms. The dollar value of the resulting energy savings are traditionally split between the two parties. ESCOs, like all businesses, strive to capture the largest profits by targeting particular market segments. Some utilities have also created subsidiaries that operate as ESCOs, benefitting from the experience gained while running the utility-sponsored DSM programs. Concern exists regarding the private market's ability to provide energy savings to small commercial and residential customers.

DSM and Electric Efficiency Efforts in Other States

Twenty-four states and the District of Columbia have either restructured their state's electric industries via legislation or, in the case of New York, with the issuance of a comprehensive regulatory order.[26] California was an early leader in introducing retail restructuring in 1996. Currently, Maryland is one of the states that is in the process of restructuring its electric industry. However, despite the restructuring efforts within almost half the states, the other (26) states have not actually carried out similar structural changes, and, accordingly, the electric utilities within these states are still required to consider demand-side management (DSM) programs as part of the integrated resource planning process.[27]

Electric utility-sponsored energy efficiency efforts have involved all electric utilities, whether they are investor owned, publicly owned, cooperatively run, or federally-managed. In 1997, the Department of Energy's Energy Information Administration (EIA) reported that "the future of electric utility sponsored energy efficiency programs is uncertain due to competition.... [where] a utility would have little incentive to reduce energy sales."[28] At the same time, fewer of

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[26]EIA, "Status of State Electric Industry Restructuring Activity as of September 2001," Available: http://www.eia.doe.gov/cneaf/electricity/chg_str/regmap.html (September 23, 2001)

[27]A majority of the remaining states have commission or legislative investigations ongoing regarding restructuring. The recent supply shortages and drastic price increases in California have seriously suppressed the interest of many of theses states to continue forward with introduction retail competition.

[28]EIA, *U.S. Electric Utility Demand-Side Management 1996*, Document No. DOE/EIA-0589(96), (Washington, D.C.: GPO, 1997), 7. Hereafter referred to as *U.S. Electric Utility DSM.*

the large utilities reported having DSM programs to the EIA. Decreases in the number of utilities having DSM programs were initially two percent per year in 1996 and 1997, but drops in participation increased to 9 percent in 1998, and ten percent in 1999.[29]

The large utilities offered the majority of the DSM programs, and of the large electric utilities, the investor-owned utilities (IOUs) achieved the bulk of the resulting energy savings, as shown in Table 2, below.

Table 2. U.S. Electric Utility DSM Program Energy Savings by Class of Ownership, 1995 Through 1999 (Million Kilowatt hours)

	1995	1996	1997	1998	1999
Investor Owned	48,060	50,382	44,576	43,273	43,704
Publicly Owned	3,218	4,486	4,298	4,130	4,540
Cooperative	230	523	622	51*	578
Federal	5,911	6,452	6,910	1,713	1,742
U.S. Total	**57,421**	**61,842**	**56,406**	**49,167**	**50,563**

Notes: Totals may not equal sum of components because of independent rounding.

* The apparently anomalous 1998 energy savings figure for electric cooperatives is as provided by EIA and no explanation or reason for the value of this figure is available.

Source: Energy Information Administration, Form EIA-861, "Annual Electric Utility Report." As reported within the EIA's "Electric Utility Demand Side Management 1999 Executive Summary," Table 2.

The 1998 and 1999 data in Table 2 are provided for electric utilities with sales greater than or equal to 150,000 megawatt hours (MWh); in the prior years, utilities with sales greater than or equal to120,000 MWh are included. IOUs accounted for 86.4 percent of the energy savings in 1999; publically owned utilities accounted for 9 percent; cooperatives, 1.1 percent; and federally owned utilities, 3.4 percent. In 1999, annual electric sales were 3,312 billion kilowatt-hours, and energy savings from the large electric utilities increased to 50.6 million kilowatt-hours; thus representing 1.5 percent of the annual electric sales.[30] Energy conservation

[29]EIA, *U.S. Electric Utility DSM 1995; U.S. Electric Utility DSM 1996, and U.S. Electric Utility DSM 1997 through 1999 Executive Summaries.*

[30]Calculated from EIA, *U.S. Electric Utility DSM 1999 Executive Summary*, Table 2., Available: http://www.eia.doe.gov/cneaf/electricity/dsm99/dsm_sum99.html (September 24, 2001)

and energy efficiency programs accounted for over 98 percent of this energy savings; load management programs provided the remainder.[31]

