Reducing Delaware's Energy Use Work Group
Report to the Governor's Energy Advisory Council

Reducing the amount of energy Delawareans use through increased energy efficiency is the single most cost-effective strategy for reducing Delaware's greenhouse gas emissions while meeting the state's future energy needs. As shown in figure 1, energy efficiency improvements in building systems such as insulation, lighting, air conditioning and water heating, are among the greenhouse gas abatement actions with the highest returns on investment.

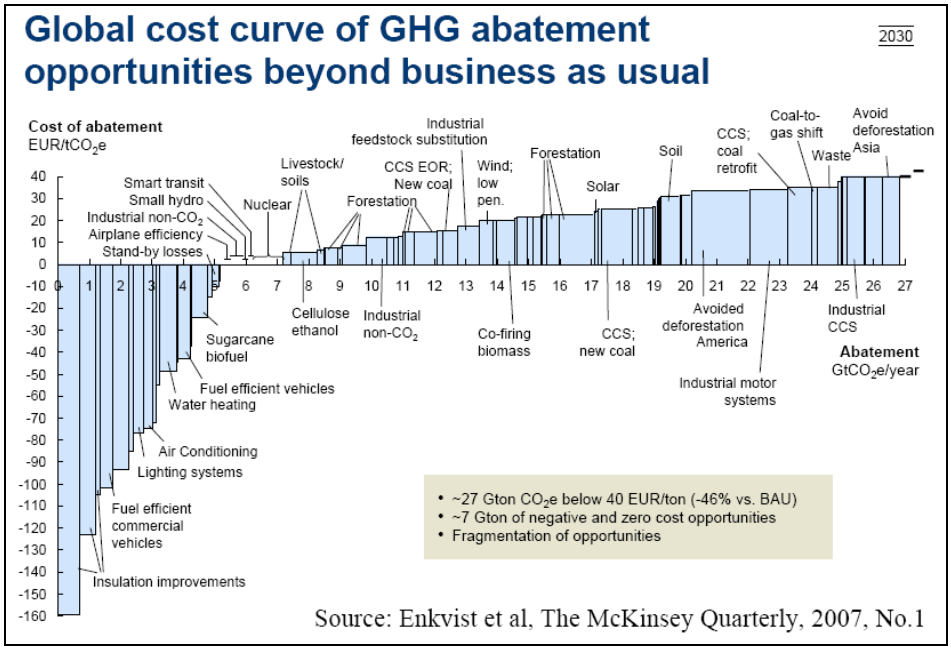


Figure 1

WORK GROUP GOAL, VISION, and OBJECTIVES

Goal: *Halt the growth in Delaware's energy use, and begin to reduce Delaware's energy consumption through energy efficiency, conservation, and distributed renewable energy resources. Achieve energy self-sufficiency and carbon neutrality in Delaware's built environment by 2030.*

Vision: *Sustained actions, starting immediately and pursued consistently over the next 20-30 years to achieve this goal will help create an ecologically viable and economically strong Delaware in which:*

- Residential and commercial buildings are energy and carbon neutral, from their construction through their useful lifespan;
- Delawareans practice conservation and utilize energy efficient equipment, appliances and techniques as standard practice;
- Commercial and industrial buildings are as efficient as feasible;
- Industrial and commercial processes are state of the art in energy efficiency;
- State government demonstrates leadership in energy conservation and efficiency.

SUMMARY OF RECOMMENDATIONS

Recommendation 1: Residential Energy Code

Delaware's Residential Building Energy Code should be updated to reflect the adoption of the most current edition of the International Energy Conservation Code (IECC). Additionally, the Delaware Energy Office should be given the authority through legislation to require an update of the State Building Energy Code to most current IECC every three years based on current code promulgation cycles. Training needs to be provided to all building code officials upon adoption of each update to the code.

[SEU1] Recommendation 2: Retrofitting of Existing Homes for Energy Efficiency

SEU should defray energy efficiency investments of existing homes, both rental units and owner-occupied.

Recommendation 3: Enhanced Energy Efficient Construction of New Homes

[SEU2]3A. The Sustainable Energy Utility (SEU) should finance the incremental investments required for meeting the EPA Energy Star Program requirements (up to an average of $2,500-$3,000).

3B. The State should match the Federal tax credit by extending a homebuilder a $2,000 tax credit for building a home that uses 50% less energy than the 2006 IECC, or the current code if more recent.

[SEU3]Recommendation 4: Energy Efficiency Financing of New Homes

The State should explore, in coordination with the SEU, new energy efficiency financing models of new and existing homes.

Recommendation 5: Expand the Weatherization Assistance Program

Double the budget of the Weatherization Assistance Program (WAP) to enable the program to provide weatherization services to between 800 and 1,000 low-income owner-occupied and rental households per year and shorten the present wait time to 1.5 years by 2016 (or sooner) and enable up to $3,500 to be spent per house.

Recommendation 6: Commercial Energy and Ventilation Codes

6A. Adopt the most recent edition of ASHRAE Standard 90.1 "Energy Standard for Buildings Except Low-Rise Residential Buildings" as our State energy code.

6B. Adopt the most recent edition of ASHRAE Standard 62 – "Ventilation for Acceptable Indoor Air Quality" as our State ventilation code.

6C. The Delaware Energy Office should be given the authority through legislation to require an update of the State Commercial Building Energy Code to most current ASHRAE Standard 90.1 every three years based on current code promulgation cycles. Training needs to be provided to all building code officials upon adoption of each update to the code.

Recommendation 7: State Energy Efficiency Policy

Delaware should create and implement a State Energy Efficiency Policy which would establish a standard for the design, construction, renovation, and operation of all State funded facilities, including schools, to optimize energy efficiency and minimize overall energy consumption.

Recommendation 8: Demonstration Project - Schools

Conduct a demonstration project, in which a school is designed, built and operated to LEED silver or gold standards. Compare the construction costs as well as the on-going operating costs to a typical school constructed and operated to current standards.

Recommendations 9: Combined Heat and Power (CHP)

9A. DNREC should develop CHP regulations for boilers/power plants on an energy output basis.
9B. Develop a set-aside of allowance allocations for energy efficiency and renewable energy in Delaware's NOx and CO2 trading programs.

[SEU4]Recommendation 10: Energy Efficiency Education Program

The Sustainable Energy Utility (SEU) should develop a comprehensive education program to inform Delawareans on energy efficiency that includes:

- *Energy efficiency steps targeted to different sectors of the economy that would include information that these groups could use to increase their energy efficiency, including easily achievable, cost effective actions;*
- *Behavioral aspects of maximizing energy efficiency and conservation;*
- *Information about the SEU as a comprehensive source of support for efficiency, conservation and renewable;*
- *Information on additional programs available from other sources, such as tax credits, deduction or rebates;*
- *Information about the scope and potential of distributed renewable in the State.*

Recommendation 11: Energy Efficiency Resource Standard

The PSC should conduct a study considering emplacement of an Energy Efficiency Resource Standard (EERS) to insure energy efficiency is treated equal to new energy supplies. The results of the study should then be reported to the Governor's Energy Advisory Council

Recommendation 12: Demand Response

12A. Support deployment of demand response, AMI and Smart Grid technologies, with dynamic pricing, by ensuring that this demand response effort continues through to completion statewide.
12B. Support efforts, currently underway, by the utilities, the Public Service Commission and other stakeholders to create a decoupling mechanism that will remove disincentives to the utilities to promote demand response, load management and energy efficiency. The impacts on low-income households need to be factored into the program specifics.

Recommendation 13: Energy Efficiency in PJM Capacity Market

Support development of a program for meaningful participation of energy efficiency in PJM capacity markets. Encourage participation of Delaware energy efficiency providers in the capacity market.

[SEU5]Recommendation 14: Distributed Renewable Energy

Support the SEU's goal to install customer-sited renewable energy as a mechanism to reduce transmission and distribution energy losses, dependence on the grid, peak demand, and Delaware's carbon footprint.

WORK GROUP COMPOSITION

The work group was developed to represent a diverse group of building design, construction and management companies, utilities, state and local government, universities, energy or environmental non-profits, citizen groups and energy consultants. Members of the workgroup are shown in appendix A.

WORK GROUP PROCESS (May through December, 2008)

The work group held monthly meetings, initially focused on providing background information and education to work group members on relevant topics. Later meetings focused on discussion of goals and objectives, identification of potential recommendation topics, review and discussion of recommendation "strawman proposals" developed by work group members, and finally, decisions on recommendations to forward to the Governor's Energy Advisory Council.

Presentations given to the work group and meeting notes were posted on the energy plan website (http://www.dnrec.delaware.gov/Admin/Pages/DelawareEnergyPlan.aspx) so members could keep up to speed if they needed to miss a meeting.

BACKGROUND INFORMATION

Energy Use and Energy Efficiency:

The State of Delaware has long recognized the importance of energy conservation and efficiency. In its 2003 assessment, the Governor's Energy Task Force found that "energy efficiency is Delaware's largest potential energy resource."[1] This finding is also the conclusion of the Reducing Delaware's Energy Use Work Group.

Since 1970, a substantial portion of the increased demand for energy services in the U.S. has been satisfied from continued improvements in energy efficiency. Figure 1 shows the relative contribution of various resources, including energy efficiency, toward meeting demand. Without those improvements in energy efficiency, total energy demand today would likely be 50% higher.

The trend in Figure 2 also provides evidence that economic development is not linked to energy demand. Between 1970 and 2005 the Gross Domestic Product of the United States grew by 195% while energy consumption grew by 48%.

[1] Governor's Energy Task Force, State of Delaware, Final Report, September 2003, p. 46.

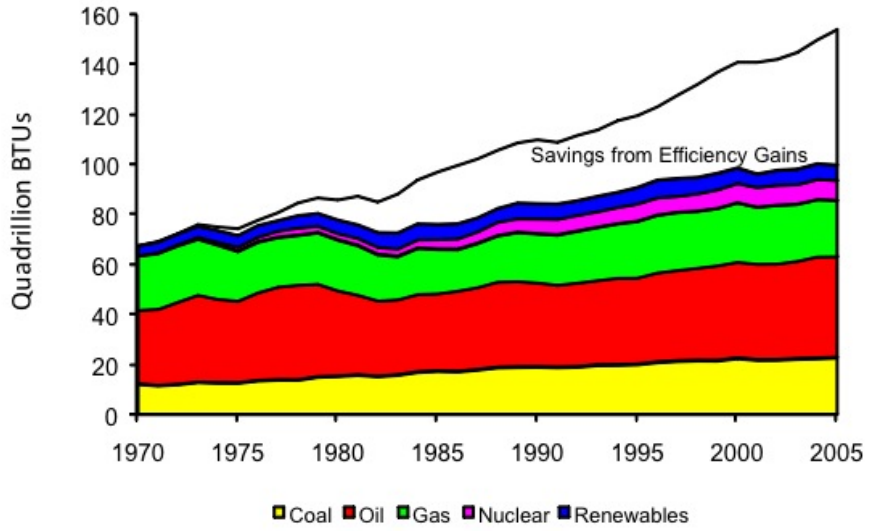


Figure 2: Energy Efficiency Gains Since 1970[2]

The importance of energy efficiency in arresting climate change additionally establishes its priority for State policy beyond that of simply managing energy supply. Projections by the Inter Governmental Panel on Climate Change (IPCC) (Figure 3) indicate that energy efficiency has the potential to reduce CO_2 emissions by 51% in the coming years. This finding is based on several factors: 1) energy efficiency and conservation are the lowest cost means of reducing CO_2; 2) the option requires the shortest lead time to implement of any low/no carbon alternative; 3) it significantly lowers energy cost and, thereby, improves competitiveness; and 4) it is the one option available for use in all sectors, across all fuels, and without geographic constraints.