Between 1990 and 1997, both energy savings and peak load reductions attributable to utility-run DSM programs were expanding on a national level. Energy savings increased due to growing utility participation rates and an expansion of DSM programs. Energy savings continued to increase even in the late 1990's when the large utilities began to withdraw from offering DSM programs. This was in part due to increasing participation rates within the established programs that were still available to established service customers. Table 3 shows a general decrease in energy savings and peak load reductions attributable to DSM programs. However, it should be noted that the decline in energy savings can partially be explained by new definition and classification of large electric utilities (120,000 MWh to 150,000 MWh of sales in 1998 and 1999). Table 3 also indicates that the cost of energy savings on a dollar per megawatt-hour basis was declining over the relevant time period, suggesting that the remaining programs had greater financial viability.

[31]Calculated from EIA, *U.S. Electric Utility DSM 1999 Executive Summary*, Table 3.

Table 3. U.S. Electric Energy DSM Savings, Actual and Potential Peak Load Reductions, Cost and Cost per KWh in Real 1999 Dollars

	1995	1996	1997	1998	1999
Energy Savings (million KWh)	57,421	61,842	56,406	49,167	50,563
Actual Peak Load Reductions (megawatts)	29,561	29,893	25,284	27,231	26,455
Potential Peak Load Reductions (megawatts)	47,029	48,344	41,237	41,430	43,570
Cost in 1999$ (thousand dollars)	2,269,715	1,817,675	1,593,810	1,401,232	1,423,644
Cost of Energy Savings ($ per MWh)	39.53	29.39	28.26	28.50	28.16

Data for 1998 and 1999 are provided for electric utilities with sales to ultimate consumers or sales for resale greater than or equal to 150,000 megawatt hours; the prior years' data are for utilities with sales of 120,000 MWh or more. Totals may not equal sum of components because of independent rounding.

Source: EIA, Form EIA-861, "Annual Electric Utility Report." As reported within the EIA's "Electric Utility Demand Side Management 1999 Executive Summary," Table 1.

Table 4, below, presents the total number of utilities involved in DSM/energy efficiency programs for the last year for which the EIA conducted the relevant analysis: 1996. The DSM/ energy efficiency programs are described by program type and include the residential, commercial, and industrial sectors. Utilities conducted various analyses to compile a list of potentially useful DSM programs, and determined the cost-effectiveness of the programs using diverse screening methods and company-specific assumptions. Programs continue to be monitored and evaluated, and Table 4 provides guidance into the types of utility-run DSM programs that have been successful throughout the U.S.

Table 4. Number of U.S. Electric Utilities with DSM Energy Efficiency Programs by End Uses and Program Types by Sector, 1996

ITEM	Sectors		
	Residential	Commercial	Industrial
End Uses			
Heating System	278	195	107
Cooling Systems	274	217	130
Water Heating	292	159	101
Lighting	181	214	181
Building Shell	192	128	86
New Construction	207	132	93
Appliances	130	65	42
Motors	--	143	164
Process Heat	--	47	80
Electrolytics	--	9	22
Other Systems	15	22	27
Program Types			
Energy Audits	303	263	198
Rebates	256	196	133
Loans	138	91	62
Other Incentives[1]	83	69	63
Other Programs	50	47	45

[1] This category reflects programs that offer cash or noncash awards to electric energy efficiency deliverers, such as appliance and equipment dealers, building contractors, and architectural and engineering firms that encourage consumer participation in a demand-side management program and adoption of recommended measures.

Notes: Data represent the total number of electric utilities that focus energy efficiency activities on specific end uses and program types.

Source: Energy Information Administration, Form EIA-861, "Annual Electric Utility Report." As the data is presented within EIA, *U.S. Electric Utility Demand-Side Management 1996*, Document No. DOE/EIA-0589(96), (Washington, D.C.: GPO, 1997), Table 4.

In 1996, most utilities reported having more energy efficiency programs for residential customers than for the commercial and industrial sectors. However, the commercial sector programs resulted in the highest energy savings (47 percent of the total) followed by the residential sector, 33 percent; industrial, 17 percent; and other miscellaneous programs (3 percent). These results are quantified in Table 5, below. One interpretation of these data is that the commercial and industrial sector programs produce a larger amount of energy savings per application due to scale economies.

Table 5. U.S. Electric Utility DSM Program Energy Savings by Sector, 1995 and 1996
(Million Kilowatt Hours)

Sector	1995	1996
Residential	20,253	20,585
Commercial	26,187	29,186
Industrial	9,620	10,493
Other	1,360	1,578
U.S. Total	**57,421**	**61,842**

Notes: • Data are provided for electric utilities with sales to ultimate consumers or sales for resale greater than or equal to 120,000 megawatt hours. • Totals may not equal sum of components because of independent rounding.

Source: Energy Information Administration, Form EIA-861, "Annual Electric Utility Report." As the data is presented within EIA, *U.S. Electric Utility Demand-Side Management 1996*, Document No. DOE/EIA-0589(96), (Washington, D.C.: GPO, 1997), Table 5.

Efforts to secure electric energy savings within the 24 states implementing retail restructuring programs are being undertaken in most of the states via a Public Benefit Funds (PBF) charge. One favorable aspect of the PBF is that it can be collected by the regulated "wires" company as a nonbypassable charge. PBFs are used to fund not only a variety of energy efficiency programs, but also other programs including renewable energy, low income customer assistance, and research and development.

For use as a comparison between the states, Table 6, below, presents in four columns the PBF information for 16 states.[32] Other states do not necessarily preclude commercial and/or industrial sector involvement. In Table 6, the first two columns introduce the total budget allocations for public benefit funds and each state's total mills per kWh charge. The next two columns, presented in bold and labeled under the heading "Energy Efficiency Program Sector Funding," provides both the funding allocations assigned directly to energy efficiency programs and, as well, what the comparable mills per kWh charge would be solely for the portion of the PBF delegated for use in energy efficiency programs.

[32]Legislation enacted in New Mexico and Washington, D.C. provide for PBFs (1.1 mills and 0.8 mills, respectively) with allocations to energy efficiency to be determined; moreover, the states of Nevada, New Hampshire, and Texas are considering PBF programs.

Of the 16 states implementing a mills per kWh charge to fund energy efficiency programs, a charge of approximately one mill per kWh is roughly the median for states that have implemented such programs. A one mill per kWh charge is within the band of funding level surcharges provided for within the mid-Atlantic states of Delaware, New Jersey, New York, and Pennsylvania. As noted in the table, the full New Jersey SBC funding level is $235 million (3.6 mills per kWh). About half of the New Jersey amount is to be used to pay for prior incurred costs and one-half on new energy efficiency programs.[33] New York figures, moreover, do not include approximately $100 million per year of energy efficiency under government and power authority programs that would roughly increase allocations by another mill per kWh.

[33]Cherie Gregoire, Valerie S. Milonovich, and Jay Spoor, *State-by-State Restructuring Public Benefits Programs, Interim Report*, prepared be the New York State Energy Research and Development Authority, Energy Analysis Program, (New York: NYSERDA, 2000), 35.

Table 6. State PBF Efforts

State	Total Annual PBF Funds	Total Mills per kWh	Energy Efficiency Program Sector Funding: Funding	Energy Efficiency Program Sector Funding: Mills per kWh
Arizona	$ 28.0	1.4	**$ 8.0**	**0.4**
California	$525.0	3.0	**$228.0**	**1.3**
Connecticut	$117.7	4.0	**$ 87.0**	**3.0**
Delaware	$ 2.6	0.3	**$ 1.5**	**0.18**
Illinois	$ 83.0	0.7	**$ 3.0**	**0.03**
Maine	$ 22.7	2.3	**$ 17.2**	**1.5**
Massachusetts	$160.0	3.7	**$130.0**	**3.0**
Montana	$ 14.0	1.1	**$ 8.9**	**0.7**
New Jersey*	$129.0	1.96	**$ 89.5**	**1.35**
New York**	$150.0	1.5	**$ 83.0**	**0.83**
Ohio	$115.0	0.8	**$ 15.0**	**0.1**
Oregon	$ 60.0	1.9	**$ 31.5**	**1.0**
Pennsylvania	$ 98.0	0.8	**$ 11.0**	**0.1**
Rhode Island	$ 16.5	2.6	**$ 14.0**	**2.1**
Vermont	TBD	TBD	**$ 13.1**	**2.5**
Wisconsin	$111.2	2.2	**$ 62.0**	**1.2**
		(Average) 1.88		**(Average) 1.21**

* Full New Jersey SBC funding is $235 million (3.6 Mills), $107 million will be used to pay off costs of prior programs, with $127 million for new programs in Energy Efficiency, Low Income, Renewable Energy, and R&D.