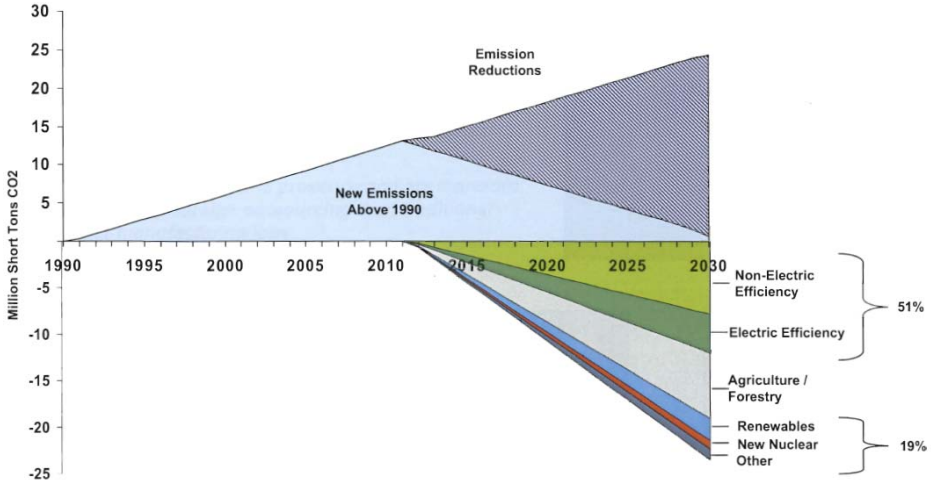


Figure 3: Projection of CO_2 Emission Reductions from Several Sources[3]

[2] Source: Center for Energy and Environmental Policy, University of Delaware

[3] Source: IPCC, 2007. Mitigation of Climate Change. Data for Figure 2 compiled from the IPCC report by staff of the Center for Energy and Environmental Policy, University of Delaware.

Total energy use across all sectors of Delaware's economy was 312.6 trillion BTUs in 2005, with a per capita use of 372 million BTUs. The US average 2005 per capita energy use was 339 million BTUs; Delaware ranked as the 19th largest per capita user of energy.[4] Delaware also ranks poorly when compared to neighboring Mid-Atlantic States, as shown in Table 1.

Table 1: 2005 Per Capita Energy Use in Mid-Atlantic States[5]

Delaware	372 million BTU
Maryland	279 million BTU
New Jersey	315 million BTU
Pennsylvania	327 million Btu

For the 2003 *Bright Ideas for Delaware's Energy Future* report, 1999 energy use figure were the most recent available. Total energy use in Delaware in 1999 was 280 trillion BTU's and per capita use was approximately 357 million BTUs. Over the six year period between 1999 and 2005, rather than becoming more energy efficient, per capita energy use increased 4.2%.

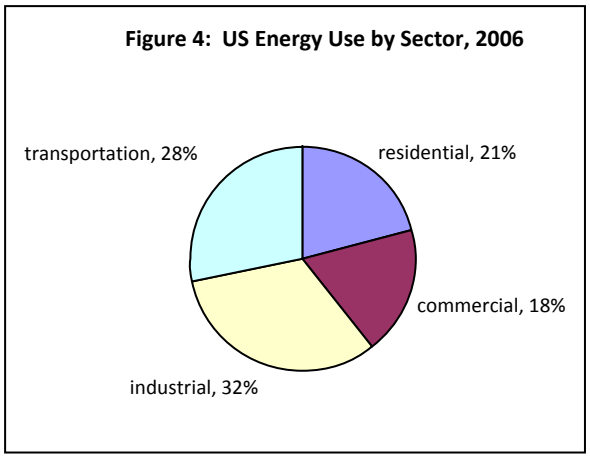
The most energy efficient states, Rhode Island, New York and California, has 2005 per capita energy uses of 213, 217, and 232 million BTUs, respectively.[6] Per capita energy use in each of these states is less than two-thirds that of per capita use in Delaware.

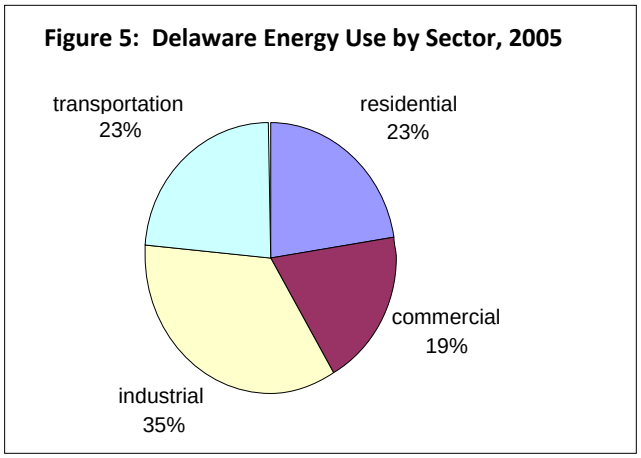
One reason why Delaware's per capita energy use is relatively so much higher is the ratio of industrial energy use to the small population as compared to the other states. Even accounting for that, great opportunity exists to increase the energy efficiency of Delawareans.

Energy Use by Sector:

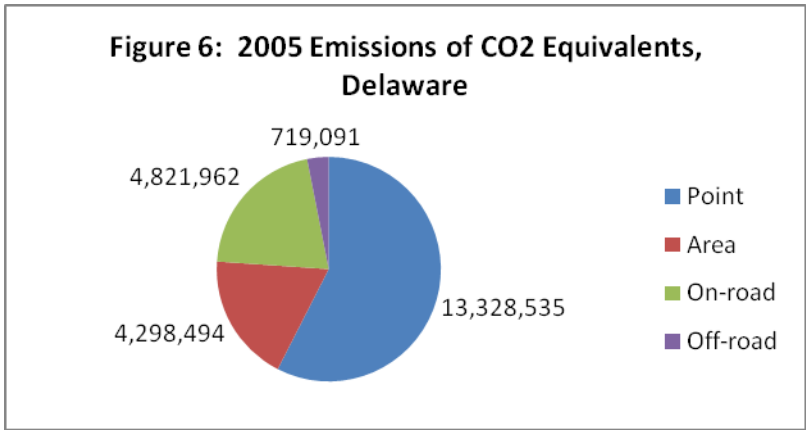
Energy use in Delaware is distributed among the economic sectors similarly to the overall national distribution. In Delaware, less energy is used, relatively, for transportation, and more in the residential and industrial sectors, Figures 4 and 5 below. The change in Delaware between 1999 and 2005 were 3% increases in the percentage of energy used each in the residential and commercial sectors (from 20-23% residential and 16-19% commercial) and decreases in the percentages used industry and transportation (from 39-35% industrial use and 25-23% transportation).

[4] Energy Information Agency. US information: http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=DE#Datum.
[5] Energy Information Agency. US information: http://www.eia.doe.gov/emeu/aer/pdf/pages/sec2_2.pdf.
[6] Ibid.





Carbon dioxide (CO2) emissions are closely related to energy use. Figure 6 shows the 2005 emissions in Delaware broken down by type of source. On-road and off-road represent emissions from transportation sources, point sources include emissions from utilities and other power generation systems, covering the commercial, industrial and residential sectors. The emissions related to the commercial and residential sectors are mainly building-related emissions; industrial emissions include both building and processing related emissions.



Source: Delaware DNREC, Air Quality Management Section, 2005 GHG Inventory Summary 9-15-08

Energy Use Projections: [7]

The two main non-transportation forms of energy used by consumers in Delaware are electricity and natural gas. The 2003 *Bright Ideas for Delaware's Energy Future* report predicted that by 2010 there would be an 18.5% growth in electricity consumption and an 8.8 % growth in natural gas consumption. Where the State stands on each of those is discussed below.

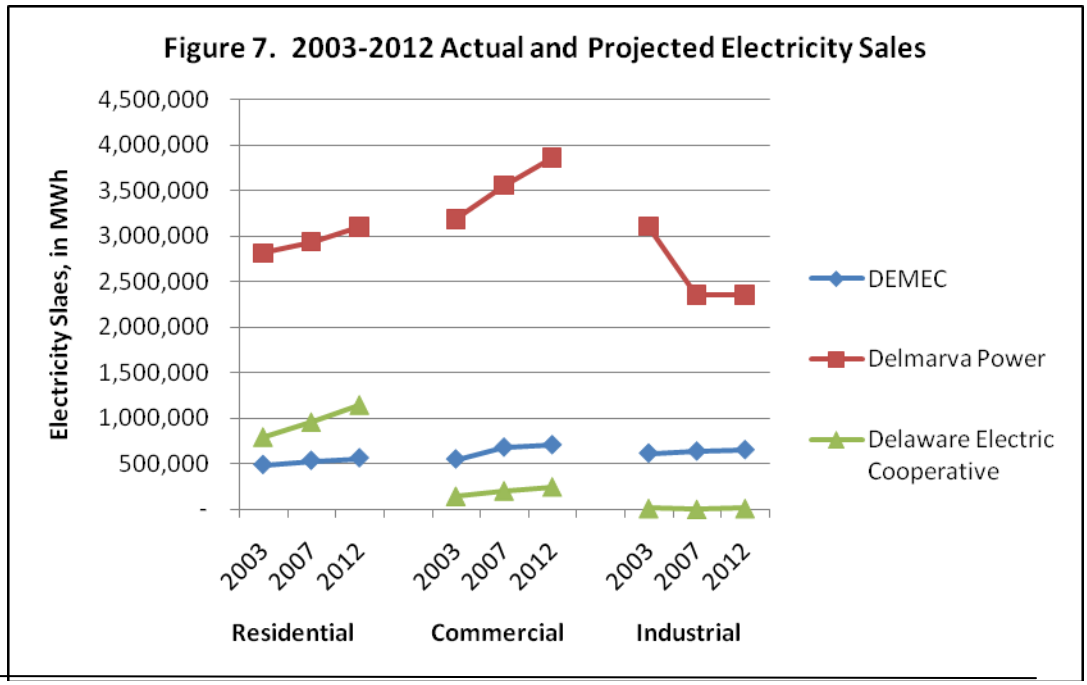
Although other fuels are used, including propane and fuel oil (mainly for heating), the use of these is much smaller than that of electricity and natural gas. Projections for these fuels were not included in the 2003 report, nor addressed here.