** New York funding level to be revised for 2002.

Source: Martin Kushler and Patti Witte, ACEEE, *Summary Table of Public Benefit Programs and Electric Utility Restructuring,* March 2001 Update, Available: http://www.aceee.org/briefs/mktabl.htm (October 9, 2001).

The organization and development of energy saving programs within the states that are restructuring varies, but most tend to outline the basic parameters of each target market and describe some of the central programs. Some programs have been determined to operate more effectively and to deliver greater benefits if they are implemented on a statewide basis. A

common rationale used to allocate funds among energy efficiency programs considers each customer segment's energy usage. Some states have discussed placing a cap on the total amount collected for larger energy-intensive manufacturers.

A second approach used in certain other states is to pursue energy savings pivots upon principal end-uses that encompass the broad sector descriptions. Such a viewpoint would develop, for example, a lighting program and apply that program across all economic sectors that require lighting. This approach would be developed when a program administrator with general oversight and responsibility for the set of energy saving programs employs multiple subcontractors to implement the various components of the overall energy efficiency program. The program administrator, who is held accountable for achieving desired outcomes, selects subcontractors with the level of expertise required to design and implement specific programs. Subcontractors are evaluated according to agreed-upon metrics and are subsequently assessed via the achievement of specific market outcomes. A program administrator may take this approach to avoid redundancy and limit the operation and management expenses related to the programs; therefore, a subcontractor's experience may be weighted towards a specific technological application rather than experience garnered within a specific economic sector.

Appendix D

Cost-Effectiveness Tests

Different parties (i.e., utilities, consumers, and society as a whole) will have different criteria by which DSM programs are judged cost-effective and suitable for implementation. State regulatory commissions have developed and approved several standardized cost tests to judge the efficacy of utility-run DSM programs: the utility cost test, the participant cost test, the total resource cost test, and the rate impact measure test.[34] These cost tests are also known by other names, but are designed to rank and prioritize programs around a net present value and cost benefit evaluation. Several of these cost tests can consider costs other than those directly attributable to the consumer implementing a particular measure (e.g., environmental and health externalities). The state regulatory commissions do not always approve all four of the cost tests for use, but rather determine that a subset of the cost tests should be utilized in determining cost effectiveness. Utility-run DSM programs within Maryland have traditionally relied upon the total cost resource test to determine cost-effectiveness. Many of the utilities' traditional tests of cost-effectiveness in comparison to supply options, however, do not apply within a restructured environment.

Below is a brief presentation of the four dominant cost-effectiveness tests included to provide a general understanding.

Utility Cost Test

The Utility Cost Test is used to screen DSM programs that operate within a regulated market structure. The test may be applicable to the regulated "wires" portion of the electric utility in Maryland. The focus of this test is on the utility and not upon any participants within the DSM program; therefore, participant costs are excluded from consideration. The Utility Cost Test measures the net change in the utility's revenue requirement (i.e., that level of revenue requested to cover expenses and provide a reasonable return on invested capital) brought about by a (potential) utility-run DSM program. Within the Utility Cost Test, the DSM costs are compared with the reduction in costs incurred by the utility which result from the reduced energy and demand obligations.

Participant Cost Test

With the Participant Cost Test, the benefits and costs of a DSM program weigh a participating customer's energy bill against any of the expenses incurred by the customer. (Rebates, if determined to be a viable option, are also considered as a benefit to the participant.) If the energy-saving measure saves more money on a customer's energy bill than the expenses undertaken to obtain the energy-savings, then the program is assessed to be cost-effective.

Total Resource Cost Test

The Total Resource Cost Test compares the total amounts that the regulated utility and the participants spend on an energy-saving measure to the total amount of avoided supply side resources (e.g., fuel, new power plant capacity). (Transfer payments between the two groups,

[34]EIA, *U.S. Electric Utility DSM 1996*, 2.

such as reduced rates or rebates are not considered, but all costs associated with the program are weighed.) If the costs associated with supply resources outweigh the DSM program costs, the DSM program is determined to be--in the aggregate--cost-effective, and regulated costumers, on average, would save more money. A DSM program that is cost-effective under the Total Resource Cost test may lead to higher rates, but the rate is more than offset by the overall savings in the average customer's monthly bill.

Rate Impact Measure Test

The Rate Impact Measure Test considers the direction and the degree to which rates change for all customers within a group as a result of the program's implementation. The rate impact measure test is the most stringent cost-effectiveness test. As energy savings increase, rates may increase to allow for utility cost coverage. The Rate Impact Measure Test, therefore, determines the effects not only upon the participating customers that may benefit from an energy-saving measure, but considers the customers that are ineligible or unable to participate, and consequently, not only see higher rates, but higher overall energy bills. A particular measure is assessed to be cost-effective if non-participants see no increase in their utility bills. Sometimes this test is referred to as the "no losers" test.

Appendix E

Recommendations from the Industry Advisory Panel Concerning the Work of the Task Force on Energy Conservation and Efficiency

December 4, 2001

As members of the Industry Advisory Panel for the Governor's Task Force on Energy Conservation and Efficiency, Allegheny Energy, Baltimore Gas & Electric (BGE), Pepco Energy Services (PES), and Southern Maryland Electric Cooperative (SMECO) applaud the efforts of the Task Force to further examine energy use within Maryland and to identify additional energy conservation and efficiency opportunities. We appreciate the opportunity to observe and advise the Task Force as it performs its work, as well as this opportunity to share our experience and expertise concerning energy efficiency and electricity use within the State. We offer the following recommendations for the Task Force's consideration as it develops its proposals concerning future publicly-funded energy conservation programs, and we ask that they be included as an attachment to the Task Force's final report to the Governor.

We are joined in submitting these recommendations by Choptank, Conectiv Power Delivery (Conectiv), Potomac Electric Power Company (Pepco), and Washington Gas Light Company.

RECOMMENDATIONS

- ***The competitive market should be permitted and encouraged to provide energy efficiency services.*** A robust market for energy efficiency already exists within Maryland. Therefore, the use of public funds for the purpose of providing rebates or other financial incentives directly to customers is unnecessary and would be a disincentive to customers, particularly industrial or commercial classes, to invest their own funds in energy efficiency and conservation measures.

- ***Maryland's efforts to encourage energy efficiency and conservation should emphasize the continued development of private sector energy efficiency markets to the point where the State no longer needs to be involved.*** As such, energy efficiency building codes and equipment standards, coupled with the limited and judicious use of tax incentives, should be considered because they will lead to more permanent market transformation.

- ***Any energy efficiency programs must be demonstrated to be cost-effective for participants and should not impose an economic burden on non-participants.*** Specifically, the direct electricity cost savings derived from any expenditure of public funds to reduce electric energy and demand consumption must exceed program costs. Non-pecuniary societal benefits and costs that are impossible to reasonably measure should not be incorporated in any cost-effectiveness analyses. Many of these difficult to measure benefits and costs are already internalized thanks to existing regulations imposed upon electricity suppliers. The Electric Customer Choice and Competition Act of 1999 specifically requires that the implementation of the Act not adversely impact the

"continuation of cost effective" energy programs. Clearly, the Legislature intended that such programs be funded only if they were determined to be cost effective.

- ***Energy efficiency rebates should be avoided in the development of any state-mandated energy efficiency and conservation programs, because they are costly and distort competitive markets.***

- ***Any public energy efficiency programs should be funded from general State funds rather than through surcharges imposed on electric distribution bills.*** The energy efficiency programs contemplated by the Task Force are not limited to saving electricity. They constitute a new, statewide social program and as such, no particular industry should be singled out as the program's collection agent. For example, a home energy efficiency measure such as insulation saves whatever fuel is used to heat the home, i.e., gas, oil, electricity, etc. Therefore, it would be inappropriate to impose the cost of such measures only on electricity customers when based on a per kilowatthour charge. Furthermore, imposing such costs on electricity customers would offset or eliminate electric rate reductions resulting from the transition to competition and would place an undue financial burden on low income customers.

- ***If any additional cost burdens are placed on electric distribution companies, a funding mechanism must be established to provide cost recovery.*** Electric delivery rates have been frozen or capped for these companies well into the future. Additional cost burdens related to the provision of

mandated energy efficiency services would impair the financial health of these companies, unless a timely full cost recovery mechanism is established. Furthermore, surcharges placed on electricity bills should be developed by class-of-service, i.e., those classes of customers eligible to participate in newly offered conservation services should pay for those programs.