[7] Data supplied via e-mail by each company/organization.

Electricity

Statewide, electricity sales grew 1% between 2003 and 2007, with projected sales growing an additional 7% by 2012, much lower than the 18% projection noted above. Sales projections reflect kWh sold, thus representing changes in consumption and numbers of customers. Both the number of customers and consumption by residential users grew 8% between 2003 and 2007. Commercial use showed the largest growth, 12% in number of customers and 15% in consumption. Industrial sales fell 20%, even though the number of industrial customers increased 101% (the growth in customers is attributable to a large increase in the number of industrial customers purchasing from Delaware Municipal Electric Corporation providers). The reduction in industrial energy use was the main driver for the reduced projection.

Figure 7 represents the growth in electricity sales for Delmarva Power, Delaware electric Cooperative and Delaware Municipal Electric Corporation (DEMEC). Both actual sales between 2003 and 2007 and projections through 2012 are included. As shown in the graph, both residential and commercial sales have increased and are projected to continue to increase. Industrial sales have either held fairly constant or, in the case of Delmarva Power, significantly decreased between 2003 and 2007, and are projected to remain fairly constant.

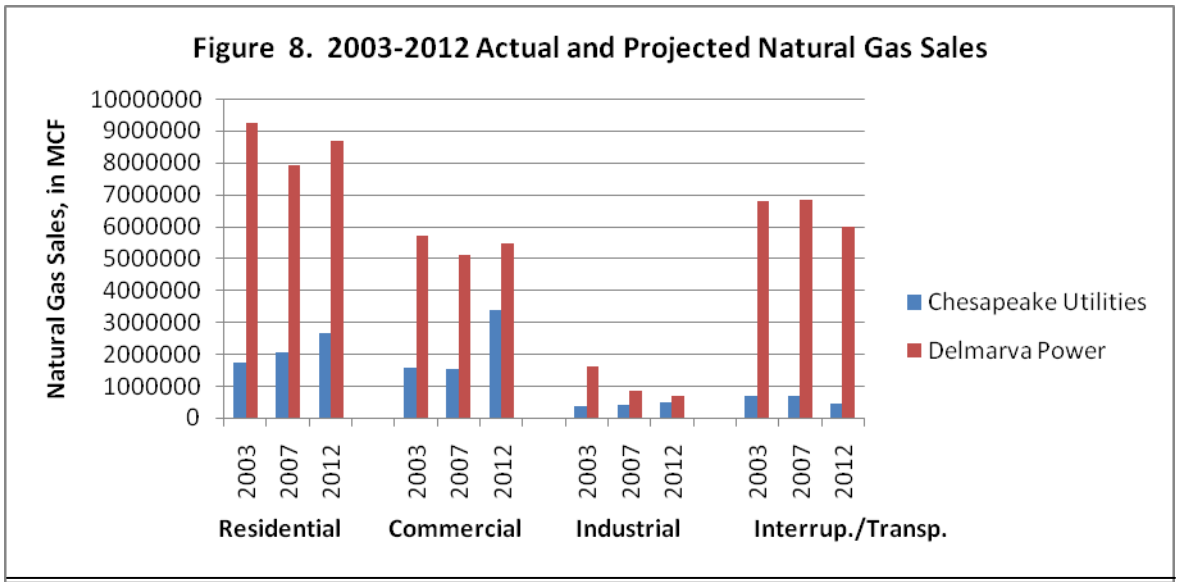


Natural Gas

Statewide, natural gas sales fell 8% between 2003 and 2007, with a projected statewide increase of 10% between 2007 and 2012. Sales projections reflect MCF of natural gas sold, thus representing changes in consumption and numbers of customers. The actual and projected sales for Chesapeake Utilities and Delmarva Power, broken out by customer class, are shown in Figure 8.

The sales for the two companies show different trends due mainly to their respective geographic locations. Over the 2003 to 2007 period, sales for Chesapeake Utilities have increased 7.9%. Sales projected for 2012 would represent a 62% increase from 2003 levels. Chesapeake is

generally located south of the C&D Canal, where the most growth is occurring. Delmarva Power, located in the mainly grown-out, northern region, saw a decrease in sales of 11% between 2003 and 2007. Less than 1% growth is anticipated between 2007 and 2012.



Changes in Policies and Challenges Between 2003 and 2008:

Policy Changes

Many of the recommendations in *Bright Ideas for Delaware's Energy Future* were implemented. An update on the status of the recommendations is included in Appendix B. The *Ensuring Delaware's Energy Future* report, issued in 2006, was developed via Executive Order 82, in response to the rate increases following the removal of the electricity rate caps. The report included recommendations for specific actions, both for consumer costs and energy efficiency, to address the impacts of the rate increases on customers. These recommendations resulted in creation of the Energy An$wers program.

In 2006, $8 million was allocated to the Department of Natural Resources and Environmental Control for rebates for the purchase energy efficient appliances and equipment for both homes and businesses, what was then titled, "Energy An$wers".

- By the end of the program in 2008[8], over 71,000 Delawareans participated in the program compact fluorescent light bulb initiative ("Flip the Switch Delaware"), with 142,680 compact fluorescent light bulbs distributed through the state's libraries. Potential energy savings from the program are 40,239,144 kWh of energy, valued at $4,023,914. These savings would prevent emissions of 63.5 million pounds of greenhouse gases, the equivalent of removing 2,258 cars from the road for 1 year.
- The Energy An$wers for Home Appliances program had over 4,500 participants, with approximately $1million paid in average grants of $160. The estimated savings over the life of

[8] The program was de-funded due to State budget issues, therefore the full $8 million was not expended.

the appliances will be over 28 million kWh and 39 million pounds of CO2. The cost of the appliance efficiency calculated out at $0.03/kWh.

- The Energy An$wers for Business program had 31 completed and pending projects totally approximately $1.2 million in grant funds. [9]

Delaware's Sustainable Energy Utility - Institutional and Financial Mechanism for Energy Efficiency, Conservation and Distributed Renewable Energy

The other significant policy action was creation of the Sustainable Energy Utility (SEU) by the legislature in 2007. The SEU is a pioneering effort by the State of Delaware to create an *institution* to comprehensively plan, develop and implement energy efficiency, energy conservation and distributed renewable energy programs in a self-sustaining manner. As show in Figure 9, the SEU model is an alternative to the conventional approach to energy efficiency, which has treated various aspects of the energy system as distinct "silos" with limited overlap and coordination between them.

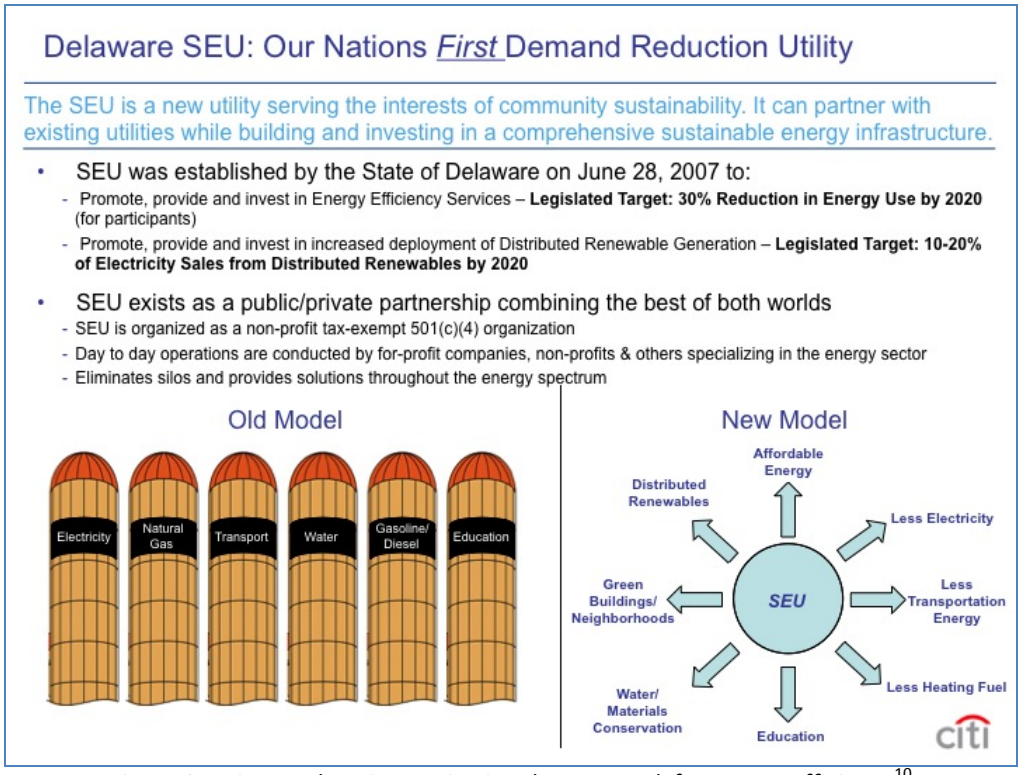


Figure 9: A Comprehensive Institutional Framework for Energy Efficiency[10]

In addition to a comprehensive institutional structure, the SEU was created with a mechanism to channel investments to these areas in a *self-sustaining manner*. Realizing energy efficiency requires investments at the time of building construction, retrofitting or appliance purchase in the built environment. For transportation, a host of additional decision points can be targeted for investment

[9] Philip J. Cherry, Delaware, DNREC, "Funding Energy Efficiency Efforts in Delaware," presentation to the Reducing Energy Use Work Group, June 16, 2008.

[10] Citi Municipal Securities, Green Community Program, p. 64.

incentives. Efforts to "green" the vehicle fleets of government and large companies and to incentivize use of public transit, car-sharing, van pooling and employee commute options that can lower emissions could be supported through SEU investments.

From a financial perspective of risk and return on investment, the merits of energy efficiency are now clearly recognized. As seen in Figure 10 the only investment that offers lower risk than energy efficiency are U.S. treasury bills (T-Bills). In terms of rate of return energy efficiency out performs all financial instruments. But unlike T-Bills, energy efficiency maximizes return on investment while minimizing risk.

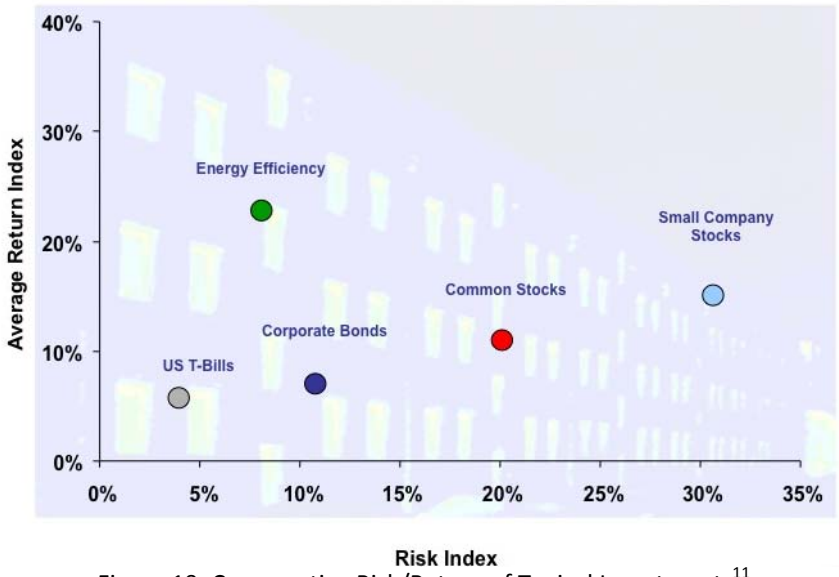


Figure 10: Comparative Risk/Return of Typical Investments[11]

Building on the strong financial foundations of energy efficiency investments, the SEU will incentivize energy efficiency investments in all sectors and for all fuels by providing the investment required to install energy efficiency measures at reduced or no initial cost to residents, businesses, state and local governments, school districts, community organizations etc. This is enabled by a mechanism that shares the savings for a limited time between the participant and the SEU. This arrangement helps refinance the SEU, which is then able to further incentivize a new round of energy efficiency investments. After the shared savings period, all savings will accrue to the participant.

This financing structure is the key to the SEU self-sustainability model. It provides the potential to self-finance so that investments in energy efficiency and distributed renewable energy are not curtailed based on the availability of limited public monies.

Federal Appliance Standards

The 2007 Federal Energy Bill updated the appliance and equipment efficiency standards and added efficiency standards for the following products:

- General Service & Reflector Lamps (Light Bulbs)
- Residential Boilers

[11]Ehrhard-Martinez, Karen and John A. "Skip" Laitner "The Size of the US Energy Efficiency Market: Generating a More Complete Picture." (ACEEE). May 2008.

- Clothes Washers
- Dishwashers
- Dehumidifiers
- Electric Motors
- Metal Halide Lamp Fixtures
- Walk-in Coolers and Freezers
- External Power Supplies

The updated and new standards will significantly improve the appliance energy efficiency required nationally and go beyond requirements currently in place in most, if not all states. According to the American Council for an Energy-Efficiency Economy, the standards will save at least 2.0 quadrillion Btu's in 2030 and reduce CO2 emissions by 135 million metric tons.[12] At this point, there is no need for Delaware to develop separate appliance standards.

Energy Challenges in 2008

The energy challenges facing Delaware in 2008 are similar to those posed in 2003:

- *Increasing Energy Demand*

  Although growing more slowly than in 2003, Delaware is still facing a higher-than-national-average population growth, resulting in increased demand for energy services.

  Although many new homes are being built more energy efficiently, average house size has increased, as has the number of electricity-based products in homes.[13]

- *Increased Energy Cost*

  Removal of the electricity price caps, $100/barrel oil, and rising natural gas prices have significantly increased average home and business energy costs in Delaware since the initial energy plan in 2003. This challenge is more significant now than during development of "Delaware's Energy Future".[14]

- *Environmental Issues & Climate Change*

  Energy generation and use is the single largest contributor to pollution, smog and greenhouse gases in Delaware and nationally.

  Public awareness of the link between energy generation and consumption and climate change has grown considerably over the past 5 years.

[12] American Council for an Energy-Efficient Economy, "Appliance Efficiency Standards in the 2007 Energy Bill: Key Facts". December 2007. http://www.aceee.org.

[13] National Association of Home Builders. http://www.nahb.org/fileUpload_details.aspx?contentID=80051

[14] This challenge incorporates three of the challenges identified in "Delaware's Energy Future": Increased Energy Cost, Utility Deregulation, and Electricity Prices and Removal of Electricity Rate Caps.

RECOMMENDATIONS

As shown in Figure 11, buildings represent the largest source of CO2 emissions, as well as the largest growth in emissions, in the United States since the 1940's. Therefore, the work group focused its efforts on the energy efficiency opportunities in buildings, aka Delaware's "Built" environment. Industrial energy use and CO2 emissions have remained relatively stable, as companies have had direct economic incentive to implement energy conservation and efficiency programs. Although not a focus of the work group, several recommendations do relate to increasing industrial energy use reductions in Delaware.

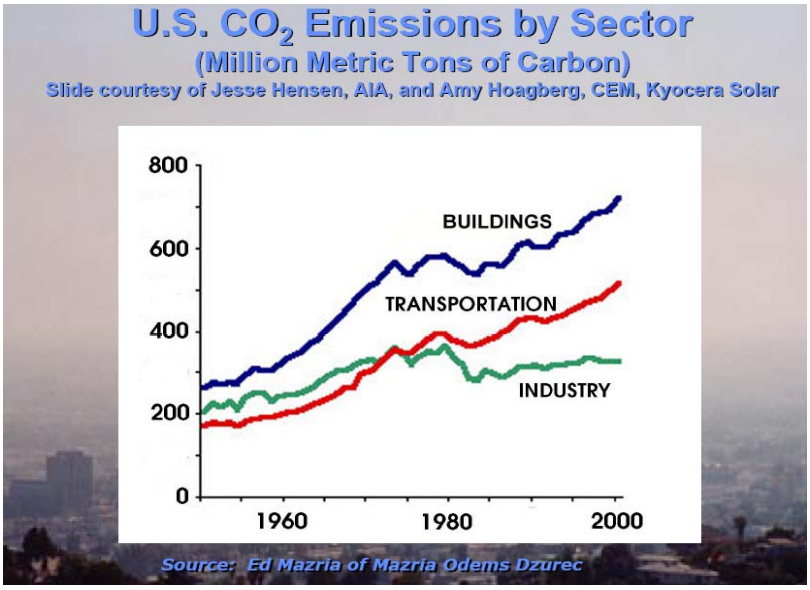


Figure 11

Many of the recommendations from the work group are in alignment with the stated goals and objectives of the SEU and can be implemented by the SEU. Those recommendations are denoted by an [SEU#] designation before the recommendation. The SEU may also be involved in assisting implementation or funding of other recommendations. These opportunities are identified in the recommendation write-ups.

Residential Sector Recommendations

Delaware's buildings use over half of the total energy used in the state, and homes account for the majority of building energy use. Improving the energy use of the residential sector involves looking at both existing homes and new homes, at builders, lenders, and buyers, to be sure that everyone involved understands that efficiency is good business.

The Sustainable Energy Utility (SEU) Task Force has highlighted the energy efficiency potential of the residential sector in the state and suggested a target reduction in energy use by program

participant of 30% by 2020.[15] It should be noted that the 30% reduction target is also in the estimated range of 2003 Governor's Energy Task Force Report.[16]

Regarding the residential sector, the SEU currently includes plans to cover, at no initial cost to participating properties, the full incremental cost of high-efficiency versus standard efficiency equipment and measures. This includes the difference in price between qualifying Energy Star and standard appliance and equipment models.

Residential energy efficiency recommendations are presented under the following categories:

1. Existing Homes
2. New Homes
3. Financing Purchase of Existing Homes
4. Financing New Homes
5. Rental Properties
6. Low-income Households

Recommendation 1: Residential Energy Code

Delaware's Residential Building Energy Code should be updated to reflect the adoption of the most current edition of the International Energy Conservation Code (IECC). Additionally, the Delaware Energy Office should be given the authority through legislation to require an update of the State Building Energy Code to most current IECC every three years based on current code promulgation cycles. Training needs to be provided to all building code officials upon adoption of each update to the code.

Background

Energy Codes are a subset of a broader group of codes known as building codes. Building codes are written legal requirements governing the design and construction of buildings. Most of the codes adopted by state and local governments set minimum standards for safe occupancy and to protect individuals from substandard living and working conditions. All building codes generally reflect a consensus of current design and construction practice. They are intended to lock in safe current practice as a minimum standard for design and construction of residential and commercial structures.

Energy codes cover areas of construction such as wall and ceiling insulation, window and door specifications, Heating, Ventilation, and Air-Conditioning (HVAC) equipment efficiency, as well as lighting fixtures and controls. In some sense, energy codes are different compared to other building codes. They do not exist to protect the immediate health and safety of the building occupants in the same way as other codes. However, energy codes offer other substantial benefits to the individual and society. Most notably, implementing energy codes results in a reduced demand for energy. This in turn leads to a reduction in pollution associated with the burning of fossil fuels in the home or in power plants. An increase in national energy security, reductions in utility bills, and increased utility system reliability are also important benefits from the adoption of energy codes.

The International Energy Conservation Code (IECC) is the benchmark residential energy code by which the US Department of Energy (DOE) makes its determinations for the purposes of fulfilling the mandate set forth in federal law. Many states reference these standards in their state building or energy conservation codes, although a number of states have also developed their own energy codes.

[15] SEU Task Force. *The Sustainable Energy Utility: A Delaware First*. 2007. The reduction in energy use is for participants and as such efforts should be undertaken to maximize participation in SEU programs in the state.

[16] Delaware Energy Task Force. *Bright Ideas for Delaware's Energy Future.* 2003.

States that reference the code frequently introduce amendments to adapt the codes to their specific climate and political environment. The IECC is generally promulgated once every three years, with amendments and supplements made available in between editions.

The 2003 Governor's Energy Task Force Report recommended that the State adopt updated building energy codes in both the residential and commercial sectors. As a result, Senate Bill 306 was introduced and passed in 2004 updating the State's Energy Code to the IECC 2000 edition on the residential side and ASHRAE Standard 90.1 -1999 on the commercial side. Attempts in 2007 and 2008 to update these codes to the most current editions failed in the General Assembly. All three surrounding states (Maryland, Pennsylvania and New Jersey) are currently utilizing the 2006 IECC.

Research shows that modern energy codes could save about 330 Trillion BTU by 2030, almost 2% of total current residential energy consumption. There would also be comparable savings in consumer energy bills, air pollution and greenhouse gas emissions.

Energy codes capture what would otherwise be lost opportunities. Current energy standards provide energy efficiency provisions that are relatively easy and inexpensive to address in new construction, and that are far more expensive, or even impossible, after the fact. Building energy codes are one of the easiest and most cost efficient ways for states and local jurisdictions to implement energy management policies.