- **The Maryland Public Service Commission should continue to be responsible for reviewing and verifying the cost-effectiveness of any proposed publicly funded energy efficiency programs, approving the implementation of programs demonstrated to be cost-effective, and approving any resulting surcharges placed on electric utility distribution bills.** The Commission has historically had these responsibilities and should maintain them. Commission cost-effectiveness review is required by the Electric Customer Choice and Competition Act of 1999, Section 7-211.

- ***Any publicly-funded energy efficiency programs should be evaluated for cost-effectiveness under requirements established prior to the initiation of the program.***

- ***A sunset provision should be established for any publicly-funded energy efficiency programs that may be established so that they will be evaluated and discontinued when determined no longer cost effective and/or when the private sector is capable of providing these resources.*** We recommend that an energy efficiency oversight board be established that includes

representatives of electric utilities, energy industry members, customers and regulators.

- ***Contractors within the market, including non-regulated utility affiliates, should provide any publicly-funded program offerings through a competitive RFP selection process.*** Such a process would support and encourage the existing private competitive energy efficiency industry and avoid the development of costly and unnecessary government bureaucracies.

- ***A publicly-funded energy efficiency education program geared toward residential customers should be a central component of any government-funded energy efficiency or conservation programs.*** Such a program would make the public aware of energy efficiency and conservation opportunities already available in the private sector, and would likely provide near-term energy efficiency benefits.

- ***Utilities and competitive suppliers should be encouraged to offer price-sensitive load programs to permit appropriate price signals to reach customers.***

BACKGROUND

The Industry Advisory Panel's recommendations for the Task Force's consideration are based upon their decades-long involvement in Maryland's efforts to encourage energy efficiency. According to the Maryland PSC Staff, electric peak demand savings attributable to utility DSM programs exceeded 1,802 MW as of 1995

and were projected to exceed 3,000 MW by 2010. (Report On Energy Efficiency And Conservation Programs, Maryland Public Service Commission, February 2001, p. 15.) Assuming that a new power plant has a size of approximately 400 MW and assuming the reserve requirement is 19.5 percent, these utility DSM programs have helped defer the construction of 5.3 power plants in 1995 and are projected to avoid the construction of approximately 9 power plants by 2010.[35] However, note that the construction of power plants is a deregulated market activity and that the actual impact of these DSM programs on the number of new power plants constructed can not be easily predicted.

During the last two decades, the utilities have offered their customers a wide array of energy efficiency and load management programs, ranging from time-of-use electricity pricing to direct control peak demand reduction programs to extensive energy efficiency loan and rebate programs. In addition to providing direct energy and demand savings, these programs have encouraged the development of an active energy efficiency market within the State and have raised the regional market for electricity to a higher efficiency level. Energy efficiency improvements were achieved in all customer segments through utility sponsored efficiency measures impacting end-uses and building envelopes. With the exception of time-of-use rates, all of these energy efficiency program offerings were subject to frequent and rigorous cost-effectiveness screening using methodologies approved by the Maryland Public Service Commission (PSC).

During the 1990s, the electric utilities worked closely with the PSC to establish active conservation collaboratives, comprised of PSC staff, the Office of the People's Counsel, utility representatives, State agencies, and interested customers, to identify, develop and implement cost-effective conservation programs as well as evaluate them.

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[35] It is important to note that the sizes of several recently planned generation plant expansions in Maryland are larger than 400 MW; if these larger plant sizes were used in this calculation, the number of power plants deferred would be reduced.

The Commission reserved for itself the final authority to approve energy efficiency programs recommended by the collaboratives.

By the late 1990s, the number of cost-effective energy efficiency programs declined largely due to a reduction in avoided electric utility capital costs and a transformation of the regional electricity market to a higher efficiency level, which resulted in an increase in the number of program participants who were considered "free riders".[36] When conservation programs were no longer determined to be cost-effective, the collaboratives recommended changes to make the programs cost-effective or recommended their elimination. The Commission decided whether to accept changes to the programs, or to authorize their discontinuance. By 1999, the majority of utility-sponsored energy efficiency programs were determined to be no longer cost-effective and were discontinued by the Commission. The members of the collaboratives were unable to identify additional cost-effective energy efficiency program offerings; therefore, few new programs were recommended and established.

While the extensive Maryland electric utility energy efficiency program offerings of the 1990s provided significant electric energy and demand savings, they also resulted in significant increases in the electric rates of Maryland electricity consumers. Funding for the energy efficiency programs was obtained through per kilowatt-hour surcharges on all electricity bills. The increased costs of electricity for all customers resulting from these surcharges increased the number of customer complaints about the funding of conservation programs, particularly among larger commercial and industrial customers.