When an energy code is adopted statewide, it results in lower barriers to builders marketing themselves across the state, and even regionally or nationally. The consistency in standards opens up the market, providing incentives for manufacturers to offer and develop more building products, which can also lead to lower supply prices for builders. Additionally, the demand created for new services relevant to the new code can expand or open up new markets for builders. A uniform code also enables localities to pool limited resources and combine personnel to form county wide or regional enforcement programs.

Aside from the environmental benefits, energy codes, as part of broader energy efficiency policies, have potential economic benefits. ACEEE released a study in 2005 which found that the implementation of statewide energy efficiency programs (including building energy codes) in the Midwest would result in significant job creation. The region was expected to produce 30,220 jobs resulting in compensation of $750 million by 2010, and 66,620 jobs resulting in compensation of $1,770 million by 2020. Since the Midwest imports most of its natural gas, a reduction in demand means less money flowing out of the region, and more savings. These savings in turn work through economic multipliers to increase regional investment and growth.[17]

[SEU1] Recommendation 2: Retrofitting of Existing Homes for Energy Efficiency

SEU should defray energy efficiency investments of existing homes, both rental units and owner-occupied.

Background

Homes in existence today will continue to be the majority of our housing stock for a long time to come and these homes are all in need of some level of energy efficiency improvement. It has been traditionally very difficult to get owners of these homes (or owners of rental units) to see the long-term benefits of improving energy efficiency when most of these measures are not visible after they

[17] http://www.aceee.org/buildings/codes.htm

are installed. The SEU law incorporates nation wide best practices, which show that homeowners respond favorably to incentives for energy improvements.

A cost-effective level of retrofitting (averaging approximately $2,500-$3,000) – insulation, air sealing, and replacement equipment – can result in an average savings of 25-30% on the heating and cooling portion of the bill. A lighting package taking advantage of Compact Fluorescent or Solid State LED lights and an appliance package to offer incentives for replacement of refrigerators and washing machines with Energy Star rated models will save on base load usage at a similar percentage.
The SEU should require performance monitoring and make provisions to finance pre-and post retrofit audits. The audits must be standardized and administered through a network of certified auditors.

The SEU will require performance monitoring and make provisions to finance pre-and post retrofit audits. The audit must be standardized and administered through a network of certified auditors. Similar programs throughout the Northeast offer levels of incentive from free audits, worth about $500, to 50% of the retrofit cost, with program outlay per existing home capped at $3,000.

Cost

Cost to the SEU of approximately $1 million/year, including administration costs. For example, at $2,500/home, this would enable retrofitting 400 homes/year.

Recommendation 3: Enhanced Energy Efficient Construction of New Homes

[SEU2] 3A. The Sustainable Energy Utility (SEU) should finance the incremental investments required for meeting the EPA Energy Star Program requirements (up to an average of $2,500-$3,000).
3B. The State should match the Federal tax credit by extending a homebuilder a $2,000 tax credit for building a home that uses 50% less energy than the 2006 IECC, or the current code if more recent.

Background

It is easier to incorporate energy efficiency measures into a home under construction than it is to change these items later. To that end, builders of new homes must be encouraged to build to a higher standard.

At this point, as identified by the SEU taskforce, the logical level of efficiency over the current Delaware code is the Federal EPA Energy Star Program. This program uses third party verification to certify that a home uses 15% less energy for heating, cooling and water heating than the 2006 code allows (note – the 2006 code requires higher efficiency than the codes in place in Delaware today). The Federal Government also allows the builder (not owner) of a new home to take a $2,000 tax credit if the home uses 50% less energy than the same code allows for heating and cooling.

A very effective first step (recommendation 2A) would be for the SEU to finance the incremental investments required for meeting the Energy Star Home requirements. A shared-savings agreement that incorporates the SEU, homebuilder and eventual owner will need to be worked out. This arrangement does not lead to any initial increase in cost to the homebuilder or the eventual homeowner. After the shared-savings period, the homeowner captures the energy savings for the life of the home. As in retrofitting of existing homes, a lighting package taking advantage of compact fluorescent or solid state LED lights and an appliance package to offer incentives for Energy Star refrigerators and washing machines can offer saving on base load usage.

A complementary incentive (recommendation 2B) would be for the State government to extend to homebuilders a $2,000 tax credit for building to the 50% less energy than the 2006 code standard.

Cost

The cost of 3A would be part of the program operations of the SEU, and should require no additional State funding.

The tax credit in recommendation 3B would require additional state funding of $2,000 per home, plus administration. A cap can be placed on the number of homes eligible for the tax credit per year.

[SEU3]Recommendation 4: Energy Efficiency Financing of New Homes

The State should explore, in coordination with the SEU, new energy efficiency financing models of new and existing homes.

Background

Energy Efficiency Financing would enable builders selling in to the new home market and buyers of an existing home to enter into shared-savings agreements with the SEU. Under these arrangements, builders and buyers could receive financing from the SEU to defray the incremental investment required for energy efficiency upgrades. The financing could be arranged so that these upgrades will save more money per month through reduced energy bills than the monthly cost of repayment to the SEU. The measures will also increase the value of the home.

Yet another approach is the Energy Efficiency Mortgage, (EEM). The instrument has been in existence for more than 15 years but it has not been widely utilized due to buyers financing through their builders rather than going to separate banking institutions for their mortgages. The work group speculates that the downturn in the housing market might enhance the effectiveness of EEMs. By using lending agencies that participate in the program, there is the opportunity to boost sales of energy efficient homes and also assist in funding energy efficiency upgrades in existing homes.

Cost

The cost will be minimal for the exploration and evaluation of financing models. Cost for implementation will be identified during that process.

Recommendation 5: Expand the Weatherization Assistance Program

Double the budget of the Weatherization Assistance Program (WAP) to enable the program to provide weatherization services to between 800 and 1,000 low-income owner-occupied and rental households per year and shorten the present wait time to 1.5 years by 2016 (or sooner) and enable up to $3,500 to be spent per house.

Background

Delaware has a high-performing low-income weatherization program; Delaware households that receive weatherization save on average 16%- 18% of their annual household energy usage, or $227 annually. These benefits accrue for years after the initial efficiency improvements. Delaware's Weatherization Assistance Program benefits not only low-income households, but the entire State, achieving a societal benefit-cost ratio of 3.4.[18]

Additionally, the U.S. Department of Energy has found that 52 direct jobs are created for every

[18] Y-D. Wang, J. Byrne, J. Kulkarni, A. Banerjee, et al. "Energy, Economic, and Environmental Impacts of the Delaware Low-Income Weatherization Assistance Program." Newark, DE: Center for Energy and Environmental Policy. (2006).

million dollars invested in weatherization programs. Delaware has not significantly invested in low-income weatherization programs. Delaware currently augments federal funding for its Weatherization Assistance Program by a weatherization surcharge on electricity rates of $0.000095 per kWh (about $800,000 annually); and some of those funds can be used for emergency energy assistance rather than weatherization.

Combined federal and state funding allows the Delaware Office of Community Services to weatherize 500 low-income households per year. Though 500 households are weatherized each year, 750 households at up to 80% of the state median income are added to the WAP waiting list each year. No households at 80% of the state median income are currently served, and no households in rental units are served, though many other states have demonstrated techniques to successfully leverage landlord contributions for weatherization assistance. The SEU Task Force Affordable Energy Working Group recommended that the SEU expand cost-effective, weatherization services to income tiers up to 80% of the state median income, and to both single and multi-family rental units.

With the recommended increase in funding, the SEU and State Weatherization Program will be able to implement the partnership that they have designed that will implement this recommendation. The SEU would cover, at no initial charge to participants, the full incremental cost of high-efficiency versus standard efficiency equipment and measures. This includes the difference in price between qualifying Energy Star and standard appliance and equipment models. After the shared-savings period the participant will keep the entire savings accruing from the energy-efficiency measures. These added measures will not only save more money per month than their cost per month, but they will increase the value of the residential property at re-sale time

Cost

Doubling the WAP budget would raise it to $5 million per year.

Commercial Sector Recommendations

Recommendation 6: Commercial Energy and Ventilation Codes

6A. Adopt the most recent edition of ASHRAE Standard 90.1 "Energy Standard for Buildings Except Low-Rise Residential Buildings" as our State energy code.

6B. Adopt the most recent edition of ASHRAE Standard 62 – "Ventilation for Acceptable Indoor Air Quality" as our State ventilation code.

6C. The Delaware Energy Office should be given the authority through legislation to require an update of the State Commercial Building Energy Code to most current ASHRAE Standard 90.1 every three years based on current code promulgation cycles. Training needs to be provided to all building code officials upon adoption of each update to the code.

Background

Commercial Energy Code: Delaware's current commercial energy code is ASHRAE Standard 90.1 – 1999. There have been three revisions to this standard since 1999 issued in 2001, 2004 and the current standard is ASHRAE Standard 90.1 – 2007. The standard provides for minimum energy-efficient requirements for the design and construction of:

1. new buildings and their systems
2. new portions of buildings and their systems
3. new systems and equipment in existing buildings

Approximately 96 addenda have been incorporated into the Standard since 1999 many of which call for increased energy efficiency. Use of the current standard will result in more energy efficient buildings.

The original ASHRAE Standard 90 was published in 1975 and revised editions were published in 1980, 1989, and 1999. As technology and energy cost began changing more rapidly, the ASHRAE board voted in 1999 to place the standard on continuous maintenance. Starting with the 2001 edition, the standard is now published in the fall of every third year. All approved addenda will be included in the future additions.

Ventilation Code: The current ventilation (outside air) criteria in the International Mechanical Code used throughout Delaware is based on ASHRAE Standard 62-1989. After 20 years of Indoor Air Quality research and experience with ventilation system design, ASHRAE introduced an improved version of the standard in 2004 that was updated in 2007. The new standard greatly reduces the outside air requirements for many types of occupancies resulting in significant energy and first cost savings. If adopted, a campaign to inform existing building owners of the change should be conducted as part of an educational program to reduce excess outside air introduction into their buildings and maximize the potential energy savings.

The original ASHRAE Standard 62.1 was published in 1973 and revised editions were published in 1981, 1989, 1999, 2001 and 2004. In its 1989 edition, and in response to a growing number of buildings with apparent indoor air quality problems, the standard increased minimum outdoor airflow rates significantly and introduced a requirement for finding outdoor air intake flow requirements for multiple-zone, recirculating systems. The 1999 and 2001 editions made several minor changes and clarifications that did not impact the minimum required outdoor airflow rates. In its 2004 edition, it modified the Ventilation Rate Procedure, changing both the minimum outdoor airflow rates and the procedures for calculating both zone-level and system-level outdoor airflow rates. The 2007 edition of the standard updates, revises, and improves it in several ways, without changing minimum outdoor airflow rates.

A campaign to inform the builders and developers in the State of the change should be conducted as part of an educational program to reduce excess outside air introduction into their buildings and maximize the potential energy savings.

Cost

Adopting the current addition of ASHRAE Standard 90.1 may increase construction cost slightly but will reduce energy consumption and operating cost. Copies of the standard are available from ASHRAE for $119.00 each.

Adopting the current addition of ASHRAE Standard 62.1 will reduce construction cost, energy consumption and operating cost in many new buildings. If implemented it would also reduce energy consumption and operating cost in many existing buildings. Copies of the standard are available from ASHRAE for $65.00 each.

State Funded Construction Recommendations

Recommendation 7: State Energy Efficiency Policy

Delaware should create and implement a State Energy Efficiency Policy which would establish a standard for the design, construction, renovation, and operation of all State funded facilities, including schools, to optimize energy efficiency and minimize overall energy consumption.

Background/Additional Detail

State funded buildings include state government buildings and facilities, schools, libraries, etc. The new energy standard would have to supersede any locally enforced building code requirements; therefore it would need to be implemented and enforced statewide by the executive branch of the State government.

The proposed State Energy Efficiency Policy would be a multi-faceted approach incorporating the following action items:

A. Enact legislation to establish a 'State' Energy Standard for Design and Construction of State Funded Buildings, which meets or exceeds the latest energy standards set forth in the most recent addition of ASHRAE Standard 90.1 "Energy Standard for Buildings Except Low-Rise Residential Buildings" thereby setting a uniform energy efficiency standard for all State buildings.

B. Design and construct all new State funded buildings in accordance with the latest U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Green Building Rating System for New Construction (LEED-NC); and operate, maintain, and renovate all existing State owned and operated buildings in accordance with LEED-EB (Existing Building) standards to maximize the operational efficiency of the facilities while minimizing their environmental impact. LEED for fit-outs should be utilized where the State rents, rather than owns, buildings. For all the above, LEED silver should be the minimum rating allowable.

   While the LEED initiative is not solely directed toward energy efficiency, building to the LEED rating system provides a good standard of design that improves the overall building operating efficiency (hence energy efficiency), as well as the added benefit of improved indoor environmental quality, sustainability, and carbon footprint reduction.

   This recommendation does not address the issue of official LEED certification, but rather the standards to which buildings are designed and built.

C. Utilize the existing Energy Performance Contracting Act (Delaware Code, Title 29, Chapter 69, Subchapter V) to conduct energy audits and implement energy conservation measures in all existing State buildings and schools to improve the overall building operating efficiency while minimizing energy consumption and maximizing energy savings.

   Delaware already has the means to successfully implement "guaranteed energy savings performance contracts" for all existing State buildings and only needs to develop a program to realize the benefits statewide.

D. Mandate the use of Life Cycle Cost Analysis (Delaware Code, Title 29, Chapter 69, Subchapter 1, Section 6909A) to justify funding for all State building construction and renovation projects.

   Use of Life Cycle Cost criteria would preclude the low-bid, initial cost design criteria that don't address areas such as operating efficiency, maintenance and replacement costs, and total energy costs over the 'useful life' of the facility.

E. Centrally manage the energy usage in State owned and operated facilities to benchmark, track, and optimize overall building energy efficiency in an effort to minimize the State's overall energy costs and consumption.

Centralized management of energy usage allows the State to collect and trend energy data, map consumption and establish energy reduction strategies, improve and maintain building operating efficiencies, and take advantage of such energy cost savings incentives as aggregate energy procurement and demand response programs.

F. Commission all new State building construction, and retro-commission all existing State buildings, including schools, to ensure that building systems meet their design intent, operate and interact optimally, and function in a manner to maximize overall operating and energy efficiencies.

Most of the State owned and operated buildings have never been commissioned and those that were most likely no longer operate in the most operationally or energy efficient manner

Cost

The cost to implement the action items identified for the proposed State Energy Efficiency Policy should be negligible. There would be a nominal increase in new construction and design costs with the inclusion of the added LEED initiative and commissioning requirements; however, these initial costs should be negated by the energy and operating efficiency savings derived over the life of the facility. The incorporation of energy efficiency measures in state funded construction, including schools, can be funded through the bond offerings managed by the SEU. The State only needs to realize a statewide Energy Performance Contracting Program to retro-commission all existing State buildings at no additional capital cost.

Recommendation 8: Demonstration Project - Schools

Conduct a demonstration project, in which a school is designed, built and operated to LEED silver or gold standards. Compare the construction costs as well as the on-going operating costs to a typical school constructed and operated to current standards.

Background

The ability compare the construction costs as well as the on-going operating costs from a LEED certified school building to the benchmark of typical school buildings will provide decision makers with quantitative data regarding the relationship between costs and benefits associated with LEED programs. It is expected that a LEED certified building will cost more to construct, and possibly more to maintain since preventive maintenance cannot be deferred without negatively impacting the efficiency performance of the school. However it is expected that the State will realize reduced operating costs from such a properly constructed and maintained structure.

Cost

$1,000,000 +- for construction of the school. The additional costs due to LEED certification are part of what would be determined during the demonstration project. The incorporation of energy efficiency measures into the project can be funded through the bond offerings managed by the SEU. SEU may be a source of funding for the energy efficiency and renewable energy portions of the project.

Institutional/Industrial Sector Recommendations

Recommendations 9: Combined Heat and Power (CHP)

9A. DNREC should develop CHP regulations for boilers/power plants on an energy output basis.

9B. Develop a set-aside of allowance allocations for energy efficiency and renewable energy in Delaware's NOx and CO2 trading programs.

Background

Definition: Combined Heat and Power is the generation of electricity and heat sequentially from the same heat input.

Use of CHP increases the system's overall efficiency by providing electric and thermal service with higher efficiency and lower emissions than conventional separate systems. CHP can provide a way to reduce emission rate without strict reliance on the application of emission controls, however multiple outputs of power and heat must be accounted for. Therefore, output based standards are key to recognizing efficiency benefits of CHP. (Example: LB/MWh output instead of LB/MMBTU input.)

Air quality regulations have traditionally established standards on the basis of mass of pollutants allowed per unit of thermal heat input. Attempts in the past to establish standards on an output basis or otherwise referred to as fuel-neutral regulations have faced opposition by various industries such as coal and oil producers. Most regulations today establish fuel specific standards on a heat input basis. Regulations do not specifically discourage CHP but they do not provide any specific incentives either.

U.S. EPA states the following "Output-based regulations (OBR) encourage efficiency and renewable energy as air pollution control measures. OBR levels the playing field by establishing performance criteria and allowing efficiency and renewable energy to compete on equal footing with other methods of reducing emissions, such as combustion controls and add-on controls.

Traditionally, boilers and power generators have been regulated on an input basis. That is, emission limits have been established on a unit of pollutant emitted per unit of fuel input basis (e.g., pounds per million British thermal units [lb/MMBtu]). This approach relies on the application of pollution control devices to reduce emissions and does not explicitly recognize the efficiency of the process in converting fuel input into a useful output.

Significant opportunities exist to reduce pollution upstream in the energy generation process by encouraging efficiency improvements through CHP. Establishing emission limits on an output basis—units of pollutant per unit of useful output (e.g., pounds per megawatt-hour [lb/MWh])—recognizes efficiency improvements as pollution prevention."

In Delaware, only Regulation 1144, "Control of Stationary Generator Emissions" addresses CHP and it defines CHP as follows:

> "**Combined heat and power**" and "**CHP**" means a *generator* that sequentially produces both electric power and thermal energy from a single source, where the thermal energy is wholly or partly used for either industrial processes or other heating or cooling purposes.

This regulation establishes allowable emission rate in terms of LB/MWh output but it has limited scope because it only applies to internal combustion engines. It does not cover boilers or other forms of power plants.

There may be opportunities under allowance trading programs to provide incentives under a set-aside program. For instance a specific *recommendation* may be to create a set-aside of allowance allocations for energy efficiency and renewable energy in Delaware's NOx and CO2 trading programs. Delaware could allocate specific tons of NO_x or CO2 allowances as set-aside each year for projects that reduce the consumption of electricity or energy other than electricity, or generate electricity using renewable energy.

Boilers and other forms of power plants are still covered by input-based regulations. Another *recommendation* could be to consider development of CHP regulations for boilers/power plants.

Calculating emissions from CHP can be done using two approaches:

1. Add thermal output to electric output to reduce effective emission rate. (CA & TX DG Regs.)
2. Calculate credit for avoided thermal generator (boiler). (DE Reg.)

The first option is simpler but second option more directly reflects actual emission benefits. Merits of each approach should be further explored in future rulemakings.

Cost

The only costs are those related to regulation development.

Recommendations Impacting Multiple Sectors

[SEU4]Recommendation 10: Energy Efficiency Education Program

The Sustainable Energy Utility (SEU) should develop a comprehensive education program to inform Delawareans on energy efficiency that includes:

- *Energy efficiency steps targeted to different sectors of the economy that would include information that these groups could use to increase their energy efficiency, including easily achievable, cost-effective actions;*
- *Behavioral aspects of maximizing energy efficiency and conservation;*
- *Information about the SEU as a comprehensive source of support for efficiency, conservation and renewable;*
- *Information on additional programs available from other sources, such as tax credits, deduction or rebates;*
- *Information about the scope and potential of distributed renewable in the State.*

Background

The SEU will be targeting significant reductions in energy use through energy efficiency. Reports from the American Council for Energy Efficiency (ACEEE) confirm the potential for significant reduction in energy use through energy efficiency (add stats from ACEEE). Education will be important to realizing this potential. The SEU Contract Administrator will develop educational programs. As described in the Request for Proposal for the SEU Contract Administrator (CA):

"The CA shall develop and implement a public and consumer information strategy to: (1) promote customer participation in and market awareness of SEU services; (2) increase consumer awareness and understanding of the benefits of energy efficiency and renewable energy both for participants and non-participants; and (3) increase consumer demand for SEU services; and (4) affect consumer decision-making in consumer-driven energy efficiency choices. When appropriate, the CA will develop and implement energy education and technical training services and initiatives in cooperation with Delaware educational institutions."[19]

Educational programs should target various segments of energy users in Delaware including residential, commercial and industrial.[20] Within these groups, there could be programs tailored for

[19] Delaware Energy Office, Delaware Sustainable Energy Utility, Contract Administrator, Request for Proposals, August 1, 2008, Paragraph 3.4, page 16.

[20] Because transportation issues are being addressed in the Transportation workgroup, education for motorists will be proposed by that Workgroup.

various categories of users, including, for example, schools, churches, and hotels. This workgroup recommends support for an energy efficiency component in the state K-12 Science Education standards.

Education will help Delawareans understand 1) the benefits and importance of energy efficiency, 2) the potential for significant reductions in energy use through efficiency, and 3) the programs and other incentives available to support energy efficiency. The education would include the importance of reducing energy use before implementation of renewable energy.

Cost

The education program described above would be integrated with the SEU's educational program, which has a target funding level of $850,000 per year. There would be no additional cost to the State for the education program.