In 1999, the Maryland Legislature approved the Electric Customer Choice and Competition Act, which established retail electricity supplier choice for Maryland electricity consumers. As a result of this legislation, Maryland's investor-owned

[36] "Free riders" are program participants who would have made the energy efficiency improvement without receipt of any of the additional incentives provided by a specific conservation program.

electricity utilities entered into settlement agreements with the stakeholders in the restructuring process which established accelerated time schedules for the introduction of competition, addressed utility stranded costs issues, and reduced electricity prices for a "transition period".[37] These settlement agreements were then reviewed and approved by the Commission. As a result of these agreements, the electric generation market in Maryland is no longer regulated; Maryland consumers are free to choose alternate suppliers of electricity; and Maryland electricity consumers are enjoying the benefits of reduced electricity rates.

The Act established an Electric Universal Service Program (EUSP), which created a surcharge on all electric distribution bills to fund arrearage retirement, bill payment assistance, and installation of weatherization measures that reduce electricity consumption. (Section 7-512.1 of the Maryland Public Utilities Companies Article.) The current annual budget for these programs statewide is $34 million.

The Legislature required that the Maryland Public Service Commission, in consultation with the Maryland Energy Administration, prepare a report to the Legislature by February 1, 2001 concerning the status of electric energy efficiency programs and recommending future funding levels. (Section 7-211 (c) of the Maryland Public Utilities Companies Article.) In response to this requirement, on May 12, 2000, the PSC established a proceeding within Case No. 8738 to examine the future of publicly-funded electric energy efficiency programs in Maryland. Extensive oral and written comments were submitted as part of this proceeding. The following organizations offered their comments concerning appropriate publicly-funded energy efficiency programs in Maryland:

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[37] A transition period of three to seven years was established for each utility to ensure the continued supply of reliable, reasonably priced electricity for Maryland consumers during the transition to a competitive electricity supply market.

- Baltimore Gas & Electric Company
- Conectiv Power Delivery
- Allegheny Power Company
- Potomac Electric Power Company
- Southern Maryland Electric Cooperative
- Alliance to Save Energy
- American Council for an Energy Efficient Economy
- Chesapeake Bay Foundation
- Maryland Public Interest Research Group
- National Resources Defense Council
- Northeast Energy Efficiency Partnerships
- Bethlehem Steel
- Eastalco
- Maryland Industrial Group
- Town of Berlin
- U.S. Department of Energy
- Columbia Gas of Maryland
- Curtis Engine and Equipment Company
- Mid-Atlantic Petroleum Distributors Association
- Office of People's Counsel
- Maryland Public Service Commission Staff
- Washington Gas Light Company
- Maryland Energy Administration
- Maryland Department of Natural Resources
- Maryland Department of the Environment

Based upon information gathered through this proceeding, the PSC prepared, in consultation with the Maryland Energy Administration, a detailed report entitled "Report on Energy Efficiency and Conservation Programs" (Report). This report was submitted to the Legislature in February 2001, in compliance with Section 7-211 (c) of the Maryland Public Utilities Companies Article. The utilities suggest that it would be valuable for members of the Task Force on Energy Conservation and Efficiency to review the Report and overall record developed through the lengthy conservation proceeding established as part of Case No. 8738 prior to the finalization of any recommendations to the Governor.

Among the Report's highlights are a number of recommendations regarding the future of publicly-funded electricity conservation programs in Maryland, including:

- Demand side management programs are valuable and in the public interest.

- Customer energy efficiency education substantially assists any conservation effort.
- Continuation of load management programs is desirable.
- Funding for any new publicly funded energy efficiency programs should be provided through the State's general fund or through general obligation bonds rather than through any surcharge on electric utility distribution bills.
- Funding of energy efficiency programs through a surcharge disproportionately affects low income customers.
- A new surcharge would directly reduce the benefits of mandated utility rate reductions.

In closing, the Industry Advisory Panel recognizes the complexity of the Task Force's endeavor. Our experience and expertise are extensive in every aspect of the development and implementation of energy efficiency and conservation programs in Maryland over the last two decades, and we have sought to share that experience and expertise with the Task Force. We appreciate the opportunity to facilitate its deliberations by providing the foregoing recommendations for inclusion in the Task Force's final report to Governor Glendening.