Recommendation 11: Energy Efficiency Resource Standard

The PSC should conduct a study considering emplacement of an Energy Efficiency Resource Standard (EERS) to insure energy efficiency is treated equal to new energy supplies. The results of the study should then be reported to the Governor's Energy Advisory Council

Background

The concept of an EERS, also called an Energy Efficiency Performance Standard or Portfolio Standard (EEPS) is similar in design and function to the widely used renewable portfolio standard. It is well described by the American Council for an Energy Efficient Economy (ACEEE) fact sheet originally published in 2002.[21] Since publication of the fact sheet, ACEEE has studied EERS's across the country and has published a compendium of state programs.[22]

A complementary program could be creation of a mechanism to trade the attribute of energy efficiency.

Cost

Energy efficiency costs less than energy supply, so utilities should be able to buy energy efficiency improvements cheaper than energy supply, thereby reducing consumers' costs. As an EERS is a regulatory tool typically administered by state public utility commissions, some administrative costs for state oversight and regulation should be expected.

Recommendation 12: Demand Response

12A. Support deployment of demand response, AMI and Smart Grid technologies, with dynamic pricing, by ensuring that this demand response effort continues through to completion statewide.
12B. Support efforts, currently underway, by the utilities, the Public Service Commission and other stakeholders to create a decoupling mechanism that will remove disincentives to the utilities to promote demand response, load management and energy efficiency. The impacts on low-income households need to be factored into the program specifics.

[21] http://www.aceee.org/energy/energymarkets/eestndrd.htm
[22] ACEEE. State Energy Efficiency Resource Standard (EERS) Activity. May 2008. http://aceee.org/energy/state/policies/EERS_Summary_5-7-08.pdf

Background

Demand Response: Demand for electricity is highly concentrated in a small number of hours per year. In the PJM region, the top 80 – 100 hours account for 16% of peak demand.[23] In order to meet demand for electricity at all times, there must be enough generating capacity to meet demand, even at its highest levels. As a result, there are generating plants that are used less than 100 hours a year.

Further, demand for electricity is growing, straining capacity and reliability. Over the next decade, demand is projected to grow by 19 percent. Over the same period, however, generating capacity is expected to grow just 6 percent. [24] Nationally, a 5 percent reduction in demand would eliminate the need for an estimated 625 peaking plants nationwide creating a $35 billion savings over 20 years. [25]

Demand response is a tool for shaving peak demand by enabling customers to reduce their use of electricity at times of peak demand. The overall concept of demand response includes demand response devices, Automated Metering Infrastructure (AMI), and Smart Grid. Demand response devices include air conditioners and other appliances that can respond directly to price signals from a utility or Curtailment Service Provider (CSP)[26], and Smart thermostats that can communicate with a utility or CSP to receive price signals and reduce energy use when prices reach certain thresholds, at the election of the consumer.

AMI devices record customer consumption at least hourly and provide for at least daily transmittal of measurements over a communication network to a central collection point.[27]

Smart grid includes advanced sensors throughout the grid to facilitate improved reliability, enable the grid to reconfigure itself, and provide efficiency and security. AMI enables utility operational benefits that improve service and help offset the cost of advanced meters and networks. Operational benefits include automated meter reading, the ability to detect outages automatically and ensure that all outages in an area are corrected while service trucks are still in the area, and to turn customer service on and off remotely. Demand response puts downward pressure on prices. While these savings may be temporary, they are expected to be significant. A five percent load reduction could create nationwide price reduction savings of $5 billion to $10 billion. [28]

Delmarva Power filed its Blueprint for the Future in February 2007. The Blueprint filing has three main components: deployment of advanced metering infrastructure, implementation of demand response and demand-side management programs, and a decoupling mechanism. In its order on September 16, 2008, the Delaware Public Service Commission (PSC) authorized Delmarva to work with the Commission and interested parties to determine the viability of implementing demand response programs in the near term, and authorized the diffusion of AMI into Delmarva's electric and natural gas distribution system networks. Delmarva Power is now collaborating with PSC, the Division of the Public Advocate and other stakeholders to implement AMI enabled demand response programs

[23] The Brattle Group, Discussion Paper May 16, 2007.
[24] Ibid.
[25] The Brattle Group, The Power of Five Percent, How Dynamic Pricing Can Save $35 Billion in Electricity Costs, May 16, 2007., p. 5. http://www.brattle.com/Publications/ReportsPresentations.asp?PublicationID=754
[26] CSPs are aggregators of demand response. They group together customers who want to participate in demand response and facilitate their demand response participation.
[27] http://www.ferc.gov/industries/electric/indus-act/demand-response/dem-res-adv-metering.asp
[28] The Brattle Group, The Power of Five Percent, How Dynamic Pricing Can Save $35 Billion in Electricity Costs, p. 6.

for both residential and non-residential customers using technologies such as smart thermostats and switches.

Dynamic Pricing: To be effective, demand response must be coupled with some form of dynamic pricing. Dynamic pricing provides improved price signals to consumers, and encourages demand reductions during high priced periods. Basic forms of dynamic pricing include real-time pricing where electric prices are equal to wholesale market prices and fluctuate during the day, and critical peak pricing under which the price of electricity increases dramatically during the highest demand hours.

Under the current electric rate structure, residential customers pay the same price for electricity at all times of the day (though the price can change by season). Customers have no financial incentive to shift electric load to less expensive times.

Decoupling: Decoupling is a tool to moderate the link between sales volumes and utility profits. A decoupling mechanism is required to fully realize the benefits of demand response programs and other energy efficiency efforts.

In traditional regulation, rates are determined based on the estimated fixed cost of providing service plus an allowed rate of return divided by an estimated amount of sales. This rate design ties a utility's revenue to the amount of energy consumed; utilities' profits increase when their customers use more energy. Decoupling the recovery of the utility's fixed-costs from sales volumes eliminates utility disincentive to help customers reduce energy use.

Delmarva Power and Chesapeake Utilities Corporation are working with the Public Service Commission and other stakeholders to create a decoupling mechanism.

Examples of Demand Response Programs

A number of jurisdictions in the United States, including some of Delaware's neighboring states, have demand response pilots and programs. In California pilot plans, customers reduced their demand during the top 60 summer hours by 13 percent up to 43 percent, depending on the technology employed.[29] In a Chicago pilot program, participants paid real-time prices for their electricity. They shifted use to off peak times, and also reduced their overall use by 3 to 4 percent. The Illinois legislature and Commerce Commission have now ordered that real-time prices be available statewide.[30] New Jersey's Energy Master Plan targets a reduction of 900 MW of peak load by 2020 from demand response programs. Maryland is aggressively seeking peak load reductions. In the District of Columbia, an organization known as SMPPI [31] is conducting an initiative, known as PowerCentsDC™, which will measure approximately 1,400 customers' reactions to critical peak pricing and hourly pricing options.

[29] Ibid., p. 3.

[30] Nemtzow, David, Dan Delurey and Chris King, "The Green Effect", Public Utilities Fortnightly, March 2007. http://www.demandresponsecommittee.org/The_Green_Effect.pdf

[31] Under terms of the Pepco and Delmarva merger settlement agreement approved by the D.C. Commission, Pepco agreed to fund a smart meter pilot program for small customers. Representatives of PEPCO, the D.C. Commission, the D.C. Office of People's Counsel, the D.C. Consumer Utility Board, and the International Brotherhood of Electrical Workers Local 1900, formed a non-profit corporation called the Smart Meter Pilot Program, Inc. (SMPPI).

Environmental Impact, relationship to Demand Response [32]

The impact of demand response on the environment has not been well studied, is situation specific, and complex. It is likely to be positive, but could be mixed or negative in certain situations. Demand response is valued in Europe as a tool to lessen CO_2 emissions.
Generally demand response results in an overall reduction of energy use of several percent. It reduces the need for additional peaking plants and accompanying transmission and distribution facilities and thus eliminates the environmental damage that would be created by building and using these facilities. Importantly, it can facilitate an increased use of intermittent power generation, for example, wind power; it can be used to drop demand when the wind slows.

On the other hand, some demand response may be backed up by diesel generators. However, DNREC regulates these back-up generators; air permits allow only limited operation hours per year. Peak demand is sometimes met by natural gas fired generation. When peak demand is reduced, a portion of the reduction is made up at off peak times. At some times of the year and depending on many complex interacting factors, shifting the load to off peak times could mean that some load is shifted from natural gas to base load generation powered by coal.

Cost

There will be a cost to install demand response meters and AMI and Smart Grid infrastructure. However, a portion of this cost will be offset by utility operational savings. The Public Service Commission will be addressing these costs for Delmarva as part of an upcoming rate case.

Recommendation 13: Energy Efficiency in PJM Capacity Market

Support development of a program for meaningful participation of energy efficiency in PJM capacity markets. Encourage participation of Delaware energy efficiency providers in the capacity market.

Background

PJM, the grid operator for the fourteen-state region that includes Delaware, operates a capacity market in order to ensure adequate generating capability in the region. Electric generators participate in this market by offering generating capacity in turn for which they receive a capacity payment. Demand responders also participate in the market and are paid for their commitment to drop electric load when called upon by PJM.

Like electric generation and demand response, energy efficiency reduces the need for additional generation. The Federal Energy Regulatory Commission (FERC) has required that PJM allow energy efficiency to participate in the capacity market. PJM stakeholders are discussing various proposals for *how* energy efficiency will participate in the market. Proposals range from those that would not support increased deployment of energy efficiency, to those that would support implementation of energy efficiency measures.

All stakeholders agree that rigorous measurement and verification protocols would be required in order for energy efficiency to participate in the capacity market; PJM would need to be able to count

[32] Much of the following discussion is drawn from the article The Green Effect , written by David Nemtzow, Dan Delurey and Chris King, and published in Public Utilities Fortnightly in March 2007. Available at: http://www.demandresponsecommittee.org/The_Green_Effect.pdf

on promised energy efficiency actually delivering promised load reduction in order to ensure system reliability.

The benefit of participation of energy efficiency resources in the capacity market is that the energy efficiency resource providers would receive a stream of payments that would support and encourage adoption of energy efficiency measures. Large electricity users would be able to participate in the program directly. Small users, including residential customers, could participate through an aggregator.

Cost

There will be no incremental cost for this program. The costs of the capacity payments are spread to all users; however, the participation of energy efficiency in the capacity market puts a downward pressure on prices that exceeds the capacity payments.

[SEU5]Recommendation 14: Distributed Renewable Energy

Support the SEU's goal to install customer-sited renewable energy as a mechanism to reduce transmission and distribution energy losses, dependence on the grid, peak demand, and Delaware's carbon footprint.

Background

The importance of customer-sited renewable energy technologies[33] and demand side energy efficiency measures, as mechanisms for reducing energy use (and thereby reducing carbon emissions) in the State, has been consistently recognized.[34]

Customer-sited renewable energy generators can be powered by solar, wind, geothermal, biomass and small-hydro sources. This assortment of customer-sited renewable energy options has several unique benefits. Because they "are located at the point of energy use, they can greatly reduce transmission and distribution line congestion that results from transporting electricity over long distances. Customer-sited distributed energy improves electricity reliability and voltage stability with the positive effects of reducing the potential for power outages and improving electricity quality. By generating electricity at the customer's point of use during times of high peak system demand, customer-sited renewables, solar in particular, can reduce both peak and overall demand for conventional primary energy sources, thereby driving down the retail energy costs, offering protection against price spikes, and creating an immediate and tangible reduction in CO_2 emissions."[35]

Among the various sources of renewable energy, "the most ubiquitous renewable resource in the state is solar energy."[36] It was noted in the 2003 Governor's Energy Task Force report that the amount of solar energy falling on Delaware was *130 times* the annual energy consumption of the state, including transportation fuels and electricity system losses, and constitutes the largest source of renewable energy for the State. The potential reduction in grid-based energy use reduction from this source is significant. For instance, the SEU distributed PV target alone is expected to displace grid

[33] Also often prefixed as "user-sited" or "distributed"
[34] Delaware Climate Change Action Plan (2000), Center for Energy and Environmental Policy, University of Delaware. Available online at: http://ceep.udel.edu/publications/energy/reports/energy_delaware_climate_change_action_plan/deccap.htm. Also see: SEU Task Force Report (2007). Available online at: http://www.seu-de.org/
[35] SEU Task Force Report, pp. 28.
[36] Delaware Energy Task Force, Final Report, September 2003, pp. 65

electricity by an amount comparable to 35% of the estimated MWh savings for residential sector electricity from energy efficiency.[37]

The SEU has analyzed the Delaware market and and has concluded the following: "The SEU will assist Delaware households and business in installing at least 300 MW of customer-sited renewable energy by 2019 through the use of incentives and other policy measures."[38]

Cost

The SEU's customer-sited renewable energy financing mechanism incorporates a number of sources of funding such as: Tax Free Municipal Bonds; Green Energy Fund; sale of Renewable Energy Certificates (as well as special *Solar* Renewable Energy Certificates); and Shared-Savings; for realizing the target of at least 300 MW by 2019.

STRAWMAN THAT DID NOT ACHIEVE CONSENSUS

PJM Demand Response Program

A. Support participation in PJM Demand Response programs. Publicize and provide education about the programs.

B. Work with PJM to support improvements to PJM's Economic Demand response Program. Take an advocacy position with respect to restoring vitality of the Economic Demand Response program by restoring payment of the full market price for load reduction by program participants in response to a call from PJM.

Background

The regional electric grid operator, PJM, has programs supporting demand response in each of its three markets. These programs are: the Economic Load Response Program, the Synchronized Reserves Market Program, and the Emergency Response Program.

Because these PJM programs encourage demand response, they create many of the benefits discussed in recommendation 16.

One of the programs, PJM's Economic Load Response program, has been weakened and as a result, participation in the program is declining. As discussed further below, a sub group of PJM members has been designing a proposed program revision that would provide payments comparable to the expired provisions to participating consumers who reduce load on demand. The sub group has made progress in designing the new program; however, on several points the sub group has reached an impasse. PJM's Demand Response Steering Committee has asked PJM to design a compromise proposal and present it back to the Committee.

PJM's Economic Demand Response Program had a tariff under which participants who responded to PJM calls to reduce load were paid for the megawatts of load they reduced. This tariff was temporary; it expired December 31, 2007. The program still provides a payment, but the payment is significantly lower, and participation in the program has dropped as a result.

PJM members have been working to develop a proposed payment program similar to the one that expired. Many believe that the payments are needed to restore the attractiveness of the program

[37] Compare pp. 37 and 39 of the SEU Task Force Report (2007).
[38] SEU Task Force Report, p. 6.

and to halt the decline in participation. New York, New England, and California all have active and successful economic demand response programs similar to the once that ended in PJM.

Cost

There is no incremental cost for PJM's Economic Response Program. Participants only receive a payment under the program when the hourly price goes above a threshold. When the price crosses the threshold, all customers benefit from the price reduction that the demand response load reduction creates. The overall price reduction offsets the payments that are made to demand responders.

Work Group Discussion

This recommendation did not achieve consensus due to strong disapproval from Delmarva Power based on the following: For a number of years, the PJM Economic Load Response Program paid an incentive for demand response participants to reduce energy use when PJM zonal Locational Marginal Prices (LMPs) were above $75 per MWh. The payment of this incentive at relatively low price levels was very controversial, and this provision expired at the end of 2007 due to a lack of sufficient support among stakeholders to continue it. Despite some calls to revive the old incentive level, PJM Staff and stakeholder groups have turned their efforts to developing proposals for offering a new incentive for energy use reductions when LMPs are high and the effects of load reductions on energy prices are greatest. Delmarva Power has joined those efforts and will continue to work to strengthen the Economic Load Response Program.

APPENDIX A

Members – Reducing Energy Use Work Group

Chair - William E. Pelham, AIA
Wayne Barndt, Pepco Holdings
Dave Bobiak, Paragon Engineering
Arthur Boswell, Neighborhood House, Inc.
Karen Brady, Neighborhood House, Inc.
Sarah Buttner, Energy Transition Consulting LLC (on behalf of the Public Advocate)
Philip Cherry, DNREC
Ken Davis, Weatherization Assistance Program, DHSS
Diana DeAngelis, Pepco Holdings
Jim DeFrangesco, Facilities Management, Delaware Office of Management and Budget
Richard DiSabatino, EDIS Company
James Fuess, White Pine Energy
Peter Gilman, Gilman Development Company
William Holloway, Bernardon, Haber, Holloway
Steve Hudson, Sussex County Engineering Department
Leslie Lee, DHSS
John Marinucci, Delaware Dept. of Education
Manu Mathai, University of Delaware
Mike Matthews, Delaware Office of Management & Budget
Andrea Maucher, Delaware Public Service Commission
Ed Minch, Energy Services Group
Arthur Padmore, Delaware Public Advocate
Kimberly Schlichting, Delaware Municipal Electric Corporation
Charlie Smisson, Delaware Energy Office, DNREC
Nancy Terranova, Lewes Board of Public Works[39]
Jeff Tietbohl, Chesapeake Utilities
Bahareh van Boekhold, University of Delaware
Brian White, Lally-White LLP
Non-member Regular Attendee – Paul Sample, Technical Advisory Office, Legislative Council
Consultant – Andrea Kreiner, A.Kreiner Company
Staff – Kevin Yingling & Charley Robison, Delaware Energy Office, DNREC

[39] Changed jobs and left Work Group mid-process.

APPENDIX B – Status of 2003 Energy Plan Recommendations

REDUCING ENERGY USE RECOMMENDATIONS			
	Recommendation	**Agency**	**Status (Spring '08)**
1Bi,1Bv	Comprehensive residential ed program	Energy Office	Energy Star Marketing Program – Energy Answers Appliance Grant Program – Pilot Home Performance with Energy Star Program underway – Future SEU will offer extensive residential energy efficiency programs
Strategy 1Bii	info disclusure to consumers	Energy Office	Utilities state environmental costs/public benefit costs on utility bills
Strategy 1Biii	DOE programs	Energy Office	Participate in DOE Clean State Program (Alt Fuels), Million Solar Roofs and Industries of Future Programs complete – DOE funding for programs limited at this time
1Bvi, 1Bv	Promote Energy Star to businesses	Energy Office	Energy Star Marketing Program; Business Answers Program – Future SEU will offer extensive programs for business
Strategy 1Bvii	Energy Efficiant Mortgages	DNREC/DSHA	met with Fannie Mae/ no additional progress to date
Strategy 1Bviii	Commercial building ed	Energy Office	2 EO staff completed commercial energy auditor training
Strategy 1Bix	Industrial audits	Energy Office	Expected to be part of SEU program activities
Strategy 1Cii	Building Code training	Energy Office	State Energy Code Update proposed through legislation this year – workshops to be accomplished statewide before implementation
Strategy 1Di	Green Building Award	Energy Office	Made initial proposal based on Ohio Model – no award given to date
Strategy 1Dii	Direct incentives - appliances	Energy Office	Energy An$wers Program Rebates/Grants for ENERGY STAR qualified appliances
Strategy 1Diii	Commercial tax incentives	Energy Office	Potential Legislation – none to date
Strategy 1Div	Tax Incentives LEED	Energy Office	Potential Legislation – none to date
Strategy 1Dv	Tax incentives - motors	Energy Office	Potential Legislation – none to date
Strategy 1Dvi	Industrial incentives	Energy Office	Expected to be part of SEU program activities; Current Business Answers Program
1Ei,1Eiii	En Eff. Rate study/Demand Response	PSC	Currently being studied as part of Regulation Docket 59. Sustainable Energy Utility formed by legislature to take lead in Energy Efficiency programs
Strategy 1Fii	Eval weatherization funding	DHSS	SB96 was never signed into law, therefore, the WAP never received any funding from this bill. However, the WAP did receive one-time funding of $500,000 in '06 under SB280. In 07, the funding was reduced by the Division to $300,000 and to $250,000 in 08.
Strategy 8Bi	Benchmark Buildings	DAS	Some buildings were audited. Currently being done in conjunction with performance contracting
Strategy 8Bii	Performance Contracting	DAS	legislation signed. OMB recently hired energy resource in DFM focusing on this. Currently working on Carvel/Richardson Robbins building projects.
Strategy 8Biv	LCA for buildings	DAS	SB 307 signed by Governor 8/19/2004
Strategy 8Bv	Revolving loan fund		No additional work done, however, the state is looking more seriously to performance contracts and bundling smaller state operations to achieve greater cost savings.
8Bvi, 8Bviii	En. Eff. & En. Star Products	DAS	HB 434 signed by Governor 8/19/2004
Strategy 8Bviii	Employee training	DAS	Initial training was completed but has not been updated.
Strategy 8Bxi	agencies enter data	Cabinet Comm	Done automatically through current energy contract.
Strategy 8Bxv	agencies consult w/ en off& DAS	Cabinet Comm	Implemented as part of life cycle analysis legislation.
Strategy 8Bxvi	LCA on products	Energy Office	Worked with OMB/Support Services to develop guidelines/workshop completed
Strategy 8Bxvi	recycled products (en office & P2)	DNREC	DNREC's Energy Office and P2 program jointly participate ion our Green Group – looking for ways to increase recycling rates and practice source reduction
Strategy 1Fii	En. Effic. stds/ Bulk purchasing	DSHA	have standards for HVAC & water heaters
Strategy 1Eii	Pilot project - Green housing	DSHA	looking for demo funds 18 months out, mort will be tied to en efficiency